# Trends and correlates of cannabis use in Canada: a repeated cross-sectional analysis of national surveys from 2004 to 2017

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## Abstract

**Background:** Cannabis is the most widely used drug in Canada. We examined the trends in past-year cannabis consumption by sociodemographic and geographic characteristics.

**Methods:** We conducted a repeated cross-sectional analysis of the Canadian Tobacco Use Monitoring Survey, the Canadian Tobacco, Alcohol and Drugs Survey and the Canadian Alcohol and Drug Use Monitoring Survey from 2004 to 2017. Respondents were aged 15 years and older. Past-year cannabis use was analyzed using multivariable logistic regression and segmented logistic regression.

**Results:** We analyzed 289 823 respondents (51% female) between 2004 and 2017. Between 2004 and 2017, the overall prevalence of cannabis use increased from 12.2% (95% confidence interval [CI] 11.0%–13.5%) to 18.7% (95% CI 16.2%–21.5%) among men and from 6.6% (95% CI 5.9%–7.4%) to 11.1% (95% CI 9.4%–13.0%) among women. The crude rate of change was greater between 2011 and 2017 than that between 2004 and 2011 in men (odds ratio [OR] per annual change: 1.08, 95% CI 1.05–1.11) and women (OR 1.11, 95% CI 1.07–1.15). After adjustment for age, education, tobacco smoking and province, the 2011–2017 trend was stronger in men (adjusted OR 1.24, 95% CI 1.05–1.46), but not in women (adjusted OR 1.13, 95% CI 0.93–1.37). Cannabis use was associated with tobacco smoking (OR 4.94, 95% CI 4.65–5.25). Heterogeneity was found in cannabis use trends by age, education and province. Cannabis use decreased among respondents aged 15–19 years and increased in other age groups.

**Interpretation:** Cannabis consumption in Canada has increased and varies by sex, age, level of education and geography. Increases vary by sociodemographic factors and may be faster among certain groups. Further studies are warranted post-legalization.

In October 2018, the Government of Canada legalized the recreational use of cannabis nationally.[1] Before legalization, cannabis was the most widely used illicit drug in Canada,[2] and consumption increased from 14% to 17% between 2018 and 2019.[3] This rise may be a result of the increases in cannabis availability and circulation, and decreases in the perception of harm.[4,5] Surveys suggest that in the United States, the social acceptability of cannabis has increased[6] and perceptions of harm have decreased after recreational use was legalized in several states.[7] Trends in cannabis consumption may vary by sex, age, ethnicity and socioeconomic status and may be influenced by changing social norms and new legislation.[8,9]

Studies that assess the differences in cannabis use trends across relevant socioeconomic and demographic groups are essential to inform legislation and public health priorities around cannabis consumption in Canada and among vulnerable populations. In this study, we combined 3 national survey platforms in Canada to evaluate and compare trends in cannabis use between 2004 and 2017 by age, sex, level of education, recent pregnancy and province.

## Methods

We followed the recommendations of Burns and Kho[10] and the STROBE statement[11] to report the methodology used in this repeated cross-sectional study.

### Setting

The surveys included in this study were conducted in Canadian provinces between 2004 and 2017. The surveys covered all people in Canada aged 15 years or older residing in the 10 provinces. Exclusions included residents of the Yukon, Northwest Territories and Nunavut and populations living in

long-term care institutes or Canadian Forces bases. We selected representative surveys from each province with available record-level data on cannabis consumption and relevant covariates. In 2004, questions on cannabis consumption were included in routine tobacco- and substance-related surveys in Canada. The latest available survey that met these criteria was completed in 2017.

### Data sources

Data were from 3 representative survey platforms. We combined 17 cross-sectional surveys from the Canadian Tobacco Use Monitoring Survey (CTUMS, conducted annually between 2004 and 2012), the Canadian Alcohol and Drug Use Monitoring Survey (CADUMS, conducted annually between 2008 and 2012), and the Canadian Tobacco, Alcohol and Drugs Survey (CTADS, conducted biennially in 2013, 2015 and 2017).[12–23] A complete description of the surveys is available in Appendix 1 (www.cmajopen.ca/content/8/3/E487/suppl/DC1).

### Outcome

The primary outcome was past-year cannabis use (yes, used cannabis within the previous 12 months, or no). The specific survey questions are available in Appendix 2 (www.cmajopen.ca/content/8/3/E487/suppl/DC1).

### Covariates

The independent variables included were age, sex, education, tobacco smoking, province of residence and recent pregnancy.

### Statistical analysis

Individual survey files were concatenated (linked) to form a combined data set. Sampling weights were used in all analyses. These weights adjust estimates for excluded populations and survey nonresponse. The weighted prevalence of past-year cannabis consumption was calculated for each survey year across sociodemographic characteristics and province. All analyses were stratified by sex.

Logistic regression was used to adjust estimates for age, education and tobacco smoking. Analyses of the crude trends in cannabis consumption indicated an inflection point in 2011. Therefore, we fit segmented logistic regression models with separate intercepts and linear trends before and after 2011. Interaction models and Wald tests were used to determine heterogeneity in sex-specific trends by age group, level of education and province. Analyses by level of education and province were age-adjusted. All prevalence estimates are presented with 95% confidence intervals (CIs). The criterion for statistical significance was $\alpha = 0.05$. Analyses were performed using Stata statistical software (version 16.1).

### Ethics approval

This research involves secondary use of anonymous public-use health survey data without access to identifiers. It is considered exempt from research ethics board review under the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans — TCPS2.

## Results

Across the study period, men of all ages were more likely than women to use cannabis (13.4%, 95% CI 13.0%–13.8% v. 7.3%, 95% CI 7.1%–7.6%), equivalent to an odds ratio (OR) of 1.96 (95% CI 1.86%–2.06%). Cannabis use was strongly associated with age. The prevalence increased with age to a maximum of 33.0% (95% CI 31.7%–34.4%) among men and 22.1% (95% CI 20.9%–23.4%) among women aged 20–24 years, before declining (Table 1). Among those aged 65 years and older, the prevalence was 1.3% in men and 0.5% in women. Tobacco smoking was strongly associated with cannabis use. Current smokers were nearly 5 times as likely to report cannabis use in both men and women (OR 4.71, 95% CI 4.35–5.11, for men and 4.72, 95% CI 4.31–5.17, for women). There was wide variation in the prevalence of cannabis use across provinces, with the highest prevalence in British Columbia and Nova Scotia, and lower prevalence in the remaining Atlantic provinces and Saskatchewan. Data on past 3-month cannabis use were similar (Appendix 3, available at www.cmajopen.ca/content/8/3/E487/suppl/DC1).

### Trends in the prevalence of cannabis consumption

Between 2004 and 2017, the age-adjusted prevalence of past-year cannabis use increased in men and women, with greater increases after 2011 (Figure 1). In 2004, the prevalence of cannabis use was 12.2% (95% CI 11.0%–13.5%) in men and 6.6% (95% CI 5.9%–7.4%) in women. By 2017, the prevalence of cannabis use increased to 18.7% (95% CI 16.2%–21.5%) in men and 11.1% (95% CI 9.4%–13.0%) in women.

The OR for the trend associated with the annual change in cannabis consumption was 1.02 (95% CI 1.00–1.04) in men and 1.00 (95% CI 0.98–1.02) in women between 2004 and 2011, and 1.08 (95% CI 1.05–1.11) in men and 1.11 (95% CI 1.07–1.15) in women between 2011 and 2017. After adjustment for age, education, tobacco smoking and province, the OR for the 2011–2017 trend was 1.24 (95% CI 1.05–1.46) in men and 1.13 (95% CI 0.93–1.37) in women (Table 1).

### Trends by age

The prevalence of past-year cannabis consumption increased between 2004 and 2017 in men and women aged 20–24 years, 25–34 years, 35–44 years, 45–64 years and 65 years and older (Figure 2). The trends in prevalence in these age groups remained relatively stable between 2004 and 2011 and generally increased from 2011 to 2017. Cannabis consumption among those 65 years and older increased from 0.1% in 2004 to 2.2% in women in 2017, and from 0.4% to 4.0% in men, relative increases of 24 and 10 times, respectively. However, among the youngest age group of 15–19 years, there was a significant declining trend in cannabis use, from 25.2% to 21.1% among adolescent men and from 22.9% to 17.6% among adolescent women. An interaction test indicated significant heterogeneity in the annual trend across all age groups by sex ($p_{interaction} < 0.001$).

**Table 1: Prevalence and trends in past-year cannabis use among men and women in Canada, by respondent characteristics with crude and adjusted ORs, 2004–2017**

| Characteristic | Men* n = 129 984† | | | Women* n = 159 839† | | |
|---|---|---|---|---|---|---|
| | Prevalence, % (95% CI) | OR (95% CI) | Adjusted OR (95% CI)‡ | Prevalence, % (95% CI) | OR (95% CI) | Adjusted OR (95% CI)‡ |
| Trend§ | | | | | | |
| Before 2011 | | 1.00 (0.98–1.03) | 1.03 (1.00–1.05) | | 0.98 (0.96–1.01) | 1.01 (0.98–1.03) |
| After 2011 | | 1.10 (1.04–1.16) | 1.24 (1.05–1.46) | | 1.11 (1.05–1.18) | 1.13 (0.93–1.37) |
| Age, yr | | | | | | |
| 15–19 | 25.7 (24.4–27.1) | 4.31 (3.91–4.76) | 10.02 (8.70–11.53) | 19.6 (18.5–20.8) | 6.53 (5.82–7.32) | 16.66 (14.30–19.40) |
| 20–24 | 33.0 (31.7–34.4) | 6.16 (5.60–6.77) | 9.29 (8.24–10.46) | 22.1 (20.9–23.4) | 7.57 (6.75–8.49) | 11.69 (10.23–13.35) |
| 25–34 | 22.0 (20.5–23.6) | 3.51 (3.12–3.94) | 4.21 (3.70–4.80) | 11.4 (10.4–12.5) | 3.41 (2.98–3.91) | 3.78 (3.28–4.36) |
| 35–44 | 11.8 (10.9–12.8) | 1.66 (1.48–1.87) | 1.81 (1.59–2.06) | 5.5 (5.0–6.2) | 1.56 (1.35–1.80) | 1.67 (1.43–1.95) |
| 45–64 | 7.5 (7.0–8.0) | 1.00 (Ref.) | 1.00 (Ref.) | 3.6 (3.4–4.0) | 1.00 (Ref.) | 1.00 (Ref.) |
| ≥ 65 | 1.3 (1.0–1.6) | 0.16 (0.12–0.20) | 0.17 (0.12–0.23) | 0.5 (0.4–0.7) | 0.13 (0.09–0.18) | 0.15 (0.10–0.22) |
| Education¶ | | | | | | |
| Less than high school | 13.8 (13.0–14.7) | 1.64 (1.46–1.86) | 0.86 (0.74–0.99) | 7.5 (6.9–8.1) | 1.52 (1.34–1.74) | 0.72 (0.61–0.85) |
| Completed high school | 15.9 (15.1–16.7) | 1.91 (1.70–2.15) | 1.02 (0.90–1.16) | 7.8 (7.3–8.4) | 1.58 (1.40–1.78) | 0.93 (0.81–1.07) |
| Completed college | 14.9 (14.0–15.8) | 1.77 (1.57–2.00) | 1.10 (0.97–1.25) | 8.2 (7.7–8.8) | 1.64 (1.45–1.85) | 1.10 (0.96–1.26) |
| Completed university | 9.0 (8.3–9.9) | 1.00 (Ref.) | 1.00 (Ref.) | 5.2 (4.7–5.7) | 1.00 (Ref.) | 1.00 (Ref.) |
| Tobacco smoking | | | | | | |
| Current smoker | 31.9 (30.6–33.1) | 4.84 (4.46–5.25) | 7.51 (6.78–8.32) | 19.2 (18.2–20.3) | 4.86 (4.43–5.33) | 7.66 (6.86–8.55) |
| Former smoker | 9.0 (8.4–9.7) | 1.01 (0.92–1.11) | 2.78 (2.46–3.14) | 6.2 (5.7–6.8) | 1.33 (1.20–1.48) | 3.56 (3.12–4.06) |
| Never smoker | 9.0 (8.6–9.5) | 1.00 (Ref.) | 1.00 (Ref.) | 4.8 (4.5–5.1) | 1.00 (Ref.) | 1.00 (Ref.) |
| Province | | | | | | |
| Newfoundland and Labrador | 11.8 (11.0–12.7) | 1.00 (Ref.) | 1.00 (Ref.) | 5.6 (5.1–6.1) | 1.00 (Ref.) | 1.00 (Ref.) |
| Prince Edward Island | 12.5 (11.7–13.5) | 1.07 (0.95–1.20) | 1.14 (0.99–1.32) | 6.2 (5.7–6.8) | 1.13 (0.99–1.29) | 1.19 (1.02–1.40) |
| Nova Scotia | 16.2 (15.3–17.1) | 1.44 (1.29–1.60) | 1.61 (1.41–1.83) | 8.9 (8.3–9.5) | 1.65 (1.46–1.88) | 1.87 (1.60–2.17) |
| New Brunswick | 12.7 (11.9–13.5) | 1.08 (0.97–1.21) | 1.14 (1.00–1.31) | 6.3 (5.7–6.8) | 1.13 (0.99–1.29) | 1.23 (1.05–1.44) |
| Quebec | 13.4 (12.6–14.2) | 1.15 (1.04–1.28) | 1.26 (1.11–1.44) | 6.7 (6.2–7.2) | 1.20 (1.06–1.36) | 1.22 (1.05–1.42) |
| Ontario | 12.8 (12.0–13.6) | 1.09 (0.98–1.22) | 1.16 (1.01–1.32) | 6.9 (6.4–7.4) | 1.25 (1.10–1.42) | 1.46 (1.25–1.69) |
| Manitoba | 12.7 (11.8–13.6) | 1.08 (0.97–1.21) | 1.13 (0.98–1.30) | 7.7 (7.1–8.3) | 1.40 (1.23–1.60) | 1.45 (1.24–1.70) |
| Saskatchewan | 11.8 (11.1–12.6) | 1.00 (0.89–1.11) | 0.95 (0.83–1.09) | 6.4 (5.9–7.0) | 1.16 (1.01–1.33) | 1.11 (0.95–1.31) |
| Alberta | 12.7 (11.9–13.6) | 1.08 (0.97–1.21) | 1.05 (0.92–1.20) | 7.3 (6.8–7.9) | 1.33 (1.16–1.51) | 1.28 (1.09–1.49) |
| British Columbia | 16.1 (15.1–17.1) | 1.43 (1.29–1.60) | 1.78 (1.56–2.03) | 10.0 (9.1–10.8) | 1.86 (1.63–2.14) | 2.40 (2.06–2.80) |

Note: CI = confidence interval, OR = odds ratio, Ref. = reference category.
*Sex was self-reported as male or female.
†The total sample size across all surveys from 2004–2017 was 295 090 respondents. Of these, we excluded 4629 (1.6%) because of missing data on cannabis consumption, and we excluded a further 638 (0.2%) observations because of missing data on age and tobacco smoking. The analytical sample size was 289 823, and 159 839 were female (weighted frequency 51%).
‡Mutually adjusted model, includes terms for time trends, age, education, tobacco smoking and province.
§Trend analyses from segmented logistic regression models.
¶Education was not collected in 2013 and 2015.

## Trends by province

The age-adjusted prevalence of past-year cannabis use was relatively stable across provinces until 2011, after which consumption started to increase, with 2 exceptions (Figure 3). In Quebec, trends in usage were variable between 2004 and 2017; men had only moderate increases (from 13.8% to 15.6%), whereas women showed an overall decline (from 8.8% to 8.2%). In New Brunswick, between 2015 and 2017, the prevalence slowly increased in men from 12.5% to 14.7% over the study period, whereas in women the trend was variable with a substantial increase from 6.2% (95% CI 4.0%–8.3%) to 15.0% (95% CI 10.1%–19.8%). There was heterogeneity in
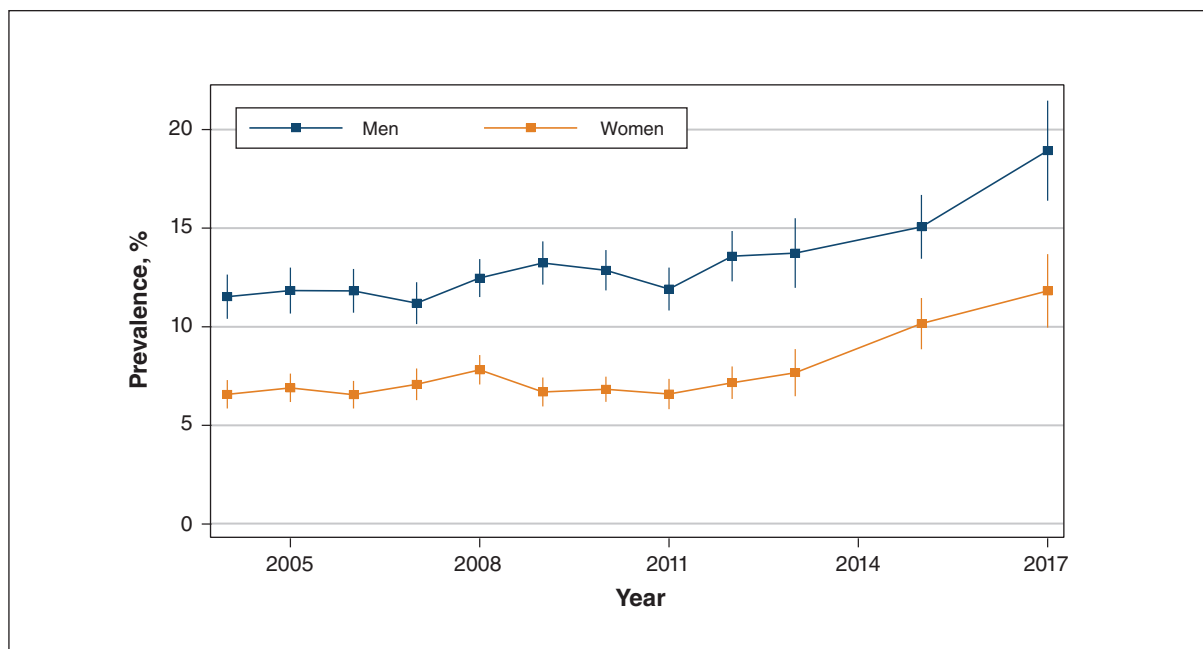
**Figure 1:** Age-adjusted trends in the prevalence of past-year cannabis consumption, by sex, Canada, 2004–2017. Estimates are shown with 95% confidence intervals. Data sources: Canadian Tobacco Use Monitoring Survey (2004–2012), Canadian Alcohol and Drugs Survey (2013–2017) and Canadian Alcohol and Drug Use Monitoring Survey (2008–2012).
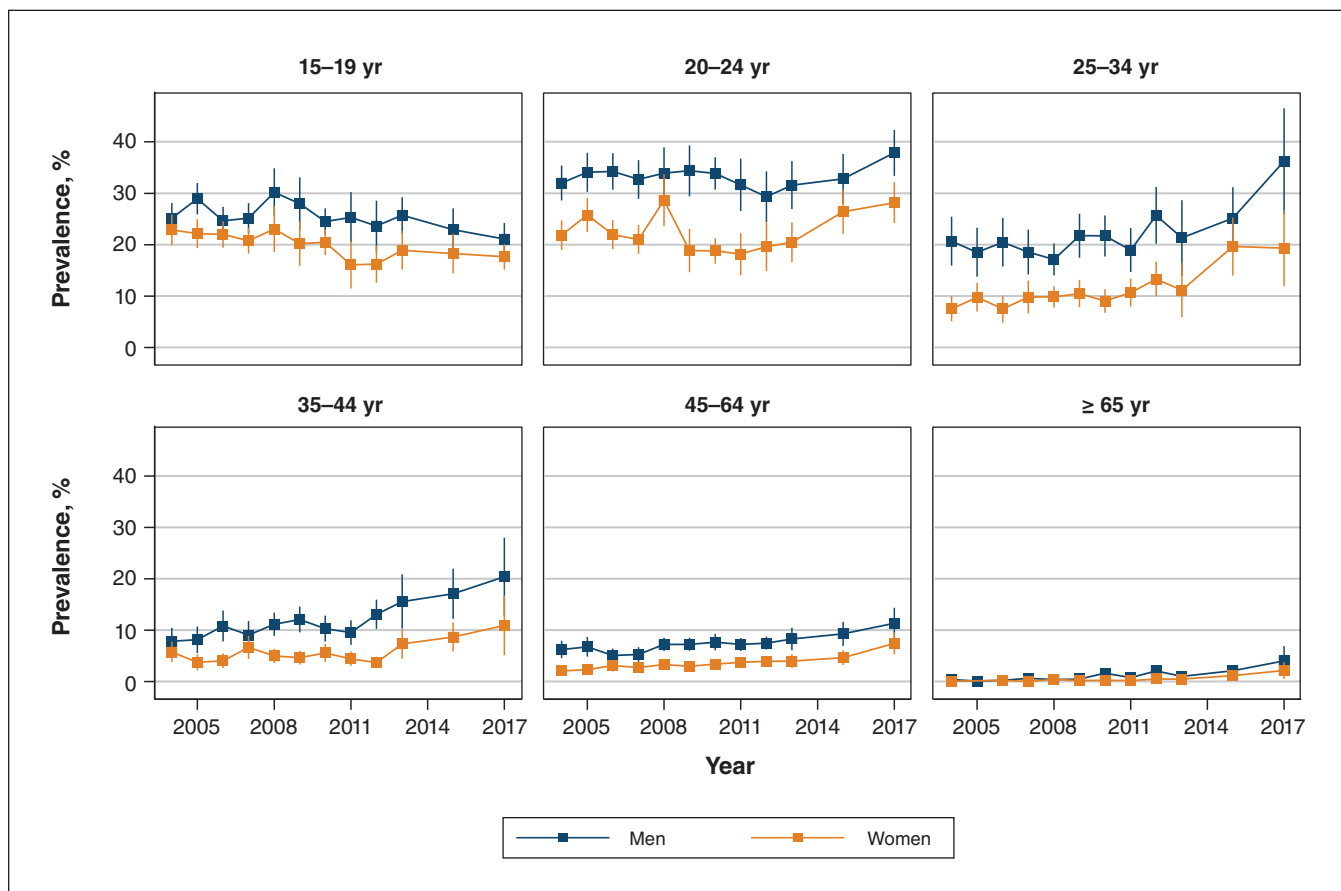


**Figure 2:** Age-specific trends in the prevalence of past-year cannabis consumption, by sex, Canada, 2004–2017. Estimates are shown with 95% confidence intervals. Data sources: Canadian Tobacco Use Monitoring Survey (2004–2012), Canadian Alcohol and Drugs Survey (2013–2017) and Canadian Alcohol and Drug Use Monitoring Survey (2008–2012).
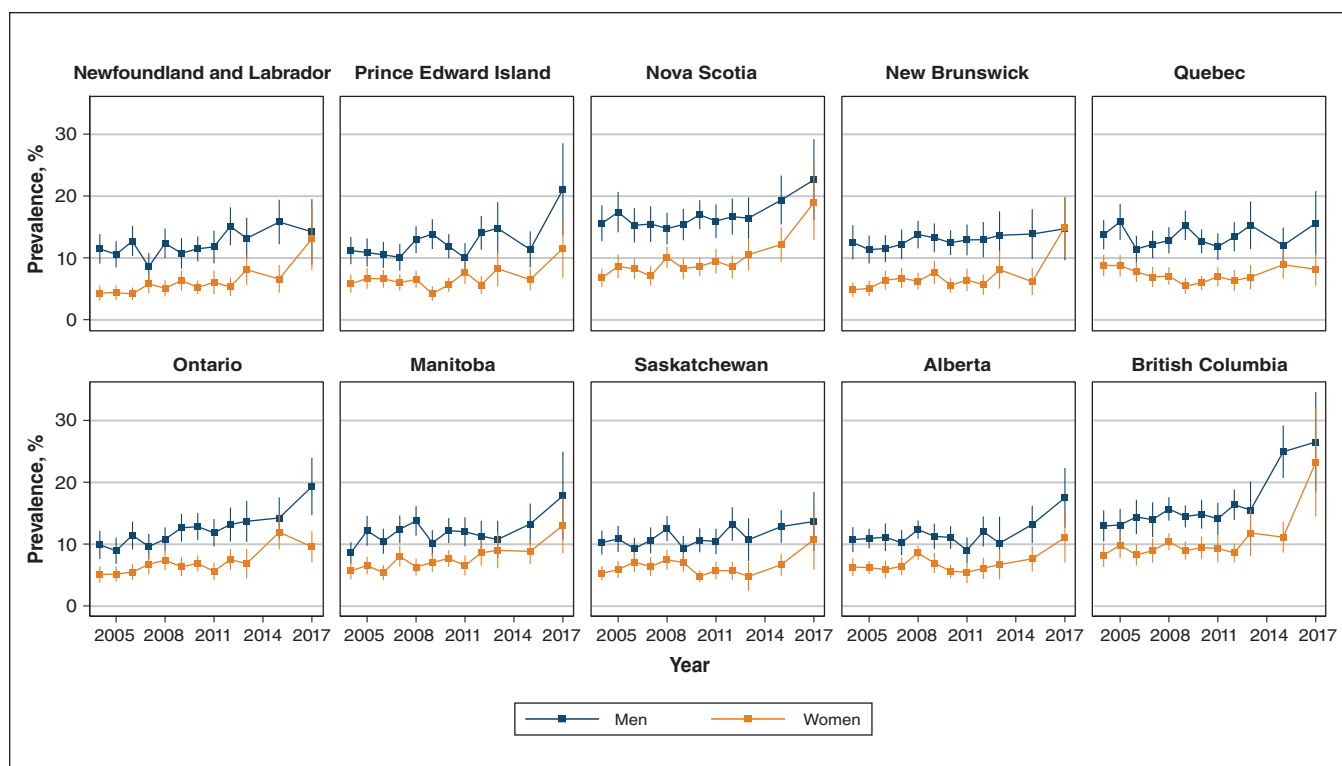
**Figure 3:** Age-adjusted trends in the prevalence of past-year cannabis consumption, by sex and province, Canada, 2004–2017. Estimates are shown with 95% confidence intervals. Data sources: Canadian Tobacco Use Monitoring Survey (2004–2012), Canadian Alcohol and Drugs Survey (2013–2017) and Canadian Alcohol and Drug Use Monitoring Survey (2008–2012).

cannabis use trends across provinces ($p_{\text{interaction}}$ = 0.02 in men and $p_{\text{interaction}}$ = 0.004 in women).

## Cannabis use during pregnancy and among women of reproductive age

We used data from CADUMS between 2008 and 2012 to investigate the prevalence of past-year cannabis use among women who were recently pregnant, compared with all women of reproductive age (15–44 yr) (Table 2). In both groups, cannabis use was more common among younger women aged 15–24 years. These women were 4.5 times (95% CI 3.96–5.10) more likely to use cannabis than women aged 35–44 years in the overall sample and 6 times (95% CI 2.54–14.39) more likely than women who reported a recent pregnancy in unadjusted analyses. In unadjusted analyses, there was a graded and inverse association between educational attainment and cannabis use in both groups, and this was stronger among women with a recent pregnancy. Adjustment for age and tobacco smoking attenuated this association, with tobacco smoking remaining strongly predictive of cannabis use. Current smokers had an adjusted OR of 6.90 (95% CI 6.13–7.76) for cannabis use among all reproductive-aged women 15–44 years and an OR of 7.90 (95% CI 4.04–15.46) for cannabis use among women with a pregnancy within the past 5 years.

Between 2008 and 2012, the age-adjusted prevalence of cannabis use decreased from 15.3% (95% CI 12.7%–17.9%) to 10.2% (95% CI 7.5%–12.9%) among women aged 15–44.

However, the trend was not statistically significant (Appendix 4, available at www.cmajopen.ca/content/8/3/E487/suppl/DC1). Among women reporting pregnancies, the prevalence of past-year cannabis use decreased between 2008 and 2009, before increasing from 8.2% (95% CI 3.8%–12.6%) in 2010 to 13.0% (95% CI 8.0%–18.0%) in 2012. The adjusted OR for the trend associated with cannabis use in pregnancy between 2008 and 2012 was 1.18 (95% CI 0.98–1.43).

## Trends by educational attainment

Data on respondents' educational attainment were available between 2004 and 2012 and in 2017 (n = 258 697). Analyses of age-adjusted trends in the prevalence of cannabis use by education level indicated heterogeneity in the rate of change by level of education between 2004 and 2017 in men and women ($p_{\text{interaction}}$ < 0.001) (Figure 4). Cannabis use appeared to be increasing faster among the higher educated groups, although data were not available in 2013 and 2015. Cannabis use was inversely associated with the level of education in age-adjusted analyses, and this was more apparent in men (OR 1.45, 95% CI 1.25–1.68, for less than high school v. university education) (Table 3). Associations were attenuated after adjustment for tobacco smoking. The adjusted association between education and cannabis showed a positive gradient in men in 2017 after adjustment for tobacco but was not statistically significant ($p_{\text{trend}}$ = 0.1) (Appendix 5, available at www.cmajopen.ca/content/8/3/E487/suppl/DC1).

**Table 2: Trends and prevalence of past-year cannabis use among all women of reproductive age (15–44 yr) and women reporting a pregnancy in the past 5 years, by respondent characteristics with crude and adjusted ORs, 2004–2017**

| | All women 15–44 yr n = 90 037 | | | Women pregnant in past 5 yr n = 2414 | | |
|---|---|---|---|---|---|---|
| | Prevalence, % (95% CI) | OR (95% CI) | Adjusted OR (95% CI)* | Prevalence, % (95% CI) | OR (95% CI) | Adjusted OR (95% CI)* |
| **Trend** | | | | | | |
| All years | | 1.03 (1.02–1.05) | 1.05 (1.03–1.07) | | – | – |
| 2008–2012† | | 0.96 (0.92–1.01) | 0.98 (0.93–1.03) | | 1.12 (0.90–1.39) | 1.18 (0.98–1.43) |
| **Age, yr** | | | | | | |
| 15–24 | 20.9 (20.0–21.7) | 4.50 (3.96–5.10) | 7.21 (6.26–8.30) | 20.3 (12.1–32.1) | 6.05 (2.54–14.39) | 3.50 (1.29–9.52) |
| 25–34 | 11.4 (10.4–12.5) | 2.20 (1.89–2.57) | 2.23 (1.89–2.62) | 9.3 (6.8–12.5) | 2.43 (1.21–4.88) | 1.83 (0.88–3.79) |
| 35–44 | 5.5 (5.0–6.2) | 1.00 (Ref.) | 1.00 (Ref.) | 4.0 (2.2–7.2) | 1.00 (Ref.) | 1.00 (Ref.) |
| **Education** | | | | | | |
| Less than high school | 16.5 (15.2–17.9) | 2.61 (2.24–3.05) | 0.97 (0.81–1.15) | 21.6 (10.8–38.4) | 6.58 (2.36–18.33) | 2.52 (0.91–6.96) |
| Completed high school | 14.8 (13.8–15.9) | 2.30 (1.99–2.66) | 1.09 (0.93–1.27) | 13.7 (8.8–20.7) | 3.80 (1.70–8.47) | 1.68 (0.68–4.20) |
| Completed college | 12.5 (11.6–13.5) | 1.88 (1.63–2.18) | 1.17 (1.00–1.37) | 10.6 (7.4–15.1) | 2.85 (1.35–6.01) | 2.10 (0.98–4.52) |
| Completed university | 7.0 (6.3–7.9) | 1.00 (Ref.) | 1.00 (Ref.) | 4.0 (2.2–7.3) | 1.00 (Ref.) | 1.00 (Ref.) |
| **Tobacco smoking** | | | | | | |
| Current smoker | 29.8 (28.2–31.6) | 4.89 (4.41–5.43) | 6.90 (6.13–7.76) | 27.6 (19.4–37.6) | 9.88 (5.13–19.03) | 7.90 (4.04–15.46) |
| Former smoker | 12.8 (11.6–14.2) | 1.69 (1.48–1.94) | 3.11 (2.65–3.64) | 11.5 (7.6–17.2) | 3.38 (1.75–6.54) | 3.34 (1.66–6.69) |
| Never smoker | 8.0 (7.5–8.5) | 1.00 (Ref.) | 1.00 (Ref.) | 3.7 (2.4–5.8) | 1.00 (Ref.) | 1.00 (Ref.) |

Note: CI = confidence interval, OR = odd ratios, Ref. = reference category.
*Mutually adjusted model, includes terms for time trends, age, education and tobacco smoking.
†Pregnancy data available only between 2008 and 2012.

## Interpretation

We found that the prevalence of past-year cannabis use varied by age, sex, education and geography in Canada and was strongly associated with tobacco smoking. More than 15% of Canadians reported using cannabis in 2017. Between 2004 and 2017, the age-adjusted prevalence of cannabis use increased by 5% in women and 8% in men, relative increases of 81% and 64%. Despite the overall rise in cannabis consumption, we found decreasing trends among adolescent men and women aged 15–19 years. Compared with women, men consistently reported higher cannabis use over time, age and province, although relative increases were larger in women. The prevalence of cannabis use increased considerably among the most educated groups between 2012 and 2017.

Contemporary national data on cannabis consumption in Canada since legalization is limited and mainly presented in aggregate form.[3,24–28] Data are available on youth prevalence,[26–28] and 2 studies have included provincial differences in cannabis use across Canada.[3,24] Data from the COMPASS study among grade 9–12 students in Ontario and Alberta suggest a slight increase in cannabis use between 2016 and 2018.[26] However, the use of a convenience sample makes these results less generalizable. Previous reports of national trends in cannabis use are consistent with our results by age, sex and province,[24,25] although data on educa-

tion and pregnancy have not been previously reported. Between 2018 and 2019, the National Cannabis Survey found an increase in prevalence among people aged 15–24 years.[3,24] Consistent with our findings, this increase is driven by the 18–24 year age group and declines were found among those aged 15–17 years.[24]

Research in the US shows similar trends and age distribution, and higher consumption in males than in females.[3,4,8,9,29] Recent national surveys indicate an increase in adult (≥ 18 yr) cannabis consumption, and a decrease among adolescents (12–17 yr). Recent work by Anderson and colleagues suggests that there is a decline in the prevalence of youth cannabis consumption post-legalization of recreational cannabis.[30] These data suggest that recreational cannabis laws in the US may be associated with an 8% decrease (OR 0.92, 95% CI 0.87–0.96) in past-month use and a 9% decrease (OR 0.91, 95% CI 0.84–0.98) in heavy (more than 10 days per month) use among US students in grades 9–12.[31] These findings have some methodological limitations, particularly that few states have sufficient post-legalization data, limiting the ability to draw conclusive inferences.[32–36] In our study, we found a similar trend in this age group before legalization, which suggests an age or cohort effect in addition to any potential effect from the policy change.

There are concerns that the legalization of recreational cannabis may increase social acceptability and accessibility of the drug. In the US, recreational cannabis legalization may
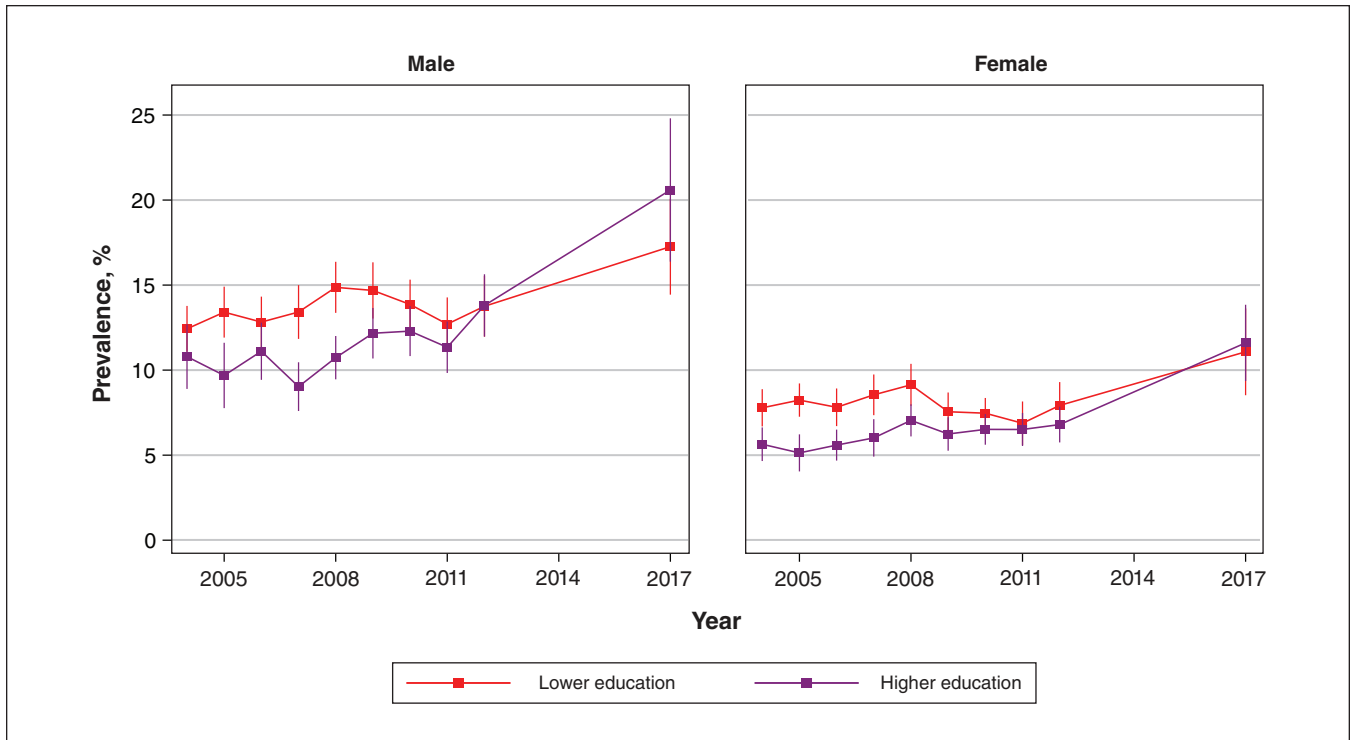
**Figure 4:** Age-adjusted trends in the prevalence of past-year cannabis consumption by level of education and sex, Canada 2004–2017. Estimates are shown with 95% confidence intervals. Lower education includes less than high school and completed high school; higher education includes completed college and completed university. Data sources: Canadian Tobacco Use Monitoring Survey (2004–2012), Canadian Alcohol and Drugs Survey (2013–2017) and Canadian Alcohol and Drug Use Monitoring Survey (2008–2012).

**Table 3:** Prevalence and association between past-year cannabis use and level of education among men and women in Canada, 2004–2017

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| Level of education | Prevalence, % (95% CI) | Adjusted OR (95% CI)* | Adjusted OR (95% CI)† | Prevalence, % (95% CI) | Adjusted OR (95% CI)* | Adjusted OR (95% CI)† |
| Less than high school | 13.8 (13.0–14.7) | 1.45 (1.25–1.68) | 0.85 (0.73–0.99) | 7.5 (6.9–8.1) | 1.18 (1.00–1.40) | 0.72 (0.61–0.85) |
| Completed high school | 15.9 (15.1–16.7) | 1.55 (1.37–1.75) | 1.01 (0.89–1.15) | 7.8 (7.3–8.4) | 1.47 (1.28–1.68) | 0.92 (0.80–1.06) |
| Completed college | 14.9 (14.0–15.8) | 1.39 (1.23–1.58) | 1.11 (0.97–1.26) | 8.2 (7.7–8.8) | 1.44 (1.26–1.64) | 1.10 (0.96–1.26) |
| Completed university | 9.0 (8.3–9.9) | 1.00 (Ref.) | 1.00 (Ref.) | 5.2 (4.7–5.7) | 1.00 (Ref.) | 1.00 (Ref.) |

Note: CI = confidence interval, OR = odds ratio, Ref. = reference category.
*Adjusted for age and survey year.
†Adjusted for age, tobacco smoking, province and survey year.

have contributed to increases in positive attitudes toward cannabis use and, ultimately, increases in consumption.[4,6,37,38] Several policy mechanisms exist, including restricting the maximum potency, increasing tax and the introduction of minimum unit pricing, which may increase the safety of cannabis use while minimizing increases in prevalence.[39] These policies should be combined with adequate public communication regarding the risks of cannabis use.

We found a substantial increase in cannabis use in older people over time, with about half of them using cannabis for therapeutic reasons. Little is known about the potential harmful effects of cannabis in senior populations. As such, cannabis

legislation should prioritize public health messages for vulnerable populations, including adolescents, pregnant women and older people.

In our study, we identified a substantial number of reproductive-age women who consume cannabis. Recently, up to 2% of pregnant women in an Ontario birth cohort reported using cannabis while pregnant, and this increased to more than 6% among women aged 15–24 years.[40] Substantial evidence exists to discourage the use of cannabis during pregnancy;[41] however, the trends we observed in our study suggest that women may be unaware of the potential risks of cannabis in pregnancy.

## Limitations

There are limitations to the present study. Cannabis consumption was self-reported. Self-reporting may under- or overestimate the true prevalence because of social desirability biases. We assessed past 12-month cannabis consumption because this question was consistently found on surveys starting in 2004, but this may only reflect occasional use. Analyses of past 3-month use, available in more recent surveys, show similar results and better capture current use.

The surveys used exclude the Canadian territories along with other segments of the population, including individuals without residential landline telephones, limiting generalizability. Residential telephone surveys indicate that 14%–16% of the Canadian population do not have landlines,[43] and characteristics of ownership may correlate with cannabis use. The survey sampling weights are designed to account for these exclusions, and our estimates align with other sources with different sampling methodologies.

Although cannabis for therapeutic reasons has been available in Canada with a physician prescription since 2001, survey questions on medical use were only available in 2015 and 2017. Although most of cannabis use is recreational, about one-third of past-year use is related to therapeutic purposes, and we were not able to differentiate therapeutic use in earlier surveys. Surveys were conducted before the legalization of recreational cannabis, and thus, we were unable to assess the influence of the new legislation. In addition, data on pregnancy have not been available nationally since 2012. Finally, educational data was missing from 2 recent surveys in 2013 and 2015, limiting trends analysis by level of education.

## Conclusion

The prevalence of cannabis consumption in Canadians varies by sex, age, level of education and geography. Cannabis consumption increased between 2004 and 2017 across most ages, remained more prevalent in men than in women and has been increasing among those with higher levels of education. Despite overall increases, there have been steady decreases in cannabis use among adolescents. Further analyses of Canadian cannabis consumption post-legalization and across socioeconomic status will be essential to advise public health policies and inform future policies.

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