



Potential harms from legalization of recreational cannabis use in Canada

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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); and use in vulnerable groups, such as children and youth, pregnant women, individuals with mental illness, individuals with low socio-economic 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.

Résumé

L'usage récréatif du cannabis a été légalisé récemment au Canada, mais des questions demeurent sur la réglementation optimale pour réduire les préjudices et assurer la santé et la sécurité du public. Comme les tendances de consommation pourraient changer après la légalisation, il importe de tenir compte des éventuels effets indésirables que cela pourrait avoir sur la santé publique. Il faudra notamment considérer les méthodes de consommation (p. ex. vapotage, ingestion) et la prolifération des produits; les effets immédiats et à long terme sur la santé et les comportements (dont la conduite avec facultés affaiblies); ainsi que la consommation dans les groupes vulnérables comme les enfants et les jeunes, les femmes enceintes, les personnes atteintes de maladies mentales, les personnes de faible statut socioéconomique et les populations autochtones. Pour soutenir les mesures de réduction des méfaits et l'élaboration de politiques fondées sur les données probantes, il est nécessaire de prévoir les ramifications possibles de la légalisation de l'usage récréatif du cannabis sur la santé publique au Canada.

Keywords Cannabis · Health legislation · Public health · Vulnerable populations

Mots-clés Cannabis · Législation sanitaire · Santé publique · Populations vulnérables

Cannabis is the most commonly cultivated and consumed illicit drug worldwide (United Nations Office on Drugs and Crime 2006). It is estimated that more than 162 million people used cannabis worldwide in 2004 (4% of the

global population aged 15–64) (United Nations Office on Drugs and Crime 2006). Approximately 14% of annual cannabis users consume cannabis daily, representing approximately 22 million individuals worldwide (United

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Nations Office on Drugs and Crime 2006). In 2018, 14% of Canadians aged 15 years or older reported cannabis use in the past 3 months, with 40% of these individuals reporting daily use (Statistics Canada 2018). Recent cannabis use was highest among individuals aged 25–34 years (26%), followed by those aged 15–24 (23%), 35–44 (16%), and 45 and older (7%) (Statistics Canada 2018).

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

Methods of consumption

Most cannabis consumption is through smoke inhalation (e.g., via a rolled joint containing dried cannabis flower) (United Nations Office on Drugs and Crime 2006). It may be smoked using a pipe (similar to tobacco) or a cigar that has been emptied of tobacco and refilled, through a water pipe, or through other makeshift devices (United Nations Office on Drugs and Crime 2006). Consumption using electronic cigarettes (e-cigarettes) is increasingly popular; re-fillable chambers for liquid (generally consisting of propylene glycol or glycerin, with or without nicotine) provide the opportunity for users to make additions to commercially available “e-liquids,” including derivatives of cannabis such as oils (Foulds et al. 2011). The potency of tetrahydrocannabinol (THC) in these cannabis oils is often higher than that of dried cannabis flower (United Nations Office on Drugs and Crime 2006). Survey data from the United States suggest that, in 2014, consumption via e-cigarette (“vaping”) was most common among younger cannabis users: 19% of users aged 18–24, 16% of users 25–34, 9% of users 35–49, and 6% of users 50 and older (Schauer et al. 2016).

Consumption of cannabis in foods (“edibles”) is the second most popular method of consuming cannabis in Canada. Among Canadians aged 15 years and older reporting cannabis use in the past 3 months, 28% had consumed cannabis in the form of edibles (Statistics Canada 2018). The subjective effects of consumption are slower in onset and longer in duration when ingested (United Nations Office on Drugs and Crime 2006). Consequently, this method may result in the accidental over-ingestion of cannabis, with potential

adverse effects such as vomiting, dizziness, and anxiety, particularly in new or infrequent users (Ashton 2001).

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

Potential harms

While cannabis is often considered less harmful than other drugs, such as alcohol and opioids, it has acute effects across organ systems (Khalsa et al. 2002). Short-term learning, memory, attention, motor skills, reaction time, and skilled activities are acutely impaired following use (Hall and Solowij 1998; National Academies of Sciences, Engineering, and Medicine 2017). Cannabis can also induce negative emotional reactions, including severe anxiety, panic, and paranoia, which are dose-related and more common in new users and/or psychologically vulnerable individuals (Ashton 2001). In data concerning cannabis-related emergency department visits in the US in 2002, the most common reason for the visit was an unexpected reaction (40–50%) (United Nations Office on Drugs and Crime 2006). In 72% of cases where cannabis was mentioned, other drugs were also used in combination (United Nations Office on Drugs and Crime 2006). The state of Colorado (which legalized medical cannabis in 2000 and recreational cannabis in 2012) found the overall rate of hospitalizations with cannabis-related billing codes increased each year since 2008 (Colorado Department of Public Health and Environment 2016). Calls to the poison control center were also higher following legalization, including those for children with unintentional exposure (Colorado Department of Public Health and Environment 2016).

There may be long-term health sequelae from cannabis consumption, particularly in terms of respiratory disease. There is substantial evidence of an association between chronic cannabis use and respiratory symptoms and chronic bronchitis episodes, although some residual confounding due to smoking tobacco is possible (National Academies of Sciences, Engineering, and Medicine 2017). Evidence is limited concerning an association between cannabis smoking and risk of developing chronic obstructive pulmonary disorder, with insufficient evidence to determine whether cannabis smoking is associated with asthma development or

exacerbation (National Academies of Sciences, Engineering, and Medicine 2017). While cannabis use has not been associated with lung or other cancers, cannabis smoke contains known carcinogens and other chemicals implicated in the development of respiratory disease (Moir et al. 2008). The elevated risk is presumed to be reduced in methods of consumption that do not include combustion (e.g., vaping, edibles); however, the relative safety of these methods is as yet unknown.

Dependence also remains a concern, with a significant portion of regular users finding it difficult to stop using, even when it has negative effects on their life (United Nations Office on Drugs and Crime 2006). Approximately 10% of individuals who have ever used cannabis will progress to daily use at some point, and approximately 20–30% will use on a weekly basis (United Nations Office on Drugs and Crime 2006). Dependence is most common among individuals aged 20–24 years, particularly males (Degenhardt et al. 2013). There is substantial evidence that being male, smoking cigarettes, and initiating cannabis use at earlier ages increases the risk for cannabis dependence (National Academies of Sciences, Engineering, and Medicine 2017). Cannabis use and dependence, in particular, may have substantial impacts in areas such as educational attainment and labour market participation.

An additional concern is whether cannabis use increases other substance use. Cannabis is frequently consumed with other legal (e.g., tobacco, alcohol) and illegal (e.g., opioids, methamphetamines) drugs (United Nations Office on Drugs and Crime 2006). It is most often smoked with tobacco in many developed countries, including in Europe and Australia (United Nations Office on Drugs and Crime 2006). However, combined use is less frequent in North America, particularly in the US and to some extent Canada (United Nations Office on Drugs and Crime 2006). The rise in e-cigarette use could increase the likelihood of dual consumption of cannabis and tobacco. There is moderate evidence to suggest that cannabis use is associated with the development of substance abuse and/or dependence, including alcohol, tobacco, and illicit drugs, with limited evidence that cannabis use is associated with initiation of tobacco use or changes in patterns of other substance use (National Academies of Sciences, Engineering, and Medicine 2017).

Last, cannabis-impaired driving is a major concern. Cannabis consumption significantly decreases psychomotor skills, impairing performance on critical tracking tasks, divided attention tasks, and assessments of reaction time (Hartman and Huestis 2013). Among Canadians with a valid driver's license who used cannabis in the past 3 months, 14% reported driving within 2 h of cannabis consumption (Statistics Canada 2018). This proportion increased to 23% of daily or weekly consumers of cannabis (Statistics Canada 2018). The biochemical measurement of impairment from cannabis remains

difficult. THC is fat-soluble; therefore, while it quickly passes out of the blood, its metabolites can remain in the brain and other organs for extended periods of time (United Nations Office on Drugs and Crime 2006). Urinalysis that detects cannabis metabolites only indicates recent use, rather than impairment at the time of testing (United Nations Office on Drugs and Crime 2006). However, studies that have measured THC in the blood or urine showed that drivers who were positive for THC (particularly at higher doses) were 3–7 times more likely to be involved in vehicular crashes compared to drivers who did not use drugs or alcohol (Ramaekers et al. 2004). Combining cannabis and alcohol impairs driving to a greater degree than either drug used alone; each drug produces a different set of functional impairments, with the combination resulting in profound effects on complex tasks such as driving (O'Kane et al. 2002).

Vulnerable populations

The impact of legalization on children and youth warrants particular consideration. The 2003 Ontario Student Drug Use Survey of students in grades 7–13 found that 30% of Ontarian youth had used cannabis at least once in the past year (compared to approximately 11% of the general population) (United Nations Office on Drugs and Crime 2006). A number of high-quality longitudinal studies illustrate the substantial negative impact of cannabis use during adolescence. A New Zealand birth cohort study found adolescent cannabis use to be associated with other illicit drug use, criminal activity, depression, and suicidal behaviours (Fergusson et al. 2002). Other longitudinal studies have found an association between cannabis use before the age of 15 and school dropout that persists after controlling for potential confounders (Hall and Degenhardt 2009). Adolescent cannabis users who drop out of school are more likely to be unemployed and are less satisfied with their lives and peer relationships in their late 20s (Hall and Degenhardt 2009). The Dunedin Study, a longitudinal prospective birth cohort, found that individuals with adolescent-onset cannabis dependence exhibited neuropsychological declines across broad domains of functioning, which were not restored fully by cessation (Meier et al. 2012). This highlights the importance of reducing youth access to cannabis-containing products.

Pregnant women are another population potentially vulnerable to the adverse effects of cannabis use. Cannabis is the most common illicit drug used during pregnancy, with prevalence of use estimated to be between 3% and 30% in various populations (Metz and Stickrath 2015). One study found that approximately half of users consumed cannabis to treat nausea and vomiting associated with pregnancy (Metz and Stickrath 2015). While this is not necessarily recreational use, it suggests that use by pregnant women may increase following

legalization as more women choose to self-medicate with cannabis. This behaviour may be encouraged by the cannabis industry; one study found nearly 70% of cannabis dispensaries in Colorado recommended cannabis to treat first-trimester nausea (Dickson et al. 2018). Nausea and vomiting of pregnancy is an approved indication for medical cannabis use in 21 states in the US, despite a lack of clarity surrounding its safety in pregnancy (O'Connor 2018).

Cannabis freely crosses the placenta and is excreted in breast milk (Metz and Stickrath 2015). Animal data suggest that high doses of cannabis may cause fetal growth retardation and congenital malformations, although epidemiological studies have not found an increase in birth defects associated with cannabis use in humans (Hall and Degenhardt 2009). Determining causality for the few reported adverse associations is difficult, given that cannabis is frequently consumed with other drugs (Hall and Degenhardt 2009). However, there is substantial evidence that maternal cannabis use is associated with low birth weight, and limited evidence of an association between cannabis use and pregnancy complications and admission to neonatal intensive care (National Academies of Sciences, Engineering, and Medicine 2017).

Other vulnerable groups include individuals with low socio-economic status, individuals with mental illness, and Indigenous populations. Data from the US show that individuals with the lowest incomes are at the highest risk for cannabis dependence (Carliner et al. 2017). As is the case with alcohol, tobacco, and other drugs, individuals with mental illness consume cannabis with greater frequency than the general population. Data from the National Epidemiologic Survey on Alcohol and Related Conditions found individuals with mental illness in the past 12 months to be 2.5 times more likely to consume cannabis than individuals without mental illness in the past 12 months, and 3.2 times more likely to have a cannabis use disorder (Lev-Ran et al. 2013). Likewise, Indigenous populations have higher use than the general population. The First Nations Regional Health Survey 2008/10 found that 32.3% of respondents had used cannabis in the past year, with 12.4% of respondents using cannabis daily (First Nations Information Governance Centre 2010). Considering the impact of legalization on these vulnerable populations is of critical importance in Canada.

Public health perspective

With the recent legalization of recreational cannabis, Canada can likely expect social normalization with associated increases in use. In Colorado, which legalized cannabis in 2012, past-year cannabis use in those 18 and older increased from 15% to 24% between 2008–2009 and 2015–2016 (Substance Abuse and Mental Health Services Administration 2016). While legislation and regulations are

in place to minimize the harms of cannabis use, additional steps are needed to promote public health and safety. In March 2017, Health Canada began a public education and awareness campaign informing Canadians about the health and safety risks of cannabis, including information concerning impaired driving (Investing News Network 2017). The Society of Obstetricians and Gynaecologists of Canada also launched a public awareness campaign advising women against the use of cannabis during pregnancy (The Society of Obstetricians and Gynaecologists of Canada (SOGC) 2018). These efforts can be supported at the provincial/territorial, municipal, and community levels with the development of comprehensive harm reduction programs, as well as the promotion of patient–care provider conversations.

We have highlighted three key areas which could be targeted to mitigate potential harms from cannabis legalization: (1) new methods of consumption which may increase the potency of cannabis consumed (and the potential for adverse reactions), as well as its appeal to minors; (2) the concomitant use of cannabis with other drugs, which could result in increased use of tobacco and alcohol (with known health consequences) following cannabis legalization and could contribute substantially to driving impairment; and (3) the potential for significant impacts on populations which may be particularly at risk for long-term consequences from cannabis use.

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