

Impaired driving and legalization of recreational cannabis

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“Don’t drive high.” This is the message that the government of Canada wanted all drivers to take to heart after the legalization of recreational cannabis in October 2018. However, the association between the use of legal recreational cannabis and impaired driving is not clear. Although cannabis consumption has the potential to substantially impair psychomotor skills and cognitive functions — reducing performance on critical tracking and divided-attention tasks, slowing reaction time and increasing lane weaving¹ — the influence of cannabis on driving tasks varies by individual, dose and methods of consumption, and time since consumption before driving.² Some studies have found associations between cannabis use and impairment of driving — including in driving simulators, closed-course driving and epidemiologic studies³ — but others have not.⁴ Furthermore, the findings of studies are frequently confounded by users’ consumption of cannabis with other legal (e.g., tobacco, alcohol) and illegal (e.g., opioids, methamphetamines) substances,³ making it difficult to estimate the relative contribution of cannabis consumption to motor vehicle collisions. This in turn leads to difficulty in establishing the optimal approach to educating both health care providers and the public about the effects of cannabis, so as to deter driving under the influence of cannabis.

We analyze the association between recreational cannabis legalization and fatal motor vehicle collision rates and discuss the implications of existing evidence for Canadian policy and physicians’ practice.

What is known about the use of cannabis and driving in Canada?

According to survey data from Statistics Canada, the proportion of Canadians who reported having consumed cannabis in the past 3 months increased from 14% to 17% from 2018 (before legalization) to 2019.⁵ Although individuals may be more likely to report cannabis use after legalization,⁶ these data suggest that overall use may have increased since legalization. Among all

KEY POINTS

- Analyses of data suggest that legalization of recreational cannabis in United States jurisdictions may be associated with a small but significant increase in fatal motor vehicle collisions and fatalities, which, if extrapolated to the Canadian context, could result in as many as 308 additional driving fatalities annually.
- Efforts to deter cannabis-impaired driving in Canada include the implementation of federal tetrahydrocannabinol driving limits (≥ 2 ng/mL) with associated penalties, the development of measures and tools for the detection of cannabis impairment, and public education about the risks of cannabis-impaired driving.
- Health care professionals have an opportunity to educate patients about the safer use of cannabis products, including advising against cannabis use and driving (especially in combination with alcohol), with a suggested wait time of at least 6 hours before driving.

recent users of cannabis with a driver’s licence, 13% reported driving within 2 hours of cannabis consumption.⁵ This proportion appears to be unchanged before and after legalization, but the absolute number of individuals who reported driving after recent cannabis use increased from 573 000 to 622 000 owing to the larger overall number of users.⁵ In addition, nearly 20% of users who reported driving after consuming cannabis also reported co-consuming alcohol.⁵

An analysis based on 2012 survey data estimated cannabis-related collisions in Canada to cost \$1.1 billion (95% confidence interval [CI] \$37 million to \$2.9 billion) annually in societal and economic costs, with drivers aged 34 years and younger responsible for the bulk of the costs.⁷ The authors estimated 75 cannabis-attributable deaths (95% CI 0–213), 4407 injuries (95% CI 20–11 549) and 7794 collisions resulting in property damage only (95% CI 3107–13 086); these findings indicate lack of clarity regarding the specific effect of cannabis on motor vehicle collisions.⁷

How has legalization of recreational cannabis affected the incidence of motor vehicle collisions in other jurisdictions?

We published an analysis of data collected from 2007 to 2018 in jurisdictions in the United States that have legalized recreational cannabis⁸ to inform an estimate of the potential impact of legalization on motor vehicle fatalities in Canada. For our study, we retrieved the annual number of fatal motor vehicle collisions and associated deaths for 2007–2018 from the US Fatality Analysis Reporting System for the 11 jurisdictions with legalized recreational cannabis in effect before 2019 (as of January 2021, recreational cannabis use has been made legal in 15 states and the District of Columbia), and examined the association between legalization of recreational cannabis and fatal motor vehicle collisions. We compared jurisdiction-specific rates before and after legalization and then meta-analyzed estimates across jurisdictions. We found that legalization was associated with increased rates of fatal motor vehicle collisions (incidence rate ratio [IRR] 1.15, 95% CI 1.06–1.26) and associated deaths (IRR 1.16, 95% CI 1.06–1.27).⁸ Our findings suggested that legalizing cannabis on a national scale could result in an additional 4843 motor vehicle fatalities per year in the US, an increase of 16%. In Canada, 1922 motor vehicle fatalities were reported in 2018;⁹ a 16% relative increase would correspond to 308 additional deaths annually.

Previous studies have also examined the association between legalization of recreational cannabis and fatal motor vehicle collisions. A 2016 study found that the proportion of drivers in Washington state involved in a fatal crash who tested positive for tetrahydrocannabinol (THC) approximately doubled (8% to 17%) in the year after legalization.¹⁰ Although the mere presence of THC does not necessarily denote impairment, the results suggest at minimum that more drivers had consumed cannabis after legalization. The authors of a 2019 study compared changes in traffic fatalities in 3 states with recreational legalization (Colorado, Washington and Oregon) versus neighbouring states without legalization.¹¹ They found a temporary increase in traffic fatalities in the first year after legalization, which the authors attributed to a possible celebratory response to legalization or an increase in inexperienced cannabis users, or both. They also hypothesized that later reductions in traffic fatalities could be a result of drivers substituting cannabis for alcohol use.

Another 2019 study also compared fatal crashes after recreational cannabis legalization in Colorado and Washington,¹² showing a nonsignificant trend toward increased fatal motor vehicle crashes over the 5 years before and after legalization compared with control states. A separate analysis that compared rates before and after commercial dispensaries opened (as legalization and commercial sale began at different times) found a significant increase in fatal motor vehicle collisions (+1.8 fatal collisions/billion vehicle miles travelled, 95% CI 0.4–3.7) after commercial dispensing began. A 2020 study using similar data found an increase in motor vehicle fatalities in Colorado (+1.5 fatalities/billion vehicle miles travelled, $p = 0.047$)

but not in Washington (+0.08 fatalities/billion vehicle miles travelled, $p = 0.67$) after the legalization of recreational cannabis retail sales.¹³ The authors hypothesized that differences between the states (e.g., greater retail density, cannabis use and cannabis tourism) may have contributed to the observed increase in traffic fatalities in Colorado but not Washington. Another study was conducted in 2020, which found an increase in motor vehicle fatalities (+2.1 fatalities/billion vehicle miles travelled, 95% CI 1.3–3.0) in 4 states (Colorado, Washington, Oregon and Alaska) after legalization of recreational cannabis retail sales, compared with 20 control states without legalized recreational or medical cannabis.¹⁴

Overall, available data from ecological studies suggest that legalization of recreational cannabis may be associated with a small but important relative increase in fatal motor vehicle collisions in the US. This increase may or may not be temporary. Further robust analyses should be conducted as more data become available.

Are steps to detect and deter cannabis-impaired driving in Canada likely to be effective?

In Canada, prudent regulatory and public health measures to deter cannabis-impaired driving may be able to prevent increases in cannabis-impaired driving and its consequences since the legalization of recreational cannabis. However, a multidisciplinary response is required for optimal detection and deterrence.¹⁵ Substantial uncertainty exists concerning the optimal use of available measures and tools for detecting cannabis-impaired driving.²

Canada presently uses psychomotor assessments that can be performed at the roadside to screen for drug impairment.³ These include Standardized Field Sobriety Tests: the one-leg stand, horizontal gaze nystagmus and walk-and-turn.¹⁶ These tests were developed for assessing impairment related to alcohol use, and their validity for detecting impairment due to cannabis is uncertain.³ After a failed Standardized Field Sobriety Test, an officer with specialized training, such as a drug recognition expert, will conduct more complex neurologic and ophthalmological tests to assess potential impairment. However, there are few such experts in Canada, as training is expensive and time-consuming, and law enforcement's ability to make experts available across broad jurisdictions is strained.^{2,17} In addition, drug recognition experts are not medically trained, and the accuracy with which officers can detect impairment and attribute it to a particular class of drugs varies.¹⁸ The validity of both Standardized Field Sobriety Tests and the drug recognition expert program for cannabis impairment remains uncertain, and other methods to either complement or replace these approaches should be investigated.

Biochemical measures of cannabis in blood, urine or saliva may be used in addition to psychomotor assessments when considering level of impairment. Canada's *Bill C-46* (2018) permits police to perform roadside testing of saliva for THC, with several testing devices currently approved and others being

evaluated.¹⁹ *Bill C-46* also specifies threshold driving “*per se*” limits for THC (2–5 ng/mL and \geq 5 ng/mL) with minimum impaired driving penalties and higher penalties for lower levels of THC if alcohol is also present (\geq 2.5 ng/mL THC with blood alcohol concentration \geq 0.5 mg/mL).¹⁹ Provinces and territories may implement stricter policies (Quebec and Saskatchewan have zero-tolerance policies, with penalties for any detectable THC).^{20,21} The practical application of these limits and their ability to withstand legal challenges remain unclear, however, because they are not based on a demonstrated correlation between THC levels and driving impairment.^{17,22}

Tetrahydrocannabinol is fat soluble and therefore passes quickly from blood into the brain and other organs, where its metabolites can remain for extended periods of time, making the accurate biochemical measurement of impairment difficult.³ Furthermore, relative impairment at a certain concentration of THC may potentially differ between individuals owing to variation in tolerance,²³ and chronic daily users of cannabis may continue to have detectable levels of THC in saliva or urine after weeks or even months of abstinence.^{24,25} The varied methods of cannabis consumption (e.g., smoking, vaping, edibles) also confound measurement, given different patterns of THC rise and fall in body fluids.² Substantial improvement in the accuracy of current biochemical measures to detect cannabis impairment is needed to both ensure public safety and protect the rights of legal cannabis users.

Despite uncertainty regarding test accuracy, messaging that reinforces to the public that impaired driving will be detected and penalties enforced is likely to be effective in deterring cannabis-impaired driving. Public awareness of the establishment of alcohol limit laws introduced between 1982 and 2000 in US jurisdictions is estimated to have reduced alcohol-related collisions by 14%–15%.^{26,27} The establishment of federal limits for driving after consuming THC may therefore prove to be useful and provide Canada with an advantage over deterrence strategies in the US. Of the 11 US jurisdictions that had legalization regulations for recreational cannabis in effect by 2020, only 4 had cannabis-specific driving limits.⁸

Other deterrence strategies include “zero-tolerance” policies for young drivers, sobriety spot checks roadside, and administrative sanctions (e.g., ticketing, fines, vehicle seizure, licence suspension) applied after impaired driving convictions.² A recent review considered that proactive policing techniques, when highly publicized and visible, can have an immediate and large effect on reducing impaired driving.²⁸

Can health care professionals help to prevent cannabis-impaired driving?

Brief counselling interventions in primary care settings have been shown to reduce problematic alcohol use and other risky behaviours²⁹ and may be adapted to counselling about cannabis use and driving. There is no evidence to suggest that driving risks are different for people who use cannabis for therapeutic versus recreational purposes. Therefore, the same information may be imparted to both groups.

Canada’s Lower-Risk Cannabis Use Guidelines recommend several evidence-based steps that patients could use to reduce their risk of several harms (Appendix 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.191032/tab-related-content).³⁰ These steps include choosing lower-potency products, limiting to occasional use, and choosing nonsmoking methods of consumption such as vapourizers or edibles (however, the guideline cautions that although edibles are safer for respiratory health, it is easier to consume larger doses and experience more severe impairment as a result of delayed psychoactive effects).³¹ The guideline also recommends against cannabis use and driving (especially in combination with alcohol), with a suggested wait time of at least 6 hours before driving.³⁰

Box 1 lists some evidence-based statements of fact that may be useful to health care practitioners when cautioning patients who use cannabis regarding driving high. Patients may not be aware that consumption in motor vehicles (even when parked) is prohibited, and that any cannabis in the vehicle must be stored out of reach of the driver (e.g., in the trunk).³² National guidance and provincial legislation behooves physicians to advise patients using any form of cannabis (including synthetic cannabinoids) that they may exceed legal THC limits even if they wait 6 hours

Box 1: Patient tool for cannabis-impaired driving in Canada

- Cannabis use impairs driving, making it more difficult to carry out tasks like staying in your lane, maintaining a consistent speed, making good decisions on the road and avoiding hazards.^{1,2}
- Drinking alcohol and using cannabis together impairs driving more than either drug alone.⁵
- Consumption in motor vehicles (even when parked) is prohibited. Cannabis in motor vehicles must be stored in a closed area out of reach of the driver and passengers (e.g., in the trunk).³
- Drugged driving is illegal. The police have many tools available to detect impaired driving, including sobriety and saliva tests roadside, blood testing and evaluation by a drug recognition expert. Penalties for a drugged driving offence include a maximum \$1000 fine (THC > 2 ng/mL but < 5 ng/mL), or for higher levels of THC (\geq 5 ng/mL):⁴
 - First offence: mandatory minimum \$1000 fine; possibility of up to 10 years in prison
 - Second offence: mandatory minimum 30 days in prison (maximum 10 years)
 - Third offence: mandatory minimum 120 days in prison (maximum 10 years)
- Cannabis affects each person differently, and its effects depend on the product used and the method and amount of consumption. With edibles in particular, it can take longer for the subjective effects to be felt and could result in consuming more than intended. When you consume cannabis, its effects make it difficult for you to know that you are impaired.²
- Do not take chances. Plan ahead if you are going to consume, either by making alternative transportation arrangements, or consuming well in advance of when you intend to drive (at least 6 hours).²

after consumption before driving (particularly in provinces like Quebec and Saskatchewan, which have zero-tolerance policies for THC),^{17,33,34} and emphasize the possible penalties for exceeding legal limits (regardless of impairment).³⁵ Although peak THC concentrations in plasma typically occur within 5–30 minutes of consumption and taper off after 2–4 hours, impairment may persist for 3–6 hours after consumption, depending on route and individual factors. Health care professionals should also be aware of discretionary or mandatory reporting requirements in their jurisdiction related to substance use and driving,³⁶ although knowledge gaps remain concerning determining fitness to drive, particularly for long-term regular users of cannabis.

Conclusion

Evidence from the US suggests that there is the potential for a small but important increase in fatal motor vehicle collisions after the legalization of recreational cannabis in Canada, which could result in about 308 additional road fatalities annually,⁸ as well as thousands more nonfatal injuries. However, the implementation of impaired driving regulations and educational campaigns, including federal THC driving limits and public awareness of these limits, may contribute to the prevention of potential increases in cannabis-impaired driving in Canada. Health care professionals should provide patients who use cannabis with clear, evidence-based guidance for safer cannabis use.

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