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Drugs and Driving Framework

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Executive Summary

The purpose of this Drugs and Driving Framework (DDF) is to provide an environmental scan of the drugs and driving issue in Canada and several other countries by summarizing the effects of illicit (e.g., cannabis), prescription, and over-the-counter drugs on driving performance, reviewing recent research on the prevalence of drugs and driving, and describing recent measures in the areas of policy and legislation, enforcement and adjudication, public awareness and education, health promotion, and technology that have been implemented to address drugs and driving. Short and long-term activities are offered as optional measures that could be implemented to reduce drugs and driving in Canada. Based on the environmental scan and stakeholder consultation, several priority actions that could be pursued by CCMTA are recommended.

Drug impaired driving is a much more complex issue than alcohol impaired driving because there are so many different kinds of psychoactive drugs, drugs are harder to detect in the body, often because the levels are lower, there is a lack of standardized testing for drugs, and different drugs have different effects on driving performance. Furthermore, the absorption, action, and elimination of these psychoactive drugs are difficult to predict given individual differences among users.

Based on a review of recent research, it is evident that drug impaired driving is becoming a serious road safety problem in Canada. Indeed, it would appear to rival alcohol impaired driving in terms of its prevalence in night-time roadside surveys of drugs and driving (i.e., 7.2% of drivers in British Columbia had been using drugs in 2010 compared to 9.9% who had been drinking) and in fatal collisions (i.e., 37% of tested fatally injured drivers had been using drugs compared to 41% who had been drinking). The presence of drugs other than alcohol in fatally injured drivers has increased by 24% from 2000 to 2008.The drugs that have been found to be most prevalent in Canadian drivers are cannabis, cocaine, amphetamines, and depressants such as benzodiazepines. The prevalence of drugs and driving in Canada is not dissimilar to that observed elsewhere (e.g., U.S., European countries, Australia).

A major limitation of the research on drugs and driving is the lack of evidence that the presence of a drug in a driver's body is indicative of the driver's performance actually being impaired by that drug at the time of a collision or apprehension by the police. It can be argued that the causal relationship between the use of a drug and collision involvement has not been clearly established. Also, some of the drivers found to be using drugs were also using alcohol. Therefore, as noted by the Organization for Economic Cooperation and Development in its 2010 report "Drugs and Driving", "Alcohol continues to be the single most prominent factor in serious road crashes. The issue of drug-driving should not detract from the ongoing battle to reduce or eliminate alcohol-related crashes." (Beirness, et al., 2010, p.75).

Further research is needed on the magnitude and the nature of the drugs and driving problem in Canada, especially if per se laws with legal limits are to be established. A protocol for assessing the potential of drugs to impair driving recently developed in the United States could be useful in guiding further research on drugs and driving in Canada.

Canada, like many developed countries has legislation, both federal (Criminal Code of Canada) and provincial/territorial (highway traffic acts), to deal with drug impaired drivers. There are also special enforcement techniques that are employed by the police to detect drug impaired drivers such as the Standardized Field Sobriety Test (SFST) and the Drug Evaluation and Classification (DEC) program which uses specially trained and certified Drug Recognition Evaluators (DREs) to assess drivers for drug impairment. Relatively few educational campaigns have been conducted in Canada to raise the public's awareness of the problem of drugs and driving and the current legislation addressing it, so it is possible that most Canadians know little about this issue. Some drug impaired drivers are assessed as having an addiction problem which needs to be treated in order to prevent further drug impaired driving and many Canadian jurisdictions offer such treatment. Unfortunately, there have not been sufficient evaluations conducted to determine whether the current legislative, enforcement, awareness/educational, and treatment initiatives have been effective in reducing drug impaired driving and consequently, best practices in these areas are not well established.

Similarly, at the international level, there are numerous activities that have been implemented in the area of legislation, enforcement/adjudication, awareness/education, and treatment to deal with drugs and driving. Although there are some best practices which are starting to emerge, much is still unknown about their effectiveness in reducing drug impaired driving. Consequently, best practices in other countries are not yet evident.

There are many governmental and non-governmental groups that are working on the issue of drugs and driving in Canada which presents an opportunity to facilitate a cooperative and collaborative approach among these groups to address drugs and driving in the future. An earlier draft of the DDF was intended to be a consultative document that would initiate a collaborative approach with stakeholders by having them identify any significant gaps in the current research and program activities that have been conducted in Canada and other countries, to confirm that the activities presented below are worth pursuing, and to identify any other activities that are not included.

Consultation on the draft DDF was conducted by the CCMTA Secretariat by receiving comments from the CCMTA Expert Working Group on Drugs and Driving and the Road Safety Research and Policies Standing Committee, from stakeholders by e-mail, and at a one and half day workshop in Ottawa on February 22-23, 2012 with about 40 stakeholders.

The following activities are offered as primary areas of focus that jurisdictions may want to consider in order to reduce drug impaired driving in Canada. Given that there are numerous activities, they are presented as short-term and longer-term initiatives. Short-term initiatives are considered as priority activities that could be conducted during the tenure of Road Safety Strategy 2015, Canada's latest national road safety program (i.e., 2012-2015).

Legislation and Policy

Short-term

- Evaluate administrative laws addressing drug impaired driving to determine their effectiveness in reducing such activity;
- Develop a model or models of administrative legislation for drugs and driving that could be adopted by jurisdictions;
- Require new drivers who are in Graduated Driver Licensing programs to have no psychoactive drugs in their body while driving;
- Include information about the effects of drugs on driving and the legislation on drug impaired driving in the driver's handbook and test new drivers for their knowledge of drug impaired driving as part of licensing process, if it is not already being done.

Longer-term

- Establish per se legal limits for certain drugs (e.g., cannabis) within the Criminal Code of Canada (CCC), provided research leads to appropriate cut off limits;
- Amend the CCC to permit the use of point-of-contact immunoassay tests of oral fluid samples by the police as a roadside screening device for some drugs, provided research leads to appropriate cut off limits and levels of accuracy.

Enforcement and Adjudication

Short-term

- Conduct greater police enforcement through periodic Reduce Impaired Driving Everywhere (RIDE) type programs where police roadblocks are set up to detect both alcohol and drug impaired drivers;
- Provide for more training of front-line police officers in the administration of the Standardized Field Sobriety Test (SFST) to detect drug impaired drivers;
- Assess the validity of the SFST for detecting drug impaired drivers;
- Discuss with the CACP how more DREs can be trained, their skills can be maintained and upgraded, and how they can retained longer as DREs;
- Provide more DREs in rural areas or set up "flying squads" of DREs which could travel from one area to another to support the local police services when they conduct RIDE programs;
- Separate alcohol and drug impaired driving convictions in police and driver records;
- Conduct training workshops for Crown attorneys about drugs and driving and the DEC program;
- Develop and conduct voluntary workshops for judges about drugs and driving and the DEC program;
- Conduct an evaluation of the DEC program in order to determine its impact on drug impaired driving.

Longer-term

- Develop training programs such as the Advanced Roadside Impaired Driving Enforcement (ARIDE) and the Drugs That Impair Driving programs based on those that are used in the U.S. to assist front-line police officers in identifying drug impaired drivers and raise their awareness about the magnitude of the problem of drug impaired driving in Canada.

Public Awareness and Education

Short-term

Develop and implement a national drugs and driving awareness campaign based on social research, which targets the general population and specific groups (e.g., students, police, doctors, pharmacists, high risk groups) using mass media (e.g., newspapers, radio, electronic billboards, bus shelter ads) and social media (e.g., Facebook, Twitter, websites);

- Develop and implement more focused awareness and education campaigns based on social research which target young drivers who may be more likely to drive while impaired by illicit drugs such as cannabis and older drivers who may be more likely to be impaired by medications such as benzodiazepines.

Health Promotion

Short-term

- Work with drug addiction agencies (e.g. Canadian Centre on Substance Abuse, etc.) to develop a best practice for the assessment and treatment of drivers convicted of drug impaired driving;
- Meet with healthcare professional groups (e.g., physicians, nurses, pharmacists) to discuss how their members can become more engaged in raising awareness about the effects of drugs on driving;
- Encourage physicians to use the Screening, Brief Intervention, and Referral to Treatment (SBIRT) measure to detect alcohol and drug abuse problems in their patients.

Longer-term

- Discuss with Health Canada the feasibility of developing a labeling program for prescription and over-the-counter drug packaging to increase drivers' awareness of the risks of driving under the influence of specified drugs;
- Discuss with Health Canada the need for regulations that require advertisements for medications to mention potential negative effects of the drug on driving;
- Discuss with pharmacists the possibility of establishing computer systems that identify drugs and/or interactions of drugs which can impair driving.

Technology

Short-term

- Support the development of more accurate point-of-contact immunoassay tests of oral fluid for the detection of specific drugs (e.g., cannabis, methamphetamine, cocaine) that could be used at the roadside by police officers;
- Create a scientific committee made up of toxicologists from the three major forensic toxicology laboratories in Canada to establish guidelines for the testing of bodily fluids of drug impaired driving suspects.

Research

Short-term

- Researchers could consider adopting the protocol for assessing the potential of drugs to impair driving recently developed in the United States as a guide to further research on drugs and driving in Canada;
- Encourage increased testing of fatally injured drivers by coroners/medical examiners so that at least 70% of the drivers are tested for the presence of drugs in each jurisdiction or a random sample of driver fatalities of sufficient size for analysis is tested in each jurisdiction;
- Encourage testing seriously injured drivers admitted to hospital for presence and level of alcohol and other drugs;
- Conduct responsibility studies in each region to determine whether drivers who have drugs in their body prior to an injury or fatal collision are more likely to be considered by investigating police officers to have been responsible for the collision;
- Conduct roadside surveys of alcohol and drug use by drivers in each region of Canada including night-time and daytime testing;
- Conduct a public opinion survey to determine Canadians' knowledge, perceptions, attitudes, and experiences with respect to drugs and driving;
- Conduct focus groups with younger and older drivers regarding drugs and driving;
- Support experimental research using driving simulators and closed driving courses to test drivers under the influence of commonly used drugs (e.g., cannabis, cocaine, amphetamines, benzodiazepines) at dosage levels higher than those that have been used in previous research;
- Conduct research to validate the divided attention tests that are a part of the Standardized Field Sobriety Test;
- Conduct evaluations of effectiveness of interventions to reduce drug impaired driving.

Longer-term

- Conduct case-control studies in each region of Canada to determine whether drivers involved in fatal or injury collisions (cases) are more likely to have drugs and/or alcohol present in their body compared to control drivers tested later at the collision sites so that the risk of a collision at different doses of a drug can be established.

Benchmarking

Short-term

- Establish the percentage of fatally injured drivers testing positive for drugs other than alcohol in their blood as the primary measure of changes in drugs and driving;
- Use roadside surveys conducted during 2012 and at the end of RSS 2015 (i.e., 2016) to determine whether the prevalence of drugs and driving has changed;
- Use social surveys conducted during 2012 and at the end of RSS 2015 (i.e., 2016) to determine whether the public's knowledge, perceptions, attitudes, and experiences regarding drugs and driving have changed.

Longer-term

- Establish the percentage of seriously injured drivers testing positive for drugs based on blood testing conducted by a network of trauma centres as a supplementary index of change.

Consultation

Short-term

- Given that a safe systems (i.e., holistic) approach is preferred to address the issue of drugs and driving, it is important to consult with stakeholders (i.e., jurisdictions, police services, healthcare community, non-governmental organizations) on the Drugs and Driving Framework in order to garner their support for the optional activities above and to solicit their participation in implementing them.

Recommended Priority Actions

Based on the environmental scan of the current situation in Canada and other countries regarding drug impaired driving and on the results of the consultation conducted with stakeholders, it is proposed that the following actions be considered as priorities over the next 3-4 years:

Policy and Legislation

- Develop an evidence-based model or models for an administrative law addressing drug impaired driving;

Enforcement and Adjudication

- Provide greater resources to train front-line officers on the administration of the SFST and to train DREs;
- Fund DRE research, including assessment of validity of divided attention test of SFST.

Education and Awareness

- Develop awareness and education programs for the general public and for specific groups (e.g., students, police, doctors, pharmacists, high risk groups) based on social research (e.g., public opinion survey, focus groups).

Research and Development

- Improve the quality and timeliness of data collected regarding alcohol and drug use by fatally injured drivers;
- Test seriously injured drivers admitted to hospital for presence and level of alcohol and other drugs;
- Conduct responsibility studies to determine whether drivers who have drugs in their body prior to an injury or fatal collision are more likely to be considered by investigating police officers to have been responsible for the collision;
- Develop and implement point-of-contact immunoassay test devices;
- Evaluate the effectiveness of interventions to reduce drug impaired driving both current and future;
- Conduct periodic roadside surveys of alcohol and other drug use by drivers.

It should be recognized that CCMTA will not be in a position to lead or participate in all of these actions given its mandate. However, during the next year, CCMTA will pursue the following actions:

- Develop a model(s) for administrative laws,
- Conduct a public opinion survey on drugs and driving,
- Discuss police training with Canadian Association of Chiefs of Police,
- Discuss development of an immunoassay test with the Drugs and Driving Committee of Canadian Society of Forensic Science,
- Support a pilot daytime roadside survey in B.C.,
- Develop a strategic action plan for DDF.

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1.0 Background

Impaired driving by alcohol and other drugs is an international problem. In March of 2011, the United Nations General Assembly declared the period 2011-2020 as the Decade of Action for Road Safety which is being led by the World Health Organization. One of the areas of focus for the Decade of Action is the reduction of impaired driving by alcohol or other drugs.

Also, in March, 2011, the United Nations Commission on Narcotic Drugs passed Resolution 54/2 which urged member states "to develop national responses to address the issue of drug-affected driving, by assessing and monitoring the magnitude of this phenomenon at the national level and by exchanging information and best practices on effective responses, including engagement with the international scientific and legal communities, while respecting the principles of human dignity and physical integrity and relevant ethical considerations". This resolution also encourages member states "to support national and international efforts to collect global prevalence data, in accordance with relevant data-protection legislation, develop effective roadside testing options to assess drug-affected driving, consistent with their legal framework, raise public awareness and increase safety by developing, where appropriate a coherent and comprehensive strategy to decrease the occurrence of drug-affected driving, including through collaborative efforts that include academia, the private sector, professional associations, nongovernmental organizations, civil society, national red cross and red crescent societies, victims organizations, youth organizations and the media".

The Canadian Council of Motor Transport Administrators (CCMTA) is a non-profit organization comprising representatives of the provincial, territorial and federal governments of Canada which, through a collective consultative process, makes decisions on administration and operational matters dealing with licensing, registration and the control of motor vehicle transportation and highway safety. It also comprises associate members whose expertise and opinions are sought in the development of strategies and programs.

CCMTA created the Strategy to Reduce Impaired Driving (STRID) in 1990 to reduce the percentage of fatal collisions involving drinking drivers by 20% by 1995. STRID was renewed in 1995 with a target of a 20% reduction in fatalities and serious injuries involving a drinking driver by 2001 as one of the elements of Road Safety Vision 2001, Canada's first national road safety plan. More recently, STRID 2010 was a major component of Road Safety Vision 2010 having a target of a 40% reduction in alcohol-related fatalities and serious injuries by 2010. STRID 2010 broadened the scope of impaired driving to include other drugs than alcohol, as well as distraction and fatigue as sources of driver impairment. While STRID has had a positive impact on reducing impaired driving in Canada over the past 20 years, impaired driving still remains a serious issue today. Since the latest national road safety program, Road Safety Strategy (RSS) 2015, launched in January 2011, continues to focus on driver impairment by alcohol, other drugs, distraction and fatigue, this Drugs and Driving Framework (DDF) was developed to contribute to the goals of RSS 2015.

1.1 Purpose of the Framework

The purpose of this Drugs and Driving Framework (DDF) is to provide an environmental scan of the drugs and driving issue in Canada and several other countries by reviewing the effects of illicit (e.g., cannabis), prescription, and over-the-counter drugs on driving performance, the research on the prevalence of drugs and driving, and recent measures in the areas of policy and legislation, enforcement and adjudication, public awareness and education, health promotion, and technology that have been implemented to address drugs and driving. Short and long-term activities are offered as optional measures that could be implemented to reduce drugs and driving in Canada. Based on the environmental scan and stakeholder consultation, several priority actions that could be pursued by CCMTA over the next 3-4 years are recommended.

2.0 Nature and Prevalence of the Drugs and Driving Problem

This section summarizes the effects of the major classes of drugs on the body and then examines the data regarding the prevalence of drugs and driving and the collision risk associated with drug impaired driving in Canada.

2.1 Effects of Drugs

Drugs and driving is a much more complex issue than alcohol impaired driving because there are so many different kinds of psychoactive drugs, drugs are harder to detect in the body (i.e., levels are measured in nanograms rather than milligrams), there is a lack of standardized testing for drugs across laboratory systems, and different drugs have different effects on driving performance. Furthermore, the absorption, action, and elimination of these psychoactive drugs are difficult to predict given individual differences among users.

Psychoactive drugs can be obtained illegally, by prescription from a physician, or over-the-counter at pharmacies. The Drug Evaluation Classification (DEC) programs, used by police services in Canada and in the United States to detect drug impaired drivers, categorize drugs into the following classes based on common signs and symptoms displayed by users of these drugs (e.g., pupil dilation, heart rate, blood pressure, balance, etc.) rather than on chemical compounds:

- Cannabis;
- Central Nervous System (CNS) Depressants;
- Central Nervous System (CNS) Stimulants;
- Hallucinogens;
- Dissociative Anesthetics;
- Narcotic Analgesics;
- Inhalants.

This classification of drugs is used to examine the effects of drugs. The main sources for the following description of the effects of these drugs are the Driving under the Influence of Drugs, Alcohol, and Medicine (DRUID) project (Berghaus, et al., 2010), the report on Drugs and Driving by the Organization for Economic Cooperation and Development (OECD) (Beirness, et al., 2010), Jonah, et al. (2004), Mann et al. (2003), and Reed and Tonn (2011).

2.1.1 Cannabis

Cannabis is a drug that usually comes from the leaves of the marijuana plant and is typically smoked. The use of cannabis is illegal in many countries. However, in Canada and some other countries, people suffering from various illnesses are allowed to use marijuana by prescription to treat their ailment (e.g., reducing pain from neuropathy, reducing spasticity associated with multiple sclerosis). Physiological effects of cannabis include increased pupil size (i.e., dilation), normal pupil reaction to light, and increased pulse rate. The main active component of cannabis is delta-9-tetrahydrocannabinol (THC) which has both CNS depressant properties and in some cases, visual hallucinogenic effects at higher doses. Cannabis typically creates general euphoria and in some cases, feelings of relaxation and intoxication, and detachment in proportion to the amount smoked. These effects can distract the driver's attention from the driving task and can also reduce eye-hand coordination and performance on complex tracking tasks as well as impair divided attention activity. There may also be more steering corrections and difficulty in maintaining the vehicle in the proper lane, and increased braking time. These latter effects can combine to slow the driver's response to an emergency situation (e.g., someone pulling out in front of them). However, some drivers under the influence of cannabis compensate by driving slower giving them more time to focus on the driving task.

Research indicates that concentrations as low as 2 to 5 ng/mL can have psychological and physical effects on driving, particularly for new or occasional cannabis users. The level of impairment increases with the dosage of THC entering the blood stream with most of the effects appearing within the first hour post-administration. This rapid distribution and elimination of THC from the blood in the body can result in the measured levels not reflecting the THC level at the time of the collision. Since THC metabolites can be found in urine samples weeks after consumption, it is difficult to determine whether the presence of cannabis in the body actually means that driver performance was negatively affected by it.

In a review of the literature on cannabis and driving, Mann et al. (2003) concluded that "…laboratory studies have found that the ingestion of cannabis is related to performance deficits". However, they note that these lab studies are limited because they are measuring peak performance rather than typical performance, they do not address the impact of long term drug use on performance (i.e., habituation to the drug), and they often use doses of cannabis which are lower than street use.

A recent meta-analysis of nine medium and high quality studies of cannabis and driving (i.e., adequate selection of cases and controls, comparability of cases and controls, assessment of exposure to risk) concluded that acute (i.e., recent) cannabis use nearly doubled the risk of a collision and this risk was greater for fatal collisions (Asbridge, et al., in press).

According to a recent OECD report (Beirness, et al., 2010), the research on the effects of cannabis on driving are mixed with some showing impairment but others not. However, the OECD report notes that the mixture of cannabis with alcohol, even at low doses, can have a very negative impact on crash involvement. The effects of alcohol and cannabis can be additive for some people (e.g., 4+4=8) but for others they can actually be multiplicative or synergistic (e.g., 4x4=16) causing much higher levels of impairment of performance.

2.1.2 CNS Depressants

Central Nervous System (CNS) depressants include drugs such as benzodiazepines and antihistamines. The typical physiological effects of depressants are slower pupil reaction to light, nystagmus (i.e., eyes jump when following light rather than move smoothly), and pupil dilation. Generally, the effects of CNS depressants on driving are similar to those of alcohol: lack of attention, slower reaction times, poor maintenance of lane position, driving too fast or too slow, and failing to obey traffic signals. Therefore, people starting on a course of such medication should not drive until they have habituated to the medication, as determined by a physician.

Benzodiazepines (e.g., diazepam, lorazepam) are sedatives which are typically used to treat insomnia and anxiety. Benzodiazepines cause sleepiness and detachment once taken but there can also be "hangover" effects over the next few days. They have the greatest effect during the first two weeks of use. Dubois, et al. (2008) have noted that it is the benzodiazepines with a longer half-life (i.e., takes longer for drug to be eliminated from the body) that are associated with greater collision risk where the driver made a least one unsafe action prior to a fatal collision. Furthermore, the combination of alcohol with benzodiazepines significantly increases the risk of at-fault collision involvement (Maxwell, et al., 2010). However, the OECD report concludes that "…the evidence pertaining to the contribution of benzodiazepines to road crashes is mixed and inconsistent" (Beirness, et al., 2010, p. 59).

Antihistamines (e.g., diphenhydramine, fexofenadine) are used to block effects of the transmitter histamine in the body caused by allergic reactions. Antihistamines have impairing effects (e.g., sedation) for the first few days while the patient is on the medication but there is usually habituation to the drug after several days. Newer CNS depressants (e.g., fluoxetine) have less sedative effects. As with benzodiazepines, the combination of alcohol with antihistamines can elevate drivers' risk of a collision.

Drugs such as prochlorperazine, diazepam, and fluoxetine are used to treat mental disorders such as schizophrenia, anxiety, and depression respectively. Patients with schizophrenia are typically incapable of driving if they are not taking prescription medication regularly. There are some impairing effects of these antipsychotic drugs when patients start taking them but they typically habituate to the drug in several days depending on the dosage level.

2.1.3 CNS Stimulants

These stimulants include such drugs as cocaine, amphetamine, methamphetamine, and ecstasy (MDMA). Generally, the physiological effects of stimulants are increased heart rate, blood pressure, body temperature, rate of speech, and pupillary dilation. Cocaine is an illegal drug created from the leaves of the coca plant which produces a feeling of euphoria and increased wakefulness. Amphetamines are prescribed to treat disorders such as Attention

Deficit and Hyperactivity Disorder (ADHD), narcolepsy, and Parkinson's Disease and to control weight. Methamphetamine is stronger than amphetamine and is used to reduce appetite and increase energy. Ecstasy is a powder composed of mainly of Methylenedioxy-methamphetamine (MDMA) but it can contain other drugs such as ketamine or Lysergic Acid Diethylamide (LSD). As a stimulant, ecstasy intensifies sensory awareness but it can also produce hallucinations for some users.

Research indicates that there are few negative effects on driving while on cocaine or amphetamines but rather these stimulants may actually improve reaction times while the drugs remain active, particularly if the driver is tired (e.g., Berghaus, et al, 2010; OECD, 2010). However, there is some evidence suggesting that stimulants may result in impulsive and aggressive driving where drivers take risky actions such as driving too fast or passing when it is not safe to do so (Reed and Tonn, 2010). In addition, users of stimulants may exhibit sleepiness and exhaustion once the stimulating effects have worn off which can reduce driver attention.

2.1.4 Hallucinogens

This class of drug includes LSD and magic mushrooms. The usual physiological effects are increases in heart rate and body temperature and dilated pupils. LSD creates hallucinations and changes the senses of time and space and the perception of colour. The effects of LSD peak about 2-4 hours after consumption but the intensity of the effects depends on the dose taken, the user's mood, and their expectations about the effects of LSD. Magic mushrooms can cause users to have a kaleidoscopic field of vision or change the colour and form of faces. These hallucinogens have significant effects on psychomotor skills and cognitive ability.

Users can have difficulty focusing on the driving task, particularly divided attention tasks, and may react to things that are not really there. They may also exhibit paranoia as a result of the hallucinations. Drivers under the influence of such hallucinogens clearly should not be driving a vehicle.

2.1.5 Dissociative anesthetics

These anesthetics include ketamine and phencyclidine (PCP). The physiological effects of these drugs include increases in pulse, blood pressure, and body temperature. Ketamine is actually a tranquilizer used by veterinarians to sedate animals but it is also used clinically for treating burns and recreationally to experience intense hallucinations, out of body experiences and changes in time and space perception. Ketamine also has sedative effects creating drowsiness and hence slower reaction time and decreased motor coordination. All of these effects are incompatible with the safe operation of a vehicle.

2.1.6 Narcotic Analgesics

This class of opioid drugs, which includes morphine, heroin, methadone, codeine, and oxycodone, is intended to induce sedation and pain relief. There are natural opiods (i.e., morphine) which come from the dried resin of poppy seed pods (i.e., opium), those that are derived by treating natural opiates chemically (e.g., heroin), and synthetic opioids which are created in the laboratory (e.g., methadone). With the exception of heroin, these drugs are used clinically but they can be abused by patients or obtained illegally by other users. The

physiological effects include decreased pulse rate, blood pressure, and body temperature, and pupillary constriction.

These analgesics have a euphoric effect and slow reaction times, cause sedation and drowsiness, and create a sense of detachment from the world. Their use can lead to a lack of motor coordination and concentration. Drivers under the influence of these drugs may drive more slowly, weave into other lanes, react slowly to hazards and even fall asleep. There is also the possibility that drivers will take risks such as speeding. A study by Dubois, et al. (2010) showed that women aged 25 to 55 who tested positive for opioids were more likely to have made an unsafe driver action (UDA) prior to a fatal collision while men aged 25 to 65 testing positive for this drug were more likely to have engaged in a UDA. The most frequent UDAs were failing to keep in the proper lane and driving too fast.

As the effects of analgesics wear off, people may become agitated or even aggressive. Drivers who are regularly taking low doses of analgesics for chronic pain can develop a tolerance for them after a few weeks and be able to drive safely.

2.1.7 Inhalants

Inhalants (e.g., toluene, gasoline, cleaning solvents) are substances which when inhaled create a feeling of sedation and can negatively impact perceptions, coordination, concentration, and the executive functions which are all required to operate a vehicle. Physiological effects often include slow reaction to light, elevated pulse and blood pressure.

2.1.8 Summary of Drug Effects

Table 1 summarizes the typical effects of the seven classes of drugs on human physiology, behavior in general, and driving behaviour in particular. These effects of drugs reflect the use of the drug alone and not in combination with alcohol or other drugs. Also, some drugs have a rebound effect as the drug wears off which is the opposite of the drug effect.

The effects of drugs vary by the class and amount of drug used. However, as noted in a report to the U.S. Congress (Compton et al., 2009), it is difficult to predict the effects of psychoactive drugs on an individual for the following reasons:

- There is a poor correlation between the effects of a drug on psychomotor, behavioural, and/or executive functions and blood or plasma levels because the effects do not necessarily correspond to peak levels of the drug and the drug may still be detected even after the impairing effects have disappeared;
- Some people are more sensitive to the effects of a drug particularly if they are a first time or infrequent user but with repeated exposure many people develop a tolerance to the drug;
- People differ considerably in the rate of absorption, distribution throughout the body, action of the drug on the body, and the elimination of the drug; and
- The level of drug or metabolites in the blood can accumulate with repeated use even though they are no longer having any effects on the body.

Therefore, it is not always evident that a person with a drug in their body was actually impaired by that drug when stopped by the police or involved in a collision. Also, it should be emphasized that while many of these drugs may have little impairing effect on driver performance, research shows that combining them with alcohol can result in considerably higher levels of impairment.

Table 1: Summary of the Effects of Drugs

Effects of Drugs			
Class of Drug	**Physiological Effects**	**Behavioural Effects**	**Effects on Driving**
Cannabis	- Pupillary dilation - Normal pupil reaction to light - Increased pulse rate	- Relaxation - Euphoria - Detachment - Visual hallucinations - Distorted perception -Impaired coordination and concentration - Difficulty with problem solving - Difficulty with learning and memory	- Poor attention to task - Slower reaction time - More steering corrections - Slower braking - Poor speed maintenance
CNS Depressants	- Slower reaction to light - Horizontal and vertical gaze nystagmus - Pupillary dilation	- Sedation - Drowsiness - Detachment - Impaired coordination and concentration	- Slower reaction time - Poor attention to task - Poor lane positioning - Poor speed maintenance - Fail to obey traffic signs
CNS Stimulants	- Increased heart rate, blood pressure, body temperature, rate of speech, and pupillary dilation	- Euphoria - Increased wakefulness	- May increase reaction time - May increase erratic/ aggressive/risky driving - Possible rebound effect (i.e., sleepiness)
Hallucinogens	-Increased heart rate, body temperature	- Intensified sensations - Altered perception of reality (visual, aural, tactile, time) - False beliefs - Mania - Disorganization of thought - Distraction by hallucinations	-Slower reaction time -Perceived things that are not there and react to them
Dissociative anesthetics	- Increased pulse, blood pressure, body temperature	- Drowsiness - Blurred vision - Altered perception of reality (visual, aural, tactile, time)	-Poor attention to task -Poor reaction time

Effects of Drugs			
Class of Drug	**Physiological Effects**	**Behavioural Effects**	**Effects on Driving**
		- Impaired coordination - Distraction by hallucinations	
Narcotic analgesics	- Decreased pulse rate, blood pressure, body temperature - Pupillary constriction - Droopy eyes	- Drowsiness - Altered perceptions of reality - Impaired coordination and concentration - May become agitated or aggressive as drug wears off	- Slower reaction - Poor lane positioning - Drive slowly - Fall asleep at wheel
Inhalants	- Normal pupil size - Slow pupil reaction to light	- Feeling of sedation - Impaired coordination and concentration - Distorted perception	- Slower reaction time - Fall asleep at wheel

2.2 Toxicology

The presence of drugs in drivers suspected of impaired driving can be identified through forensic toxicology. It is important to be able to determine the actual level of the drugs or their metabolites in the body but this is not always possible. The length of time that a drug remains detectable in the body depends on the dosage of the drug consumed, the frequency of usage, the rate of metabolism and elimination of the drug, the type of specimen used in the analysis, and what is being measured (i.e., drug or its metabolite). Testing for drugs can be conducted at the roadside or in the laboratory, the latter being used as evidence against a driver charged with drug impaired driving. Coroners also test for the presence of drugs in fatally injured drivers.

There are three main types of specimens used to detect drugs: blood, urine, and oral fluid (i.e., saliva).

2.2.1 Blood Specimens

The consensus of research according to the OECD (Beirness, et al., 2010) is that blood is the "gold standard" for drug testing since it indicates recent usage but even the testing of blood samples will not necessarily reveal whether the driver is or was impaired by the drug due to large individual variability in tolerance to the drug. Nevertheless, blood provides more information than other types of specimens. Taking blood samples from living subjects is an invasive method of determining the presence of drugs and must be conducted by trained professionals who may not be immediately available so that by the time the blood is drawn, the level of the drug may have declined. There are also issues about preserving the sample so that it can be tested. Therefore, while it is the most appropriate sample for post-mortem

examinations and the testing of injured drivers at hospitals, it is not very practical for the testing of drivers suspected of drug impaired driving.

2.2.2 Urine Specimens

Urine specimens can also be obtained from suspected impaired drivers but they do not indicate when a drug was used nor the level of the drug and hence the degree of impairment is uncertain. Urine tests are not very easy to administer at the roadside since a bathroom is required, and there are privacy issues but these issues are less problematic at the police station when a urine sample is requested for evidentiary testing. However, it is possible that the driver can tamper with the urine sample by diluting the sample with water. There are also practical issues when a driver does not need to urinate and would have to wait before being able to do so, thereby slowing the investigation process. Urine samples are typically taken by police for evidentiary testing for drugs by forensic toxicology labs.

2.2.3 Oral Fluid Specimens

Some impairing drugs such as cannabis, cocaine and amphetamines can be detected in oral fluid/saliva samples after recent use. THC can be detected once the drug enters the elimination phase but while its presence in the oral fluid specimen may indicate recent use, it does not necessarily imply current impairment. Recent cannabis use (last 30 minutes) can leave a residue in the mouth which can increase the concentration in the oral sample and therefore not provide a proper determination of the amount of the active drug in the driver's body. Oral fluid samples can be diluted or contaminated. Also, drivers may become nervous when stopped by the police and develop a dry mouth from which sufficient saliva cannot be extracted for testing, slowing the investigation process.

2.2.4 Sample Analysis Methods

Drug screening needs to have high levels of sensitivity (i.e., detecting drug when it is present) and specificity (i.e., not detecting the drug when it is not present). There are essentially two testing techniques: Immunoassay and Mass Spectrometry.

Immunoassay is a biochemical test which uses antibodies to detect the presence of one or more drugs in a solution such as blood, urine or oral fluid based on a minimum concentration of a drug. There are a number of point-of-contact (POC) screening devices which can detect drugs or their metabolites in samples of oral fluid or urine. However, these devices do not indicate the level of the drug present and more importantly, they have poor specificity resulting in drivers being suspected of drug impaired driving when in fact they are not impaired (Verstraete, et al., 2006). As a result of these limitations, immunoassay test results cannot be used as evidence in a drug impaired driving court case but rather the results provide the grounds for suspicion of drug impaired driving which needs to be confirmed by mass spectrometry (MS). However, POC immunoassay tests, particularly on oral samples, can be used in research to determine if a driver had consumed a drug.

Gas chromatography MS has been the type of analysis most often used in forensic toxicology but laboratories are moving towards liquid chromatography. The MS produces ions from compounds in the test sample and then separates these ions based on their charge/mass ratios. These MS instruments are expensive and not always readily available for use but they

provide positive identification of a compound required for reporting. Therefore, the best testing protocol is to use POC immunoassay testing of oral fluid specimens at the roadside, at least for some drugs, to provide grounds for suspicion of drug impaired driving and then conduct MS testing of urine or blood as the evidentiary measure of impairment. It may still be necessary to conduct behavioural testing to establish impairment by drugs.

2.3 Magnitude of the Drugs and Driving Problem in Canada

Different types of data have been examined in Canada and in other countries to determine the magnitude of the problem of driving while impaired by drugs other than alcohol, including fatality and injury data, roadside survey data, and self-reported survey data. Some of the Canadian studies using these types of data are reviewed in this section with an emphasis on those published since 1995. Some of the studies conducted in other countries, including the U.S., are summarized in Appendix A.

2.3.1 Canadian Fatality and Injury Data

Coroners or medical examiners in Canada have been testing fatally injured drivers for the presence and level of alcohol in their bodies for the past 35 years usually based on blood samples. Fatally injured drivers and pedestrians are tested in all jurisdictions. The collection of these data by the Traffic Injury Research Foundation has been co-funded by Transport Canada and CCMTA since 1987. Starting in 2000, fatally injured drivers are also being tested for the presence of drugs other than alcohol that are classified by researchers according to the Drug Classification Evaluation categories (i.e., cannabis, depressants, stimulants, narcotic analgesics, hallucinogens, dissociative anesthetics, and inhalants).

Brault et al. (2004) analyzed the blood tests performed on drivers who were killed in collisions occurring in Quebec from April 1999 to December 2002 and found that 40% of the cases had alcohol in their bodies, 20% had cannabis, 10% had benzodiazepines, and 8% had cocaine. An earlier study by Mercer and Jeffrey (1995) found that 13% of fatally injured drivers were positive for cannabis in British Columbia.

Beasley, et al. (2011) analyzed Canadian coroner data for the years 2000-2007 and compared the percentage of fatally injured drivers with alcohol present to the percentage of these drivers with other drugs present. It should be noted that while 84% of drivers were tested for the presence of alcohol, only 46% were tested for other drugs and that the drug testing rates varied considerably by jurisdiction from a low of 25% to a high of 90%. Furthermore, not all drivers were tested for all classes of drugs. Given there is reason to believe that some coroners may have been selective regarding which drivers to test for drugs and what drugs for which to test, it is possible that the percentages for the presence of drugs may be somewhat biased in jurisdictions with a low testing rate.

Beasley, et al. found that among those drivers who were tested for both alcohol and other drugs, 37% had some alcohol in their bodies, while 33% tested positive for one or more of the seven classes of psychoactive drugs. The most frequently detected drugs alone were CNS depressants (35.6%), cannabis (25.8%), and CNS stimulants (19%). About 60% of drivers had

only one drug in their system, while 22% had two drugs. About 30% of the drivers had blood alcohol concentrations (BACs) of 81mg/100mL or higher (i.e., over the legal limit). For the 45% of drivers who were tested for both alcohol and other drugs, it was found that 45% had no alcohol or other drugs present, 19% tested positive for a drug but were negative for alcohol, 22% tested positive for alcohol but were negative for drugs, and 14% were positive for both alcohol and one or more other drugs. The drugs combined most often with alcohol were cannabis (36%), stimulants (27%), and depressants (26%).

The use of alcohol alone was higher for male drivers (24%) than female drivers (15%), as was the use of alcohol and drugs together (15% vs 10%) but the use of drugs alone was similar (18% vs 20%) for both sexes. Women were more likely to have been using a depressant drug with (46%) or without alcohol (58%). Males were more likely to be using cannabis, stimulants, or narcotic analgesics than females with or without alcohol. While alcohol use peaked for those drivers aged 19-34 and then declined with age, drug use alone was relatively similar across age groups ranging from 16% among those aged 19-24 to 21% among those 45-54. Not surprisingly, among those with drugs present, cannabis was detected more often among drivers under 44, with the highest prevalence being for the under19 age group (69%). Depressants were more common for those drivers 35 and older (34%), rising to 64% for those 65+, and narcotic analgesics were also found more often among those 55 and older (29%).

Considering time of day, it was observed that alcohol alone was much more common for fatal collisions occurring between midnight and 06:00 (42%) and between 18:00 and midnight (29%), while drugs alone were found more often (24%) in drivers killed in day time collisions (i.e., 06:00-18:00). The combination of alcohol and drugs was more frequent in the midnight to 06:00 timeframe. This could reflect the fact that people taking prescription drugs would have the drug in their system all day and not just at night. Similarly, recreational drugs like cannabis or cocaine may be more likely to be used throughout the day and not just at night, particularly if the person is addicted to them. While alcohol alone was detected more often on weekends (32%), drugs alone were more common during the weekdays (21%). While alcohol only fatalities peaked in the summer, fatalities positive for only drugs were similar across all seasons. These data suggest that alcohol and other drugs are used differently and may need to be dealt with differently.

Alcohol alone was more often found in drivers of pick-up trucks, light trucks, and ATVs/snowmobiles (34%, 30%, and 33% respectively). Drug use alone was higher for drivers of heavy commercial trucks (23%) than was the case for drivers of other vehicle types. Drivers were more likely to have been positive for both alcohol and drugs when they drove with a passenger (17%). Drivers who were not using safety devices (i.e., seat belts or helmets) were much more likely to have been positive for drugs and/or alcohol (71%). Single vehicle collisions were more likely to involve a driver who had either used alcohol alone (33%) or drugs and alcohol together (21%) compared to drivers involved in multiple vehicle collisions (13% and 8% respectively). Alcohol was more often involved when the estimated speed was below 90kph (22%) but other drugs were more frequently found when the speed was over 90kph (37%). Drugs and drugs/alcohol together were more common when the roads were not straight and level (42%) and when the weather was clear (38%). The investigating police officer was more

likely to indicate that the driver's condition was a factor contributing to the collision if the fatally injured driver was subsequently found to have alcohol or other drugs in their blood (85%). Similarly, driver action was more often identified as a contributing factor if the driver had been drinking alcohol or using drugs (48%).

A more recent study by Beasley and Beirness (2011) extended the earlier study by adding the 2008 coroner data to the dataset. The results indicated that 41% of the fatally injured drivers who were tested for both alcohol and other drugs were positive for alcohol and 37% were positive for other drugs. The authors noted that the percentage of fatally injured drivers testing positive for drugs has risen from about 29% in 2000 to 37% in 2008, an increase of 24%.

Relatively few studies have looked at drug use by injured drivers in Canada. Stoduto et al. (1993) conducted a study at a Toronto trauma centre where 854 drivers who were being treated for injuries sustained in a collision in the late 1980s were tested for alcohol and other drugs using blood and urine tests. The results indicated that while 35% of drivers tested positive for alcohol, 41% were found to have some other drug in their body, with cannabis and benzodiazepines being the most common (14% and 12% respectively) suggesting that the prevalence of drugs rivaled that of alcohol even at that time.

A pilot study was conducted at the Vancouver General Hospital during 2008-2009 in which blood samples of 100 injured drivers were tested for alcohol and other drugs (Brubacher, 2010). The results of this study showed that 38% of the drivers tested positive for alcohol and in fact, 36% of the sample were above the legal limit. Cannabis was detected in 9% of drivers while cannabis metabolites, which do not necessary indicate recent cannabis use, were detected in 19% of the cases. Cocaine was detected in 7.3% of drivers and its metabolite was found in 10.9%. The presence of amphetamines and opiates were found in 3.6% of drivers, while benzodiazepine and antihistamine were identified in 9% of drivers.

Based on this pilot study, Brubacher and his colleagues are currently conducting a culpability study of injured drivers who are taken to five hospitals in BC over the next five years to determine if they had been using cannabis prior to the collision. The culpability for the collision will be determined based on police collision reports to ascertain whether drivers who had been using cannabis were more likely to have been considered by the police to be responsible for the collision compared to those drivers who had not been using cannabis.

2.3.2 Canadian Roadside Surveys

Roadside surveys have been conducted in some jurisdictions whereby drivers voluntary provide breath, urine, or oral fluid samples in order to test for the presence of alcohol and other drugs. A roadside survey conducted in Quebec in the late 1990s (Brault, et al., 2004) found that about 12% of drivers' urine samples tested positive for at least one psychoactive drug with cannabis and benzodiazepines being more commonly detected (6.7% and 3.6% respectively). However, given the relatively low rate of testing of the urine samples (49%), these estimates may be biased.

Beirness and Beasley (2011) conducted a night-time roadside survey during June 2010 in five communities in British Columbia (Vancouver, Abbotsford, Saanich, Prince George and

Kelowna). A similar survey had been conducted in 2008 in the first three communities. The survey was conducted Wednesday to Saturday between the hours of 21:00 and 03:00 at 16 sites within each community. A sample of 2,840 drivers voluntarily provided breath samples to determine their blood alcohol concentration (BAC) and oral fluid samples were taken in order to detect the presence of other drugs. Breath samples were provided by 86% of drivers and 71% of drivers provided oral fluid samples.

The weighted results showed that 9.9% of drivers had positive BACs and 7.2% tested positive for drugs. Of those drivers testing positive for drugs, 11% were also positive for alcohol.

Of the drivers breath-tested, 2.2% had BACs over the 80mg/100mL legal limit. Drinking drivers were more often male, aged 25-44, and were more frequent and heavy drinkers. Drivers were more likely to have positive BACs later at night and on the weekend. Drinking drivers were more likely to be coming from pubs, bars, or clubs.

The most common drugs detected were cannabis (4.5%), cocaine (2.3%), and opiates (1.2%). Of the drivers testing positive for cannabis, 50% had THC levels of 30 ng/mL or higher. About 17% of the drug positive drivers had used more than one drug. Males were more likely to have been using cannabis and cocaine but females were more likely to have been using opiates. There was no significant difference in the presence of drugs as a function of age, day of week or time of day, unlike the presence of alcohol. Drivers testing positive for drugs were more likely to be coming from their home (35%) or the home of a friend/relative (32%) and drivers with a same-sex passenger were more likely to test positive for drugs (11%).

Roadside surveys of driving after drug use have not been conducted in other Canadian jurisdictions. It is possible that the prevalence of driving while under the influence of drugs is not the same in other jurisdictions as that observed in QC and BC.

2.3.3 Canadian Surveys of Self-Reported Driving After Using Drugs

The Traffic Injury Research Foundation (TIRF) has conducted several national telephone surveys, including questions on driving after drug use, in order to prepare its Road Safety Monitor reports. In an earlier study by Simpson, et al., (2006), respondents were asked whether they had driven within two hours of using cannabis during the past year. It was found that 2.4% of the respondents had done this, which was a statistically significant increase from 1.5% in 2002 and 2.1% in 2004, suggesting that driving after the use of cannabis was on the rise. About 70% of those who reported driving after using cannabis also reported driving within two hours of drinking. The researchers also reported that cannabis users were more likely to be male, unmarried, live in urban areas, and have had a traffic ticket or been involved in a traffic collision during the last year. There was also evidence presented indicating that cannabis users were riskier drivers since they were more likely to take risks when driving for fun and to drive over the posted speed limit. Users of cannabis were less supportive of such measures as requiring drivers who cause injury to be tested for drugs or drivers having to submit to blood, urine or saliva tests if drug use is suspected. When asked about young drivers impaired by alcohol or drugs, 87% of the respondents thought the issue was serious or extremely serious whereas only 61% believed older drivers impaired by prescription medication was this serious.

A more recent survey by TIRF (Marcoux, et al., 2011) found that of the 21.4% of young drivers (16-24) who had used marijuana or hashish in the past 12 months, 19.7% reported that they had driven a motor vehicle within two hours of using marijuana or hashish. Overall, 4.2% of young drivers surveyed had driven after using cannabis. Of the 5.1% of adults (25+) using marijuana or hashish, 28.8% reported that they have driven a motor vehicle within two hours of using marijuana or hashish. Overall, 1.5% of adults surveyed had driven after using cannabis.

Walsh and Mann (1999) reported that about 2% of Ontario drivers admitted to driving after using cannabis in 1996-1997. An analysis of Canadian Addiction Survey data collected in 2004 (Beirness and Davis, 2006) indicated that 4.8% of drivers had reported driving after using cannabis, a doubling of the rate since the survey was last conducted in 1989. It was considerably higher for young drivers aged 16-19 (21%). A 2002 survey by the Centre for Addiction and Mental Health (CAMH) of Ontario drivers 18 years of age and older found that 3% of respondents reported driving after use of cannabis during the 12 months prior to the survey. A 2009 CAMH survey reported that this number had dropped to 1.8%. The Canadian Centre on Substance Abuse (2011) reported that in 2005-2007, 11 to 16% of grade 12 students, depending on the province, said that they had driven within one hour after using cannabis in the last 12 months.

It is difficult to compare the results of these various public opinion surveys given the different samples in terms of age and location, and the questions asked.

2.3.4 Canadian Studies of Risk of Collision While Under the Influence of Drugs

In order to determine the risk of a collision while a driver is under the influence of alcohol or another drug, data are required on the presence of these substances in the bodies of drivers involved in collisions (cases) as well as data on the presence of alcohol and drugs in the bodies of a sample of drivers not involved in a collision who pass through the collision site later on the same day of the week and time of day (controls). While there have not been any of these true case-control studies conducted in Canada, Brault et al. (2004) compared the presence of drugs in roadside survey respondents with the presence of drugs in fatally injured drivers in Quebec. The risk of a fatal collision was higher if the driver had been using cannabis, benzodiazepines, or stimulants. A responsibility analysis did not indicate that drivers using these drugs were any more likely to have been considered responsible for the fatal collision than those drivers who were drug free.

2.3.5 Summary

Canadian data based on coroner testing of fatally injured drivers, testing of injured drivers, and roadside surveys indicate that the prevalence of drugs and driving rivals that of drinking and driving. Among fatally injured drivers, 41% had been drinking while 37% had used drugs, the latter percentage representing an increase of 24% from 2000 to 2008. Cannabis or its metabolites were identified in 28% of a small sample of injured drivers tested at a hospital while 18% were positive for cocaine or its metabolite. The most recent roadside survey data indicate that 9.9% of the drivers had been drinking, while 7.2% had used a drug, most often cannabis, cocaine, amphetamines, or antidepressants.

The OECD report “Drugs and Driving” concludes that based on a review of the available international research literature, including that from Canada, the prevalence of drugs detected in drivers involved in fatal or injury collisions is in the range of 14 to 25% (Beirness, et al., 2010). Cannabis is the drug most commonly detected, being reported in about 10% of cases followed by benzodiazepines in 5-9% of cases. The variation from one study to another may reflect actual differences in the prevalence of drugs and driving or it may have resulted from differences in the research methodologies employed. Despite a considerable amount of research, it remains uncertain whether the presence of these drugs in the bodies of drivers contributed to the causation of the collisions, unlike the effects of alcohol on the risk of a collision.

3. 0 Framework for Preventing Drug Impaired Driving

3.1 Target Groups

There are several target groups toward which this Drugs and Driving Framework could be directed:

- General population;
- Young drivers using recreational drugs (e.g., cannabis);
- Drivers using prescription and over-the-counter drugs alone or in combination with others;
- Police officers who are enforcing drugs and driving laws;
- Crown prosecutors and judges involved in drug impaired driving cases;
- Healthcare professionals (i.e., physicians, nurses, and pharmacists).

3.2 Program Elements

The main program elements of the framework to address the target groups are:

- Policy and legislation;
- Police enforcement and adjudication;
- Education and awareness;
- Health promotion;
- Technology;
- Research and evaluation; and
- Linkages.

Ideally, jurisdictions and their partners will consider adopting a safe systems (i.e., holistic) approach in addressing driving while impaired by drugs using these different program elements, individually or in combination, depending on their situation as determined by a thorough analysis of the data on drug impaired driving in their respective jurisdictions.

3.2.1 Policy and Legislation

There are essentially two types of laws currently addressing drug impaired driving: per se laws and behavioural impairment laws. Per se laws set a legal limit for a drug and if the testing, using

blood, urine or oral fluid samples, indicates that the driver is over that limit, then they are charged with driving while impaired by drugs. These per se laws are often zero tolerance such that if there is any level of a drug detected by the testing, then the driver is deemed to be impaired, regardless whether or not there was any evidence of behavioural impairment. These laws are zero tolerance mainly because, at this time, it is not known what level of a drug in the body should be considered to impair driving such that it poses an unacceptable risk. These types of laws make it easier for prosecutors to prove drug impairment in court. However, these zero tolerance laws usually apply only to some illegal drugs such as cannabis or cocaine and not to prescription or over-the-counter drugs. Concern has been raised that these zero tolerance per se laws are really drug control laws intended to deter illegal drug use and not specifically to prevent drug impaired driving.

Behavioural impairment laws require a police officer to first provide evidence that a driver's performance is impaired and then the driver can be required to submit a sample of bodily fluid for testing. Police officers typically use the Standardized Field Sobriety Test to screen drivers at the roadside for behavioural impairment and then if there are reasonable and probable grounds for suspecting the presence of drugs, a trained and certified police officer administers the Drug Evaluation and Classification assessment.

The laws regarding impaired driving by drugs are reviewed for Canada and several other countries in the following sections.

3.2.1.1 Canadian Legislation

Canada has opted for a behavioural impairment type of law to address drug impaired driving. As a result of the enactment of Bill C-2 in July 2008, the Criminal Code of Canada (CCC) was amended giving police officers authority to:

- Upon suspicion, demand that drivers participate in divided attention tests, usually the Standardized Field Sobriety Test (SFST), to determine impairment;
- If there are reasonable and probable grounds to suspect impairment by drugs based on the SFST, submit suspected drivers to a Drug Recognition Evaluator (DRE) who will subject the driver to a more detailed series of standardized tests prescribed under the Drug Evaluation and Classification (DEC) Program;
- If the DRE notes signs and symptoms of classes of a drug(s) known to be related to impairment, collect bodily fluid samples (i.e., blood, urine and/or oral fluid) at the officer's discretion (usually urine) for drug testing.

Failure to comply with these requests will result in the same penalties which apply to a conviction for alcohol impaired driving under the Section 255 of the CCC. On conviction for a first offence of drug impaired driving, the penalty is a fine of at least $1,000 and for a second offence, it is a minimum of a $2,000 fine and 30 days in jail. In addition, there is a one year prohibition from driving for a first offence and two years for a second offence.

While most provinces/territories have short-term licence suspensions for drivers with BACs between 40-50 and 80mg/100mL, several jurisdictions have also legislated administrative sanctions to address drug impaired driving. BC has a 24 hour driving prohibition for drivers if the

police officer believes on reasonable and probable grounds that the driver's ability to drive is affected by a drug other than alcohol. Alberta has a similar law. Saskatchewan has a 24-hour suspension if the driver fails the SFST. In the Northwest Territories, a driver can receive a 24-hour suspension as a result of a drug-related observation by the police. In the Yukon, if the police officer has reasonable and probable grounds to believe that the driver's physical or mental ability to drive is impaired by alcohol or another drug, the driver must surrender their licence for 24-hours. Manitoba has passed a law whereby a driver receives a 24 hour driver's license suspension for a first violation resulting from a failure of a physical coordination test. A driver will receive a 24 hour suspension followed by a three month driver's license suspension if they refuse to comply with a demand for a physical coordination test. In Ontario, if a driver refuses to comply with police officer's demand to perform an SFST, provide a sample, or submit to DRE testing, the driver's licence can be suspended for 90 days. Quebec has a legal provision that if a driver's physical performance is impaired by drugs, their licence can be suspended for 24-hours but it is not yet in effect. In Newfoundland and Labrador, the police officer will determine if the driver is impaired by drugs using the SFST/DEC. Table 2 compares the jurisdictions' administrative sanctions for first alcohol and drug impaired driving offences.

It is not known if these administrative laws addressing drug impaired driving have been evaluated but it would be useful if their effectiveness was assessed to determine whether they reduce drug impaired driving.

If a driver is suspected of drug impaired driving, police officers in some jurisdictions can administer a 24-hour licence suspension or charge the driver under the CCC. Currently, there is a debate about the use of administrative laws since it is possible that the police officer will administer a 24-hour suspension to a drug impaired driver rather than pursue the more time consuming DEC procedure for determining reasonable and probable grounds of impairment by drugs in order to lay a criminal charge. A similar debate has existed for a number of years regarding the use of administrative sanctions for drinking drivers.

There are also issues regarding the testing of drivers for drug impairment once alcohol has been detected. For example, a driver may have a BAC of 40mg/100mL and may have also been using cannabis so that their level of impairment is actually considerably higher given the combined effects of the two drugs. Similarly, a driver may have consumed low levels of two or more drugs other than alcohol which individually may not be very impairing but together may have a greater negative effect on driving. If the officer does not recognize the presence of drugs and pursue a drug investigation, the driver could be allowed to continue driving even though they are impaired. Police officers need to be adequately trained so that they can detect signs of drug impairment as well as alcohol impairment.

Table 2: Comparison of Jurisdictional Administrative Sanctions for Alcohol/Drug Impaired Driving

Alcohol Impaired Driving			Drug Impaired Driving	
Jurisdiction	**Legal Limit (mg/100mL)**	**Sanction for First Offence**	**Basis for Sanction**	**Sanction for First Offence**
BC	50	3 day licence suspension and possibly 3 day vehicle impoundment	Driver's ability to drive affected by drug as assessed by the officer	24hr licence suspension
AB	50	24 hr licence suspension (3 days pending)	Driver's ability to drive affected by drug as assessed by the officer	24hr licence suspension
SK	40	24 hr licence suspension	Driver fails SFST	24hr licence suspension
MB	50	24 hr licence suspension	Driver fails Physical Coordination Test	24hr licence suspension
ON	50	3 day licence suspension	Driver fails/refuses to comply with police officer's demand to perform an SFST, provide a sample, or submit to DRE testing	90 day licence suspension if charged under Criminal Code
QC			Driver's ability to drive affected by drug as assessed by the officer	24hr licence suspension*
NB	50	7 day licence suspension		
NS	50	7 day licence suspension		
PEI	50	7 days licence suspension		
NL	50	7-day licence suspension	Drug related observation by police	7 day licence suspension
NT	50	24 hr licence suspension	Driver's ability to drive affected by drug as assessed by the officer	24hr licence suspension
YK	50	24 hr licence suspension	Driver's ability to drive affected by drug as assessed by the officer	24hr licence suspension
NU	50	24 hr licence suspension		

*Legislation not yet in effect

3.2.1.2 Legislation in the United States

The White House Office for National Drug Control Policy has developed a National Drug Control Strategy which includes a goal of achieving a 10% reduction in drugged driving prevalence by 2015. This goal will be attained through:

- Encouraging states to adopt per se drug driving laws;
- Collecting further data on drugged driving;
- Enhancing prevention of drugged driving by educating communities and professionals;
- Providing training to law enforcement on identifying drugged drivers;
- Developing standard screening methodologies for drug testing laboratories to use in detecting the presence of drugs.

Unlike Canada which addresses impaired driving through the CCC, in the United States, each state passes its own laws regarding impaired driving. Most U.S. states have drug impaired driving laws where the prosecutor has to show that there is a connection between drug use and the impairment of the driver, usually based on behavioural measures. However, there are a number of U.S. states that have some type of per se law for drug impaired driving. Three states (Nevada, Ohio, and Virginia) have set specific cutoff levels for some illegal drugs (e.g., cannabis, cocaine, methamphetamine, etc.). It is not evident how these limits were determined. In seven states (Arizona, Delaware, Georgia, Indiana, Minnesota, Pennsylvania and Wisconsin), it is illegal to have any level of drug or its metabolite in the body while driving (i.e., zero tolerance). In five other states (Illinois, Iowa, Michigan, Rhode Island, Utah), it is illegal to have any amount of a prohibited drug (metabolites cannot be used) in the body while operating a motor vehicle. Five states have made it illegal for a drug addict or habitual user of drugs to drive a vehicle (California, Colorado, Idaho, Kansas, and West Virginia). In two states (North Carolina and South Dakota), it is illegal for people under the age of 21 to drive with any amount of drug in their body. In total, 22 states have some form of per se law addressing drugged driving.

Two states have driving under the influence of drug laws (DUID) within their criminal codes (Idaho and Texas) while the remaining states have DUID laws within their transportation or motor vehicle codes. Only Hawaii and New York have drugged driving laws separate from alcohol impaired driving laws which makes it difficult to distinguish between alcohol and drug offences in most states. All but five U.S. states apply their implied consent laws whereby drivers must provide a specimen if requested by the police for drug testing or face sanctions. Nine states provide for criminal penalties if the driver refuses to provide a specimen.

In terms of penalties on conviction, the states vary considerably. While some use fines of varying amounts or incarceration for different lengths of time, others use community service, electronic monitoring, restitution, and assessment of costs. A number of states require that offenders participate in an educational or treatment program before reinstating their driver licences.

A review of per se laws in several states (Lacey, et al., 2010) found that police and prosecutors were supportive of them because it was more likely that impaired driving by drugs cases would be prosecuted. Unfortunately, there were no data showing the effectiveness of these laws

mainly because it was not possible to distinguish between alcohol and drug impairment convictions.

3.2.1.3 Legislation in European Countries

According to the OECD report (Beirness, et al., 2010), the following countries in Europe have zero tolerance per se laws for specific drugs, usually illegal ones like cannabis: Belgium, France, Portugal, Slovenia, Sweden, and Switzerland. Norway has set legal per se limits for 20 specified drugs, as shown in Table 3. However, given the lack of accurate testing devices, the police still have to conduct behavioural assessment of drivers before a body fluid is tested. Behavioural testing is also required to determine impairment by other drugs not covered by this legislation

Table 3: Legal limits for 20 drugs in Norway

Drugs	Impairment limits (ng/ml in whole blood)	Limits for graded sanctions comparable to 0.05 % (ng/ml in whole blood)	Limits for graded sanctions comparable to 0.12 % (ng/ml in whole blood)
Benzodiazepines and benzo-like			
Alprazolam	3	6	15
Clonazepam	1.3	3	8
Diazepam	57	143	342
Fenazepam	1.8	5	10
Flunitrazepam	1.6	3	8
Nitrazepam	17	42	98
Oxazepam	172	430	860
Zolpidem	31	77	184
Zopiclone	12	23	58
Cannabis			
THC	1.3	3	9
Central stimulants			
Amphetamine	41	*	*
Cocaine	24	*	*
MDMA	48	*	*
Methamphetamine	45	*	*
GHB			
GHB	10 300	30 900	123 600
Hallucinogens			
Ketamine	55	137	329
LSD	1	*	*
Opioids			
Buprenorphine	0.9	*	*
Methadone	25	*	*
Morphine	9	24	61

Other countries such as Austria and the Netherlands have behavioural impairment laws while the laws of Denmark and Germany use both types of evidence. Spain and the United Kingdom do not have any laws specific to drug impaired driving but refer to impaired driving by alcohol or drugs. The drug testing medium used most often to detect drugs is blood but urine and oral fluid testing are also permitted in some countries. As in the U.S., some jurisdictions deal with drug impaired driving within their criminal law, while others address it through their traffic laws.

3.2.1.4 Legislation in Australia and New Zealand

Australia does not have a national law dealing with drug impaired driving but rather each state addresses it within their own legislation. Some Australian states (e.g., Victoria and South Australia) have zero tolerance laws for drugs prescribed by regulation (e.g., cannabis, amphetamine) as well as behavioural impairment measurement for other drugs. Australia has had random breath testing laws for many years which allow the police to demand a breath test from drivers without any suspicion of drinking. This random testing approach has been extended to several illicit drugs in the state of Victoria. Drivers are requested to provide an oral fluid sample and if prohibited drugs are detected, the drivers are required to provide a second sample. If the second sample is positive, the driver is not allowed to drive away and their sample is sent to the lab for evidentiary testing. If the results of the analysis reveal the presence of the prohibited drug, then the driver is charged with drugged driving. The penalty on conviction of a first offence can be a fine of up to 12 penalty points or licence cancellation for six months.

New Zealand has a behavioural impairment law similar to that of Canada which applies to the whole country.

Clearly, different countries and states within countries have adopted different legal approaches to drug impaired driving. However, there is a dearth of evaluations demonstrating that these laws have had any positive impact on drugs and driving.

Some of the policy issues that need to be discussed and resolved are:

- Is the behavioural impairment approach to dealing with impaired driving by drugs the best approach for Canada or should we move to a per se law for some illegal drugs (e.g., cannabis, methamphetamine, ecstasy, etc.) such that any driver with any specified illegal drugs in their body or a proscribed amount of a drug is charged with committing an offence?
- There is a growing problem with people taking medication which has not been prescribed for them. For example, people bring medications to a party and they are shared. There is a problem with such drugs being stolen from pharmacies and there is also concern that young people are taking drugs that have been prescribed for their parents.
- There are new designer drugs being created such as methylenedioxypyrovalerone, Bolivian Bath Salts, which is similar to methamphetamine and hallucinogens, and Spice or K2 which is a synthetic cannabinoid. As a result, it is difficult to keep abreast of the various drugs that are being used by drivers, although a behavioural impairment type of law would still allow for testing for impairment by any class of drug.

- Many prescription drugs do not have a clinically significant effect on driving. Furthermore, some people who are taking prescribed medications (e.g., schizophrenics, diabetics, heart disease patients) may actually perform better while driving even though there may be some side effects. The ethical conundrum is whether it is better to prohibit these people from driving, thereby reducing their mobility or to permit them to drive provided they take their medication.
- Some drivers are taking cannabis medically in order to treat certain ailments but it is not known whether this practice is creating a safety problem.
- If a driver consumes a low level of alcohol (i.e., BAC=40 mg/100mL) and then takes another drug such as cannabis or diazepam, the resulting effects could be much more impairing than the effects of either drug alone. Poly-drug use poses the same type of problem.

3.2.1.5 Model Drugs and Driving Legislation

Currently, in Canada, alcohol impaired driving is addressed by the CCC and by administrative laws, the latter being included in jurisdictional traffic laws. These administrative laws are intended to address lower levels of alcohol impairment which generally pose less of a risk to the safety of people on our roads, by removing the driver from the road immediately. Offences under these laws are relatively easy to handle compared to charges under the Criminal Code since they do not require court involvement.

The CCMTA (2005) has developed model legislation (STRID Strategy to Address Lower BAC Drinking Drivers) to deal administratively with BACs in the 50-80 mg/100mL range. The key elements are:

1. An immediate roadside suspension of 7-14 days if the driver registers a BAC of 50 mg/100mL or more on an approved screening device or instrument;

2. The police must request the surrender the driver's licence, and forward it to the Registrar of Motor Vehicles. This will make it more risky for these individuals to drive during the suspension;

3. If a driver incurs a second, third or subsequent 50 mg/100mL infraction within three years, his or her licence will be suspended for 30, 45, and 60 days, respectively;

4. Drivers who receive two or more suspensions for driving over 50 mg/100mL or for failure or refusal of a field sobriety test within 3 years are required to undergo an impaired driver's assessment from a recognized agency;

5. Drivers who receive three or more 50 mg/100mL suspensions within three years will be required to install, at their own expense, an alcohol interlock on their vehicle for six months as a condition of licence reinstatement;

6. The Registrar must be informed of all 50 mg/100mL suspensions and record them on the driver's record, and print them on all driver abstracts for a period of 10 years from the date of suspension;

7. A driver who receives a 50 mg/100mL suspension should be required to pay a licence reinstatement fee in the $150 to $300 range. Drivers who incur a second, third or subsequent 50mg/100mL suspensions within three years should be required to pay increased licence reinstatement fees. While it may be appropriate to subsidize the true costs of apprehending, testing and processing first-time violators of the 50 mg/100mL law, repeat violators should bear an increasing share of the full costs.

Some jurisdictions have adopted at least some of the elements of this low blood alcohol concentration legislative model such as longer suspension periods (e.g., 7 days) and the recording of offences so that repeat offenders can be identified.

A similar legislative model could be considered by jurisdictions for drug impaired driving in Canada and indeed, as noted earlier, seven jurisdictions already have adopted some elements of this type of administrative law. The penalties for drug impaired driving should be the same as those for alcohol impaired driving, with the exception of alcohol ignition interlocks. As these administrative laws regarding drug impaired driving are implemented, they ought to be evaluated for their effectiveness in reducing drug impaired driving.

Given sufficient research on the risk of a collision while under the influence of a drug, it may be possible to establish a per se law with specific legal limits at least for some drugs such as cannabis, cocaine, amphetamines, and some depressants. For example, Gotenhermen et al. (2007), having reviewed the experimental and epidemiological evidence, concluded that a serum THC concentration of 7-10 ng/mL is equivalent to a BAC of 50 mg/mL in terms of driver impairment. Drivers over the limit for THC could be subject to provincial/territorial administrative laws. It would still be necessary to have DREs conduct evaluations to establish reasonable and probable grounds for requesting drivers to provide a blood, urine, or oral fluid sample to test for drug impairment but the setting of legal limits would likely make it easier to obtain a court conviction at least for the specified drugs.

Consideration could be given to permitting the use of point-of-contact oral fluid immunoassay testing at the roadside to screen drivers for drug use prior to the DRE conducting the DEC assessment. This may improve the efficiency and effectiveness of drug impaired driving enforcement. However, the feasibility and cost of such testing would have to be assessed before the CCC could be amended to permit it.

Most Canadian jurisdictions have Graduated Driver Licensing programs for new drivers. One of the requirements of these programs is that new drivers drive with a zero BAC during both the novice and intermediate phases. This provision could be broadened such that driving under the influence of any amount of specified psychoactive drugs is also prohibited. The driver's handbook could include additional information regarding the impairing effects of drugs other

than alcohol and the laws prohibiting drug impaired driving and the knowledge test for a driver's licence could include questions on these topics, if this is not the current practice.

3.2.2. Enforcement and Adjudication of Drugs and Driving Laws

The drugs and driving enforcement and adjudication practices being used in various countries are summarized in this section starting with Canada.

3.2.2.1 Enforcement and Adjudication in Canada

The enforcement procedure for determining whether a driver is impaired by drugs is complex in Canada. Police officers conduct Reduce Impaired Driving Everywhere (RIDE) types of programs (they may have different names in different jurisdictions) where road blocks are set up and vehicles are pulled over so that the officer can look for signs of alcohol consumption (e.g., admission of drinking, smell of alcohol, slurred speech, difficulty getting out licence, etc.). Alternatively, a driver might be pulled over because they are speeding or has committed some other traffic offence. If there are reasonable and probable grounds for suspicion of alcohol impairment, the officer can demand a breath test using a roadside screening device. If the BAC is found to be over 80mg/100mL, the driver can be charged with impaired driving under the CCC and if the BAC is between 40/50 and the 80mg/100mL legal limit, the driver's licence can be suspended administratively in most jurisdictions. However, if the BAC is below 40/50mg/100mL and yet the driver still appears to be impaired, the driver can be asked to perform the Standardized Field Sobriety Test (SFST) which consists of a horizontal gaze nystagmus test (eyes jump while following a light rather than move smoothly), a one leg stand, and a walk and turn test to determine drug impairment. Training of police officers to conduct SFST takes about two days.

If the driver fails the SFST, the police officer will take the driver to the police station and hand him/her over to a specially trained and certified Drug Recognition Evaluator (DRE) who will subject the driver to a series of medical and behavioural tests. The 12 Step Drug Evaluation and Classification (DEC) procedure conducted by the DRE is:

1. Conduct an evidentiary breath test if there is grounds for suspicion of alcohol use;
2. Interview the arresting officer to determine reason for arrest, driving behaviour observed;
3. Preliminary medical examination (e.g., pulse rate) to determine if there is reason to suspect drug impairment;
4. Eye examination for horizontal gaze nystagmus, vertical gaze nystagmus, and eye convergence;
5. Conduct divided attention tests (Romberg Balance, Walk and Turn, One Leg Stand, Finger to Nose);
6. Take vital signs (pulse rate three times, blood pressure, body temperature);
7. Dark room examinations (i.e., pupil size measured at three different light intensities, nasal and oral cavity exam);
8. Assess muscle tone (i.e., flaccid, rigid, normal);
9. Check for injection sites and take another pulse measure;

10. Interview suspect using structured interview; take statements, make observations;
11. DRE forms opinion based on all of evidence about drug impairment and category of drug(s);
12. DRE demands body fluid sample, usually urine, which is submitted to a forensic lab for toxicological analysis.

If the toxicological analysis supports the DRE's opinion regarding the suspected impairing drug, the driver can be charged with impaired driving under Section 253 of the CCC. Even if the analysis does not support the DRE's opinion, a charge can still be laid at the Crown prosecutor's discretion.

DREs take a three week training program, currently provided by the RCMP, that includes in-class and in the field testing components. DRE's have to conduct a minimum number of evaluations over a two year period and take a continuing education component (8 hours over a two day period) in order to maintain their certification.

While the DEC procedure takes a considerable amount of time to conduct and a lot of information needs to synthesized, the DREs are usually fairly accurate in their assessments. Beirness at al. (2008) conducted an evaluation of the accuracy and reliability of the Canadian DREs' assessments. About 1,350 DRE evaluations were compared with the results of toxicology tests and it was found that overall, the evaluations were correct in about 95% of the cases. While sensitivity was high for cannabis, stimulants, and narcotics (.79 -.93), it was lower for depressants (.57). The specificity was also quite high for all drugs (.93 or higher) indicating that the officers were not detecting a drug that was not present.

Beirness et al. also examined the inter-rater reliability by providing 75 Canadian police officers who were certified as DREs with the case information recorded by other DREs for 23 cases without any toxicological results provided. Overall, the inter-rater agreement was 71% which was statistically significant. Agreement was highest for dissociative anesthetics (96%), narcotic analgesics (87%), and cannabis (80%). Agreement about the presence of two drugs was highest for stimulants/narcotics (83%) and cannabis/alcohol (81%). Given that the DREs did not have information from the arresting officer and they did not observe the testing nor speak to the driver, these results are quite good.

The RCMP's National Drug Recognition Expert Program provides resources for the creation of a solid instructor and certified DRE base so that police enforcement agencies can eventually become autonomous in identifying and training a sufficient number of members to effectively enforce drug driving laws in Canada. However, this funding may end in 2015.

3.1.2.2 Enforcement in the United States

In the U.S., the police conduct two types of enforcement activity to detect impaired drivers: sobriety checkpoints and saturation patrols. Sobriety checkpoints are similar to RIDEs in Canada and are conducted at roadblocks where vehicles are stopped and the police officer asks the driver a few questions (e.g., "Have you had anything to drink") and may ask to see their driver's licence, vehicle ownership and insurance while looking for signs of impairment. If there are signs of impairment, the officer administers the SFST and if the officer believes that there is

evidence of impairment, a roadside screening breath test could be given or the driver could be taken to the police station where a DRE would conduct an assessment for drug impairment. Sobriety checkpoints are conducted mainly to raise the perceived likelihood that impaired drivers will be caught (i.e., general deterrence).These sobriety checkpoints have been found to reduce fatal and injury collisions involving alcohol by 20% (Elder et al. 2002). There are also saturation patrols which are usually conducted at sites and times where there is a known high concentration of impaired driving and all drivers are stopped and subjected to the same procedure just described. Saturation patrols are conducted primarily to apprehend impaired drivers (i.e., specific deterrence).

In addition to SFST and DRE training, front-line police officers in 37 states take Advanced Roadside Impaired Driving Enforcement (ARIDE) training to provide them with greater awareness of drug impairment and how to recognize possible drug impaired drivers based on clinical signs and symptoms. This ARIDE training takes about 16 hours. There is also an 8-hour course developed by the National Highway Traffic Safety Administration (NHTSA) called Drugs That Impair Driving which is used in conjunction with SFST training for front-line police officers to provide a general description of drugs and those that are most common in driver impairment, physical signs that indicate drug use, and medical conditions that show similar signs to drug use.

Unlike in Canada, there is mandatory testing for alcohol and other drug use by commercial vehicle drivers in the U.S.

3.1.2.3 Enforcement in Other Countries

A number of Australian states have random drug testing (RDT) laws as well as random breath testing laws which permit the police to stop drivers at random at the roadside and demand a breath test for alcohol and/or an oral fluid test for specific illegal drugs (i.e., cannabis, methamphetamine) using a point-of-contact immunoassay test. The Victoria police maintain that their RDT program has resulted in a decrease in illegal drugs in fatally injured drivers from 24% in 2005 to 15% in 2009 (Victoria Police, 2010).

Research on the effectiveness of RDT in several European countries was conducted as part of the Driving Under the Influence of Drugs, Alcohol, and Medicines (DRUID) project. For example Veisten, et al. (2010) examined the cost-benefit of drug driving enforcement and concluded that increased enforcement using roadside oral fluid screening would be beneficial particularly in countries which currently have a low level of enforcement (e.g., Netherlands).

A study conducted in Israel by Schechtman and Shinar (2005) looked at the use of a model based on logistic regression analysis to predict drug impairment and compared their model with the predictions of DREs using the full set of signs and symptoms of the DEC. The subjects were 48 regular users of the study drugs (opiates, cannabis, depressants, amphetamines) who were tested twice after taking a high dose or a low dose of a drug or a placebo (i.e., no drug). Each person was subjected to all three conditions. Then 39 DREs evaluated the subjects to determine if they were under the influence of a drug and if so, which one using the ocular and vital signs that are part of the DEC (e.g. pupil size, pupil reaction to light, blood pressure, heart rate). The results showed that using a regression model for each drug based on specific

predictors was more accurate in identifying drug use than the DREs' decisions based on all the data collected, with the exception of codeine, where there was no difference. For example, the predictive model for the probability of cannabis use was:

P(c) = 14.19 -.53 x (pupil diameter in direct light) x - 1.06 (reaction of pupil to light) - .14 x (average pulse rate)

This model had a sensitivity of .63 and specificity of .91. This study suggests that it may be possible to optimize the information gathered by DREs during a DEC assessment to improve the prediction of the likelihood of drug use by drivers.

3.1.2.4 Enhancing the Enforcement and Adjudication of Impaired Driving by Drugs Laws

The key to any successful traffic enforcement program is to increase the public's perceived likelihood of being stopped, charged and convicted for a traffic offence. According to the BC roadside survey results (Beirness and Beasley, 2011), drivers perceive the likelihood of being caught for drugged driving to be lower than that for alcohol impaired driving. In order to raise this low perceived likelihood, it is necessary to conduct more enforcement campaigns which are highly visible to the public. When the police are conducting RIDE type programs looking for alcohol impaired drivers, they should also be on the lookout for signs of drug impaired driving. In addition, there should be awareness campaigns conducted to alert the public that the police will be enforcing impaired driving laws and will be looking for drivers who are impaired by alcohol, by drugs, or by both. These campaigns should also explain the risks associated with drug impaired driving.

As noted earlier, there are not enough DREs available to conduct the DEC assessments in Canada. A study conducted by LeCavalier and Beirness (2009) concluded that based on a ratio of six DREs per 100,000 population as a target for DRE training and distribution across the country, about 1,500 more active DREs are needed over the next 3 years in Canada (there were about 500 DREs at the time of the study). It is noted that it is crucial that more funding be made available to support this DRE training. There are also issues regarding ongoing training of DREs so they can maintain and upgrade their skills. There is also a problem with DREs staying on the job only a couple of years and then moving on to other jobs resulting in the need to train someone else.

The shortage of DREs appears to be particularly problematic in rural areas. As noted in the BC roadside surveys, drug impaired driving is not just an urban phenomenon but is occurring in smaller communities as well. One solution might be to have "flying squads" which move from one rural community to another to support a local enforcement campaign for a couple of weekends accompanied with a high level of local media coverage.

Presentations could be given at meetings of the Canadian Association of Chiefs of Police (CACP) to raise awareness about the problem of drugged driving, which research shows rivals alcohol impaired driving at least in terms of prevalence, and about the DEC program. Police Services could be encouraged to provide more funding in order to send their officers to DRE training. However, funding should not be diverted from the enforcement activity to detect alcohol impaired driving laws.

Since some front-line police officers may be unaware of the impairing effects of drugs and the growing frequency of their use by drivers, awareness campaigns could be conducted among officers so that they will be more likely to look for drug impaired drivers. The NHTSA's "Drugs That Impair Driving" program may be appropriate for such an awareness campaign or a similar program could be developed specifically for Canadian police officers. Similarly, ARIDE programs could also be adapted by Canadian police services to assist police officers in detecting drug impaired drivers at the roadside. CCMTA and the jurisdictions could work with the CACP and police colleges to develop these training programs.

Some concern has been raised recently in court cases regarding the validity of the SFST divided attention tests given that these tests were originally developed to detect alcohol impairment. There is a need to conduct research on these tests in order to determine their validity in detecting drugs other than alcohol.

Apparently, in some jurisdictions, there has been a reluctance on the part of some Crown attorneys to pursue drug impaired driving cases given that some judges do not perceive the evidence given by DREs to be sufficiently scientific, resulting in acquittals in some cases If these drug impaired cases are not being pursued by Crowns, DREs are less motivated to charge drivers. Public Safety Canada and the Ontario Crown Attorney's Association hosted a workshop on drug impaired driving prosecutions in Toronto in 2011. The purpose of the workshop was to provide a forum for the attorneys' to learn about prosecuting drug impaired driving cases involving drug evaluations. In excess of eighty Crown attorney's attended and spent two days listening and interacting with drug evaluators, toxicologists and Crown attorney's who have experienced drug impaired driving trials. The workshop was so well received that the RCMP will be conducting similar workshops across the country (e.g. Regina in March 2012) so as to provide an equal opportunity for other provincial prosecution services. A similar voluntary workshop for judges could be developed and offered across the country as well to raise their knowledge about drug impaired driving and the DEC program. In addition, the National DRE Program will be hiring two people with combined DRE and forensic backgrounds who will be able to provide an understanding of the science behind DRE testing to the courtrooms.

The effectiveness of the DEC program in reducing drug impaired driving has yet to be evaluated. Such an evaluation would assist in developing a best practice for the program.

3.2.3 Public Education and Awareness

It is necessary to raise public awareness and knowledge regarding drug impaired driving. Some of the activities that have been conducted in Canada and other countries are reviewed below.

3.2.3.1 Canadian Public Education and Awareness Campaigns

A survey of Canadian jurisdictions conducted in May 2011 by CCMTA indicated that some of them are engaged in informing the public about drugs and driving. These activities are described in Appendix B.

As part of Alberta's Traffic Safety Plan, a Communications Resource Toolkit has been developed to help plan and coordinate awareness and educational activity by month in the province. The months of August and December 2011 were devoted to impaired driving by alcohol and/or drugs. This Toolkit makes it clear that driving while impaired by drugs is a crime and that refusal to submit to SFST and DRE testing will result in the same penalties as being found to be impaired by a drug based on behavioural testing and body fluid analysis.

A Manitoba Addictions Awareness Week (MAAW) website offers drug and alcohol impaired driving information and the Addictions Foundation of Manitoba counselors educate students on the harmful effects of drug and alcohol use. Manitoba Public Insurance (MPI) attends various community, school and business events with a drug impaired driving display offering information on dangers associated with drug impaired driving. The MPI display also incorporates the impairment goggles that demonstrate vision impairment and the loss of balance and coordination caused by alcohol and drugs. In addition, a drug impaired driving fact sheet highlighting collision risk and criminal sanctions is provided to participants.

Ontario has developed the iDrive Road Stories which is a youth oriented road safety DVD used in high schools to raise awareness among young drivers of the risks of unsafe driving including impaired driving by drugs. There are also public education materials such as posters, information cards, bookmarks and bus shelter ads developed in partnership with communities to raise awareness of the risks of drug-impaired driving.

Senior driver seminars that are held across Ontario include a component on prescription and over-the-counter medications and their effects on safe driving. Seniors are told that if they experience any of the following symptoms, they should not drive and should contact their doctor:

- Drowsiness;
- Dizziness;
- Blurred vision;
- Difficulty concentrating and staying awake;
- Confusion;
- Memory lapses;
- Difficulty keeping a steady course while driving (staying in the proper lane).

Seniors are also informed that certain drugs (such as tranquillizers, antihistamines, sleeping pills and some pain pills) are most likely to cause the above symptoms and affect their driving ability and that some antihistamines as well as cold and flu remedies, can also cause them to become drowsy.

The Societé d'Assurance Automobile du Québec (SAAQ) has distributed a pamphlet informing the public of the risks of drug impaired driving. In addition, advertising messages on impaired driving often address alcohol and drugs or refer to impaired driving in general without specifying the source of impairment.

The Community Legal Information Association of PEI has a website entitled Drinking, Drugs and Driving which provides information about the legal consequences of driving while impaired by alcohol or drugs.

Preventing Alcohol Related Trauma in Youth (PARTY) and No Regrets programs which include material on the risks of drugs and driving, are offered in several provinces (e.g., ON, NS). Nova Scotia's Department of Health and Wellness Department has a website called "unwasted.ca" which is an interactive and educational tool that was promoted to high school students when considering issues of addiction, risk taking and substance use. There is one segment that specifically speaks to the risk of smoking marijuana and driving.

Several other jurisdictions are planning awareness and education activity (BC/PE/SK/YK).

Transport Canada has a pamphlet on impaired driving called Smashed/Impact which includes a section on drug impaired driving, the law, and the sanctions. Transport Canada is also distributing the IDrive video to schools outside of Ontario except for Quebec which has its own video. Health Canada ran an awareness campaign from 2007-2009 targeted at the parents of youth 13-17 to tell them what illicit drugs look like, how illicit drugs are used, and the harms of illicit drug use to youth's social lives, schooling and health. Awareness campaigns regarding drug impaired driving might target the parents of youth who are close to becoming new drivers.

Mothers Against Drunk Driving (MADD) Canada has developed a video targeted at teens called "Not Ready to Go" which tells the story of five teenagers who were killed and nine others who were injured in a cannabis related multi-vehicle crash as told by the survivors, families and emergency responders. MADD has also aired television commercials on drugs and driving.

The Canadian Public Health Association conducted an awareness campaign on cannabis and driving in 2006 targeted at young Canadians aged 14-18. Prior to developing the campaign, several focus groups were conducted with youth to obtain their views about the issue. As a result of this research, a campaign called "Senseless" was created showing airline pilots smoking marijuana with the tagline "If it doesn't make sense here, why does it make sense when you drive". The materials developed included a discussion guide, frequently asked questions, ten questions to trigger discussion amongst youth, and posters showing the pilots smoking marijuana.

In general, there do not appear to have been any broad based media campaigns which have attempted to raise the public's awareness regarding the dangers of drug impaired driving. The effectiveness of the awareness programs that have been conducted is not known.

3.2.3.2 Other Countries' Public Education and Awareness Campaigns

The United Kingdom's Department for Transport has a website which informs the public about the effects of drugs on driving, the law regarding drugs and driving, the behavioural testing that the police perform to detect impairment and the sanctions for a drugged driving convictions. A major television advertising campaign was conducted in August 2009 warning drivers that the police can identify drivers under the influence of drugs and that if they are convicted, they will be subject to the same penalties as alcohol impaired drivers (Telegraph, 2009). The overall objective of the campaign was to make drugs and driving socially unacceptable.

Poland conducted an awareness program on drugs and driving in 2009 aimed mainly at young people who use recreational drugs (Jablonski, 2011). The campaign called "Don't drug drive! Drugs turn off your brain" was based on social research which indicated that young people did not associate drug use with impaired driving as they did with alcohol. The campaign included television and radio ads, press and outdoor ads, posters, and a website, the latter providing a forum for heated discussions about drugs and driving. The campaign was considered quite successful and received a number of awards. The TV spots were translated so that they could be shown in other countries. A subsequent campaign focused on both alcohol and drug impaired driving which included similar messages and media.

The Australian Drug Foundation has a website which provides fact sheets for drivers about the effects of medication and illegal drugs on driving and fact sheets for medical professionals to use when talking with their patients regarding the risks of drugs and driving. The public automobile insurers in the Australian states of Victoria (Transport Accident Commission) and South Australia (Motor Accident Commission) have conducted multi-media statewide drugged driving campaigns which have provided information on the dangers of drugs and driving, enforcement, including random drug testing, and penalties. The Victoria campaign's slogan was "If you drive on drugs, you're out of your mind" and targeted young drivers using cannabis and other illegal drugs. There have also been advertising campaigns in Victoria publicizing the Drug Buses used by the police for random drug testing with the slogan, "Now we can catch you". The South Australia television campaign asked people whether they would trust a surgeon, airline pilot, or bus driver to do their jobs safely if they were on drugs and then asked so why would you trust yourself on them.

The effectiveness of these international awareness programs is not known.

3.2.3.3 Enhancing Public Awareness and Knowledge

It is quite possible that Canadians are unaware of the impairing effects of illicit, prescribed, or over-the-counter drugs on driving or the current federal and provincial/territorial laws with respect to drug impaired driving. It is also likely that drivers believe that their chances of being detected of drug impaired driving are quite low compared to alcohol impaired driving (Beirness and Beasley, 2011). An initial national media campaign could be conducted to raise the public's awareness regarding the potentially impairing effects of drugs on driving and the current laws that are in effect prohibiting such behaviour. The combination of alcohol use with the consumption of other drugs would also be highlighted because of the elevated risk this creates and the frequency with which this activity takes place. Such a campaign would be broad based

and aimed at all segments of the population. Various media could be employed including television, radio, newspapers, posters, bus shelter ads, billboards, and brochures as well social media such as websites, YouTube, Facebook, Twitter, etc. Common materials could be developed which could be used and adapted for use by the jurisdictions.

Social research could determine what the public actually knows about drugs and driving. A survey of the public's level of knowledge, perceptions, attitudes, and experiences regarding drug impaired driving would be useful in developing awareness and educational activity that can be targeted to specific high risk groups. It would also serve as a benchmark for public awareness and knowledge. This survey could include drivers from all age and gender groups and be nationally representative.

Focus groups could also be conducted with young drivers to ascertain their motivations for using illicit drugs such as cannabis or using pharmaceuticals not prescribed for them and then driving and to determine what measures they believe would be likely to deter such activity. These focus groups could ascertain whether drug impaired driving is linked to other risky driving behaviours (e.g., alcohol impaired driving, speeding, using cell phones while driving, etc.). Focus groups could also be conducted with older drivers to get their views on the possible impairing effects of medications and how they think this risk might be best addressed. Based on this social research, additional awareness and education campaigns could be targeted at younger and older drivers. Some of these materials could be developed by members of the target groups (e.g., young drivers).

Some drivers are taking medications to treat various medical issues such as heart disease, diabetes, high blood pressure, sleeping disorders, depression, etc. some of which may be impairing. When drivers renew their licence, they could be provided with information about the impairing effects of some of the more common drugs such as benzodiazepines.

Any awareness campaign must be developed carefully so that it does not imply that all drugs impair driving since many pharmaceutical drugs do not. The main objective of such a campaign is to raise awareness about the risks of drug impaired driving and to inform the public that there are laws, criminal and administrative, which prohibit drug impaired driving, and that the police are well trained to detect them. Awareness campaigns should not be expected to change people's behavior with regard to drug impaired driving but rather to raise awareness, increase knowledge, and possibly change some attitudes. These campaigns should be evaluated in order to determine whether their objectives have been achieved.

3.2.4 Health Promotion

Some drug users are addicted to the drugs (e.g., cocaine, heroin) and require extensive assessment and treatment to overcome these addictions. The nature of the treatment may well vary by the drug. Several countries have programs to address drug addictions as well as other health promotion initiatives.

3.2.4.1 Canadian Health Promotion Activity

A number of Canadian jurisdictions have remedial programs for drivers who have been convicted of impaired driving by alcohol/and or drugs. These programs are described in Appendix B.

The Responsible Driver Program (RDP), offered by BC's Office of the Superintendent of Motor Vehicles through Stroh Health Care is not specific to drug impaired driving convictions but applies to drivers who have received three immediate roadside prohibitions within a 5 year period. The focus of the program is to separate driving from alcohol/drug use. Drivers pay an $880 program fee and can attend either a one-day education session in a classroom setting or 16-hour group counseling program, scheduled over a three-month period. Also BC's new Guide to Determining Fitness to Drive for medical practitioners has a section on Psychotropic Drugs.

Albertan drivers convicted of impaired driving by alcohol or drugs for the first time are required to participate in the one day impaired driver program called Planning Ahead and repeat offenders must complete the weekend Impact Course.

Drivers convicted of alcohol or drug related offences in Manitoba are required to be assessed by the Addictions Foundation of Manitoba through the Impaired Driver Program and then they may have to go to educational workshops or remedial programs.

In Ontario, all drivers convicted of impaired driving (including drug-impaired driving) have to complete a remedial measures program ("Back on Track") which is delivered by the Centre for Addiction and Mental Health. The program includes assessment, education or treatment, and follow-up before the driver's licence is eligible for reinstatement. Content specific to drugs other than alcohol is included in the program.

Québec has the Alcofrein educational session for impaired drivers. While many jurisdictions have medical programs that seek to identify drivers with medical conditions that may affect driving, including alcohol and drug dependence, in Québec, a diagnosis of active substance abuse or dependency is grounds for immediate licence suspension. In order to obtain their permit after such a suspension, a driver must either complete the approved programme at the Association des centres de réadaptation des dépendances du Québec (ACRDQ) or meet the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria for a diagnosis of complete prolonged remission. Québec appears to be the only jurisdcition to use the DSM-IV criteria to define substance abuse.

In Newfoundland and Labrador, a driver is assessed by an addictions counselor who determines if there is an issue with drugs and whether treatment or rehabilitation is required.

The effectiveness of these Canadian treatment programs in reducing drug impaired driving is not known.

3.2.4.2 Health Promotion in Other Countries

In South Dakota, there is the 24/7 Sobriety Project where repeat impaired driving offenders on parole or probation must maintain sobriety and are required to submit to twice daily alcohol testing and to random urinalysis drug tests or wear sweat patches that monitor drug use. This program has been quite successful in reducing recidivism (Loudenburg, et al., 2011).

Hawaii's Opportunity Probation and Enforcement (HOPE) program only offers treatment for alcohol and drug abuse to those offenders requesting it. All offenders are monitored for alcohol and nonmedical drug use and those who fail to remain abstinent are referred to treatment. This behavioural triage approach improves the cost-effectiveness of treatment programs (Hawken, 2010).

A review of rehabilitation and treatment programs in Europe which was conducted as part of the DRUID project, (Boet, et al, 20008) concluded that:

- Alcohol and drug dependent drivers are, by EU legislation, not considered to be fit to drive;

- Psychosocial treatments of alcohol and drug dependent patients are well established interventions to support the maintenance of abstinence and to lower the amount and frequency of alcohol and drug consumption. No strategy could be identified to be superior in general. It is important to consider characteristics of the patient, predominant symptoms of the dependence, and also motivational aspects while matching patients and treatment approaches;

- A combination of different treatment strategies provides the advantage of simultaneously addressing different factors and levels of influence;

- In general, the relapse-rates of alcohol or drug dependent patients are high, even after successful completion of addiction therapy;

- Pharmacological treatment is, according to the existing literature, often used as an adjunctive approach to psychosocial therapy;

- The addiction-specific approach is a fundamental element within the rehabilitation of dependent impaired driving offenders.

It would appear that the best treatment strategies are those that are tailored to the individual patient's specific drug problem and combine strategies that are most effective. However, there should also be interventions for the more casual drug user to prevent them from becoming drug dependent. More needs to be learned about the treatment programs in Europe and their effectiveness.

Some countries such as France have made the labeling of pharmaceutical products mandatory and companies must indicate the potential level of driving impairment on the packaging. France uses a three colour code with pictograms where a yellow label says “Be careful. Do not drive without having read the leaflet”, an orange label says “Be very careful. Do not drive without the advice of a medical professional” or a red label says “Attention: Danger. Do not drive”. As part of the DRUID project, a similar labeling approach was developed using a pictogram with a colour coded rating scale indicating the level of risk in traffic when using a drug and was assessed in Spain and the Netherlands (de Gier, 2011). However, it is not known how manufacturers decide which label to affix to drug packaging nor is it known whether these labeling systems have increased awareness about the effects of drugs on driving or reduced the likelihood of driving while impaired by drugs.

3.2.4.3 Enhancing Health Promotion

As people age, they often take a variety of medications to treat various ailments. Some of these medications can have an impairing effect on driving performance. Physicians, nurses, and pharmacists can play a key role in educating people about the effects of these medications on driving performance. Pharmacists may be best situated to provide this information but it may require some funding for them to provide this service.

Special attention should be paid to the interactive effects of drugs. While use of one drug by itself may not have any impairing effects, they might have a very debilitating impact when used along with another drug or alcohol. Some of the drug combinations of greatest concern are narcotics with non-steroidal anti-inflammatory drugs, muscle relaxants, anti-anxiety drugs, anti-depressants, and antibiotics (Lococo and Staplin, 2006). There could be computer systems established which tell pharmacists when a specific prescription drug may have impairing effects on driving, either alone or in combination with other drugs, so that they can alert the consumer to the risk. These systems have been recommended by the DRUID project.

The Screening, Brief Intervention, and Referral to Treatment (SBIRT) initiative could be used with first drug impaired driving offenders to determine if they have a drug abuse problem (Madras, et al., 2009). It could also be used by family physicians to identify drug abuse problems among their patients during annual check-ups.

Health care professionals could also be educated about the impairing effects of certain pharmaceuticals so that they can prescribe those medications which are least impairing to properly treat their patient’s medical ailment. They could also be encouraged to increase the dosage of the drug gradually over time to facilitate habituation to its effects.

CCMTA may want to approach Health Canada to determine whether there are any current standards for drug package labeling and whether a labeling program similar to that in France and other European countries would be feasible for Canada. While some advertisements for drugs mention some of the side effects of these drugs, few of them note their effects on driving. Health Canada may want to examine the need for regulations requiring advertisements to indicate the effects of specified drugs on driving.

It would be worthwhile looking at the effectiveness of current jurisdictional assessment and rehabilitation programs for alcohol and drug dependency among drivers to determine their effectiveness in preventing recidivism. A best practice could be developed based on the successful programs in Canada and elsewhere (e.g., Europe, Australia, U.S.).

3.2.5 Technology

While the current point-of-contact (POC) immunoassay tests using oral fluid are fairly sensitive (high percentage of true positives) in detecting some drugs, their specificity (i.e., low percentage of false positives) has been limited. The Rosita-2 project in Europe (Verstraete and Raes, 2006) found that the POC oral fluid tests available at that time did not provide reliable results for most drugs. A recent DRUID project (Mathijssen and Bernhoft, 2010) determined that while there had been some improvement in the sensitivity and specificity of POC oral fluid screening devices, sensitivities for some of the more common drugs were still low (e.g., 11-59% for cannabis). There is a need for improvement in this testing technology so that more drugs can be detected with higher rates of sensitivity and specificity. The use of more accurate oral fluid testing at the roadside could complement the use of the SFST. Also, according to DuPont, et al. (2011), it may be possible to develop breath tests that can detect recent use of some drugs (e.g., cannabis).

Currently, it can take up to three months for police officers to receive the results of toxicology tests indicating whether a drug identified by a DRE was in fact present in the driver's body. Also, different forensic toxicology laboratories test for the presence of different drugs using different methodologies. Therefore, there is a need for guidelines that specify the standard practices that should be followed by laboratories when testing for the presence of a drug and what drugs they should be searching for. There are currently three forensic toxicology laboratories in Canada which conduct analyses of bodily fluid obtained from suspected drug impaired drivers. Drug testing might be improved if a scientific committee was formed with toxicologists from these three laboratories to develop guidelines that all laboratories could follow when conducting drug testing.

3.2.6 Research

One of the major gaps in the research literature reviewed earlier is the lack of knowledge about whether a drug that is detected in a driver's body through the analysis of blood, urine or oral fluid actually impaired the performance of the driver and was a contributing factor in a collision. Drivers may have the metabolite of a drug still in their body even though they took the drug several days or even weeks ago and they are no longer influenced by it. Many studies have found the presence of a drug among collision-involved drivers but the drug use may only reflect that the drivers are risk takers and that drug use and risky driving are correlated but not necessarily causally linked. There is a need for better methods for determining if the drug was actually impairing the performance of the driver at the time of the collision or at the time they are stopped by the police.

The NHTSA convened an expert panel on drugged driving to develop a consensus protocol for assessing the potential that a drug would impair driving performance (Kay and Logan, 2011). The recommended protocol is to conduct pharmacological analyses to determine the extent that a drug negatively influences cognitive functioning and then epidemiological and toxicological data are analyzed to determine the collision risk associated with the use of the drug. Then a validated behavioural battery of tests is used to evaluate the effect of the drug on behaviours relevant to safe vehicle operation. As Kay and Logan point out, a small group of drugs accounts for most of the medication-based driver impairment (i.e., antihistamines, tricyclic antidepressants, analgesics, benzodiazepines, muscle relaxants) so these drugs should be the initial focus of research on medicinal drugs. The protocol also specifies laboratory tests, guidelines for testing on a simulator, and on-road naturalistic studies of driving. It also specifies a standard set of behavioural measures (e.g., alertness, attention, sensory perceptual functions, processing speed, reaction time) that should be used in this research.

An earlier set of guidelines for research on drugs and driving was produced by a group of international experts (Walsh, et al., 2008). These protocols could also be used to guide future research on drugs and driving in Canada.

The experimental research on the effects of common illegal drugs such as cannabis and cocaine, or medications such as benzodiazepines on driving is somewhat inconclusive. It is possible that the levels of the drugs that have been used in this research have not been as high as those actually being observed on the road. Further research on the effects of these drugs on driving using higher doses could be conducted using driving simulators or closed driving courses in order to establish a dose-response relationship at least for the more commonly used drugs. However, the doses used must not pose a risk to the health and safety of the subjects participating in the research. This research would support any future move toward per se laws for drugs and driving which set specific limits.

While coroners/medical examiners have been testing fatally injured drivers for the presence of drugs other than alcohol for some time, the testing rates for drugs are still too low and selective to allow for firm conclusions about the involvement of drugs in fatal collisions. Funding for these tests appears to be the major barrier to higher testing rates in some jurisdictions. If funding cannot be provided for testing of at least 70% of fatally injured drivers in each jurisdiction, then an alternative approach might be to test a random sample of fatally injured drivers for specified drugs. However, the sample size should be large enough to permit reliable estimates of the prevalence of drugs for each jurisdiction. While there have been some discussions with coroners/medical examiners to determine how better and more complete data on the prevalence of drugs in fatally injured drivers can be acquired, further discussions could be pursued.

There has been relatively little research on the prevalence of drugs in injured drivers. The study currently being conducted by Brubacher et al. in BC will provide information on the relationship between cannabis use by injured drivers and their culpability for the collision. However, there is need for other similar research on injured drivers in other jurisdictions and on other commonly used drugs. A network of trauma centres could be established across the country, perhaps one

per region (i.e., BC, Prairies, ON, QC, Atlantic Canada, the North), which regularly tests the blood of drivers injured in collisions to permit the monitoring of drug impaired driving. There may be some opportunity to partner with the Canadian Institutes of Health Research on the creation of such a network. Work on such a network could begin with a feasibility study.

There is a need for more roadside surveys of alcohol and drug use by drivers in Canada since the only recent surveys have been conducted in BC which may not be representative of Canada as a whole. Ideally, every jurisdiction would conduct such a survey. However, a survey conducted in each of the regions would represent a major step forward in determining the prevalence of driving under the influence of drugs in Canada. Since the U.S. roadside survey has observed a relatively high prevalence of drugs in the daytime, the Canadian surveys could also include some daytime sites.

While five Canadian jurisdictions can separate drug impaired driving convictions from alcohol impaired convictions (BC/AB/ON/SK/NS), only Saskatchewan can provide the actual number of convictions for drug impaired driving over the past three years (see Appendix B). There is a need for better data which separate the number of drivers being convicted for drug impaired driving from the number convicted for alcohol impaired driving.

More case-control studies are needed to determine the dose-response relationship between drugs and collision involvement (i.e., at what drug dosage does the risk of a fatal or injury collision become unacceptable). A case-control study requires a sample of collision cases involving a driver fatality or injury and a sample of control drivers passing through the collision location later on the same day of the week and time in order to determine the prevalence of drug impairment among drivers. A study currently being conducted by NHTSA in the U.S. will assist in filling this gap but such a study in Canada is crucial if legal per se limits are going to be set for at least some drugs in the future.

There is also a need to conduct more culpability studies, in addition to the current one being conducted by Brubacher, et al., to determine whether drivers under the influence of various drugs are more likely to have been responsible for collisions compared to drug-free drivers.

As noted earlier, in order to develop targeted public awareness and education campaigns, it is necessary to conduct a survey of the public regarding drugs and driving to gauge their level of awareness, knowledge, perceptions, attitudes, and experience regarding drugs and driving and potential solutions to address it, and to conduct focus groups among potential target groups (e.g., young drivers who are using illicit drugs or prescription drugs inappropriately and older drivers who are more likely to take prescription medications) to get more information about their views on drugs and driving.

There is a need to conduct research among older drivers to determine which prescriptions and over-the-counter drugs they are taking with particular emphasis on drug combinations which can be particularly impairing. A NHTSA report (Lococo and Staplin, 2006) provides a number of methodologies for identifying the drugs being taken by seniors (e.g. “brown bag” method where seniors bring all their medications in a bag to the office of a medical professional so they can be inventoried) and for assessing driver performance (e.g., drive own vehicle on a closed course

with driving evaluator) which have been found to be acceptable to most older people. The current CanDrive project is looking at the factors affecting the involvement of older drivers in collisions and a complementary study could look at the issue of drug use and driving among seniors. Discussions with CanDrive could be conducted to determine the feasibility of such a study.

As jurisdictions implement the various elements of the Drugs and Driving Framework, it would be useful if an evaluation framework were established so that the effectiveness of the measures can be assessed. The results of these evaluations will not only assist a jurisdiction to optimize their efforts to deter drug impaired driving, they will also assist other jurisdictions in identifying best practices that they may want to adopt.

3.2.7 Linkages

The Government of Canada's National Anti-Drug Strategy (NADS), launched in 2007, focuses on illicit drug use issues including drug impaired driving which is of interest to 12 federal department strategy partners. The CCMTA's Drugs and Driving Framework should be consistent with this national drug strategy.

The Canadian Centre on Substance Abuse (CCSA) is very involved in the issue of drug impaired driving and sponsored an international symposium on the topic in July 2011. A recent discussion with CCSA revealed their interest in consulting with CCMTA and with other stakeholder groups about the DDF and its implementation.

3.3 Stakeholder Responsibilities

Transport Canada is responsible for the administration of the Motor Vehicle Safety Act which primarily addresses the safety of motor vehicles sold in Canada through regulating motor vehicle safety standards and enforcing compliance with them. It is also responsible for the administration of Motor Vehicle Transport Act which regulates the motor carrier industry. In addition, Transport Canada conducts research on vehicles, road infrastructure and road users, develops, maintains, and analyzes collision data, develops road safety policy and programs, and provides road safety information to the public.

Justice Canada is responsible for amendments to the CCC which includes sections dealing with impaired driving by alcohol or other drugs and is the lead on the NADS. Public Safety is responsible for policing policy in Canada and for the Royal Canadian Mounted Police which provides contract policing services in many of the provinces/territories.

Health Canada is responsible among other things for the regulation of the safety of drugs sold in Canada. The Public Health Agency of Canada is responsible for the promotion of healthy lifestyles including a reduction in the use of alcohol and other drugs.

Ministries of transportation or highways are the lead agencies for road safety in most jurisdictions (AB, ON, NS, PEI, NT, YK, NU). In others, it is public auto insurers (Saskatchewan Government Insurance, Manitoba Public Insurance, Societé d'assurance automobile du Québec) in collaboration with other agencies such as the ministry of transportation/highways. In other jurisdictions, it is the public safety department (NB) or departments which provide a number of services to the public (NL) that are responsible. In BC, the Office of the Superintendent of Motor Vehicles is the lead agency in partnership with the Insurance Corporation of British Columbia and the ministry of highways. These jurisdictional agencies license drivers and vehicles, build and maintain the road infrastructure, regulate motor carriers, conduct road safety research, develop collision databases, develop safety related policies and programs, and provide safety information to the public.

3.4 Partners

The following partners could be engaged in the development and implementation of the Drugs and Driving Framework:

- CCMTA (Board, Road Safety Research and Policies, Driver and Vehicles, Expert Working Group on Drugs and Driving);
- Federal/provincial/territorial governments (i.e., transportation, justice, health, public safety, education);
- Public automobile insurers (i.e., ICBC, SGI, MPI, SAAQ);
- Private automobile insurers (e.g.., Insurance Bureau of Canada);
- Enforcement community (e.g., CACP, RCMP, OPP, Sûreté du Québec, Toronto Police Services, etc.);
- Crown attorneys ;
- Healthcare professionals (e.g., Canadian Medical Association, Canadian Pharmacists Association, Canadian Nurses Association);
- Mothers Against Drunk Driving, Arrive Alive, Canada Safety Council, Canadian Automobile Association, and other not-for-profit groups;
- Senior citizen groups (Canadian Association of Retired Persons, Federal Superannuates National Association);
- Driver education groups;
- Transportation Association of Canada and other infrastructure groups;
- Canadian Vehicle Manufacturers (CVMA), Association and Association of International Automotive Manufacturers of Canada (AIAMC), and vehicle manufacturers in Canada (e.g., GM, Ford)
- School boards, universities, community colleges.
- Research organizations such as Traffic Injury Research Foundation, Canadian Institutes for Health Research, Centre for Addictions and Mental Health, Canadian Centre on Substance Abuse, Canadian Association of Road Safety Professionals and a number of universities (e.g., Dalhousie, Montreal, Ottawa, New Brunswick, York, Western Ontario, etc.).
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Given the desirability of taking a safe system (i.e., holistic) approach to drugs and driving and the considerable interest among various stakeholders in becoming partners in the implementation of the DDF, consultation with these groups before the DDF is finalized would be advantageous.

3.5 Monitoring

Assuming that the rate of testing fatalities for drugs can be improved, the percentage of fatally injured drivers with drugs detected could serve as the primary index for assessing change in the prevalence of drug impaired driving. In addition, there could be periodic roadside surveys of alcohol, drugs and driving (e.g., one during 2012 and one at the end of RSS 2015) to assess changes in the prevalence of driving after drug use. Periodic social surveys (e.g., one during 2012 and one at the end of RSS 2015) could also be carried out to determine how knowledge, perceptions, attitudes, and experience regarding drugs and driving are changing over time. A network of trauma centres could also be established across the country, perhaps one centre in each region, to monitor the prevalence of alcohol and other drugs in the blood of drivers injured in collisions.

Given that new psychodynamic drugs, Illicit and pharmaceutical, are emerging all the time, there should be a system established to monitor these new drugs and whether they impair driving.

3.6 Consultation

In the preparation of this DDF, there has been a considerable amount of consultation with stakeholders. An early draft was shared with the CCMTA's Expert Working Group on Drugs and Driving for comment and then a revised draft was reviewed by members of the Road Safety Research and Policies Committee of CCMTA. Next, the revised draft was distributed to a broad group of stakeholders including those from transportation, justice, police, health, insurance, and research organizations. Finally, about 40 stakeholders representing these organizations participated in one day and a half workshop on February 22-23, 2012 in Ottawa in order to get their views on the DDF and the priority activities that ought to be pursued during the next 3-4 years. The following priorities were identified by the participants in the workshop:

1. Enforcement and Adjudication
   Enhance funding for DRE and SFST training and research, including assessment of the validity of divided attention test of the SFST.

2. Policy and Legislation
   Develop an evidence-based model of administrative legislation on drugs and driving.

3. Research
   Increase the testing of fatally and seriously injured drivers with a goal of 100% testing using standard protocols.

4. Evaluation
   Evaluate the effectiveness of interventions to reduce drug impaired driving (both current and future).

5. Technology
   Support the development and implementation of point-of-contact immunoassay test devices.

6. Education, Awareness and Health Promotion
   Based on social research, develop awareness and education programs for the general public and for specific groups (e.g., students, police, doctors, pharmacists, high risk groups).

The DDF was finalized taking into consideration the comments received during the consultation process.

4.0 Conclusions

Drugs and driving is a much more complex issue than alcohol impaired driving because there are so many different kinds of psychoactive drugs, drugs are harder to detect in the body, there is a lack of standardized testing for drugs, and different drugs have different effects on driving performance. Furthermore, the absorption, action, and elimination of these psychoactive drugs are difficult to predict given individual differences among users.

Based on a review of the available data, it is evident that drug impaired driving is a serious road safety problem in Canada. Indeed, it would appear to rival alcohol impaired driving in terms of its prevalence in roadside surveys and in fatal and injury collisions. Furthermore, the prevalence of drugs in fatally injured drivers has increased by 24% between 2000 and 2008. The drugs that have been found most frequently in the research are cannabis, cocaine, amphetamines, and depressants such as benzodiazepines. However, a major shortcoming of this research is the lack of evidence that the presence of a drug in a driver's body means that the driver's performance was actually impaired by the drug at the time of the collision or apprehension by the police. The causal relationship between drug use and collision involvement has not been clearly established. Also, some of the drivers found to be using drugs were also using alcohol. Therefore, as noted by the Organization for Economic Cooperation and Development in its 2010 report "Drugs and Driving", "Alcohol continues to be the single most prominent factor in serious road crashes. The issue of drug-driving should not detract from the ongoing battle to reduce or eliminate alcohol-related crashes" (Beirness, et al., 2010, p.75).

Canada, like many developed countries has legislation, both criminal and administrative, to deal with drug impaired drivers, although the effectiveness of such legislation is not known. There are also special enforcement techniques that are being used to detect drug impaired drivers such as the Standardized Field Sobriety Test and the Drug Evaluation and Classification program which uses specially trained Drug Recognition Evaluators to assess suspected drivers. The effectiveness of such enforcement measures in deterring drug impaired driving is not known at this point. Relatively few educational campaigns have been conducted in Canada to raise the public's awareness of the problem of drugs and driving and the current legislation addressing the issue, so it is possible that most Canadians know little about this issue. Some drug impaired drivers are found to have an addiction problem which needs to be treated in order to prevent further drug impaired driving but it is not known if such programs are effective in reducing recidivism.

Further research on the magnitude and the nature of the drugs and driving problem in Canada is needed, especially if there is a desire to establish per se laws with legal limits. A protocol for assessing the potential of drugs to impair driving recently developed in the United States could be useful in guiding further research on drugs and driving in Canada.

There are many governmental and non-governmental groups that are working on the issue of drugs and driving in Canada. This presents an opportunity to facilitate a cooperative and collaborative approach to addressing the issue of drugs and driving in the future.

5.0 Future Activities to Address Drug Impaired Driving

The following activities are offered as primary areas of focus that jurisdictions and other organizations may want to consider in order to reduce drug impaired driving in Canada. Given that there are numerous activities, they are presented as short-term and longer-term initiatives. Short-term initiatives are considered as priority activities that could be performed during the RSS 2015 (i.e., 2012-2015).

5.1 Legislation and Policy

Short-term

- Evaluate administrative laws addressing drug impaired driving to determine their effectiveness in reducing such activity;
- Develop a model or models of administrative legislation for drugs and driving that could be adopted by jurisdictions;
- Require new drivers who are in Graduated Driver Licensing programs to have no psychoactive drugs in their body while driving;
- Include information about the effects of drugs on driving and the legislation on drug impaired driving in the driver's handbook and test new drivers for their knowledge of drug impaired driving as part of licensing process, if it is not already being done.

Longer-term

- Establish per se legal limits for certain drugs (e.g., cannabis) within the Criminal Code of Canada (CCC), provided research leads to appropriate cut off limits;
- Amend the CCC to permit the use of point-of-contact immunoassay tests of oral fluid samples by the police as a roadside screening device for some drugs, provided research leads to appropriate cut off limits and levels of accuracy.

5.2 Enforcement and Adjudication

Short-term

- Conduct greater police enforcement through periodic Reduce Impaired Driving Everywhere (RIDE) type programs where police roadblocks are set up to detect both alcohol and drug impaired drivers;
- Provide for more training of front-line police officers in the administration of the Standardized Field Sobriety Test (SFST) to detect drug impaired drivers;
- Assess the validity of the SFST for detecting drug impaired drivers;
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- Discuss with the CACP how more DREs can be trained, their skills can be maintained and upgraded, and how they can retained longer as DREs;

- Provide more DREs in rural areas or set up “flying squads” of DREs which could travel from one area to another to support the local police services when they conduct RIDE programs;
- Separate alcohol and drug impaired driving convictions in police and driver records;
- Conduct training workshops for Crown attorneys about drugs and driving and the DEC program;
- Develop and conduct voluntary workshops for judges about drugs and driving and the DEC program;
- Conduct an evaluation of the DEC program in order to determine its impact on drug impaired driving.

Longer-term

- Develop training programs such as the Advanced Roadside Impaired Driving Enforcement (ARIDE) and the Drugs That Impair Driving programs based on those that are used in the U.S. to assist front-line police officers in identifying drug impaired drivers and raise their awareness about the magnitude of the problem of drug impaired driving in Canada;

5.3 Public Awareness and Education

Short-term

- Develop and implement a national drugs and driving awareness campaign based on social research, which targets the general population and specific groups (e.g., students, police, doctors, pharmacists, high risk groups) using mass media (e.g., newspapers, radio, electronic billboards, bus shelter ads) and social media (e.g., Facebook, Twitter, websites);
- Develop and implement more focused awareness and education campaigns based on social research which target young drivers who may be more likely to drive while impaired by illicit drugs such as cannabis and older drivers who may be more likely to be impaired by medications such as benzodiazepines.

5.4 Health Promotion

Short-term

- Work with drug addiction agencies (e.g. Canadian Centre on Substance Abuse, etc.) to develop a best practice for the assessment and treatment of drivers convicted of drug impaired driving;
- Meet with healthcare professional groups (e.g., physicians, nurses, pharmacists) to discuss how their members can become more engaged in raising awareness about the effects of drugs on driving;

- Encourage physicians to use the Screening, Brief Intervention, and Referral to Treatment (SBIRT) measure to detect alcohol and drug abuse problems in their patients.

Longer-term

- Discuss with Health Canada the feasibility of developing a labeling program for prescription and over-the-counter drug packaging to increase drivers' awareness of the risks of driving under the influence of specified drugs;
- Discuss with Health Canada the need for regulations that require advertisements for medications to mention potential negative effects of the drug on driving;
- Discuss with pharmacists the possibility of establishing computer systems that identify drugs and/or interactions of drugs which can impair driving.

5.5 Technology

Short-term

- Support the development of more accurate point-of-contact immunoassay tests of oral fluid for the detection of specific drugs (e.g., cannabis, methamphetamine, cocaine) that could be used at the roadside by police officers;
- Create a scientific committee made up of toxicologists from the three major forensic toxicology laboratories in Canada to establish guidelines for the testing of bodily fluids of drug impaired driving suspects.

5.6 Research

Short-term

- Researchers could consider adopting the protocol for assessing the potential of drugs to impair driving recently developed in the United States as a guide to further research on drugs and driving in Canada;
- Encourage increased testing of fatally injured drivers by coroners/medical examiners so that at least 70% of the drivers are tested for the presence of drugs in each jurisdiction or a random sample of driver fatalities of sufficient size for analysis is tested in each jurisdiction;
- Encourage testing seriously injured drivers admitted to hospital for presence and level of alcohol and other drugs;
- Conduct responsibility studies in each region to determine whether drivers who have drugs in their body prior to an injury or fatal collision are more likely to be considered by investigating police officers to have been responsible for the collision;
- Conduct roadside surveys of alcohol and drug use by drivers in each region of Canada including night-time and daytime testing;
- Conduct a public opinion survey to determine Canadians' knowledge, perceptions, attitudes, and experiences with respect to drugs and driving;
- Conduct focus groups with younger and older drivers regarding drugs and driving;

- Support experimental research using driving simulators and closed driving courses to test drivers under the influence of commonly used drugs (e.g., cannabis, cocaine, amphetamines, benzodiazepines) at dosage levels higher than those that have been used in previous research;
- Conduct research to validate the divided attention tests that are a part of the Standardized Field Sobriety Test;
- Conduct evaluations of effectiveness of interventions to reduce drug impaired driving.

Longer-term

- Conduct case-control studies in each region of Canada to determine whether drivers involved in fatal or injury collisions (cases) are more likely to have drugs and/or alcohol present in their body compared to control drivers tested later at the collision sites so that the risk of a collision at different doses of a drug can be established.

5.7 Benchmarking

Short-term

- Establish the percentage of fatally injured drivers testing positive for drugs other than alcohol in their blood as the primary measure of changes in drugs and driving;
- Use roadside surveys conducted during 2012 and at the end of RSS 2015 (i.e., 2016) to determine whether the prevalence of drugs and driving has changed;
- Use social surveys conducted during 2012 and at the end of RSS 2015 (i.e., 2016) to determine whether the public's knowledge, perceptions, attitudes, and experiences regarding drugs and driving have changed.

Longer-term

- Establish the percentage of seriously injured drivers testing positive for drugs based on blood testing conducted by a network of trauma centres as a supplementary index of change.

5.8 Consultation

Short-term

- Given that a safe systems (i.e., holistic) approach is preferred to address the issue of drugs and driving, it is important to consult with stakeholders (i.e., jurisdictions, police services, healthcare community, non-governmental organizations) on the Drugs and Driving Framework in order to garner their support for the optional activities above and to solicit their participation in implementing them.

5.9 Recommended Priority Actions

Based on the environmental scan of the current situation in Canada and other countries regarding drug impaired driving and on the results of the consultation conducted with stakeholders, it is proposed that the following actions be considered as priorities over the next 3-4 years:

Policy and Legislation

- Develop an evidence-based model or models for an administrative law addressing drug impaired driving;

Enforcement and Adjudication

- Provide greater resources to train front-line officers on the administration of the SFST and to train DREs;
- Fund DRE research, including assessment of validity of divided attention test of SFST.

Education and Awareness

- Develop awareness and education programs for the general public and for specific groups (e.g., students, police, doctors, pharmacists, high risk groups) based on social research (e.g., public opinion survey, focus groups).

Research and Development

- Improve the quality and timeliness of data collected regarding alcohol and drug use by fatally injured drivers;
- Test seriously injured drivers admitted to hospital for presence and level of alcohol and other drugs;
- Conduct responsibility studies to determine whether drivers who have drugs in their body prior to an injury or fatal collision are more likely to be considered by investigating police officers to have been responsible for the collision;
- Develop and implement point-of-contact immunoassay test devices;
- Evaluate the effectiveness of interventions to reduce drug impaired driving both current and future;
- Conduct periodic roadside surveys of alcohol and other drug use by drivers.

It should be recognized that CCMTA will not be in a position to lead or participate in all of these actions given its mandate. However, during the next year, CCMTA will pursue the following actions:

- Develop a model(s) for administrative laws,
- Conduct a public opinion survey on drugs and driving,
- Discuss police training with Canadian Association of Chiefs of Police,

- Discuss development of an immunoassay test with the Drugs and Driving Committee of Canadian Society of Forensic Science,
- Support a pilot daytime roadside survey in B.C.,
- Develop a strategic action plan for DDF.

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7.0 Appendix A: Magnitude of the Drugs and Driving Problem in Other Countries

Some of the research that has been conducted in other countries on the magnitude of the drugs and driving problem is reviewed in this appendix.

United States

Fatality and Injury Data: Using data from the Fatality Analysis Reporting System (FARS), the U.S. National Highway Traffic Safety Administration (NHTSA) has determined that the percentage of fatally injured drivers who were positive for drugs other than alcohol has increased from 28% in 2005 to 33% in 2009 (NHTSA, 2010). However, most drivers were not tested for drugs so the validity of these results is questionable. Nevertheless, they are similar to prevalence of drugs in fatally injured drivers in Canada.

Romano and Voas (2011) examined data for fatally injured drivers involved in single-vehicle crashes killed in states in which more than 79% of the drivers were tested for drugs other than alcohol and had a known result. About 25% of the drivers tested positive for drugs with cannabinoids and stimulants each contributing 6% to the drug-positive results. Stimulants more than cannabinoids were found to be associated with the four types of crashes under study (i.e., speeding, failure to obey/yield, inattention, and seat belt nonuse). Some drugs showed a protective effect over the four crash types under study. Significant interactions between drugs and alcohol were observed.

A study conducted in Washington State (Logan and Schwilke, 2004) reported that for fatally injured drivers whose blood and serum samples were tested, 46% were positive for alcohol and 39% were positive for CNS active drugs, the most common being depressants (14%), cannabis (13%), and stimulants (10%). Walsh et al. (2005) tested injured drivers at a trauma centre in Baltimore and found that about half of the drivers tested positive for drugs other than alcohol with half of these drivers testing positive for cannabis (i.e., 25% overall).

Crouch et al. (1993) tested the blood, vitreous humour in the eye, or urine of truck drivers fatally injured in eight states in the late 1980s and reported that about 13% were positive for cannabis, 11% were positive for amphetamine or methamphetamine, and 8% were positive for cocaine.

U.S. Roadside Survey of Alcohol and Drug Use by Drivers: A major roadside survey of drivers using alcohol or other drugs was conducted by NHTSA during 2007 (Lacey, et al., 2009). Drivers were stopped randomLy at 300 representative sites across the U.S. and asked to voluntarily participate in the survey. While 86% of the drivers provided breath samples, 71% gave oral fluid samples, and 39% of night-time drivers provided blood samples. The survey data were collected on Friday and Saturday nights from 10:00pm to midnight and Saturday and Sunday nights between 1:00am and 3:00am. In addition, data were collected during the daytime on Friday from 9:30 to 11:30pm and 1:30 and 3:30pm. The results indicated that 2.2% of drivers

had BACs at or higher than the 80 mg/100mL legal limit which represented about an 80% decline since the first survey was conducted in 1973. The oral fluid tests indicated that 14.4% of drivers were drug positive at night compared to 11% during the daytime. When both oral fluid and blood tests were used for night-time drivers, 16.3% were positive for drugs with the most common being marijuana (8.6%), cocaine (3.9%), and methamphetamine (1.3%).

Risk of Collision While Under the Influence of Drugs: Soderstrom et al. (2005) tested drivers admitted to a Maryland hospital for injuries sustained in a collision between 1997 and 2001 using samples of blood for alcohol and urine for other drugs. The odds-ratio was significantly higher for alcohol (7.5 times higher risk) and cocaine (2.3) but not THC (1.2).

Lowenstein et al. (2001) conducted a responsibility analysis for drivers injured in Denver in June 1995 and found that while cannabis alone did not increase the risk of being responsible for the collision, combining alcohol with cannabis did (odds-ratio=3.5).

Bedard et al. (2007) performed a modified responsibility analysis on drivers aged 20 to 49 who were involved in a fatal collision and had a zero BAC. Drivers with cannabis present in their body had an odds-ratio of 1.3 even after controlling age, sex and driving record, indicating somewhat greater responsibility.

NHTSA is currently conducting a case-control study which will compare drug use by drivers involved in collisions of all severities in Virginia Beach, VA with drug use by a similar sample of control drivers not involved in collisions. The results of this study, expected to be finished in 2012, will indicate the extent to which drug use increases the risk of a collision at least for this community.

Magnitude of the Drugs and Driving Problem in Other Countries

There have been several large projects conducted by the European Commission including Roadside Testing Assessment (Rosita and Rosita-2) which examined the accuracy of roadside drug testing devices, IMMORTAL (Impaired Motorists, Methods of Roadside Testing and Assessment for Licensing) that studied which drugs impair driving the most, and more recently the DRUID (Driving under the influence of drugs, alcohol, and medicine) which looked at all aspects of impaired driving by alcohol and other drugs in Europe. The DRUID project finishes in the Fall of 2011 but several reports have already been released. DRUID is the most extensive study of the impairing effects of alcohol and other drugs on driving conducted anywhere to date.

The results of several studies that have been conducted in European countries and in Australia are reviewed.

United Kingdom: Turnbridge, et al. (2002) tested fatally injured drivers in England and Wales in 1997 and found that 17.7% of them had taken a single drug other than alcohol and 6.3% had taken more than one drug. Drivers tested positive for cannabis in 8.2% of the cases.

A roadside survey of driver drug use was conducted in Glasgow Scotland in 2003-2004 as part of the IMMORTAL project (Buttress, et al., 2005). Of those drivers providing oral fluid samples, 4.1% were positive for MDMA, 3.1% for cannabis and 1.3% for codeine.

Ingram et al. (2000) conducted a computer-assisted self inventory among drivers aged 17 to 39 in Scotland and determined that 5% of them reported that they had driven after using drugs in the past year, mostly cannabis (4%).

Barbone et al. (1998) conducted a case-crossover study among a sample of drivers taking benzodiazepines between 1992 and 1995 in Tayside, UK. The odds-ratio for a collision was higher (1.62) for drivers 30 and under who were using benzodiazepines and they were more likely to be at-fault.

France: A very large case-control study was conducted as part of the DRUID project by Laumon, et al. (2006) using drivers involved in collisions between October 2001 and September 2003. It was reported that overall, 7% of drivers tested positive for cannabis based on blood tests but the percentage for those under 25 was higher at 17%. Being positive for cannabis increased the risk of being responsible for a fatal collision by 1.8 times compared to a risk of 8.4 times for those drivers with a BAC of 50 mg/100mL or higher. A multiplicative effect was found for alcohol and cannabis together increasing the risk to 15.9 times higher. The odd-ratios for amphetamine, cocaine and opiates were not different from 1.0. An older study by Marquet et al. (1998) found that 14% of drivers being treated at a hospital emergency ward as a result of an injury sustained in a collision tested positive for cannabis using urine samples compared to 8% of patients at the ER for other reasons.

Scandinavia: A roadside survey conducted in Norway as part of the IMMORTAL project from May 2003 to June 2004 using oral fluid samples determined that the presence of drugs and alcohol was less than 1% (Assum, et al., 2005). A very large survey was performed in southeast Norway between April 2005 and April 2006 with oral fluid samples being taken from drivers (Gjerde, et al., 2008). Only 4.5% tested positive for alcohol or any other drug, with benzodiazepines being the most common drug detected (1.4%)

In a study by Ahlm, et al. (2009) in northern Sweden, fatally injured drivers and injured drivers receiving hospital treatment were tested between December 2004 and November 2006 using blood or urine for fatalities and blood for injured drivers. Illegal drugs were detected in 9% of fatalities and 4% of those injured while prescription drugs were found in 7% of fatalities and 13% of the injured drivers. Alcohol was much more commonly found for fatalities and injured drivers (38% and 21% respectively). Sjogren, et al. (1997) took blood samples from dead and injured Swedish drivers in the early 1990s, and reported that 7% of the former and 10% of the latter were positive for drugs, mostly opiates, benzodiazepines, cannabis and amphetamines. Alcohol alone was more frequent for fatalities (21%) and the injured drivers (13%).

A Danish study revealed that 7% of injured drivers who were tested using blood and/or oral fluid samples were positive for drug use, mostly cannabis and benzodiazepines (Bernhoft, et al. 2004).

Netherlands: Smink et al. (2005) performed blood tests on drivers involved in collisions in the late 1990s and reported that 64.5% were positive for alcohol, and 41% were positive for drugs, mainly cannabis (16.9%) and benzodiazepines (10.3%). As part of the IMMORTAL project, a roadside survey was conducted by Mathijssen and Houwing (2005) in the Tilburg region of the Netherlands from January 2002 to March 2004. Oral fluids were provided by drivers and they were screened by police for impairment. Opiates including codeine were found in 6.6% of the drivers, cannabis in 4.5%, and benzodiazepines in 2.1% while alcohol alone was only detected among 2.3% of the drivers. Mathijssen and Houwing also compared injured drivers with a group of control drivers to conduct a case-control study based on blood and urine samples. While the odds-ratios were higher for benzodiazepines and morphine, they were not higher for cannabis and codeine. Drugs combined with alcohol resulted in higher risks of a collision as did other drug combinations.

Australia: Longo, et al. (2000) reported that among South Australian injured drivers during the mid-1990s, 10.8% had been using cannabis and 2.7% had benzodiazepines in their body. Swann (2000) performed a responsibility analysis for fatally injured drivers using blood samples and noted that the odds ratios were elevated for alcohol (7.5) and for cannabis (6.4) but less so for other drugs (3.4). Drummer et al. (2004) looked at the blood samples from drivers fatally injured in the 1990s and found that 27% were positive for drugs compared to 29% positive for alcohol. Cannabis was the most common drug detected (14%) after alcohol. They performed a responsibility analysis and discovered that cannabis, particularly higher levels over 5ng/mL increased the risk that the driver would be considered at-fault for the collision. Cannabis plus alcohol over 50 mg/100mL further raised the risk of culpability for the collision. A study conducted in a Melbourne trauma hospital tested drivers injured in collisions between December 2000 and April 2002 and found that 47% were positive for cannabis, 16% for benzodiazepines, and 11% for opiates (Ch'ng et al., 2007). Ogden, et al. (2010) tested the blood of 1,066 seriously injured drivers admitted to a hospital in Victoria and determined that 11% had used cannabis, 9.4% had used benzodiazepines, and 17.6% had used amphetamines. A study of drivers and riders admitted to hospital as a result of a vehicle collision identified that 23% had BACs greater than 50mg/100mL and 7% had drug dependency problems, mostly with marijuana, methamphetamine, and MDMA (Lindsay and Ryan, 20110).

Davey and Freeman (2009) carried out a night-time roadside survey downstream from a random breath testing site in Brisbane, Australia. They reported that 4.6% of drivers who provided oral fluid samples tested positive for drugs mainly MDMA (2.2%), cannabis (1.3%), and amphetamines (1.1%).

A large (N=6,800) internet social survey regarding drugs and driving was conducted by the Australian Drug Foundation (Mallick et al., 2007). While 13% of the respondents admitted to driving with a BAC over the 50 mg/100mL limit, 12% said that they had driven within three hours of cannabis use during the last 12 months, and 7% said that they had used methamphetamine and then driven. Users of drugs were much less likely to perceive driving under the influence of drugs as very risky compared to non-users of drugs. The majority of the respondents said that they knew little or nothing about the effects of drugs on driving unlike alcohol which the majority

said they knew a lot about.

8.0 Appendix B: Jurisdictional Survey on Drugs and Driving - May 2012

JURISDICTIONAL DRUG SURVEY												
Issues	**BC**	**AB**	**SK**	**MB**	**ON**	**QC**	**NB**	**NS**	**PE**	**NL**	**NT**	**YK**
Most jurisdictions have short-term (i.e., 24 or 72 hrs or a week) suspensions for drivers with BACs below the legal threshold but above an administrative limit, such as 50mg%. Is there a comparable suspension in your jurisdiction for drivers who have used drugs?	yes	yes	yes	yes			no		no	yes	yes	yes
Most jurisdictions have administrative suspensions (e.g.: 90 days) for refusing a breath test or having a BAC >80 mg%. Is there a similar suspension for drivers in your jurisdiction who are deemed impaired by drugs after performing the Standardized Field Sobriety Test(SFST)/ Drug Recognition Expert (DRE) exam, or similarly refuse or fail to complete the DRE exam?	no	yes	yes	yes		yes	no			yes		yes
Most jurisdictions have some form of educational or remedial program requirement for drivers convicted of (alcohol) impaired driving. Is there a special program available in your jurisdiction for those whose impaired driving conviction was the result of drug use?	yes	yes		yes	yes	yes	no		yes	yes		
Can you track the number of collisions involving drug impaired driving, independent of alcohol impaired driving in your jurisdiction?	yes	Impaired by drugs is option on collision form.But if impaired by both, alcohol takes precendent.		yes	yes	no	no		yes	yes	yes	yes
Can you track the number of convictions involving drug impaired driving, independent of alcohol impaired driving in your jurisdiction?	yes	No - cc sections are not unique to ID only drugs.	yes	yes	yes	no	no	yes	yes			
Are there any public education/awareness efforts underway or planned to address drug-impaired driving in your jurisdiction?	planned		planned			planned	no		planned			planned
Does your jurisdiction track the number of: SFST trained officers? If so, what is the number?	yes	yes	yes	yes	yes 100*	yes 2100	yes	yes	yes	no		yes
Does your jurisdiction track the number of: DRE trained officers? If so, what is the number	yes	yes	yes 30	yes	yes 225	yes 29	yes	yes	yes	no	yes	yes
Does your jurisdiction track the number of: certified breath technicians? If so, what is the number?	yes	yes	yes	yes	yes 865	yes 2200	yes	yes	yes	no	yes	yes
Note for Quebec: The number of DRE trained officers may seems low but it is important to take into account the fact that it took a long												
* OPP certified SFST officers as of Apr/12 (not including municipal police services)												
NL these are police coordinated												