

1 **Potential Harms from Legalization of Recreational Cannabis Use in Canada: A Commentary**

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19 **Commentary**

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ABSTRACT

With the recent legalization of recreational cannabis use in Canada, questions remain concerning optimal regulation to minimize harms and ensure public health and safety. Patterns of use are subject to change following legalization, and it is important to consider the potential adverse effects that this may have on public health. Important areas of consideration are methods of consumption (e.g., vaping, edibles) and product proliferation; acute and long-term health and behavioural effects (including impaired driving); as well as use in vulnerable groups such as children and youth, pregnant women, individuals with mental illness, individuals with low socioeconomic status, and indigenous populations. To support harm reduction measures and evidence-based policy, there is a need to anticipate the potential ramifications that legalization of recreational cannabis use may have on public health in Canada.

MeSH terms: Cannabis, health legislation, public health, vulnerable populations

1 **BACKGROUND**

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3 Cannabis is the most commonly cultivated and consumed illicit drug worldwide.(1) It is estimated
4 that more than 162 million people used cannabis worldwide in 2004 (4% of the global population aged
5 15-64).(1) Approximately 14% of annual cannabis users consume cannabis daily, representing
6 approximately 22 million individuals worldwide.(1) In 2018, 14% of Canadians aged 15 years or older
7 reported cannabis use in the past 3 months, with 40% of these individuals reporting daily use.(2) Recent
8 cannabis use was highest among individuals aged 25-34 years (26%), followed by those aged 15-24
9 (23%), 35-44 (16%), and 45 and older (7%).(2)

10 Expected positive impacts from the national legalization of recreational cannabis use in Canada
11 include increased tax revenue for the Canadian economy, decreased black market activity, and reduced
12 criminal charges (which disproportionately affect marginalized populations). In this commentary, we
13 discuss the possible impact of recreational cannabis legalization on methods of cannabis consumption,
14 potential harms, and vulnerable groups.

15 **METHODS OF CONSUMPTION**

16 Most cannabis consumption is through smoke inhalation (e.g., via a rolled joint containing dried
17 cannabis flower).(1) It may be smoked using a pipe (similar to tobacco) or a cigar that has been emptied
18 of tobacco and refilled, through a water pipe, or through other makeshift devices.(1) Consumption using
19 electronic cigarettes (e-cigarettes) is increasingly popular; re-fillable chambers for liquid (generally
20 consisting of propylene glycol or glycerin, with or without nicotine) provide the opportunity for users to
21 make additions to commercially available ‘e-liquids’, including derivatives of cannabis such as oils.(3)
22 The potency of tetrahydrocannabinol (THC) in these cannabis oils is often higher than that of dried
23 cannabis flower.(1) Survey data from the United States suggest that, in 2014, consumption via e-cigarette
24 (“vaping”) was most common among younger cannabis users: 19% of users aged 18-24, 16% of users
25 25-34, 9% of users 35-49, and 6% of users 50 and older.(4)

1 Consumption of cannabis in foods (“edibles”) is the second most popular method of consuming
2 cannabis in Canada. Among Canadians aged 15 years and older reporting cannabis use in the past three
3 months, 28% had consumed cannabis in the form of edibles.(2) The subjective effects of consumption
4 are slower in onset and longer in duration when ingested.(1) Consequently, this method may result in the
5 accidental over-ingestion of cannabis, with potential adverse effects such as vomiting, dizziness, and
6 anxiety, particularly in new or infrequent users.(5)

7 Overall, the industry-led proliferation of cannabis-containing products will likely result in
8 increased use of higher potency cannabis products. The presentation of these products in forms that
9 appeal to youth (e.g., e-cigarettes) is particularly concerning, given the negative effects of cannabis use
10 on the developing brain. Despite bans on the sale of cannabis to minors, it remains to be seen whether
11 the increased availability of these products in the general population will afford youth greater access than
12 prior to legalization.

13 **POTENTIAL HARMS**

14 While cannabis is often considered less harmful than other drugs such as alcohol and opioids, it
15 has acute effects across organ systems.(6) Short-term learning, memory, attention, motor skills, reaction
16 time, and skilled activities are acutely impaired following use.(7, 8) Cannabis can also induce negative
17 emotional reactions, including severe anxiety, panic, and paranoia, which are dose-related and more
18 common in new users and/or psychologically vulnerable individuals.(5) In data concerning cannabis-
19 related emergency department visits in the United States in 2002, the most common reason for the visit
20 was an unexpected reaction (40-50%).(1) In 72% of cases where cannabis was mentioned, other drugs
21 were also used in combination.(1) The state of Colorado (which legalized medical cannabis in 2000 and
22 recreational cannabis in 2012) found the overall rate of hospitalizations with cannabis-related billing
23 codes increased each year since 2008.(9) Calls to the poison control center were also higher following
24 legalization, including those for children with unintentional exposure.(9)

1 There may be long-term health sequelae from cannabis consumption, particularly in terms of
2 respiratory disease. There is substantial evidence of an association between chronic cannabis use and
3 respiratory symptoms and chronic bronchitis episodes, although some residual confounding due to
4 smoking tobacco is possible.(8) Evidence is limited concerning an association between cannabis smoking
5 and risk of developing chronic obstructive pulmonary disorder, with insufficient evidence to determine
6 whether cannabis smoking is associated with asthma development or exacerbation.(8) While cannabis
7 use has not been associated with lung or other cancers, cannabis smoke contains known carcinogens and
8 other chemicals implicated in the development of respiratory disease.(10) The elevated risk is presumed
9 to be reduced in methods of consumption that do not include combustion (e.g., vaping, edibles), however
10 the relative safety of these methods is as yet unknown.

11 Dependence also remains a concern, with a significant portion of regular users finding it difficult
12 to stop using, even when it has negative effects on their life.(1) Approximately 10% of individuals who
13 have ever used cannabis will progress to daily use at some point, and approximately 20-30% will use on
14 a weekly basis.(1) Dependence is most common among individuals aged 20-24 years, particularly
15 males.(11) There is substantial evidence that being male, smoking cigarettes, and initiating cannabis use
16 at earlier ages increases the risk for cannabis dependence.(8) Cannabis use, and dependence in particular,
17 may have substantial impacts in areas such as educational attainment and labour market participation.

18 An additional concern is whether cannabis use increases other substance use. Cannabis is
19 frequently consumed with other legal (e.g., tobacco, alcohol) and illegal (e.g., opioids,
20 methamphetamines) drugs.(1) It is most often smoked with tobacco in many developed countries,
21 including in Europe and Australia.(1) However, combined use is less frequent in North America,
22 particularly in the United States and to some extent Canada.(1) The rise in e-cigarette use could increase
23 the likelihood of dual consumption of cannabis and tobacco. There is moderate evidence to suggest that
24 cannabis use is associated with the development of substance abuse and/or dependence, including

1 alcohol, tobacco, and illicit drugs, with limited evidence that cannabis use is associated with initiation of
2 tobacco use or changes in patterns of other substance use.(8)

3 Lastly, cannabis-impaired driving is a major concern. Cannabis consumption significantly
4 decreases psychomotor skills, impairing performance on critical tracking tasks, divided-attention tasks,
5 and assessments of reaction time.(12) Among Canadians with a valid driver's license who used cannabis
6 in the past three months, 14% reported driving within two hours of cannabis consumption.(2) This
7 proportion increased to 23% of daily or weekly consumers of cannabis.(2) The biochemical measurement
8 of impairment from cannabis remains difficult. THC is fat-soluble; therefore, while it quickly passes out
9 of the blood, its metabolites can remain in the brain and other organs for extended periods of time.(1)
10 Urinalysis that detects cannabis metabolites only indicates recent use, rather than impairment at the time
11 of testing.(1) However, studies that have measured THC in the blood or urine showed that drivers who
12 were positive for THC (particularly at higher doses) were 3-7 times more likely to be involved in
13 vehicular crashes compared to drivers who did not use drugs or alcohol.(13) Combining cannabis and
14 alcohol impairs driving to a greater degree than either drug used alone; each drug produces a different
15 set of functional impairments, with the combination resulting in profound effects on complex tasks such
16 as driving.(14)

17 **VULNERABLE POPULATIONS**

18 The impact of legalization on children and youth warrants particular consideration. The 2003
19 Ontario Student Drug Use Survey of students in grades 7-13 found that 30% of Ontarian youth had used
20 cannabis at least once in the past year (compared to approximately 11% of the general population).(1) A
21 number of high quality longitudinal studies illustrate the substantial negative impact of cannabis use
22 during adolescence. A New Zealand birth cohort study found adolescent cannabis use to be associated
23 with other illicit drug use, criminal activity, depression, and suicidal behaviours.(15) Other longitudinal
24 studies have found an association between cannabis use before the age of 15 and school dropout that

1 persists after controlling for potential confounders.(16) Adolescent cannabis users who drop out of school
2 are more likely to be unemployed and are less satisfied with their lives and peer relationships in their late
3 20s.(16) The Dunedin Study, a longitudinal prospective birth cohort, found that individuals with
4 adolescent-onset cannabis dependence exhibited neuropsychological declines across broad domains of
5 functioning, which were not restored fully by cessation.(17) This highlights importance of reducing youth
6 access to cannabis-containing products.

7 Pregnant women are another population potentially vulnerable to the adverse effects of cannabis
8 use. Cannabis is the most common illicit drug used during pregnancy, with prevalence of use estimated
9 to be between 3-30% in various populations.(18) One study found that approximately half of users
10 consumed cannabis to treat nausea and vomiting associated with pregnancy.(18) While this is not
11 necessarily recreational use, it suggests that use by pregnant women may increase following legalization
12 as more women choose to self-medicate with cannabis. This behaviour may be encouraged by the
13 cannabis industry; one study found nearly 70% of cannabis dispensaries in Colorado recommended
14 cannabis to treat first trimester nausea.(19) Nausea and vomiting of pregnancy is an approved indication
15 for medical cannabis use in 21 of the United States, despite a lack of clarity surrounding its safety in
16 pregnancy.(20)

17 Cannabis freely crosses the placenta and is excreted in breast milk.(18) Animal data suggest that
18 high doses of cannabis may cause fetal growth retardation and congenital malformations, although
19 epidemiological studies have not found an increase in birth defects associated with cannabis use in
20 humans.(16) Determining causality for the few reported adverse associations is difficult, given that
21 cannabis is frequently consumed with other drugs.(16) However, there is substantial evidence that
22 maternal cannabis use is associated with low birth weight, and limited evidence of an association between
23 cannabis use and pregnancy complications and admission to neonatal intensive care.(8)

24 Other vulnerable groups include individuals with low socioeconomic status, individuals with

1 mental illness, and indigenous populations. Data from the United States show that individuals with the
2 lowest incomes are at the highest risk for cannabis dependence.(21) As with alcohol, tobacco, and other
3 drugs, individuals with mental illness also consume cannabis with greater frequency than the general
4 population. Data from the National Epidemiologic Survey on Alcohol and Related Conditions found
5 individuals with mental illness in the past 12 months to be 2.5 times more likely to consume cannabis
6 than individuals without mental illness in the past 12 months, and 3.2 times more likely to have a cannabis
7 use disorder.(22) Likewise, indigenous populations have higher use than the general population. The
8 First Nations Regional Health Survey 2008/10 found that 32.3% of respondents had used cannabis in the
9 past year, with 12.4% of respondents using cannabis daily.(23) Considering the impact of legalization on
10 these vulnerable populations is of critical importance in Canada.

11 **PUBLIC HEALTH PERSPECTIVE**

12 With the recent legalization of recreational cannabis, Canada can likely expect social
13 normalization with associated increases in use. In Colorado, which legalized cannabis in 2012, past year
14 cannabis use in those 18 and older increased from 15% to 24% between 2008-2009 and 2015-2016.(24)
15 While legislation and regulations are in place to minimize the harms of cannabis use, additional steps are
16 needed to promote public health and safety. In March 2017, Health Canada began a public education and
17 awareness campaign informing Canadians about the health and safety risks of cannabis, including
18 information concerning impaired driving.(25) The Society of Obstetricians and Gynaecologists of
19 Canada also launched a public awareness campaign advising women against the use of cannabis during
20 pregnancy.(26) These efforts can be supported at the provincial/territorial, municipal, and community
21 levels with the development of comprehensive harm reduction programs, as well as the promotion of
22 patient-care provider conversations.

23 We have highlighted three key areas which could be targeted to mitigate potential harms from
24 cannabis legalization: 1) new methods of consumption which may increase the potency of cannabis

1 consumed (and the potential for adverse reactions), as well as its appeal to minors; 2) the concomitant
2 use of cannabis with other drugs, which could result in increased use of tobacco and alcohol (with known
3 health consequences) following cannabis legalization, and could contribute substantially to driving
4 impairment; and lastly, 3) the potential for significant impacts on populations which may be particularly
5 at risk for long-term consequences from cannabis use.

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