3

Clearing the Smoke on Cannabis

Cannabis Use and Driving

Douglas J. Beirness, Ph.D.
Senior Research & Policy Analyst and Advisor, CCSA
Amy J. Porath-Waller, Ph.D.
Senior Research & Policy Analyst, CCSA

CCSA - CCLAT

Canadian Centre on Substance Abuse

This is the third in a series of reports that reviews the effects of cannabis use on various aspects of human functioning and development. In this report, the effects of cannabis use on driving are discussed. Other reports in the series present the effects of chronic cannabis use on neurocognitive functioning and mental health, maternal cannabis use during pregnancy, and the respiratory effects of cannabis use.

Background

Cannabis is the most widely used illicit drug in Canada. According to the 2004 Canadian Addiction Survey, nearly 45% of Canadians aged 15 years and older reported using cannabis at least once and 14% reported use in the past year (Adlaf, Begin & Sawka, 2005). The use of cannabis is generally more prevalent among youth, with 39.3% of 15- to 17-year-olds and 69.9% of 18- to 19-year-olds reporting lifetime use. Rates of past-year use increase from 15–17 years of age (29.2%) to 18–19 years of age (47.2%). Approximately 46% of past-year cannabis users in Canada aged 15 and older reported using cannabis two or fewer times during the three months prior to the survey. A sizable percentage of past-year users indicated that they use cannabis more regularly on either a weekly (20.1%) or daily (18.1%) basis.

A growing body of evidence suggests that cannabis use may negatively impact several aspects of people's lives, including mental and physical health, cognitive functioning, ability to drive a motor vehicle, and pre- and postnatal development among offspring. In this report—the third in a series reviewing the effects of cannabis use on various aspects of human functioning and development (see Porath-Waller, 2009a, b)—the topic of cannabis use and driving is addressed. The issue of driving while impaired by cannabis has become increasingly important in Canada from both

public policy and road safety perspectives. The coming into force of the *Tackling Violent Crime Act* on July 2, 2008 (see text box) makes it timely to review the evidence on the prevalence of cannabis-impaired driving, the impact of cannabis on driving performance and collision risk, and methods for detecting drivers who are impaired by this substance. This report also discusses implications for policy and practice.

On July 2, 2008, the *Tackling Violent Crime Act* (Bill C-2; Government of Canada, 2008) was enacted. This legislation revised the *Criminal Code of Canada* to provide police with the authority to demand a driver suspected of being under the influence of drugs to submit to a Standardized Field Sobriety Test, to participate in an evaluation of drug influence by an officer trained in the Drug Evaluation and Classification program (known as a Drug Recognition Expert, or DRE), and to provide a sample of blood, breath or oral fluid to determine the type of drug(s) used.

The Standardized Field Sobriety Test (SFST) consists of a set of three tests: walk-and-turn, one-leg stand, and an examination of eye movements known as nystagmus. This set of tests provides validated evidence of impairment and is widely used throughout the United States.

A Drug Evaluation and Classification assessment involves a systematic 12-step procedure to assess the common effects associated with various classes of drugs. It concludes with the demand for a sample of blood, urine, and/or oral fluid for toxicological testing for drug content. Refusing to comply with any of these demands is a *Criminal Code* offence with penalties that are equivalent to those for an impaired driving conviction.

What is Drug-impaired Driving?

Drug-impaired driving refers to driving a motor vehicle (including all-terrain vehicles, snowmobiles and boats) while impaired by any type of drug (illegal, prescription or over-the-counter medication) or any combination of drugs and alcohol. Drug-impaired driving is an offence under the *Criminal Code of Canada.*

According to the *Criminal Code* (S. 253a), "everyone commits an offence who operates a motor vehicle or ...has the care or control of a motor vehicle, ...whether it is in motion or not while the person's ability to operate the vehicle... is impaired by alcohol or a drug."

Prevalence of Cannabis Use and Driving

An analysis of data from the 2004 Canadian Addiction Survey revealed that 4.8% of drivers in Canada admitted driving within two hours of using cannabis at least once in the past year (Beirness & Davis, 2006). This is more than double the 2.3% of drivers who reported driving after using cannabis in the 1989 National Alcohol and Other Drugs Survey (Eliany, Giesbrecht & Nelson, 1990). The average age of those who drove after cannabis use was 28 years—considerably younger than those who did not drive after using cannabis. Males were 3.6 times more likely than females to drive after cannabis use.

Among young people, the prevalence of driving after using cannabis is considerably higher. A student survey in Ontario found that 19.3% of students in Grades 10 through 12 reported driving after using cannabis (Adlaf, Mann & Paglia, 2003). A similar survey in the Atlantic provinces reported that 15.1% of senior students admitted driving after using cannabis (Asbridge, Poulin & Donato, 2005). Data from the 2004 Canadian Addiction Survey show that among drivers aged 16 to 18 years, 20.6% reported having driven after using cannabis. All three of the above cited surveys found that young people reported driving after using cannabis more frequently than driving after consuming alcohol.

In a recent roadside survey that collected oral fluid and breath samples from a random sample of nighttime drivers in British Columbia, 4.6% of drivers tested positive for cannabis. Of these, 20% also tested positive for alcohol (Beirness & Beasley, 2009). Male drivers and those between the ages of 25 and 34 were most likely to test positive for cannabis.

Cannabis use is not uncommon among drivers involved in collisions. In a study of seriously injured

drivers admitted to a regional trauma unit in Toronto, 13.9% tested positive for cannabis (Stoduto et al., 1993). Among drivers killed in road crashes in Quebec, 19.7% were found to test positive for cannabis (Brault, Dussault, Bouchard & Lemire, 2004). An examination of fatally injured drivers in Canada between 2000 and 2006 revealed that 14.9% of those tested were positive for cannabis (Beirness, Beasley, LeCavalier, Boase & Mayhew, 2009).

Cannabis is a tobacco-like greenish or brownish material consisting of the dried flowering, fruiting tops and leaves of the cannabis plant, *Cannabis sativa*. Hashish or cannabis resin is the dried brown or black resinous secretion of the flowering tops of the cannabis plant. Cannabis produces euphoria and relaxation, changes in perception, time distortion, deficits in attention span and memory, body tremors, and impaired motor functioning. It is a controlled substance under the *Controlled Drugs and Substances Act*—meaning that the acts of growing, possessing, distributing and/or selling cannabis are illegal.

Effects of Cannabis on Driving Performance

Experimental studies have assessed the nature and extent of the effects of cannabis on a wide variety of cognitive and motor tasks (e.g., Ashton, 2001; Berghaus & Guo, 1995; Ramaekers, Robbe & O'Hanlon, 2000). Performance deficits have been found in tracking, reaction time, visual function, and divided attention. Studies of driving performance (both simulated and on-road) show increased variability in lateral position in the lane, headway gap, and speed as a function of cannabis use. Cannabis also impaired performance on divided attention tasks—those that require a person to monitor and respond to two different sources of information simultaneously or rather, that divide his or her attention between the two information sources. Research has also noted that cannabis compromised the driver's ability to handle unexpected events. Combining cannabis with even small amounts of alcohol greatly increased the negative effects on driving skills (Ramaekers et al., 2000).

Although the weight of evidence clearly reveals significant psychomotor impairment as a result of cannabis use, it has been suggested that experienced users may be aware of their state of intoxication and impairment and attempt to compensate for it by employing behavioural strategies such as slowing down, increasing headway, and reducing risk-taking behaviours (Smiley, 1986). These tactics, however, may not be sufficient to compensate for all the impairing effects of cannabis—especially higher-order cognitive functions such as divided attention tasks and decision-making. Despite the perception of being able to compensate, the risk of crash involvement remains elevated, particularly when cannabis use is combined with other substances, most notably alcohol.

The Risk of Collision after Using Cannabis

Several studies have examined the risk of crash involvement associated with cannabis use by comparing the extent to which drivers who have used cannabis are overrepresented in collisions compared to drivers who have not used cannabis. Although some studies report no increase in collision risk, recent research clearly shows increased crash risk beginning at very low levels of cannabis that escalates with dose (Drummer et al. 2004; Laumon, Gadegbeku, Martin, Biecheler, & the SAM Group, 2005; Mura et al. 2003). It should also be noted that the research demonstrates that drivers who have been using both cannabis and alcohol are at significantly greater risk of collision (Brault et al. 2004; Drummer et al. 2004; Longo, Hunter, Lokan, White & White, 2000; Williams et al. 1985). Further large-scale studies using rigorous and consistent methods are necessary to provide definite and unambiguous evidence of the increased risk of crash involvement associated with cannabis use by drivers.

Detecting Drivers Impaired by Cannabis

The detection of cannabis use among drivers is considerably more complex than that for alcohol. Cannabis cannot be detected in breath and requires toxicological analysis of samples of bodily fluids such as blood, urine or oral fluid. To address this complication, an alternative approach known as the Drug Evaluation and Classification (DEC) program was developed to assist police officers in identifying drivers impaired by cannabis or other substances. The DEC program is a systematic and standardized procedure for police officers to recognize and evaluate behaviours and physiological indicators associated with cannabis and six other categories of psychoactive substances: central nervous system (CNS) depressants, inhalants, dissociative anesthetics, CNS stimulants, hallucinogens and narcotic analgesics. The 12-step DEC procedure includes a series of coordination tests, eye examinations, measures of blood pressure and temperature, a breath alcohol test, observations of the suspect, an interview, and a sample of blood, urine and/or oral fluid for toxicological analysis. The purpose of the procedure is to provide the officer with the necessary evidence to determine whether or not the suspect is impaired, whether the observed impairment is due to drugs, and which category (or categories) of drugs might be responsible. The results of the 12-step protocol, when corroborated by toxicological evidence of drug use, provide sufficient evidence to proceed with drug-impaired driving charges.

Cannabis has a unique DEC profile that includes poor coordination and balance, reduced ability to divide attention, elevated pulse and blood pressure, dilated pupils, inability to cross one's eyes, reddening of the conjunctiva (i.e., the thin tissue covering the white part of the eye), and eyelid and/or body tremors. This pattern of symptoms is indicative of recent cannabis use.

Since it was first implemented over 30 years ago, the DEC program has grown substantially and is being used in at least 38 U.S. states. In Canada, the DEC protocol was first introduced in 1995 in British Columbia, although participation of the driver was voluntary and not subject to penalties for refusal to comply. On July 2, 2008, new legislation came into effect that made the DEC protocol the national standard for Canadian law enforcement agencies to investigate suspected cases of drug-impaired driving.

Evidence of the accuracy of the DEC program is accumulating. A review of existing DEC program evaluation studies reports the overall accuracy of DEC evaluations of suspected impaired drivers made by trained DRE officers to be in excess of 80% (Beirness, LeCavalier & Singhal, 2007). A recent analysis of over 1,400 DEC evaluations conducted in Canada revealed that DREs are extremely accurate (95%) in detecting drivers who are impaired by drugs (Beirness, Beasley & LeCavalier, 2009). The bottom line is that the police in Canada now have a tool at their disposal to detect, arrest, charge and convict drivers whose ability to operate a vehicle safely is impaired by cannabis.

Penalties for Drug-impaired Driving

Drivers who are impaired by drugs are subject to the same penalties as those impaired by alcohol. For a first offence, impaired drivers face a fine of not less than $1,000, a mandatory driving prohibition of 12 months, and a possible jail sentence of up to 18 months. A second offence leads to a mandatory minimum of 30 days in jail and a two-year prohibition from driving. For third and subsequent offences, the penalty is imprisonment for a minimum of 120 days plus a three-year driving prohibition. Impaired drivers who cause an accident can face a maximum 10-year sentence in the case of causing bodily harm, and a life sentence in the case of causing death. In addition, provincial/territorial licensing authorities often impose longer periods of suspension and may require offenders to complete an alcohol/drug assessment, attend an educational program, or participate in a rehabilitation program.

Conclusions and Implications

Drivers who have used cannabis are not uncommon on Canada's roadways and the frequency of the behaviour appears to be increasing. Among younger drivers, driving after using cannabis now rivals or exceeds rates of driving after drinking.

The apparent increase in the incidence of driving after cannabis use, particularly among young Canadians, may be attributable in part to the increased use of cannabis. Clearly, with more users—and more frequent use—the likelihood of driving after using cannabis rises proportionately. The fact that young cannabis users may not perceive their driving ability to be adversely affected—and/or perceive it to be less affected than after consuming alcohol—provides a false sense of security. In addition, many young people believe that it is difficult for police to detect and charge drivers for driving while impaired by cannabis (or other drugs) (Davey, Davies, French, Williams & Lang, 2005; Patton, Mackay & Broszeit, 2005). Such beliefs are unfounded and greater efforts must be made to ensure that drivers understand the risks associated with driving after using cannabis.

Although there is much to be learned from years of experience in the area of drinking and driving, societal attempts to control driving after cannabis use must recognize the substantial differences that exist and develop an innovative and comprehensive approach to deal specifically with this issue. Such an approach requires a combination of research, prevention, enforcement, and rehabilitation. Research is needed to provide better estimates of the magnitude of the problem and greater understanding of the factors that give rise to the behaviour. Awareness and education programs need to be developed for both the general population and specific high-risk groups—such as youth—to provide factual information and dispel common myths. Schools, driver licensing offices, and driver education programs are potential targets for the implementation of such prevention activities. Enforcement efforts can be bolstered with more widespread application of the DEC program. This program provides the police with a standardized and systematic means of determining impairment due to drugs which, when combined with analysis of a sample of bodily fluid, provide the basis for drug-impaired driving charges. Assessment and rehabilitation programs also play a role in an overall strategy. For those convicted of drug-impaired driving, the extent of their drug use should be assessed and, where warranted, treatment and rehabilitation programs made available to help ensure the behaviour does not recur or escalate. Together, these elements can be integrated to create a comprehensive and effective response to the issue of driving while impaired by cannabis.

Acknowledgements

The authors wish to acknowledge the external reviewer for comments on an earlier version of this report.
Production of this document has been made possible through a financial contribution from Health Canada's Drug Strategy Community Initiatives Fund.
The views expressed herein do not necessarily represent the views of Health Canada.

References

Adlaf, E., Mann, R.E., & Paglia, A. (2003). Drinking, cannabis use and driving among Ontario students. *Canadian Medical Association Journal*, *168*, 565-566.

Adlaf, E.M., Begin, P., & Sawka, E. (Eds.). (2005). *Canadian Addiction Survey: A national survey of Canadians' use of alcohol and other drugs: Prevalence of use and related harms: Detailed report.* Ottawa, ON: Canadian Centre on Substance Abuse.

Asbridge, M., Poulin, C., & Donato, A. (2005). Motor vehicle collision risk and driving under the influence of cannabis: Evidence from adolescents in Atlantic Canada. *Accident Analysis and Prevention*, *37*, 1025-1034.

Ashton, C.H. (2001). Pharmacology of cannabis: A brief review. *British Journal of Psychiatry, 178*, 101-106.

Beirness, D.J. & Beasley, E.E. (2009). *Alcohol and Drug Use Among Drivers: British Columbia Roadside Survey 2008*. Ottawa, ON: Canadian Centre on Substance Abuse.

Beirness, D.J., Beasley, E., & LeCavalier, J. (2009). The accuracy of evaluations by Drug Recognition Experts in Canada. *Canadian Society of Forensic Sciences Journal*, *42*, 75-79.

Beirness, D.J., Beasley, E., LeCavalier, J., Boase, P., & Mayhew, D. (2009). Drug use by fatally injured drivers in Canada. In *Proceedings of the 19th Canadian Multidisciplinary Road Safety Conference*, Saskatoon, June 8-10.

Beirness, D.J., & Davis, C.G. (2006). *Driving Under the Influence of Cannabis: Analysis Drawn from the 2004 Canadian Addiction Survey*. Ottawa, ON: Canadian Centre on Substance Abuse.

Beirness, D.J., LeCavalier, J., & Singhal, D. (2007). Evaluation of the Drug Evaluation and Classification program. A critical review of the evidence. *Traffic Injury Prevention*, *8*, 368-376.

Berghaus, G., & Guo, B.L. (1995). Medicines and driver fitness—findings from a meta-analysis of experimental studies as basic information to patients, physicians, and experts. In: C.N. Kloeden, and A.J. McLean (Eds.) *Alcohol, Drugs and Traffic Safety—T'95: Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety* (pp. 295-300). Adelaide: ICADTS.

Brault, M., Dussault, C., Bouchard, J., & Lemire, A.M. (2004). The contribution of alcohol and other drugs among fatally injured drivers in Quebec: Final results. In *Proceedings of the 17th International Conference on Alcohol, Drugs and Traffic Safety* (CD ROM).

Davey, J., Davies, A., French, N., Williams, C., & Lang, C.P. (2005). Drug driving from a user's perspective. *Drugs: Education, Prevention and Policy*, *12*, 61-70.

Drummer, O.H., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M.D., et al. (2004). The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accident Analysis and Prevention*, *36*, 239-248.

Eliany, M., Giesbrecht, N., & Nelson, M. (Eds.). (1990). *National Alcohol and Other Drugs Survey: Highlights Report.* Ottawa, ON: Health and Welfare Canada.

Government of Canada. (2008). *Tackling Violent Crime Act.* Retrieved July 28, 2008 from http://www2.parl.gc.ca/HousePublications/Publication.aspx?Docid=3320180&file=4.

Laumon, B., Gadegbeku, B., Martin, J.L., Biecheler, M.B., & the SAM Group. (2005). Cannabis intoxication and fatal road crashes in France: population based case-control study. *British Medical Journal*, *331*, 1371-1377.

Longo, M., Hunter, C.E., Lokan, R., White, J., & White, M. (2000). The prevalence of alcohol, cannabinoids, benzodiazepines and stimulants amongst injured drivers and their role in driver culpability. Part 2: the relationship between drug prevalence and drug concentration, and driver culpability. *Accident Analysis and Prevention*, *32*, 623-632.

Mura, P., Kintz, P., Ludes, B., Gaulier, J.M., Marquet, P., Martin-Dupont, S., et al. (2003). Comparison of the prevalence of alcohol, cannabis and other drugs between 900 injured drivers and 900 control subjects: results of a French collaborative study. *Forensic Sciences International*, *133*, 79-85.

Patton, D., Mackay, T., & Broszeit, B. (2005). *Alcohol and other Drug Use by Manitoba Students.* Manitoba: Addictions Foundation of Manitoba.

Porath-Waller, A.J. (2009a). *Clearing the Smoke on Cannabis: Chronic Use and Cognitive Functioning and Mental Health.* Ottawa, ON: Canadian Centre on Substance Abuse.

Porath-Waller, A.J. (2009b). *Clearing the Smoke on Cannabis: Maternal Cannabis Use during Pregnancy.* Ottawa, ON: Canadian Centre on Substance Abuse.

Ramaekers, J.G., Robbe, H.W., & O'Hanlon, J.F. (2000). Marijuana, alcohol and actual driving performance. *Human Psychopharmacology*, *15*, 551-558.

Smiley, A.M. (1986). Marijuana: On road and driving simulator studies. *Alcohol, Drugs and Driving, 2*, 121-124.

Stoduto, G., Vingilis, E., Kapur, B.M., Sheu, W.J., McLellan, B.A., & Libanx, C.B. (1993). Alcohol and drug use among motor vehicle collision victims admitted to a regional trauma unit: Demographic, injury, and crash characteristic. *Accident Analysis and Prevention*, *25*, 411-420.

Williams, A.F., Peat, M.A., Crouch, D.J., Wells, J.K., & Finkle, B.S. (1985). Drugs in fatally injured young male drivers. *Public Health Reports*, *100*, 19-25.

Canadian Centre on Substance Abuse

75 Albert Street, Suite 500
Ottawa, ON K1P 5E7
Canada
Phone: (613) 235-4048
Fax: (613) 235-8101
info@ccsa.ca
Website: www.ccsa.ca

ISBN 978-1-926705-10-1

Production of this document has been made possible through a financial contribution from Health Canada's Drug Strategy Community Initiatives Fund. The views expressed herein do not necessarily represent the views of Health Canada.