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Research

Characteristics of Canadians likely to try or increase cannabis use following legalization for nonmedical purposes: a cross-sectional study

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Abstract

Background: The Government of Canada legalized nonmedical use of cannabis in October 2018. Our objectives were to determine the percentage of Canadians intending to try or increase their cannabis use following legalization and to explore characteristics associated with this intent.

Methods: We used data from the 2018 National Cannabis Survey and constructed multivariable regression models. Respondents' data were weighted and bootstrapped. We report relative measures of association as adjusted odds ratios (ORs) and absolute measures of association as adjusted risk increases (RIs).

Results: Among the 39 000 households selected for recruitment for the survey, 17 089 respondents provided complete data (43.8%) and our weighted analysis represented 27 808 081 Canadians aged 15 years and older. An estimated 18.5% of respondents (95% confidence interval [CI] 17.6%–19.5%) indicated they intended to try or increase cannabis use following legalization. Being more likely to try or increase cannabis use was associated with younger age (15–24 yr v. ≥ 65 yr; adjusted OR 3.8, 95% CI 2.6–5.6; adjusted RI 20.1%, 95% CI 13.9%–26.2%), cannabis use in the past 3 months versus no use (adjusted OR 3.3, 95% CI 2.8–3.9; adjusted RI 20.4%, 95% CI 17.1%–23.6%), higher income (≥ $80 000 v. < $40 000; adjusted OR 1.5, 95% CI 1.3–1.9; adjusted RI 6.1%, 95% CI 3.2%–9.0%) and poor or fair mental health versus good to excellent mental health (adjusted OR 2.0, 95% CI 1.6–2.6; adjusted RI 11.5%, 95% CI 6.7%–16.2%).

Interpretation: Nearly 1 in 5 respondents reported that they intended to try or increase cannabis use after legalization; however, intention may not translate into behaviour. Continued monitoring should help to establish rates and patterns of cannabis use among Canadians following legalization.

According to the 2017 Canadian Tobacco Alcohol and Drugs Survey, 15% of Canadians aged 15 years and older reported using cannabis in the past year, the same percentage as for current cigarette use.[1] Approximately 78% of respondents reported consuming alcohol in the past year and 24% reported heavy drinking.[1] Overall, substance use was highest among males aged 20–24 years.[1] There is substantial evidence that cannabis use is associated with motor vehicle collisions, decreased birthweight (if consumed during pregnancy), chronic bronchitis episodes (if cannabis is inhaled), psychotic symptoms and disorders, and cannabis addiction.[2–6] The lifetime risk of cannabis abuse (recurrent use) or dependence (symptoms of tolerance and withdrawal) among Canadians was 6.8% in 2012, and 1.3% of Canadians met criteria for cannabis abuse or dependence in the past year.[6] Moreover, the potency of illicit cannabis increased from 4% in 1995 to 12% in 2014, with higher potency associated with increased risk of adverse health outcomes.[7–11] In general, people who use cannabis more frequently and at a younger age are at higher risk for harm.[11,12]

In an effort to promote responsible use, deter criminal activity and protect public health and safety, the federal government legalized nonmedical use of cannabis on Oct. 17, 2018.[13] Cannabis use for medical purposes has been legal in Canada since 2001.[14] The evidence from the United States

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on the impact of legalization is mixed, with some studies showing increased rates of use and others showing no change.[15–18] It is crucial to monitor the prevalence of cannabis use, patterns of use and modes of use to determine the impact of policy change.[19] In 2018, Statistics Canada, the national statistics agency, developed and implemented the National Cannabis Survey (NCS), a cross-sectional survey designed to better understand the frequency of cannabis use and monitor changes in attitudes and behaviour as a result of legalization.[20]

Our study objectives were to (a) determine the percentage of Canadians (aged ≥ 15 yr) likely to try or increase cannabis use after legalization of use for nonmedical purposes and (b) explore characteristics associated with intent to try or increase cannabis use.

Methods

We followed the reporting standards outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[21]

Study design and respondents

This was a cross-sectional study involving analysis of the 2018 NCS master file.[20,22] The NCS was developed by Statistics Canada in consultation with the Public Health Agency of Canada, the Department of Justice Canada and Public Safety Canada. Cognitive testing of questionnaire content was conducted and validation of estimates was done through cross-tabulations of other data and consultation with Statistics Canada stakeholders. The data used in this study were collected before legalization of nonmedical use of cannabis, from February to September 2018, in 3 waves. Participation in the NCS was voluntary and data were collected through an electronic questionnaire or computer-assisted telephone interview. The study population consisted of noninstitutionalized Canadians aged 15 years and older who resided in one of Canada's 10 provinces or one of its 3 territory capital cities. The sampling method was a 2-stage simple random sample of dwellings and people stratified by province or territory, which aimed to represent the Canadian population.[20] The authors of this paper have no relationship with the developers of the NCS and accessed data through the Statistics Canada Research Data Centre (RDC) at McMaster University.[23]

Measures

Our primary outcome measure was derived from an NCS question that asked respondents if they were likely to try cannabis or increase their consumption when it became legal to use it for nonmedical purposes.[22] The response options were "Yes," "Maybe" and "No." We also summarized whether respondents indicated they would be more likely to try different types of cannabis products or acquire cannabis from another source, using pairwise deletion for missing data (i.e., reporting all cases for which we had data). Information on gender, age, cannabis use in the past 3 months, education level, income level, main activity during the previous week and self-reported mental health are also reported. As the NCS categories of male and female for gender are commonly understood as the sex of a person, we have interpreted them as such in our paper.[24] Categories for age, education, income, main activity and self-reported mental health were collapsed to ensure adequate cell size and simplify analysis and interpretation. The full questionnaire is available elsewhere.[22]

Statistical analysis

Data from the 3 independent NCS waves were pooled for analysis. We used descriptive statistics to summarize the data, and we constructed univariable and multivariable logistic regression models to explore factors associated with the intent to try or increase cannabis use following legalization ("Yes" and "Maybe" were combined and compared with "No"). Among respondents likely to try or increase cannabis use after legalization, we considered those who had not used cannabis in the past 3 months to be those looking to try. Our independent variables were sex, age, cannabis use in the past 3 months, education, income, main activity and self-reported mental health. We adjusted our multivariable regression model for survey wave and province or territory of residence. Results are presented as odds ratios (ORs) with 95% confidence intervals (CIs). An OR greater than 1 indicates an increased association, meaning the odds of respondents endorsing the intent to try or increase cannabis use following legalization are greater in the comparison group than in the reference group. All analyses were 2-tailed and statistical significance was defined as $p < 0.05$. For all statistically significant associations in our adjusted model, we calculated adjusted risk increases (RIs) as the difference between the risk of the outcome in the reference group (e.g., Canadians aged ≥ 65 yr) and the risk in the comparison group (e.g., Canadians aged 15–24 yr), while holding all other variables constant.[25]

Before conducting our analysis, we reviewed unweighted cross-tabulations of independent variables and the outcome to ensure adequate cell sizes (≥ 10 events).[26] Bootstrap weights provided by Statistics Canada were applied to convert unweighted frequencies to represent the Canadian population and adjust for nonresponse bias in the survey sampling design.[27] Missing data were excluded from the regression analysis using listwise deletion (i.e., only complete cases were analyzed). The likelihood ratio test determined if the multivariable logistic regression model fit significantly better than a model with no predictors, and the Wald test indicated whether predictors in the model had significant associations at the $p < 0.05$ level compared with no association. We performed a Hosmer–Lemeshow test, which compares whether or not observed rates and associations match expected rates and associations in subgroup analyses in the model population, to assess the goodness of fit of our adjusted model.[28] All data pooling, modification and statistical analyses were performed using Stata/SE 15 software (StataCorp LLC).

Ethics approval

As per Article 2.2(a) of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, research is exempt from research ethics board review if it relies exclusively on publicly available information that is legally accessible to the public and appropriately protected by law.[29] Our results were reviewed by an analyst at the Statistics Canada Research Data Centre at McMaster University before release to ensure that the confidentiality of survey respondents' information was respected.

Results

There were 39 000 households selected for recruitment for NCS Waves 1–3 and the response rates were 51.2% (Wave 1), 51.3% (Wave 2) and 51.6% (Wave 3). A total of 17 089 respondents provided complete data and were included in our multivariable logistic regression analysis (completion rate 43.8%). There was an equal distribution of males and females, most were employed (59.2%) and reported good to excellent mental health (93.8%), and 15.2% reported use of cannabis in the past 3 months (Table 1). The "please specify" category of sex was removed from analysis and reporting because of low response ($n < 10$). Overall, 18.5% (95% CI 17.6%–19.5%) of respondents reported they were likely to try or increase their cannabis use after legalization for nonmedical purposes; of these respondents, 66.5% reported not having used cannabis in the past 3 months. Almost a quarter (22.6%, 95% CI 21.7%–23.6%) reported they were likely to try different types of cannabis products and 16.7% (95% CI 15.8%–17.6%) reported they were likely to acquire cannabis from a new source after legalization (Figure 1).

In our adjusted model, younger age (15–24 yr; adjusted OR 3.8, 95% CI 2.6–5.6; adjusted RI 20.1%, 95% CI 13.9%–26.2%), cannabis use in past 3 months (adjusted OR 3.3, 95% CI 2.8–3.9; adjusted RI 20.4%, 95% CI 17.1%–23.6%), higher income (≥ $80 000; adjusted OR 1.5, 95% CI 1.3–1.9; adjusted RI 6.1%, 95% CI 3.2%–9.0%) and poor or fair mental health (adjusted OR 2.0, 95% CI 1.6–2.6; adjusted RI 11.5%, 95% CI 6.7%–16.2%) were associated with a greater likelihood of trying or increasing cannabis use following legalization compared with reference categories (Table 2). The Hosmer–Lemeshow ($p = 0.5$) and likelihood ratio ($p < 0.05$) tests suggested a good fit of our adjusted model.

Interpretation

The NCS data collected before legalization suggest that nearly 1 in 5 Canadians were likely to try or increase cannabis use after it was legalized for nonmedical purposes, with the majority of these people not having used cannabis in the past 3 months. Respondents who were younger, had used cannabis in the past 3 months, reported having a higher income and reported worse mental health were significantly more likely to try or increase cannabis use following legalization. Nearly 1 in 4 respondents reported they were likely

Table 1: Weighted table of respondent characteristics (n = 27 808 081)

Characteristic	Percentage (95% CI)
Sex	
Female	50.3 (50.0–50.6)
Male	49.7 (49.4–50.0)
Age, yr	
≥ 65	18.5 (18.2–18.7)
45–64	32.6 (32.3–32.9)
35–44	16.6 (16.4–16.8)
25–34	19.5 (18.7–20.4)
15–24	12.9 (12.0–13.7)
Cannabis use in past 3 mo	
No	84.8 (84.0–85.7)
Yes	15.2 (14.3–16.0)
Education level	
Bachelor's degree or higher	32.7 (31.7–33.8)
College or diploma	33.7 (32.6–34.7)
Less than HS or HS only	33.6 (32.6–34.7)
Income level, $	
< 40 000	49.7 (48.7–50.8)
40 000–79 999	32.0 (31.0–33.1)
≥ 80 000	18.3 (17.5–19.0)
Main activity	
Employed	59.2 (58.1–60.2)
Student	6.8 (6.1–7.5)
Caregiving/housework	8.4 (7.8–9.1)
Retired/LTI	20.6 (20.0–21.2)
Other	5.0 (4.4–5.6)
Mental health	
Good to excellent	93.8 (93.2–94.4)
Fair or poor	6.2 (5.6–6.8)
Province or territory capital city, grouped	
Ontario	39.4 (39.1–39.7)
Quebec	22.9 (22.7–23.2)
Atlantic provinces	6.5 (6.4–6.6)
Manitoba	3.4 (3.3–3.4)
Saskatchewan	3.0 (2.9–3.0)
Alberta	11.5 (11.3–11.6)
British Columbia	13.3 (13.1–13.5)
Territory capital cities	0.05 (0.049–0.051)
Survey wave	
1	32.9 (32.6–33.2)
2	33.5 (33.2–33.8)
3	33.7 (33.4–34.0)

Note: CI = confidence interval, HS = high school, LTI = long-term illness. Percentage totals for ages and provinces do not add up to exactly 100% because of bootstrapping and rounding. A weighted count (n) can be calculated by multiplying the proportion by the total population size.

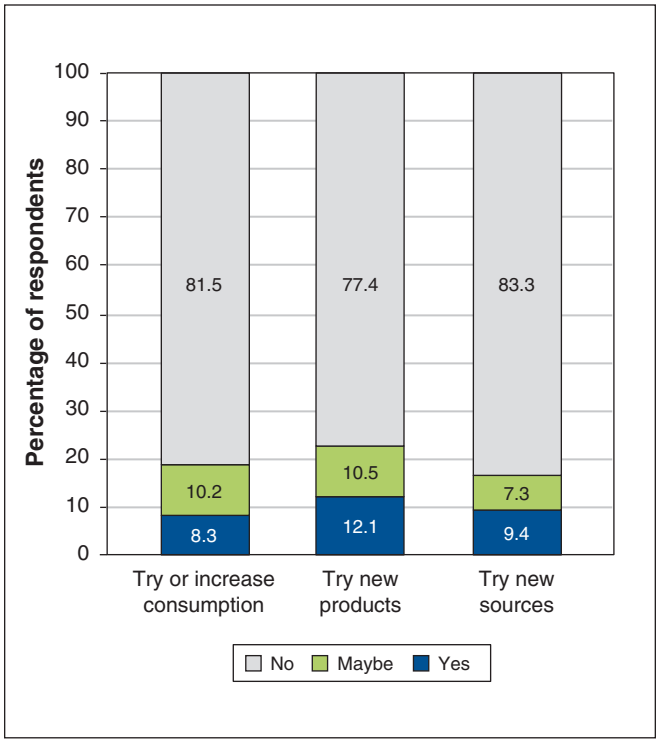

Figure 1: Percentages of respondents who reported they would try or increase their cannabis consumption (n = 29 928 424), try or consume different types of cannabis products (n = 29 607 064), and obtain or purchase cannabis from another source (n = 29 300 593), following legalization of cannabis use for nonmedical purposes.

to try consuming different types of cannabis products, which will become legally available in October 2019.[30] A 2017 survey of 1087 Canadians found that up to 46% were willing to try cannabis-infused food products.[31] In addition, a 2018 Deloitte survey found that 58% of Canadians who use cannabis preferred edible products.[32] We also found that 1 in 6 respondents would obtain cannabis from new sources after legalization, and the Deloitte survey reported that Canadians who use cannabis may shift up to 63% of their purchases toward legal channels.[32]

Complementing our findings, a 2014 survey of 3532 US adults aged 18–34 years found that 13.5% reported they would consume cannabis more frequently if use was legalized.[33] This is concerning as younger people are at a higher risk of experiencing harms associated with cannabis use than older people.[11,12] However, previous studies have shown that the correlation between cannabis use intention and subsequent behaviour can range from 0.39 to 0.84, and it is affected by attitudes and subjective norms (perceived social pressure).[34–38] The 2014 US study also found that those who did not use cannabis but experienced anxiety were more interested in trying cannabis if use was legalized.[33] Although some studies have reported an association between cannabis use and the development of schizophrenia, depressive disorders and increased suicidal ideation, attempts and completion, management of psychiatric disorders is also one of the top reasons cited for cannabis use.[12,39–42] However, there is very limited evidence that cannabis use is effective for treating symptoms related to mental illnesses (e.g., anxiety and posttraumatic stress disorder).[42–45]

The public may underestimate the harms associated with cannabis use. A 2017 survey of 16 280 US adults found that 22.4% believe cannabis is not addictive and 9% believe there are no risks associated with cannabis use.[46] A 2013 qualitative study of 76 Canadian youth (aged 14–19 yr) found that many were unaware of the potential harms associated with cannabis use.[47] The Canadian Psychiatric Association released a position statement in 2018 highlighting concerns about the impact of increased access to cannabis on mental health, particularly for youth.[48] The Canadian Medical Association has proposed developing educational interventions for youth considering the potential effects on brain development as well as advocating for a legal age of 21 years and restrictions for those under 25 years of age.[49] NCS Wave 4 data (collected from November to December 2018) show that rates of self-reported cannabis use (15%) did not change in the 3 months immediately after legalization, although 19% of respondents indicated they intended to use cannabis in the next 3 months.[50] Data for the first wave of NCS 2019 (collected from February to March 2019) indicate that 18% of respondents reported use in the past 3 months; the highest increases were seen among males aged 45–64 years and over 646 000 Canadians were estimated to be first-time cannabis users.[51] Intentions may take time to translate into action and behaviour may continue to change as nonmedical use of cannabis becomes normalized.

Limitations

Self-reported use of cannabis and intention to try or increase use may be subject to measurement error and bias. It is possible that the prevalence of cannabis use may have been underreported, although a number of studies have found data on self-reported cannabis use to be as reliable as data on other self-reported behaviours.[52–54] The NCS did not collect information on people in institutions and our findings may not be generalizable to this population. Furthermore, the NCS data we used for our study measured only intentions to use cannabis, not actual changes in behaviour.

Conclusion

Nearly 1 in 5 Canadians may try or increase cannabis use following legalization of use for nonmedical purposes, particularly those who are younger, who have used cannabis in the past 3 months, who have a higher income and who self-report their mental health as poor or fair. Clinicians, public health officials and policy-makers should pay special attention to these higher risk populations to ensure informed decision-making and responsible use. Continued monitoring through national-level surveys, such as the NCS, will be crucial in establishing rates and patterns of cannabis use among Canadians following legalization of use for nonmedical purposes.

Table 2: Results of the multivariable logistic regression analysis with the outcome of interest being more likely to try or increase cannabis use after legalization (*n* = 27 808 081)

Characteristic	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted risk increase percentage (95% CI)
Sex			
Female	Ref.	Ref.	Ref.
Male	1.3* (1.2–1.5)	1.1 (1.0–1.3)	NR
Age, yr			
≥ 65	Ref.	Ref.	Ref.
45–64	1.7* (1.4–2.1)	1.3 (1.0–1.6)	NR
35–44	2.8* (2.3–3.3)	1.8* (1.3–2.4)	6.8 (3.5–10.1)
25–34	4.2* (3.5–5.1)	2.6* (1.9–3.4)	12.6 (8.8–16.4)
15–24	5.3* (4.2–6.8)	3.8* (2.6–5.6)	20.1 (13.9–26.2)
Cannabis use in past 3 mo			
No	Ref.	Ref.	Ref.
Yes	4.3* (3.7–5.0)	3.3* (2.8–3.9)	20.4 (17.1–23.6)
Education level			
Bachelor's degree or higher	Ref.	Ref.	Ref.
College or diploma	0.8* (0.7–0.9)	0.9 (0.7–1.0)	NR
Less than HS or HS only	0.9 (0.8–1.1)	0.9 (0.8–1.1)	NR
Income level, $			
< 40 000	Ref.	Ref.	Ref.
40 000–79 999	1.0 (0.8–1.1)	1.2* (1.0–1.4)	2.5 (0.3–4.7)
≥ 80 000	1.2* (1.1–1.4)	1.5* (1.3–1.9)	6.1 (3.2–9.0)
Main activity			
Employed	Ref.	Ref.	Ref.
Student	1.4* (1.1–1.9)	0.9 (0.6–1.3)	NR
Caregiving/housework	0.8 (0.7–1.0)	1.0 (0.8–1.3)	NR
Retired/LTI	0.4* (0.4–0.5)	0.9 (0.7–1.1)	NR
Other	1.1 (0.8–1.4)	0.8 (0.6–1.1)	NR
Mental health			
Good to excellent	Ref.	Ref.	Ref.
Poor or fair	2.6* (2.1–3.2)	2.0* (1.6–2.6)	11.5 (6.7–16.2)

Note: CI = confidence interval, HS = high school, LTI = long-term illness, NR = not reported (for adjusted ORs that were not significant), OR = odds ratio, Ref. = reference category. The adjusted model includes province/territory and survey wave.
*Wald test for predictors being significant in model at $p < 0.05$.

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Data sharing: The 2018 National Cannabis Survey master file can be accessed through a Research Data Centre. The analysis code can be accessed by contacting the corresponding author.

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