

Health Reports

What has changed since cannabis was legalized?

by Michelle Rotermann

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Abstract

Background: The Canadian government legalized non-medical cannabis use by adults in October 2018 in order to minimize associated harms and re-direct profits from criminals.

Data and methods: Seven quarters of (NCS) data were combined into two groups: pre- and post-legalization periods - to examine changes in: cannabis use (overall, daily or almost daily (DAD)), source of product, driving after consumption and riding in a vehicle with a driver who had consumed.

Results: By 2019, overall cannabis use had increased (16.8% vs. 14.9%), particularly among: males, adults aged 25 and older, and in Newfoundland and Labrador, Nova Scotia, New Brunswick, and Alberta. DAD use, at 6.0%, remained stable, as did the prevalence of driving within 2 hours of consumption (13.2%). Riding in a vehicle with a driver who had used declined, overall (from 5.3% to 4.2%) and among: females, persons aged 25 and older, and in Newfoundland and Labrador, Ontario and Alberta. Where Canadians reported obtaining their cannabis also changed, with increasing percentages reporting getting some or all of their cannabis from legal sources, and fewer using illegal sources or relying on friends/family. Some provinces experienced more change than others.

Interpretation: While too soon to observe the longer-term impacts associated with the *Cannabis Act*, early indications based on data collected in the months surrounding enactment suggests some cautions and also some assurances. Ongoing monitoring will be essential particularly given the 2.0 Act modifications and the ever-changing provincial retail and regulatory landscapes.

Keywords: legalization, *Cannabis Act*, C-45, controlled and illegal drugs, marijuana, substance use

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Cannabis is one of the most widely used substances in Canada with nearly half of Canadians reporting having used it at some time in their lives.¹ In October 2018 Canada became the second country in the world to legalize its² sale, possession and non-medical use by adults² which followed the legalization of cannabis for medical purposes about two decades earlier.³ Impaired driving laws were also amended to further safeguard Canadians' health and safety.⁴

The *Cannabis Act* has three main public health goals: to keep cannabis out of the hands of youth, to keep profits out of the pockets of criminals, and to protect public health and safety by allowing adults access to legal cannabis.⁵ Provinces and territories are responsible for determining how cannabis is distributed and sold within their jurisdictions.⁶ Each province and territory also has flexibility to set additional restrictions, including limits on possession, personal cultivation, and public use, and increasing the minimum age of use.⁶

The National Cannabis Survey (NCS) has been collecting self-reported data about Canadian's cannabis consumption every three months, since February 2018.^{7,8} Nevertheless, in order to collect, process, analyze and then disseminate NCS results quarterly, it was required that the questionnaire be concise, with a short collection period (about 31 days) and a modest sample size. As such, sometimes one NCS quarter did not capture enough observations of a particular behaviour. However, because much of the NCS content remained constant, survey quarters could be combined enabling analyses not previously possible.

The primary objective of this study is to examine changes in self-reported cannabis consumption and related behaviours pertaining to the three main public health goals of the *Cannabis Act* (October 17, 2018) as well as driving (or riding in vehicles) while potentially impaired using pooled data collected before and after legalization.

Data sources

The cross-sectional, voluntary National Cannabis Survey (NCS) uses an internet-based electronic questionnaire (EQ) and its content was developed in consultation with several government departments.⁷ More information about the NCS is available online.⁷ On average, each quarter's sample (provinces only) had 5,651 respondents, a response rate of 50% and a collection period of about 31 days (Appendix Table A). The majority of respondents (61%) completed the survey unassisted, using the secure access code sent by mail (Appendix Table A). Respondents who had not completed the survey by about the third week of collection were contacted by telephone and asked to participate with the aid of trained interviewers. The target population of the survey is the household population aged 15 years or older, excluding residents of institutions, the homeless and people living on indigenous reserves.

Study sample

Data from the first, second, and third quarters of 2018 were pooled to form the pre-legalization file (n=17,683) (Appendix Table A). Because the passenger question was introduced for the second quarter of the 2018 survey, the pre-legalization file for this analysis was smaller and comprised of two rather than three quarters (n=11,866); data from the first, second, third, and fourth quarters of 2019 were pooled to form the post-legalization file (n=21,872).

Fourth quarter 2018 data are excluded from this study because its data could not be classified as occurring either before or after legalization due to the overlap between the reference period and enactment of the *Cannabis Act*. Data from the 3 territorial capitals, collected once in 2018 and again in 2019 were also excluded.

Definitions

Outcomes

Past-three month cannabis and daily or almost daily (DAD) use was based on responses to: “During the past three months, how often did you use cannabis?”

Driving within two hours of using cannabis was based on: “In the past three months, have you driven a motor vehicle within two hours of using cannabis?” Respondents who did not have a valid driver’s license were excluded from this part of the analysis.

Having been a passenger in a vehicle operated by someone who had consumed cannabis within two hours was based on: “In the past three months, have you been a passenger in a motor vehicle driven by someone who had been using cannabis in the previous two hours?”

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 or someone else grows; 2) Legal – authorized retailer or online from a licensed producer; 3) Illegal – compassion club, dispensary or storefront, online from another source, acquaintance, or dealer; 4) Friends and family – family member or friend, or shared around a group of friends; 5) Other (not-specified). The “legal only” variable distinguishes consumers who indicated only legal sources from consumers who identified multiple sources.

A higher than expected number of cannabis users reported having accessed cannabis from a legal source prior to official legalization (*Cannabis Act*). Prior to the enactment of the *Cannabis Act*, the only people with legal access were participants of Health Canada’s medical access program, the Access Cannabis for Medical Purposes Regulations (ACMPR).³ The accurate identification of a legal cannabis source might have been more challenging during the months immediately preceding the implementation of the *Cannabis Act* when unlicensed cannabis storefronts and dispensaries were comparatively common but nonetheless illegal.

NCS question wording may also have affected the results. Instead of explicitly defining suppliers as illegal or legal (difficult for respondents to admit to an illegal activity) respondents were given the option to select from a list of 11 sources which were then reduced to five sources, including legal and illegal. Some sources such as “shared among friends” resist the legal-illegal categorization because it is not obvious whether the cannabis shared was sourced legally (or not). Because of interest in monitoring changes in reporting over time the original list and question were intentionally maintained.

Comparisons to counts of active registrants of Health Canada’s ACMPR suggests there were about 342,000 legal medical users prior to non-medical legalization,⁹ considerably below the NCS-based legal estimates (Table 3). Transparency in how respondents interpret survey questions is important information for data users. As a result of potential mis-reporting, the estimated percentages of cannabis consumers who obtained cannabis from a legal source will likely be over-estimated during the pre-legalization period; while the differences between the pre- and post-legal, as well as illegal estimates will likely be under-estimated.

Covariates

Determination of whether the cannabis use or related behavior occurred **before or after legalization** was based on survey quarter. See Study Sample section above for more information.

Gender was based on: “What is your gender?” 1) male; 2) female; 3) gender diverse. Results for the gender diverse category are unreleasable due to small sample.

Province was based on residence location. The Atlantic region includes four provinces: Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick.

Spending on cannabis was based on: “How much did you spend on cannabis in the past three months?”

What is already known on this subject?

- Cannabis remains one of the most widely used drugs in Canada.
- Before legalization, the prevalence of cannabis use in Canada had been increasing, particularly among those aged 25 and older.
- The prevalence of cannabis use tends to be highest at ages 18 to 24 and higher among males than females.
- With legalization, Canadians’ access to legal cannabis via mortar retail stores and online stores has increased.

What does this study add?

- In 2019, the first year since non-medical cannabis use was legalized, 16.8% of Canadians aged 15 years and older reported using cannabis in the past three months. This was higher than the 14.9% who reported using in 2018, before legalization.
- The percentages of Canadians reporting daily (or almost daily) use remained unchanged at 6.0% in 2019.
- The likelihood of reporting driving within two hours of using cannabis also did not change with legalization—remaining stable at 13.2% of cannabis users with a driver’s license.
- In 2019, more than half (52%) of all consumers reported obtaining at least some cannabis from a legal source. Obtaining cannabis from illegal sources also dropped in the first year of legalization from 51.7% of consumers to 40.1%.

Analytical techniques

All the analyses were stratified according to whether the cannabis use or the cannabis-related behaviour occurred before or after legalization and by age, gender, province, source, and/or frequency of cannabis use (if applicable).

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

Survey sampling weights were applied so that the analysis is representative of the Canadian household population of the ten provinces. The original sampling weights pertaining to the pre-legalization period were each divided by two or three (reflecting the number of 2018 quarters used). The sampling weights associated with the post-legalization period were each divided by four (because all 2019 quarters were included). By combining quarters, the survey's analytical power is improved and the resultant pre-and-post estimates reflect the average of the quarters used.

All pre- versus post-legalization comparisons, as well as differences between characteristics and the comparison groups discussed 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 9.3 and SUDAAN 11.0.3.

Results

Cannabis use prevalence

By 2019, more than 5.1 million people nationally, or 16.8% of Canadians aged 15 or older, reported using cannabis in the three months before surveying (Table 1). This was higher than the 14.9% (4.5

million) reporting use, on average, in 2018 (before legalization).

A third (33.3%) of 18- to 24-year-olds in 2019 reported consuming cannabis in the past three months, a level unchanged from before legalization and also exceeding the rates for people in all other age groups (ranging from 5.9% to 24.4% depending on age). Consumption also continued to be higher among males than females, regardless of year.

Between 2018 and 2019 cannabis use increased, particularly among persons aged 25 and older (13.1% to 15.5%) and among males (17.5% to 20.3%). The corresponding rates for 15- to 24-year-olds (17.5% to 26.4%) and females (12.3% to 13.4%) remained constant. Whereas

Table 1

Prevalence of cannabis use and daily or almost daily use in the past 3 months, by before or after legalization and selected demographics, household population aged 15 or older, Canada (provinces only), 2018 and 2019

	Cannabis use (any) in the past 3 months								Daily or almost daily use							
	Before legalization				After legalization				Before legalization				After legalization			
	'000	%	95% confidence interval		'000	%	95% confidence interval		'000	%	95% confidence interval		'000	%	95% confidence interval	
			from	to			from	to			from	to			from	to
Total	4,457.5	14.9[†]	14.1	15.7	5,122.2	16.8	16.1	17.6	1,774.7	5.9	5.4	6.5	1,824.5	6.0	5.5	6.5
Age group																
15 to 17	217.8	19.8^{E†*}	13.4	28.3	119.2	10.4^{E*}	6.9	15.3	F	F	...	...	F	F	...	...
18 to 24 [†]	811.2	30.9	26.2	36.1	896.7	33.3	29.0	37.8	269.1	10.3	7.7	13.6	268.5	10.0	7.5	13.2
25 to 44	2,203.2	21.2^{†*}	19.6	22.8	2,577.3	24.4*	22.9	25.9	889.9	8.6	7.5	9.8	937.4	8.9	7.9	10.0
45 to 64	981.6	10.0^{†*}	9.1	11.0	1,159.3	11.9*	11.0	12.9	438.3	4.5*	3.9	5.2	432.9	4.4*	3.9	5.1
65 and older	243.7	4.1^{†*}	3.4	4.9	369.8	5.9*	5.2	6.8	96.1	1.6^{†*}	1.2	2.1	159.2	2.6*	2.1	3.1
15 to 24 [†]	1,029.0	27.6	23.8	31.9	1,015.9	26.4	23.1	30.1	350.4	9.4	7.1	12.3	295.0	7.7	5.8	10.0
25 and older	3,428.5	13.1^{†*}	12.4	13.9	4,106.4	15.5*	14.8	16.2	1,424.3	5.4*	4.9	6.0	1,529.5	5.8	5.3	6.3
Gender																
Female	1,857.7	12.3*	11.3	13.4	2,065.0	13.4*	12.6	14.4	735.5	4.9*	4.2	5.7	667.3	4.6*	3.8	4.9
Male [†]	2,568.1	17.5[†]	16.3	18.7	3,029.1	20.3	19.1	21.5	1,016.2	6.9	6.1	7.8	1,143.1	7.6	6.9	8.5
Province																
Newfoundland and Labrador	74.2	16.9[†]	14.5	19.6	92.3	21.1*	18.9	23.6	34.9	7.9*	6.2	10.0	38.7	8.9*	7.3	10.7
Prince Edward Island	20.0	16.1	13.7	18.8	24.1	18.8	16.6	21.3	8.6	6.9	5.3	8.9	9.1	7.2	5.6	9.1
Nova Scotia	168.4	21.3^{†*}	18.9	24.0	205.5	25.7*	23.1	28.5	75.9	9.6*	7.9	11.7	81.1	10.2*	8.4	12.2
New Brunswick	93.9	15.1[†]	12.9	17.7	126.8	20.3*	17.9	22.9	40.1	6.5	5.0	8.3	48.5	7.7*	6.3	9.5
Quebec	714.2	10.4*	8.9	12.0	822.7	11.8*	10.5	13.2	220.5	3.2*	2.4	4.2	229.8	3.3*	2.6	4.1
Ontario	1,812.6	15.5	14.0	17.1	2,095.7	17.5	16.1	19.0	747.2	6.4	5.4	7.5	723.0	6.0	5.1	7.1
Manitoba	170.8	16.9	14.4	19.6	166.8	16.3	14.3	18.5	67.8	6.7	5.1	8.7	61.2	6.0	4.8	7.4
Saskatchewan	119.0	13.6	11.4	16.0	137.2	15.5	13.7	17.5	50.5	5.8	4.4	7.5	52.7	6.0	4.8	7.4
Alberta	563.6	16.4[†]	14.3	18.7	676.2	19.3*	17.4	21.3	248.1	7.2	5.9	8.8	248.1	7.1	5.9	8.5
British Columbia	720.8	18.2*	16.1	20.4	774.8	19.1*	17.2	21.1	280.9	7.1	5.7	8.7	332.3	8.2*	6.9	9.8

... not applicable

^E use with caution

F too unreliable to be published

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

[†] Reference category

[†] Significantly different from corresponding "After legalization" estimate ($p < 0.05$)

Source: National Cannabis Survey first, second and third quarters 2018 and first, second, third, and fourth quarters 2019.

use among 15- to 17-year-olds declined (19.8% to 10.4%).

In 2019, about one-quarter (25.7%) of residents of Nova Scotia (N.S.) and approximately one-fifth of residents of Newfoundland and Labrador (N.L.) (21.1%), New Brunswick (N.B.) (20.3%), Alberta (Alta.) (19.3%), and British Columbia (B.C.) (19.1%) reported using cannabis in the previous three months, above estimates for the rest of Canada (all other provinces combined). At 11.8%, Quebec (Que.) residents had lower-than average use. A comparison of each province's pre-and-post rates also suggests higher percentages of N.L., N.B., Ont. and Alta. residents are using cannabis since legalization.

Daily or almost daily use (DAD)

On average, in 2019, 6.0% of Canadians aged 15 or older reported using cannabis DAD; about the same level as 2018 (5.9%) (Table 1). Regardless of year, DAD users were also more likely to be male and aged 18 to 44. Despite reaching 2.6% in 2019, persons 65 and older continued to be the least likely to consume cannabis DAD but the only population since legalization for whom DAD use increased.

The percentages of the population who reported using DAD varied across the country (3.3% to 10.2% depending on province). In general, provincial DAD use in 2019 reflected regional cannabis use trends, with rates being higher than the national average in most of the Atlantic provinces (ie. N.L., N.S. and N.B.) and B.C., and lower in Que. The one exception was Alta. where DAD use remained comparable to the national level despite having one of the higher levels of cannabis use nationwide.

Driving after cannabis use

Legalization raised concerns about increased use among drivers. According to the NCS, the likelihood of reporting driving after cannabis use did not change with legalization. For example, in 2019, 13.2% of cannabis users with a valid driver's license reported driving within two hours of using cannabis—unchanged

from 2018 (Table 2). Males remained more likely to engage in this behaviour than females (15.6% compared to 9.4%, respectively). The proportion who reported driving within two hours was also more than five times higher among drivers who reported DAD cannabis use than it was among drivers who used less than who used less than DAD (e.g. 28.8% compared to 5.2%, respectively in 2019). By contrast, driving within two hours of using varied little across the country and was not related to age either before- or after-legalization.

Passengers riding with a driver who had been using cannabis

Between 2018 and 2019, the percentage of Canadians aged 15 years or older who were passengers in vehicles operated by drivers who had consumed cannabis within the previous two hours dropped to 4.2% from 5.3% (Table 2). Reductions in this behaviour were, however, limited to three provinces (N.L. 3.6%, Alta. 3.9%, and Ont. 3.7%). At 5.5% and 6.3%, residents of B.C. and N.S. in 2019, were more likely to have been a passenger in a vehicle with a driver who had consumed than elsewhere in Canada.

This behaviour remained more common among 18- to 24-year-olds (11.9%) than it was for both younger and older Canadians (ranging from 0.7% to 6.4% depending on age group). After legalization the likelihood of being a passenger with a potentially-impaired driver was lower for females than males (3.6% versus 4.7%).

Riding with a driver who had consumed was common among passengers who also used cannabis themselves. For example, in 2019, 20.1% of users reported having been a passenger compared with 1.4% of non-cannabis users. Before legalization these estimates were higher (26.2% compared to 2.0%, respectively).

Sources of cannabis

According to the 2019 NCS, an estimated 29.4% of cannabis users reported obtaining all of the cannabis they consumed from a legal source; nearly three

times higher than before legalization (10.7%) (Table 3). Many consumers obtained cannabis from multiple sources. When all those who reported getting at least some of their cannabis from a legal source are combined, the percentage of consumers accessing (at least some) cannabis legally increased to 52.0% in 2019.

Prior to the enactment of the *Cannabis Act*, reports of having obtained cannabis legally based on the NCS were more limited (22.7%) but also likely overstated given that only use for medical purposes was legal and restricted to a comparatively smaller number of participants of Health Canada's ACMPR program.^{3,9}

Obtaining cannabis from other sources also remained a common practice in 2019 – but less so than before legalization. For example, during 2019 about four in ten consumers reported having obtained cannabis from an illegal supplier (40.1%) or to have obtained it from (or to have shared it with) friends and family (37.8%). The corresponding 2018 estimates were significantly higher (51.7% and 48.5%). Growing cannabis, either themselves or by someone else, was a supply-source for 9.9% of consumers, and 3.2% reported another (unspecified) source—both unchanged from 2018.

Many of the national findings observed since legalization are also evident at the provincial level, including increases in the numbers of residents in all provinces reporting having obtained cannabis from legal sources and fewer residents in seven of ten provinces reporting having obtaining it illegally (Table 3).

Cannabis is distributed and sold in Canada using three retail-models: government (public), private, or a hybrid depending on province.¹⁰ Each province also provides access through online stores, regardless of the numbers physical bricks-and-mortar stores.

Owing, at least in part, to variations in accessibility, which for many means proximity to physical stores, residents of regions with: more (e.g. Alta), or less (e.g. Ont. or B.C.) stores, or higher per capita access (e.g. N.L.) may report differently. Indeed, in 2019 higher percentages of the Atlantic

Table 2

Number and percentage of people driving within two hours of having consumed cannabis or reporting having been a passenger in a vehicle operated by a driver who had consumed within two hours, by before or after legalization and selected characteristics, household population aged 15 or older, Canada (provinces only), 2018 and 2019

	Driving within two hours of having consumed cannabis in past 3 months								Being a passenger in a vehicle operated by a driver who had consumed cannabis within two hours in past 3 months							
	Before legalization				After legalization				Before legalization				After legalization			
			95% confidence interval				95% confidence interval				95% confidence interval				95% confidence interval	
	'000	%	from	to	'000	%	from	to	'000	%	from	to	'000	%	from	to
Total	572.6	14.2	12.1	16.6	621.7	13.2	11.4	15.3	1,459.1	5.3[†]	4.6	6.1	1,180.5	4.2	3.7	4.6
Age group																
15 to 17	F	F	...	...	F	F	...	...	F	F	...	...	63.0	6.0^{E*}	3.3	10.6
18 to 24 [†]	111.9	16.4^E	9.9	25.8	75.4	9.7^E	5.8	16.0	364.5	15.2	10.9	20.8	289.1	11.9	9.4	15.0
25 to 44	296.8	14.6	11.8	17.8	367.8	15.3	12.6	18.5	701.1	7.6[*]	6.3	9.1	618.5	6.4[*]	5.5	7.4
45 to 64	121.6	13.0	9.9	16.7	138.2	12.5	9.8	15.9	272.0	3.0^{†*}	2.3	3.8	166.5	1.8[*]	1.4	2.3
65 and older	33.0	13.8^E	8.8	20.9	35.8	10.3^E	6.8	15.4	34.4	0.6^{E*}	0.3	1.1	43.4	0.7^{E*}	0.5	1.0
15 to 24 [†]	121.3	14.8^E	9.1	23.1	79.9	9.3^E	5.6	15.0	451.6	13.1	9.7	17.5	352.0	10.1	8.1	12.6
25 and older	451.3	14.0	12.0	16.4	541.8	14.1	12.1	16.3	1,007.5	4.2^{†*}	3.6	4.9	828.5	3.3[*]	3.0	3.8
Gender																
Female	160.7	9.7[*]	7.4	12.7	174.6	9.4[*]	7.0	12.4	672.4	4.8[†]	3.9	5.9	523.4	3.6	3.1	4.3
Male [†]	401.9	17.0	14.0	20.4	440.7	15.6	13.1	18.4	762.5	5.7	4.7	6.8	642.0	4.7[*]	4.0	5.4
Province																
Newfoundland and Labrador	10.8	15.3^E	10.2	22.4	9.3	10.9^E	7.1	16.4	27.0	6.7^{E†}	4.7	9.5	14.4	3.6^E	2.5	5.0
Prince Edward Island	2.1	12.3^E	7.5	19.6	4.3	18.2^E	12.7	25.3	6.9	5.9^E	3.8	9.1	5.5	4.6^E	3.3	6.4
Nova Scotia	25.9	16.6^E	11.3	23.6	19.3	10.3^E	7.3	14.3	41.4	5.7^E	3.9	8.1	46.2	6.3[*]	4.8	8.2
New Brunswick	15.4	17.6^E	11.4	26.1	13.2	11.4^E	7.4	17.2	33.8	5.9^E	4.2	8.2	31.3	5.4	4.0	7.3
Quebec	91.8	14.5^E	9.7	21.2	102.9	13.7	9.9	18.7	261.0	4.0[*]	3.0	5.5	250.7	3.8	3.0	4.7
Ontario	210.8	13.2^E	9.4	18.2	239.9	12.4	9.2	16.4	624.2	5.9[†]	4.5	7.6	410.9	3.7	3.0	4.7
Manitoba	20.8	13.1^E	8.3	20.0	27.5	17.6^E	12.5	24.1	45.6	4.8^E	3.3	6.8	47.7	4.9	3.7	6.5
Saskatchewan	23.0	20.2^E	13.3	29.6	15.1	11.5^E	8.1	16.2	50.0	6.0^E	4.0	8.9	39.5	4.9	3.8	6.3
Alberta	92.1	17.7^E	12.5	24.3	86.0	13.7	10.3	18.0	201.1	6.4[†]	4.6	8.8	126.3	3.9	3.0	5.0
British Columbia	79.7	11.8^E	8.1	16.8	104.3	15.1	11.0	20.4	168.2	4.6^E	3.2	6.5	208.1	5.5[*]	4.3	7.0
Used cannabis in the past 3 months																
No	...	...	...	...	...	...	...	...	478.2	2.0^{†*}	1.6	2.6	330.9	1.4[*]	1.1	1.7
Yes [†]	980.9	26.2[†]	22.5	30.4	848.2	20.1	17.8	22.5
Cannabis use frequency																
Less than daily or almost daily	139.4	5.6^{E*}	4.0	7.9	163.2	5.2[*]	3.9	7.0	478.6	21.0^{†*}	16.7	26.0	429.7	15.5[*]	13.1	18.4
Once or twice	39.5	3.1^{E*}	1.8	5.3	25.7	1.7^{E*}	1.0	3.1	247.8	20.5^{†*}	14.7	27.9	156.0	11.6[*]	8.7	15.3
Monthly	F	F	...	...	F	F	...	...	109.5	24.1^E	14.6	37.2	94.0	17.8^{E*}	12.0	25.7
Weekly	87.2	12.8^{E*}	8.0	19.9	94.4	9.4^{E*}	6.5	13.5	121.3	19.6^{E*}	13.5	27.5	179.7	20.0[*]	15.4	25.6
Daily or almost daily [†]	433.1	27.9	23.5	32.7	458.5	28.8	24.7	33.4	502.3	34.5	28.1	41.4	418.4	28.6	24.5	33.1

... not applicable

^E use with caution

F too unreliable to be published

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

[†] Reference category

[†] Significantly different from corresponding "After legalization" estimate (p<0.05)

Note: Because the passenger question was not asked in the first quarter 2018 survey, the 'Before legalization' period is defined using second and third quarter 2018 data only. Prior to legalization, 8.6% of Canadians and 6.9% afterwards reported that they did not know whether they had been in a motor vehicle operated by someone who had consumed cannabis within 2 hours. This analysis is limited to those reporting either yes or no; representing over 91% of Canadians, aged 15 or older.

Source: National Cannabis Survey first, second and third quarters 2018 and first, second, third, and fourth quarters 2019

region, including N.L. and Albertan consumers, in addition to Que. (58.0%) and Manitoba (59.3%), reported obtaining at least some of their cannabis legally, significantly above the rest of Canada, whereas residents of B.C. and Ont. reported lower-than-average-acquisition of cannabis from legal sources (36.6%

and 47.3%, respectively). While, other regional differences may be explained by other factors.

Where cannabis is accessed also tends to differ by dollar amount spent. Because it takes many more low-level spenders to accumulate the same amount of expenditure as one 'big spender,' monitoring

changes in source by spending category is another way to quantify progress made on eliminating (or substantially reducing) the cannabis black market.

Analysis of NCS data show, for example, that legalization changed little for the approximately one-quarter of cannabis consumers who reported not

paying for the cannabis they used (data not shown), and as before the majority (69.8% in 2019 and 77.1% in 2018) of those who reported not paying, continued to report that they got (or share) at least some of their cannabis with (or from) family and friends (Table 4).

For the highest spenders (that is, persons spending more than \$250 over three months), accounting for about one-fifth of consumers, more reported obtaining all (24.3% in 2019 up from 16.6%) or at least some cannabis from legal sources in 2019 than previously (59.4% compared to 39.3% in 2018). Also, use of illegal cannabis by the highest spenders decreased (from 70.1% in 2018 to 62.0% in 2019). However, reported use of cannabis obtained from friends and family remained unchanged (29.0% in 2019 versus 28.4% in 2018).

Among cannabis consumers who spent \$1-to-\$250 (over three months), the proportions obtaining cannabis legally (exclusively or at least sometimes) increased from 2018 to 2019 while those using illegal sources, as well as reports of obtaining cannabis from friends and family dropped.

Discussion

This study presents an overview of changes in cannabis use and related behaviours in the months immediately before and after the *Cannabis Act* was implemented, using nationally-representative, Canadian data from the ten provinces.

There is a growing consensus that cannabis use can harm adolescent brains^{11,12} and that cannabis use initiated at a younger age increases the likelihood of developing problem cannabis use.¹³ Cannabis use during adolescence is also associated with worse mental health¹⁴⁻¹⁶ and educational outcomes, and longer-term personal disadvantage.^{14,16} More frequent users are at the highest risk of problems.¹³ Because reported cannabis use prevalence tends to be higher after legalization¹⁷ (although some of the increase could be owing to a greater willingness to disclose) many feared that youth use would also rise. Early indica-

Table 3

Number and percentage of consumers who accessed cannabis from each source, by before or after legalization and province, household population aged 15 or older, Canada (provinces only), 2018 and 2019

	Before legalization				After legalization			
	'000	%	95% confidence interval		'000	%	95% confidence interval	
			from	to			from	to
Canada (provinces only)								
Grown by the user or another person	393.9	8.8	7.3	10.7	506.9	9.9	8.4	11.7
Illegal	2,302.4	51.7 [†]	48.6	54.8	2,048.7	40.1	37.6	42.7
Legal	1,010.1	22.7 [†]	20.3	25.3	2,656.3	52.0	49.4	54.7
Only Legal	474.5	10.7 [†]	9.0	12.6	1,501.1	29.4	27.1	31.9
Friends and family	2,159.1	48.5 [†]	45.3	51.7	1,929.4	37.8	35.3	40.4
Other (unspecified)	165.1	3.7	2.8	4.9	162.7	3.2	2.4	4.1
Province								
Newfoundland and Labrador								
Grown by the user or another person	F	F	...	...	5.2	5.6 ^{E*}	3.3	9.4
Illegal	39.4	53.2 [†]	44.7	61.6	35.8	38.8	32.1	45.9
Legal	16.7	22.5 [†]	16.4	30.1	65.4	70.8*	63.7	77.0
Only Legal	9.8	13.3 ^{E†}	8.9	19.4	37.2	40.2*	33.5	47.4
Friends and family	35.0	47.3 [†]	38.6	56.1	27.1	29.4*	23.3	36.3
Other (unspecified)	F	F	...	...	F	F	...	...
Prince Edward Island								
Grown by the user or another person	1.6	8.0 ^E	4.4	14.2	2.5	10.2 ^E	6.2	16.4
Illegal	9.7	48.7 [†]	39.3	58.1	7.0	29.3*	22.7	36.9
Legal	5.5	27.6 [†]	19.7	37.2	17.4	72.2*	64.7	78.6
Only Legal	2.9	14.7 ^{E†}	8.8	23.4	10.7	44.4*	37.5	51.6
Friends and family	8.5	42.5	33.4	52.2	7.9	32.7	25.8	40.5
Other (unspecified)	F	F	...	...	F	F	...	...
Nova Scotia								
Grown by the user or another person	18.7	11.1 ^E	6.9	17.4	27.5	13.5	10.3	17.5
Illegal	84.5	50.3 [†]	42.4	58.1	70.1	34.3	28.2	41.1
Legal	35.3	21.0 [†]	15.8	27.4	124.2	60.8*	54.4	66.9
Only Legal	16.6	9.9 ^{E†}	6.6	14.6	70.0	34.3	28.4	40.8
Friends and family	77.4	46.0 [†]	38.4	53.9	68.8	33.7	27.6	40.5
Other (unspecified)	F	F	...	...	F	F	...	...
New Brunswick								
Grown by the user or another person	9.7	10.3 ^E	6.2	16.7	14.4	11.5 ^E	7.8	16.5
Illegal	40.1	42.7	33.9	51.9	40.0	31.7*	25.0	39.4
Legal	14.1	15.0 ^{E*†}	10.0	22.0	76.2	60.5*	53.1	67.5
Only Legal	5.8	6.2 ^{E*†}	3.2	11.6	50.5	40.1*	33.4	47.2
Friends and family	56.4	60.1 ^{*†}	51.7	68.0	38.1	30.3*	24.3	37.0
Other (unspecified)	F	F	...	...	F	F	...	...
Quebec								
Grown by the user or another person	77.0	10.9 ^E	7.2	16.1	44.7	5.5 ^{E*}	2.9	10.0
Illegal	393.7	55.5 [†]	47.3	63.4	327.3	40.1	33.9	46.6
Legal	56.2	7.9 ^{E*†}	4.6	13.3	473.3	58.0*	51.6	64.1
Only Legal	F	F	...	...	280.5	34.3	28.3	41.0
Friends and family	354.9	50.0 [†]	42.3	57.7	256.3	31.4*	26.0	37.4
Other (unspecified)	F	F	...	...	F	F	...	...
Ontario								
Grown by the user or another person	173.5	9.6 ^E	6.7	13.5	262.3	12.5*	9.6	16.3
Illegal	916.9	50.6 [†]	44.8	56.3	791.2	37.9	33.0	43.0
Legal	429.0	23.7 ^{*†}	19.1	28.9	988.1	47.3*	42.3	52.3
Only Legal	205.1	11.3 [†]	8.3	15.2	575.9	27.6	23.4	32.2
Friends and family	916.9	50.6 [†]	44.8	56.4	893.8	42.8*	38.1	47.6
Other (unspecified)	72.6	4.0 ^E	2.4	6.5	74.9	3.6 ^E	2.3	5.5
Manitoba								
Grown by the user or another person	7.8	4.6 ^{E*}	2.5	8.2	F	F	...	...
Illegal	76.5	44.8	36.7	53.1	64.1	38.6	32.0	45.6
Legal	59.7	35.0 ^{*†}	27.2	43.6	98.6	59.3*	52.4	65.9
Only Legal	23.9	14.0 ^{E†}	9.8	19.7	50.3	30.3	24.5	36.8
Friends and family	85.0	49.7	41.3	58.2	68.6	41.3	34.4	48.5
Other (unspecified)	9.0	5.3 ^E	2.9	9.5	F	F	...	...

tions from this NCS study suggests use among Canadian youth has not increased. This accords with the Colorado experience—the first to legalize non-medical cannabis.¹⁷ However, cannabis use at older ages and overall prevalence did increase, not only during the years covered by the NCS, but also over the longer term.¹⁸⁻¹⁹

For the majority, occasional use will be unremarkable, but other studies have found that when overall prevalence increases so too does the risk for cannabis use disorder.²⁰

Higher frequency cannabis use, typically defined as DAD, has been associated with: risk of cannabis dependence^{13,21} and use of other substances.^{15,22} Consumers who use cannabis more regularly also consume higher quantities by weight.^{19,21,23}

What also did not change is that cannabis use prevalence overall in addition to DAD use remained considerably more common among 15- to 24-year-olds than among people aged 25 and older. Use started during adolescence increases one's lifetime risk of developing a substance use disorder,^{20,22} among other problems.^{13-14,16,22}

Cannabis can impair one's ability to drive and is associated with an increased risk of motor vehicle collisions.^{24,25} Legalization raised concerns about cannabis-impaired driving. Statistics Canada has traditionally monitored cannabis-impaired driving by tracking incidents of drug-impaired driving (not specific to cannabis) reported by police. Police-reported crime data indicate that drug-impaired driving incidents nearly tripled from 2009 to 2018.²⁶ Some of the rise, however, may reflect improvements in detection and more complete police reporting, rather than increasing frequency of such incidents. Because not all drug-impaired driving is detected by police the NCS included questions about driving after cannabis use (as well as riding in vehicles with potentially impaired drivers) to provide a fuller statistical picture of these phenomena.

Comparisons between data collected before and after legalization suggests

Table 3

Number and percentage of consumers who accessed cannabis from each source, by before or after legalization and province, household population aged 15 or older, Canada (provinces only), 2018 and 2019

	Before legalization				After legalization			
	'000	%	95% confidence interval		'000	%	95% confidence interval	
			from	to			from	to
Saskatchewan								
Grown by the user or another person	7.7	6.5 ^E	3.5	12.0	7.6	5.5 ^{E*}	3.0	10.0
Illegal	71.4	60.1 [‡]	51.3	68.3	59.6	43.5	37.0	50.1
Legal	23.8	20.1 [‡]	14.1	27.8	80.6	58.8	52.1	65.1
Only Legal	10.1	8.5 ^{E‡}	4.8	14.5	37.6	27.4	21.7	33.9
Friends and family	48.8	41.0	33.1	49.5	47.6	34.7	28.4	41.7
Other (unspecified)	6.5	5.5	2.9	10.1	F	F	...	...
Alberta								
Grown by the user or another person	33.1	5.9 ^E	3.4	9.9	41.0	6.1 ^{E*}	3.9	9.2
Illegal	277.4	49.2 [‡]	41.8	56.7	256.7	38.0	32.5	43.8
Legal	202.7	36.0 ^{*‡}	29.5	43.0	450.3	66.7 [*]	60.8	72.1
Only Legal	102.2	18.1 ^{*‡}	13.5	24.0	258.9	38.3 [*]	32.4	44.6
Friends and family	256.9	45.6 [‡]	38.3	53.0	195.0	28.9 [*]	23.7	34.7
Other (unspecified)	29.9	5.3	2.7	10.0	F	F	...	...
British Columbia								
Grown by the user or another person	62.0	8.6 ^E	5.7	12.7	96.5	12.5	9.3	16.7
Illegal	392.7	54.5	47.3	61.5	396.9	51.4 [*]	45.2	57.6
Legal	167.0	23.2 [‡]	17.6	29.9	282.3	36.6 [*]	30.9	42.6
Only Legal	83.7	11.6 ^E	7.8	17.0	129.6	16.8 [*]	12.7	21.9
Friends and family	319.4	44.3	37.1	51.8	326.2	42.3	36.3	48.5
Other (unspecified)	F	F	...	...	F	F	...	...

... not applicable

^E use with caution

F too unreliable to be published

* significantly different from rest of Canada ($p < 0.05$)

[‡] significantly different from corresponding "After legalization" estimate ($p < 0.05$)

Note: A higher than expected number of cannabis users reported having accessed cannabis from a legal source prior to official legalization (*Cannabis Act*). This suggests some Canadians were unable to distinguish authorized dispensaries from illegal ones. The accurate identification of a legal cannabis source might have been more challenging during the months immediately preceding the implementation of the *Cannabis Act* when unlicensed cannabis storefronts and dispensaries were comparatively common but nonetheless illegal. The legal status of the reported source was not verified. Because respondents could choose more than one category, the sum of the percentages may not add to 100%. The reference period for obtaining cannabis occurred over the three month period preceding survey participation.

Source: National Cannabis Survey first, second and third quarters 2018 and first, second, third, and fourth quarters 2019.

not much has changed with 13.2% of cannabis users with a driver's license reporting having driven within two hours of using---about the same as in 2018. Males, in both years, were more likely to drive after consuming. On the other hand, reports of riding with a driver who had consumed cannabis were less common in 2019 than before, and largely owing to a reduction in the behaviour among females in particular. While the likelihood of driving after using did not differ by age, reports of getting into a vehicle with a driver who had consumed were more prevalent among 15- to 24-year-olds than those aged 25 and older and in 2019, was more common among males.

This analysis was limited to outcomes covered by the NCS. In general, the changes observed were modest which may indicate that Canada's public-health approach to legalization with considerable regulatory oversight,^{2,6} restrictions on promotion, packaging, and advertising, an emphasis on education, etc. is working. Conversely, impacts of legalization might have been slowed due to regional differences in access to legal retail stores, and supply shortages, or even the brevity of the post-legalization period. Other studies and reports relying on administrative hospital and emergency room, poison control and treatment data would provide a more complete picture

of (adverse) health effects following legalization.^{17,27}

One of the main goals of legalization was the elimination (or substantial reduction) in purchase of cannabis from the black market, that is, illegal sources. According to this study, more Canadians are obtaining cannabis legally and also fewer are using illegally-sourced cannabis than before the legislative change. While not directly comparable (owing to differences in survey methodology or design) other studies using different data have also found more Canadians are accessing cannabis legally than ever before.^{10,28}

Strengths and Limitations

This study has a number of strengths, including the use of a multiple outcomes, having comparison-data collected before and after legalization and the analytical advantage of combining survey quarters. For example, it would not be possible to conduct provincial analyses of cannabis sources or analyses of cannabis sources by spending level without combining.

Nevertheless, 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. A higher than expected number of cannabis users reported having accessed cannabis from a legal source prior to official legalization (*Cannabis Act*). As such, the NCS over-estimated the percentage of Canadians who obtained cannabis from a legal source.

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 neither be controlled nor detected, but could affect results. In Canada, as in many other countries, legal access to medical and most recently non-medical cannabis may have influenced willingness to report use. These changes may be particularly relevant for older adults, and as such, some of the observed increases may reflect not so much a change in behaviour, but rather, a new willingness to report. However,

Table 4

Number and percentage of consumers who accessed cannabis from each source, by before or after legalization and cannabis expenditures, household population aged 15 or older, Canada (provinces only), 2018 and 2019

	Before legalization				After legalization			
	'000	%	95% confidence interval		'000	%	95% confidence interval	
			from	to			from	to
Cannabis expenditures in the past 3 months								
\$0 (nothing)								
Grown by the user or another person	152.1	10.4	7.7	13.9	170.0	14.0 ^E	10.3	18.8
Illegal	347.6	23.7*	19.6	28.3	313.6	25.8*	21.0	31.3
Legal	110.1	7.5 ^{E*}	4.8	11.5	143.3	11.8*	9.1	15.2
Only Legal	34.3	2.3 ^{E*†}	1.3	4.2	60.7	5.0 ^{E*}	3.3	7.5
Friends and family	1,130.7	77.1*†	72.6	81.0	848.3	69.8*	64.8	74.4
Other (unspecified)	46.7	3.2 ^E	2.0	5.1	53.1	4.4 ^E	2.7	6.9
\$1 to \$50								
Grown by the user or another person	36.9	5.2 ^{E*}	3.1	8.8	78.4	7.2 ^E	4.5	11.5
Illegal	424.9	60.4*†	52.8	67.4	375.3	34.7*	29.3	40.5
Legal	134.0	19.0 ^{E*†}	13.6	26.0	693.4	64.0	58.3	69.3
Only Legal	67.4	9.6 ^{E*†}	6.1	14.8	466.4	43.1*	37.6	48.8
Friends and family	329.9	46.9*†	38.8	55.1	346.6	32.0	26.7	37.8
Other (unspecified)	F	F	...	...	F	F	...	...
\$51 to \$250								
Grown by the user or another person	95.9	7.8	5.6	10.6	136.3	7.6*	5.8	10.0
Illegal	800.6	64.7†	59.1	69.9	743.8	41.6*	37.3	46.0
Legal	355.8	28.8*†	24.1	34.0	1,212.9	67.8*	63.6	71.7
Only Legal	201.4	16.3†	12.5	20.9	715.1	40.0*	35.6	44.5
Friends and family	399.8	32.3†	27.0	38.1	442.5	24.7	20.8	29.2
Other (unspecified)	60.8	4.9 ^E	3.0	7.9	50.2	2.8 ^E	1.7	4.6
\$251 or more†								
Grown by the user or another person	108.2	10.6 ^E	6.8	16.1	120.9	12.2	8.8	16.7
Illegal	715.9	70.1†	64.2	75.4	615.2	62.0	56.4	67.3
Legal	401.4	39.3†	33.1	45.9	588.6	59.4	53.6	64.8
Only Legal	169.0	16.6†	12.6	21.4	241.4	24.3	19.7	29.7
Friends and family	290.4	28.4	22.5	35.3	287.8	29.0	24.1	34.5
Other (unspecified)	43.0	4.2 ^E	2.4	7.3	33.3	3.4 ^E	2.1	5.3

... not applicable

^E use with caution

F too unreliable to be published

^{*} significantly different from reference category ($p < 0.05$)

[†] reference category

[‡] Significantly different from corresponding "After legalization" estimate ($p < 0.05$)

Note: A higher than expected number of cannabis users reported having accessed cannabis from a legal source prior to official legalization (*Cannabis Act*). This suggests some Canadians were unable to distinguish authorized dispensaries from illegal ones. The accurate identification of a legal cannabis source might have been more challenging during the months immediately preceding the implementation of the *Cannabis Act* when unlicensed cannabis storefronts and dispensaries were comparatively common but nonetheless illegal. The accurate identification of a legal cannabis source might have been more challenging during the months immediately preceding the implementation of the *Cannabis Act* when unlicensed cannabis storefronts and dispensaries were comparatively common but nonetheless illegal. The legal status of the reported source was not verified. Because respondents could choose more than one category, the sum of the percentages may not add to 100%. The reference period for obtaining cannabis occurred over the three month period preceding survey participation.

Source: National Cannabis Survey first, second and third quarters 2018 and first, second, third, and fourth quarters 2019.

others studies that have assessed the accuracy of self-reported cannabis use against urine-drug testing tend to find few inconsistencies.²⁹

Combining NCS quarters yields larger sample sizes for analysis, and the resulting estimates are of higher quality than those from a single quarter. However, because

this approach combines several quarters into one, the variable of interest must be available and consistently captured on all quarters, e.g. questions about medical use were introduced at the end of 2018 highlighting the importance of continuous and consistent data collection.

Although combining NCS cycles reduces the problem of small sample sizes, it is not completely eliminated and frequently it was necessary to examine covariates separately. Small sample sizes in other parts may also have reduced the ability to reach statistical significance. The combined estimates represent period averages meaning quarterly variation is minimized.³⁰

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

Analyses are limited to household respondents and therefore some groups, known to be at high risk for drug use (e.g. the homeless) are excluded.

Conclusion

The policies governing cannabis production, distribution, sale, and consumption continue to evolve. While the first year of Canada's legalization policy was accompanied by generally modest change in cannabis-related behaviours several potentially important policy changes are coming into effect in early 2020,² including the legal sale of more potent products and edibles (which can pose special risks).^{27,31} Some provinces (e.g. Ont.) will also be: opening the

market for retail cannabis by removing the cap on the number of private stores;³² while another (N.B.) is planning to privatize formerly government-run operations.³³ One province (Que.), alternatively, has raised the legal age from 18 to 21 for 2020.³⁴ As a result, the true impacts of the *Cannabis Act* will not be known until more time has passed and the accompanying nascent retail-market-place has stabilized.

Appendix

Table A

Collection dates, sample size, response rates, percent using the Respondent Electronic questionnaire (rEQ) by National Cannabis Survey quarter, 2018 and 2019

	Collection dates									
	2018				2019				Total	Total 2018 and 2019
	First quarter	Second quarter	Third quarter	Total	First quarter	Second quarter	Third quarter	Fourth quarter		
	Feb. 19 to Mar. 18	May 16 to June 12	Aug. 16 to Sep. 12		Feb. 11 to Mar. 11	May 14 to June 16	Aug. 14 to Sep. 16	Nov. 13 to Dec. 17		
Collection days	28	28	28	(28)	29	34	34	35	(33)	(31)
Sample size										
Canada (including territorial capitals)	5,817	7,285	5,798	18,900	5,686	6,466	5,452	5,278	22,882	41,782
Canada (provinces only)	5,817	6,068	5,798	17,683	5,686	5,456	5,452	5,278	21,872	39,555
					percent					
Response rates	51.2	51.3	51.6	(51.4)	50.6	46.9	50.9	47.2	(48.9)	(50.0)
Interviews completed using rEQ	54.2	61.5	67.1	(60.9)	63.0	62.6	60.4	60.2	(62.0)	(61.3)

Note: Averages are in parentheses.

Source: National Cannabis Survey first, second, and, third quarters 2018 and first, second, third, and fourth quarters 2019.

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