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Measuring the Impact of Drug-Impaired Driving: Recommendations for National Indicators

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Abbreviations

Acronym	Definition
ADSE	approved drug screening equipment
CCMTA	Canadian Council of Motor Transport Administrators
CNS	central nervous system
DID	drug-impaired driving
DRE	Drug Recognition Expert
ME	medical examiner
RCMP	Royal Canadian Mounted Police
SFST	standardized field sobriety test
THC	tetrahydrocannabinol

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The first phase of the project included consulting more than 100 experts, whom we thank. They provided context, insights and ideas about what data were being collected in their work, what data were missing, what data they would like to see and suggestions on how to overcome some of the challenges to collecting desired data.

Three experts reviewed the report, providing their valuable time, feedback and new considerations for addressing DID that have yet to be explored. CCSA thanks:

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- Eric Dumschat, Legal Director, Mothers Against Drunk Driving (MADD) Canada.

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Conflict of Interest

The authors have no conflict of interests to declare.

Executive Summary

Key Messages

- Little is known about drug-impaired driving (DID), aside from alcohol-impaired driving, despite being an increasing risk to Canadians.
- Most data on DID comes from criminal acts and deaths. If we want to better understand and reduce DID, data are needed from other sources, like hospitalized drivers, roadside surveys, courts and public surveys.
- The DID Indicators Advisory Committee recommends 34 indicators across nine areas to better measure, understand and address the issue.
- Many professionals working in DID recommend greater collaboration and anonymized data sharing across federal, provincial, territorial and municipal government and nongovernment organizations.
- Agencies involved in DID across Canada can help reduce drug-impaired driving by collecting and sharing more DID data.

Not enough is known about driving while impaired by drugs other than alcohol[1] and its effects on people living in Canada. What Canada does know about drug-impaired driving (DID) is concerning. Coroner and medical examiner (ME) reports reveal that nearly half of drivers who died in 2016 (most recent available data) tested positive for impairing drugs and police responses to DID incidents increased by 45% between 2018 and 2019 (Brown et al., 2015, 2021; Statistics Canada, 2021b).

While helpful in understanding some of the DID issues, data from coroners, MEs and police do not provide enough information for policy makers, decision makers, and road and public safety practitioners to better understand and address the extent and impact of DID. Canada is missing a large amount of untapped data and underuses existing sources of data.

Data from sources beyond deaths and criminal acts can increase Canada's understanding of DID and help reduce the issue. For example, emerging data from roadside surveys, which randomly test drivers for the presence of drugs in their bodies, suggest that the risk of DID may be increasing among older drivers (Beirness, 2018; Beirness & Beasley, 2017). Although roadside surveys are one of the best measures of the prevalence of impaired driving, only a few have been conducted in Canada, and only in some jurisdictions. Likewise, Canada collects little to no data on injured drivers hospitalized from potential DID incidents, passengers and other road users involved in DID incidents and DID court cases. Furthermore, among the data Canada does collect, some are not collected in a standardized or systematic manner. Without more data from other sources and without improvements to data collection from existing sources, Canada is limited in its ability to effectively reduce DID.

In response to these gaps and limitations in understanding the effect of DID, the Canadian Centre on Substance Use and Addiction (CCSA) started a multiyear project to develop a set of indicators to support policy makers, decision makers, and road and public safety practitioners addressing DID. CCSA collected information from DID experts across Canada. It then formed an expert DID Indicators Advisory Committee to review the evidence, provide practical expertise and develop recommendations for measuring the effect of DID. The Advisory Committee recommended 34 indicators across nine areas (see Table 1).

1 Although alcohol is considered a drug in the impaired-driving field, alcohol is often treated separately from other psychoactive substances (e.g., cannabis, cocaine, opioids). For this report, the term "drugs" refers to psychoactive substances not including alcohol.)

Table 1: Summary of recommended indicators across nine areas to measure the impact of drug-impaired driving in Canada

Icon	Data source	Indicator
	Law enforcement: Incident data	Driver demographics Tetrahydrocannabinol (THC) blood concentration levels among tested drivers Substance category[a] and polycategory use among drivers Drivers who have received administrative sanctions Drivers recommended for criminal charge or charges[b] Approved drug screening equipment (ADSE) use and results Standardized field sobriety test (SFST)[c] results
	Law enforcement: Resource use data	Trained frontline[d] officers Certified Drug Recognition Expert (DRE) officers Requests for DREs Demands for blood (testing)
	Judicial: Court data	Disposition type (court decision) among drivers Sentencing (type and quantum[e]) data on drivers Driver demographics
	Coroner and medical examiner: Fatality data	Driver demographics Substance category[a] and polycategory use among drivers
	Hospital: Injury data	Injury data among drivers Substance category[a] and polycategory use among drivers THC use (preferably blood test) among drivers Driver demographics
	Roadside surveys: Passenger and light-duty vehicle operator data	THC use (oral fluid) among drivers Date, day of the week and time when driver was stopped Driver demographics[f] Substance category[a] and polysubstance use among drivers
	Roadside surveys: Commercial vehicle operator data	THC use (oral fluid) among drivers Date, day of the week and time when driver was stopped Substance category[a] and polysubstance use among drivers Driver demographics[f]
	Motor vehicle division: Driver record data	Driver demographics Administrative sanctions[g] issued to drivers DID criminal convictions reported for drivers Recidivism:[h] DID administrative sanctions among drivers Recidivism: DID criminal convictions among drivers
	National surveys: Public data	Driver knowledge, attitudes, perceptions and self-reported behaviour

Note. This table does not include the detailed breakdown and explanation of the individual indicators. These are found in the report.

[a]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[b]Charges by law enforcement agencies only (i.e., does not include court charge data).

[c]SFSTs are a series of behavioural tests (i.e., one-leg stand, walk-and-turn and horizontal gaze nystagmus) to detect impairment, but do not identify substance type. Although the tool was originally developed to detect impairment by alcohol, studies support its use as a screening tool for impairment by drugs in some of the other substance categories (e.g., CNS stimulants, CNS depressants, cannabis or narcotic analgesics) (Papafotiou, Carter, & Stough, 2005; Porath-Waller & Beirness, 2014).

[d]Frontline officers include uniformed police officers performing general duties, patrol or both, and whose duties include stopping motor vehicles for enforcement purposes, as well as uniformed officers assigned to full-time traffic services duties.

[e]Quantum refers to the court's punishment, which can be a fine, the length of a sentence or both.

[f]Standardized data collection methods and criteria used across Canada.

[g]Sanctions are specific to provincial or territorial jurisdictions and often include licence suspensions, fines and vehicle impoundment. Law enforcement can apply these sanctions in different combinations with or without laying criminal charges.

[h]Recidivism rates are the extent to which an individual repeats the same crime.

The 34 indicators are not comprehensive, but they offer a solid foundation to start from. Many others could and should be considered (e.g., more data on various road users affected by DID, such as passengers, cyclists and pedestrians).

Although each of the new or revised measures is essential to implement, the Advisory Committee recognizes that not everything will be possible at once. A suggested starting point would be to focus on hospitalization data, commercial roadside survey data and a national survey dedicated to DID. Broadening the scope of data collection and improving the methods used to collect them will provide substantially more insight into the DID problem in Canada.

Introduction

Not enough is known about driving while impaired by drugs other than alcohol[2] and its effects on people living in Canada. However, what we do know about drug-impaired driving (DID) is concerning. Coroner and medical examiner (ME) reports reveal that nearly half of drivers who died in 2016 (most recent available data) tested positive for impairing drugs, an increase of 15% from 2011 (Brown et al., 2015, 2021). Police have also reported a substantial increase in responding to DID incidents, such as operating a vehicle while impaired by drugs other than alcohol or failure or refusal to comply with requests (e.g., for blood samples, to perform behavioural tests, to cooperate). Most DID incidents involve drivers found to be operating a vehicle while impaired by drugs. Between 2018 and 2019, incidents went up by 45%, from 4,442 to 6,453, respectively, and more than quadrupled from 1,455 incidents 10 years earlier (Statistics Canada, 2021b).

> In 2016, nearly half of all drivers who died tested positive for impairing drugs, not including alcohol.

> From 2018 to 2019, drug-impaired driving incidents reported by police increased by 45%.

While very helpful, these data from coroners, MEs and police do not provide enough information for policy makers, decision makers, and road and public safety practitioners to better understand and address the extent and effect of DID. Canada is missing a large amount of untapped data and underusing other sources of data.

Data from sources beyond deaths and criminal acts can increase Canada's understanding of DID and help reduce the issue. For example, emerging data from roadside surveys, which randomly test drivers for the presence of drugs in their bodies, reveal that the characteristics of people who typically drive after using drugs seems to be changing. Traditionally, impaired-driving initiatives have focused on youth and young adults as a high-risk group. A 2017 roadside survey in Ontario found that the percentage of drivers 55 years old and older testing positive for drugs other than alcohol nearly doubled, from 3.2% in 2014 to 6.2% in 2017 (Beirness & Beasley, 2017). In British Columbia, drivers aged 56 to 65 years testing positive increased from 7.9% in 2012 to 13.3% in 2018, an increase of about 68% (Beirness, 2018). Furthermore, drivers older than 65 years in British Columbia testing positive for cannabis increased 12-fold, from 0.9% in 2012 to 12.1% in 2018. These data suggest that the age of drivers involved in DID incidents may be different than for drivers involved in alcohol-impaired incidents.

Other data show that society's DID costs are also important to understanding its broader impact. For example, Wettlaufer et al. (2017) have estimated that cannabis-related collisions (the most common drug found in drivers who die) caused more than 4,400 injuries and cost people living in Canada $1.1 billion in 2012 alone. The numbers are likely to be much higher when including all drugs and considering the increases in DID since 2012.

The above data are still only small pieces of the overall DID picture. There remain important gaps in Canada's knowledge on the issue. For example, data about other people affected by DID, such as passengers and other road users, are generally left out of the picture. The presence of drugs other than cannabis or the presence of multiple drugs (polysubstance use) is sometimes not investigated nor tracked (see Table 2) in favour of investigating for alcohol impairment. Critical data from sources such as roadside surveys or hospital visits are collected infrequently or not at all. These sources sometimes lack resources, capacity or automation to allow effective data collection. Among data that

[2] Although alcohol is considered a drug in the impaired-driving field, alcohol is often treated separately from other psychoactive substances (e.g., cannabis, cocaine, opioids). For this report, the term "drugs" refers to psychoactive substances not including alcohol.

are collected, some are limited by inconsistent or nonstandardized collection or reporting methods. Furthermore, these data are obtained through death and criminal incidents, which may skew Canada's understanding of DID. Canada also has a limited understanding of driver knowledge and behaviours, such as why some older adults appear to be using more drugs and more cannabis than before. More information is needed to improve Canada's ability to reduce DID.

Several areas could be used to collect raw, or primary, DID data (Meister & De Moor, 2019). (Primary or raw data is original and collected directly from the source [Hox & Boeije, 2005]. For example, a toxicology test or a police report contains raw data from the original source [e.g., bodily fluid, crash incident].) Table 2 compares the extent of potential data collected and reported with those data not collected at all or not collected regularly or systematically.

Table 2: Possible sources of data for measuring drug-impaired driving (DID) and extent collected or reported

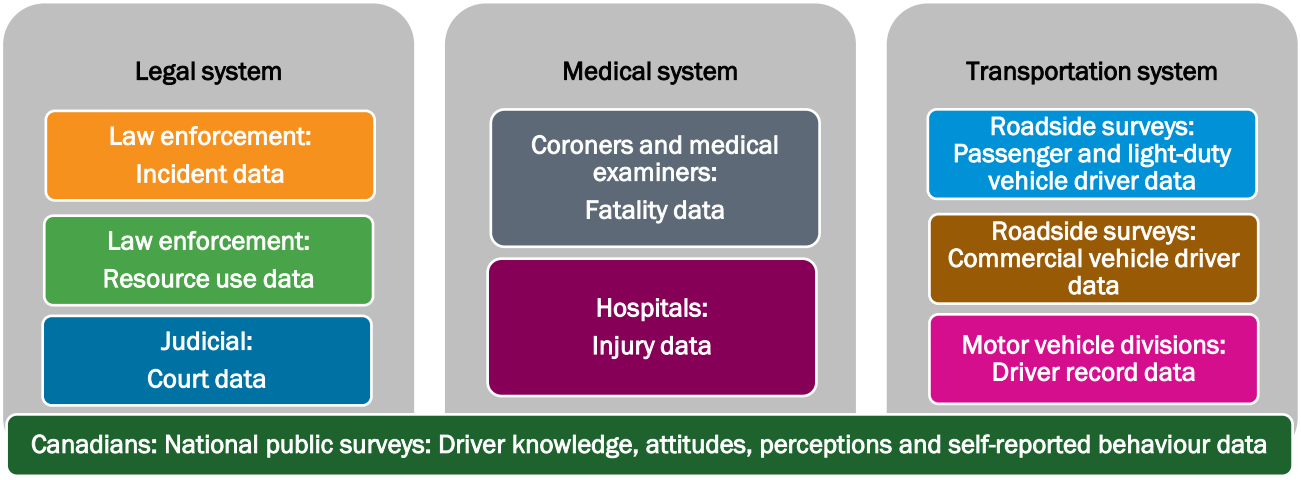
Potential data
Collected and reported mostly regularly and systematically • Law enforcement (e.g., DID incidents, charges, suspensions, reports) • Coroner or medical examiner (e.g., fatalities, toxicology results)
Not collected at all or not collected regularly or systematically • Hospitalized drivers (e.g., injuries, toxicology results) • Roadside surveys (e.g., prevalence, driver demographics) • Noninjured drivers (e.g., drivers of large commercial vehicles) • Nondrivers (e.g., passengers, pedestrians, cyclists) • Recreational vehicles (e.g., nonhighway data, boats, snowmobiles) • Property damage (e.g., damage under reporting thresholds) • Judicial (e.g., court dispositions [court decisions], recidivism [repeat offenders]) • Motor vehicle divisions (e.g., driver demographics, recidivism) • Driver knowledge, perceptions and behaviour (e.g., knowledge of impairment by medications, self-reported driving behaviours)

Overall, the impact of DID is underreported and not well understood in Canada. Without increasingly detailed data on what is occurring, it is difficult to target education, direct resources or develop plans to effectively reduce the issue.

In response to these gaps and limitations in understanding the impact of DID, the Canadian Centre on Substance Use and Addiction (CCSA) created a project to develop a set of indicators to support policy makers, decision makers, and road and public safety practitioners addressing DID. CCSA collected recommendations, challenges and potential solutions from experts across Canada and then formed an expert DID Indicators Advisory Committee to review the evidence, provide practical expertise and develop recommendations for measuring the effects of DID. (See Appendix A for the methods for developing the indicators.)

The Advisory Committee recommended 34 indicators across nine areas (see Figure 1) to measure the DID issue in Canada. Indicators include existing (e.g., number and percentage of fatally injured drivers who tested positive for impairing drugs), adjusted (e.g., number and percentage of drivers who tested positive for multiple substances, not just the most impairing substance) and new indicators (e.g., number and percentage of injured drivers who tested positive for impairing substances). These indicators form a foundation to better understand the extent of DID, assess the impact and effectiveness of efforts to reduce DID, and improve knowledge.

Figure 1: The nine areas across which the 34 indicators are recommended



In this report, we discuss the indicators for each area across three topics: the objectives and needs, data sources and limitations, and implementation challenges and suggestions. The complete, detailed list of indicators and data descriptions is in Appendix B. A summary of the indicators only is in Appendix C. We developed the recommended indicators to be standardized, systematized and shareable across agencies and jurisdictions, so policy makers, decision makers, and road and public safety practitioners can implement and build on them.

The Advisory Committee recognized that by suggesting 34 indicators that there will be broad challenges and data considerations that will need to be addressed before some of the indicators can be fully implemented. As such, this report begins with a section providing suggestions to help address the following key challenges:

- Interpreting the data,
- Implementing the recommendations,
- Sharing the data,
- Expanding the data, and
- Financing the costs.

Other challenges may exist, but these were frequently raised. We hope that the suggestions will further support organizations to implement the indicators.

We structured this report so agencies, policy makers, decision makers and other road safety professionals could easily see indicators for their agency and for other agencies. The report begins with a brief discussion of the broader implementation considerations and potential solutions. Each subsequent section presents the indicators for an individual agency or area. It concludes by briefly discussing ways to move forward.

These indicators are not a comprehensive list. Instead, they represent a core set of key measures

To be meaningful and effective, national indicators should be:

- Measurable in all jurisdictions and nationally,
- Standardized and systematized,
- Collected regularly,
- Reasonably feasible to collect and report data, and
- Shareable in a manner that does not violate privacy and confidentiality.

that could be used to develop foundational knowledge on DID issues. The Advisory Committee began with more than 70 possible indicators, showing the range of potential information that could be collected for improving responses to DID. As such, it may be helpful to think of these indicators as a first step toward improving Canada's knowledge about, and ability to assess and respond to, the DID issue and how it changes over time.

Broader Implementation and Data Considerations

There may be broader intra- and interagency considerations to understanding and implementing the indicators that must be addressed if the recommended indicators are to be fully adopted by agencies across Canada. Although the Advisory Committee was not mandated to examine these broader issues, the members felt it was important to provide initial guidance and suggestions to help stakeholders implement its recommendations.

In this section, we discuss some of the key challenges and suggestions to overcome them:

- Interpreting the data: Systematic and standardized methods
- Implementing the recommendations: A joint approach
- Sharing the data: Increasing knowledge and efficiencies
- Expanding the data: Filling gaps and increasing diversity
- Financing the costs: Benefits of investment

This is not an exhaustive list as measuring and reducing the impact of DID is a complex task. Other potential challenges (e.g., technological, qualified personnel) will also need to be further explored and addressed by appropriate experts when considering implementing the indicators.

Interpreting the Data: Systematic and Standardized Methods

Regardless of the agency collecting data, there will be challenges in accurately reporting and interpreting results because some methods are not systematic or standardized across agencies or across Canada, and some of the existing indicators are not universally defined. Reasons for these issues vary. In some cases, agencies that conduct similar work (e.g., coroners and MEs, law enforcement, motor vehicle divisions) use different data collection and reporting practices because each jurisdiction is independent. Jurisdictions have different needs and priorities, and their different funding levels may restrict the use of more costly procedures (e.g., toxicology screens, requesting a Drug Recognition Expert [DRE, police officers] evaluation for a driver).

Interpreting nonstandardized data from any indicator used across jurisdictions should be done with caution. Users of the data should be aware of the differences between data sources. For instance, coroners and MEs vary in how often they conduct toxicology screens (testing for substances) of fatally injured drivers. Differences in testing rates can depend on circumstances (e.g., if the time elapsed after death is beyond normal testing protocols), procedural differences (e.g., the decision not to test some drivers if other reasons appear to be the cause of death) or financial differences (e.g., higher costs to conduct testing) that are specific to individual jurisdictions.

> Agencies and jurisdictions should make efforts to improve systematizing and standardizing data collection and reporting.

Likewise, only some law enforcement agencies have implemented the use of approved drug screening equipment (ADSE), tools that detect cannabis, cocaine or both in drivers. Furthermore, policies about their use differ across jurisdictions. Without a consistent approach, it is challenging to determine the extent of ADSE drug detection nationally, limits the ability to compare ADSE detections across police agencies and reduces the capacity to identify potential benefits and limitations of using this tool. Most of the agency-level limitations are

discussed in their sections. However, the overall implication is that DID data are underreported and inconsistently collected across Canada in part due to the lack of systematic and standardized protocols.

To minimize these limitations, the Advisory Committee suggests that a starting point for implementing the indicators is for agencies to work together to clearly define shared data collection methods. When reporting data, agencies should also explain any limitations (e.g., insufficient funding) or regional variability (e.g., different practices) to ensure accurate interpretation of the results. A potential future, long-term solution and approach for consideration would be to improve systematization and standardization within and across agencies and jurisdictions where feasible. Options for achieving such a goal may include:

- Designating a lead agency (e.g., Statistics Canada, National Justice Statistics Initiative, Public Safety Canada) to bring together stakeholders and facilitate discussions,
- Establishing a national working group or co-ordinating committee (e.g., Federal-Provincial-Territorial Senior Officials group) to develop a national strategy, or
- Using an existing co-ordinating organization as a platform or model to bring together relevant stakeholders (e.g., the Canadian Council of Motor Transport Administrators) to co-ordinate the work.

Consulting or working with any of the above organizations would also need to consider any additional funding or capacity needs they may require to be engaged. Although a daunting task, working toward jurisdictional and national systematic and standardized methods would be beneficial to improving knowledge on and addressing the DID issue. It could also become a model for other agencies facing similar challenges and would likely improve reporting to international bodies.

Implementing the Recommendations: A Joint Approach

The Advisory Committee also noted that agencies' efforts to implement the indicators must include consulting with stakeholders who could be affected by the proposed changes. Stakeholders may include management, policy makers, decision makers and the personnel expected to carry out or manage data collection (e.g., law enforcement officers, motor vehicle division staff, hospital emergency department and laboratory staff). For example, one of the recommendations is to collect data on drivers sentenced for DID. When implementing this indicator, decision makers should consult with judicial and court personnel about how to ensure data collection is practical, feasible and able to meet policy makers' objectives. Consultations could be led by the co-ordinating body (proposed above) to facilitate efforts on systematic and standardized processes.

> Implementing the indicators needs to be a collaborative approach, from the people who will be collecting the data (e.g., hospital staff, police officers) to the key decision makers (e.g., managers, directors, etc.) who will be using and reporting the data.

Affected stakeholders will need to make decisions about costs and resources needed, appropriate methods for managing data, best practices and the use of available tools, among other considerations that could affect the uptake of new or modified indicators. For instance, are there opportunities for agencies to share tools, programs and resources? Can agencies use these indicators to identify ongoing needs to address DID and potentially make the case for more funding?

Implementing data collection for new or modified indicators should not be burdensome nor inordinately complex, striking a balance between collecting critical data and agency capacity. As

discussed above, stakeholders should also make efforts to work together toward developing standardized protocols to ensure consistency of data collection, not just within agencies but also across jurisdictions.

Sharing the Data: Increasing Knowledge and Efficiencies

One of the most frequently stated challenges to addressing DID raised by the consulted experts was the lack of interconnected data, that is centralized, interagency data sharing and co-ordination. Since there are no national and almost no jurisdictional systems for sharing critical data on impaired driving, experts report working in silos, duplicating work, having difficulty addressing gaps and having a reduced ability to see the overall picture of the issue.

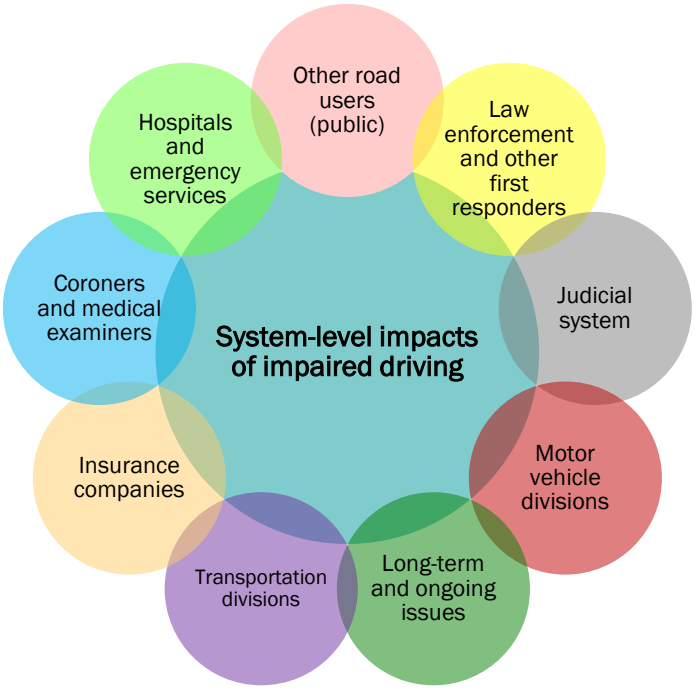
The few agencies that have connected systems (such as law enforcement and judicial agencies that jointly track arrests and court cases) face numerous challenges in sharing important data. There can be inconsistent and sometimes inaccurate data entry between agencies and outdated systems that do not communicate with other systems, which may require staff to input the same data multiple times into different programs.

Setting aside these technological limitations, experts also frequently raised issues of driver privacy and confidentiality as an important barrier to data sharing, even for those that share data within their own agency.

> To reduce duplication and working in silos, as well as improve responses to DID, data should be connected and shared within and between agencies and jurisdictions while maintaining privacy and confidentiality.

The benefits of interconnected data could be substantial. For example, the effect of a single impaired-driving incident may involve other road users (e.g., people in other vehicles, cyclists, pedestrians), law enforcement and other first responders (collision scene), hospitals (injured people), coroners or MEs (fatalities), transportation divisions (road safety concerns and infrastructure damages), insurance companies (claims and liability payouts), motor vehicle divisions (suspensions, fines, restrictions) and courts (charges), as well as long-term issues (e.g., financial losses, disabilities, treatment). Figure 2 provides a system-level view of the various agencies or groups that are potentially affected by DID incidents.

Figure 2: Various system-level impacts of impaired driving



The ability to track people involved in DID incidents across these and other areas might increase efficiencies as agencies work together, identify gaps and reduce costs by decreasing duplication and sharing resources. More importantly, sharing these data would help improve knowledge on DID through more complete information, measuring effects and tracking related risks. This information could then be used in targeting essential resources and personnel, as well as providing insights to help reduce DID. Creating a system of interconnected data could also improve the systematization and standardization of processes, as well as potentially reduce wait times for transmitting or receiving critical data (e.g., arrests, fatalities, court decisions).

To achieve any potential benefits from data sharing, agencies need to have technological, infrastructural, human rights and legal discussions. These types of discussions are beyond the role and expertise of the Advisory Committee. However, this report provides examples of data-sharing models that are used in Canada and other countries. These models could serve as a starting point for further discussion by relevant DID stakeholders and experts.

There are several models in Canada and internationally that agencies can consider for developing data-sharing systems.

Model on Existing Systems in Canada

The Canadian Institute for Health Information already collects patient health data from various medical and health sources across Canada. For instance, hospital-based and community-based ambulatory care data from emergency departments, day surgeries and other ambulatory data are collected and managed in the National Ambulatory Care Reporting System. The Canadian Institute for Health Information manages other sensitive national health data on people living in Canada; therefore, its system could serve as a potential model for managing national, sensitive DID data.

Another option could be working with Statistics Canada, which is already designed and legally structured to house and manage sensitive population data. Provincial and territorial statistics bureaus may be a jurisdictional option to standardize, clean and report some of the data to national levels. Experts consulted for this project recommended that Statistics Canada would likely need to work with a partner organization, such as one in the health sector, to ensure the data are collected and analyzed in a way that meets DID stakeholders' needs.

Other government agencies and programs could serve as examples and potential models for data sharing. British Columbia (via DataBC), the Government of Ontario's data catalogue and some areas of the federal government use CKAN (Comprehensive Knowledge Archive Network). For example, DataBC provides open access to provincial data that have been standardized within this system, and CKAN is an open-source software developed to house and manage open data. The Ontario Government manages a public catalogue of datasets in various areas, including from the transportation, justice, public safety and health sectors. Another data-sharing system example is Population Data BC (PopData). Housed at both the University of Victoria and the University of British Columbia, the program stores individual-level personal information collected by provincial and other public bodies that are linked across various sectors (e.g., health, education, research). Programs such as these would need to be examined and screened by relevant experts to determine their applicability, security and adaptability, among other considerations, or if other programs are more suitable for managing data and sharing across multiple agencies. However, these and other programs show that Canada already uses and screens legally approved data-sharing systems.

Model on Systems from Other Countries

The data collection system in New Zealand (Stats NZ Tatauranga Aotearoa) provides a broader model of a national data collection system that could be considered for Canada. This large system collects and manages data from two sources: the Integrated Data Infrastructure and the Longitudinal Business Database. The Integrated Data Infrastructure collects research and government agency data on individuals and households (e.g., income, education, health), and the Longitudinal Business Database collects data on businesses (e.g., employment, innovation, financial records). The two data sources can be linked and examined together to report on various sensitive and anonymized data. To maintain privacy and confidentiality, Stats NZ uses several processes (e.g., de-identified data, internal audits, security protocols to access data) to ensure the source of the data cannot be identified.

Since the Integrated Data Infrastructure data are tied to the individual, data are more robust and could provide more holistic insights into drivers, as opposed to examining data separately. Many indicators recommended in this report could be connected if they followed individuals involved in DID incidents, such as driver demographics, law enforcement data and medical data. The Longitudinal Business Database system may provide a model for examining potential links between DID incidents and societal costs. Since the recommended indicators propose using individual- and agency-level data (e.g., driver age, law enforcement trained in DID detection), it may be worth exploring how the New Zealand system houses and links population, agency and business data, and whether this secure system could be adapted for DID purposes in Canada.

Research on attitudes toward data integration in New Zealand revealed that the public generally expected government agencies to share data and that providing the public with a clear understanding of the need for linked data increased the public's perception of its value. (Highlights of the New Zealand study and the full study can be found online.) Given Canada's need to protect individual rights and improve public safety, a first step could be to survey public opinion about data sharing based on the wide range of Canadian needs and explain the importance for linked data. A system such as this might have the potential to help many agencies across various issues beyond DID.

Expanding the Data: Filling Gaps and Increasing Diversity

Collecting and reporting DID data has typically focused on the driver, passenger vehicles, males (particularly young males) and cannabis use. Although these are important areas, they dominate impaired-driving focus, and there is a need and interest to better understand DID across a broader range of issues. For instance, little data are reported on other road users (e.g., pedestrians, passengers, cyclists, other drivers) affected by DID incidents, yet the impact on them can be significant. Police data on DID incidents will generally capture this information. However, not all information is available at the time of the incident, and the lack of interconnected data (e.g., with hospitals, coroners and MEs, court systems) creates gaps, reducing the ability to link other road users' data with the impaired drivers' data. This also limits the ability to report data on those affected by DID.

There are also gaps in data related to drug use and impairment among individuals who use other modes of transportation, including off-road and all-terrain vehicles (ATVs), motorized watercraft, and snowmobiles (Canadian Public Health Association, 2006; Statistics Canada, 2021a).[3] These vehicles offer less protection to drivers and passengers, and potentially associated with an increased risk of operators consuming impairing drugs when the vehicles are used for recreational purposes. Similarly, motor vehicle fatalities are sometimes limited to public roadways and can miss fatalities in other contexts (e.g., private property, military base). Minimal data are collected or reported on individuals across different genders, socioeconomic backgrounds or cultural groups. This reduces Canada's ability to understand DID across different groups and potentially identify those who might benefit from targeted prevention and education efforts. Various jurisdictions and agencies are making efforts to collect some of these data. However, many jurisdictions lack the technological capabilities (e.g., computer programs), resources or policies to collect or report certain data.

> To gain better insights into DID, we need to collect and link more diverse data — such as data on all people involved in a crash or data on all drugs detected in a driver.

Where possible, the Advisory Committee has attempted to include indicators that have the potential to capture some of these data. Yet the recommendations still do not capture some of this information. This is in part due to the limitations just stated, but also because the recommended indicators represent a starting point for measuring the impact of DID and are not a comprehensive or final list. As such, stakeholders in the DID field should consider ways they can begin broadening data collection or reporting to help fill these data gaps and inform future recommendations.

Financing the Costs: Benefits of Investment

DID stakeholders may be concerned about the potential costs of implementing new or modifying existing recommended indicators. Some of the suggestions here may be inexpensive (e.g., fine-tuning collection of existing data from DRE evaluation reports), while others have the potential for significant costs (e.g., implementing and collecting commercial roadside survey data).

When considering costs to implementing the recommendations, it may be helpful to also think about the financial and human costs related to DID. Although few studies have examined financial costs, the figures are substantial. In one study, the estimated financial cost of cannabis-attributable collisions to people living in Canada in 2012 was about $1.1 billion when considering lives lost,

[3] The research cited here refers to specific studies but, overall, data on drug use in these contexts are not easily or often collected or reported.

injuries and property damage (Wettlaufer et al., 2017). The financial costs to people living in Canada would be even higher if impairment by other drugs were included.

The human costs are also increasing. Police-reported DID incidents have more than quadrupled in 10 years, from 1,455 incidents in 2009 to 6,453 incidents in 2019 (Statistics Canada, 2021b), while nearly half the drivers who died in 2016 tested positive for an impairing drug in their system (Brown et al., 2021). The increases in incidents and in the detection of drugs in drivers are likely partially due to technological improvements and increased testing and policing. However, the underlying implication is that using drugs other than alcohol before driving appears to be more common than previously thought and is increasing. Unfortunately, insufficient data limits Canada's ability to effectively reduce DID, meaning that financial and human costs will continue to rise.

Better data would help policy makers and decision makers work to improve prevention and detection efforts in DID. Targeted prevention efforts are more successful than one-size-fits-all approaches (Kreuter & Wray, 2003; Schmid et al., 2008). This requires knowledge of the common characteristics among individuals who drive impaired, what messages will resonate with them and what tools are most likely to encourage behavioural change. The same logic applies to practices to detect and discourage[4] DID. Given the differences between DID and alcohol-impaired driving, Canada needs to know when and where DID is likely to take place to properly target law enforcement operations and what types of penalties or actions would work best to discourage people from driving under the influence of drugs.

There are considerable benefits to implementing the indicators that could have a substantial impact on reducing the financial and societal costs of DID.

Providing recommendations for addressing costs is beyond the scope of the Advisory Committee. A special committee or working group could better explore financial options. Nevertheless, the Advisory Committee suggests that any analysis of potential costs of improved data collection and reporting should consider the benefits of enhancing evidence-based decision making. For example, more and better data on the prevalence and characteristics of DID incidents (e.g., location, time of day, week, month) will help inform law enforcement agencies to make better decisions on where to place resources. Similarly, data on the hospital resources used to respond to injured drivers who tested positive for drugs and any others who were injured in the incidents would help medical practitioners target resources, and education and prevention efforts to help reduce the costs and harms from DID.

[4] This is sometimes referred to as deterrence or deterrence theory. With impaired driving, drivers are less likely to drive impaired if they believe that punishment for doing so is certain, will be quick and will be severe.

What About Alcohol-Impaired Driving?

With the legalization and regulation of cannabis, increased detection of drugs other than alcohol in fatally injured drivers, the opioid crisis and gaps in knowledge and evidence about drug impairment in general, there is a growing need to improve Canada's knowledge about and response to DID. However, this focus does not diminish the importance of the impact of alcohol-impaired driving and the ongoing work to continue to reduce this long-standing issue.

Although alcohol-impaired driving is better studied, easier to detect and measure, and has more comprehensive data, like DID, understanding alcohol-impaired driving lacks many of the same standards, systems and measures to better understand and address the issue. Additionally, not as much is known about the combined use of alcohol and other drugs among drivers. Together, this highlights the need to measure and examine the effect of all potentially impairing drugs on driving.

As such, while this report includes some recommendations for indicators on alcohol in the context of polysubstance use, the Advisory Committee thinks it is equally important that a future project develop a set of national standardized indicators to measure the issue of alcohol-impaired driving or consider ways in which the DID indicators can be expanded and adapted to include alcohol.

Summary Remarks

This section described several important considerations for policy makers, decision makers, and road and public safety practitioners before adopting some of the new or modified indicators. The Advisory Committee has offered some ideas or considerations to help address these issues. Nonetheless, there are other considerations beyond the above, such as potential policy or regulatory changes, which could also challenge the adoption of some of the recommended indicators. The Advisory Committee recognized that some of these issues, both those discussed and not mentioned, go beyond the scope of their expertise. A next step could be for relevant decision makers to start discussions with stakeholders and experts to further examine ways in which some of the more challenging indicators could be implemented. The recommended indicators in this report offer a starting point for these discussions and it is hoped that the challenges will not discourage efforts to improve our knowledge or reduce our ability to address issues related to DID.

Law Enforcement: Incident Data

Police officers are typically the first to come in contact with a potentially impaired driver, so they represent an important source of incident data. Seven indicators are recommended for measuring data from DID incidents (Table 3). They include indicators that generally already exist (e.g., collecting driver sex or gender and age data), indicators that have been adjusted to improve standardization or clarity (e.g., collecting substance category data) and new indicators to broaden our knowledge (e.g., administrative sanction data).

Table 3: Indicators recommended for law enforcement to measure drug-impaired driving (DID) incidents

Data source	Indicator
Existing	Driver demographics • Number and percentage of drivers criminally charged or sanctioned (e.g., fined) by substance category (where available) across sex (or gender where possible) • Number and percentage of drivers criminally charged or sanctioned by substance category (where available) across standardized age groups[a] Tetrahydrocannabinol (THC) blood concentration levels among tested drivers • Number and percentage of drivers whose toxicological results fall across different established per se limits[b] for THC
Adjusted	Substance category[c] and polycategory use among drivers • Number and percentage of drivers who tested positive for different substance categories • Number and percentage of drivers who tested positive for polycategory, THC and alcohol, or THC and other drugs
New[d]	Drivers who have received administrative sanctions • Number of drivers who received DID administrative sanctions per capita and per licensed driver by jurisdiction • Number of drivers who received DID administrative sanctions Drivers recommended for criminal charge or charges[e] • Number of drivers recommended for DID criminal charge or charges per capita and per licensed driver by jurisdiction • Number of drivers recommended for DID criminal charge or charges Approved drug screening equipment (ADSE) use and results • Number and percentage of agencies or units that conduct ADSE tests • Number and percentage of ADSE detections (substance present) out of all ADSE results (detections plus no detections) Standardized field sobriety test (SFST)[f] results • Number and percentage of SFST poor performances (likely impairment) out of all SFST results (poor plus satisfactory performances)

[a]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

[b]Per se limits refer to the legally allowed concentration limits for different impairing substances. THC has three limits depending on the context.

[c]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[d]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[e]Charges by law enforcement agencies only (i.e., does not include court charge data).

[f]SFSTs are a series of behavioural tests (i.e., one-leg stand, walk-and-turn and horizontal gaze nystagmus) to detect impairment, but do not identify substance type. Although the tool was originally developed to detect impairment by alcohol, studies support its use as a screening tool for impairment by drugs in some of the other substance categories (e.g., CNS stimulants, CNS depressants, cannabis or narcotic analgesics) (Papafotiou, Carter, & Stough, 2005; Porath-Waller & Beirness, 2014).

Objectives and Need

Most data used to understand and address DID incidents are collected by law enforcement, and coroners and MEs. These data are critical because they measure the issue first-hand and are used by various agencies and organizations across Canada to inform their responses to DID (e.g., education, prevention, risks, costs).

Several of the indicators recommended for law enforcement are already collected and reported. For instance, examining data on driver demographics and substance categories (e.g., age, sex, substance) is often used to target at-risk drivers for education and prevention efforts. Criminal charge data are one of the methods used to measure trends in DID; however, there are important limitations to using this measure on its own. Law enforcement data are also needed by other agencies, and these other agencies sometimes use these data in combination with other data sets (e.g., public survey data, court disposition data), to help improve and broaden responses to DID.

Additional indicators are proposed to help advance and broaden the usefulness of police data already collected. The recommendations include collecting new or additional data related to the use of more than one substance (i.e., polydrug use [use of two or more substances] or polycategory drug use [use of drugs falling in two or more DRE drug categories]), administrative sanctions, recommended criminal charges, and ADSE and SFST results.

Polydrug or polycategory drug use: Individuals may use more than one substance on the same occasion (e.g., alcohol and cannabis, medications and alcohol, opioids and stimulants). This polydrug use can have more dangerous effects on drivers than some substances used on their own. When investigating drivers potentially impaired by drugs, DREs[5] follow a 12-step Drug Evaluation and Classification Program to identify potential impairment by seven different drug categories (Canadian Centre on Substance Use and Addiction, 2019). Although DREs typically report the most impairing substance, there may be other impairing substances present. Due to the increased risks associated with polydrug use and because little is known about its prevalence, the drugs commonly combined or the populations that may consume multiple drugs, it is recommended that law enforcement collect and report data on polydrug or polycategory use where applicable. This would improve knowledge on potentially higher risk impaired driving and support targeted education.

Administrative sanctions: Collecting administrative sanctions data will vary across jurisdictions due to provincial and territorial differences, but they might provide insights into which actions could be more effective for different jurisdictions (e.g., extent of administrative sanctions versus criminal charges). Per capita and per licensed driver data could provide insights into the proportion of sanctions issued or might shed light on unlicensed driver populations if sanctions are disproportionately high in jurisdictions with relatively fewer licensed drivers.

Criminal charge data: Data on criminal charges will also vary across jurisdictions for the same reasons as sanctions data. Nonetheless, they might provide insights into potentially more serious

[5] DREs are select law enforcement officers who are specially trained in the 12-step Drug Evaluation and Classification (DEC) program, which is a valid and reliable program to identify impairment by different drug categories (Canadian Centre on Substance Use and Addiction, 2019). Relevant data from DRE evaluations are captured in some of the recommended indicators. For more information on DREs, see the RCMP Drug Recognition Expert; for the DEC program, see Drug Recognition Expert Evaluations; for the Canadian Criminal Code description, see SOR/2008-196 or CCSA's Drug Evaluation and Classification Program policy brief.

DID incidents, the effectiveness to discourage DID and on the burden of DID across police and judicial agencies given the time and resources involved in criminal offences.

ADSE and SFST data: These data are not generally collected.[6] Collecting data from ADSEs (detections plus no detections) and SFSTs (poor performances plus satisfactory performances) would help provide context to potential impaired-driving stops. ADSE data could also be used to measure the number of stops involving cannabis or cocaine, depending on the device.

These new indicators could help inform the prevalence of more issues, inform the effectiveness of tools used and identify potential areas for law enforcement training. The results could be analyzed against how many stops for potential impairment led to further steps (e.g., DRE evaluations), among other potential uses.

Data Sources and Potential Limitations

Data measuring substance category, THC use, drivers recommended for charges or drivers who have received administrative sanctions are obtained from DRE evaluation reports on impaired drivers, toxicology reports from testing labs and internal police records on impaired-driving incidents. (Incidents include operating a vehicle while impaired by drugs, operating a vehicle while impaired by drugs and causing death or bodily harm, and failure or refusal to comply [e.g., provide blood samples]. Most DID incidents are those drivers found to be operating a vehicle while impaired by drugs.) Although these data are already collected and tracked, there are limitations. While most law enforcement agencies across Canada follow similar procedures for collecting DID data, there are jurisdictional and agency differences that sometimes limit the systematization and standardization of law enforcement data (Meister & De Moor, 2019). This is also sometimes true for implementation. For example, in a report from Public Safety Canada (2020), only seven jurisdictions had purchased ADSE and not all were using them.

Another limitation is that only some of these data are reported externally, usually to Statistics Canada,[7] However, these formats often do not provide enough information for other agencies and stakeholders (e.g., road and public safety practitioners) to conduct in-depth analyses and use the data. For example, detailed data on driver demographics and the category of drug or drugs being used are not publicly available, limiting the ability of different agencies to better understand and address DID risks relevant to different populations beyond age and sex.

Information from toxicology results will differ depending on the type of bodily fluid tested (e.g., urine, blood) or the duration of time after the initial incident where some drugs metabolize faster than others (e.g., cocaine, inhalants) and may not be detected or be present in lower concentration levels than at the time of the incident. Furthermore, a warrant is needed to obtain or to test existing (i.e., collected for medical treatment) blood samples or examine toxicology data from hospitalized drivers to identify impairing substances. This means that some serious impaired-driving incidents are not captured (see Hospitals: Injury Data for further discussion).

Data on administrative sanctions will vary between jurisdictions and sometimes between agencies, and therefore jurisdictional differences need to be described where necessary when reporting results.

The two approved ADSE were the Dräger DrugTest® 5000 STK-CA, used to detect THC and cocaine, and the Abbott SoToxa™, used to detect THC. Since these and potential future approved devices collect information on different drugs, a standardized method for collecting and reporting the data,

[6] The recent implementation of data collection to measure the impact of cannabis legalization and regulation by Public Safety Canada has prompted more agencies to begin collecting and reporting these data (Public Safety Canada, 2020).

[7] See Statistics Canada, 2021b, for the interactive data tables.

such as recording by device type, will be needed to account for differences between devices. Data from ADSE are recorded electronically on the device. Public Safety Canada has begun efforts to implement collecting these data.

In contrast, data from SFSTs are more challenging to collect and report on because there is no formal method or technological device for tracking tests. Rather, poor performances on SFSTs are used to proceed to more testing, such as DRE reports, while satisfactory performances halt investigations for impairment.

Despite these limitations, data from the total number of ADSE tests and total number of SFSTs conducted would provide context for potential impaired-driving stops and could help with evaluating officer training and use. ADSE data could also be used to measure the number of stops involving cannabis and cocaine, depending on the device.

Additional Data Limitations: Alcohol, Resources and Technology

There are related challenges that affect collecting DID data. When alcohol impairment is detected, most law enforcement agencies report that they do not continue to investigate for potential other drug impairment, which means that DID incidents are underestimated (J. R. Brubacher et al., 2018; Meister & De Moor, 2019). Several reasons exist for this situation, including that alcohol is already an established impaired-driving procedure and easier to process, costs and resources needed to investigate drug-impairment cases are higher than for alcohol investigations, and drug-impairment convictions are harder to pursue than alcohol. There are no additional sanctions for impairment by both alcohol and drugs.

Another challenge to collecting DID data is limited human, financial and technological resources. Conducting full DID investigations is time-consuming. Officers can begin investigating by testing with an SFST, ADSE or both. If potential impairment is detected, officers can proceed to a DRE evaluation, which involves a series of psychophysical tests, measurement of clinical indicators (e.g., temperature and blood pressure) and the collection of a bodily fluid sample. If the officer is not a DRE, a DRE must be called in and the examination can take several hours. Until recent years there has not been a large group of officers trained in SFST or DRE investigations, which has also limited the ability to collect DID data. If there are reasonable grounds to believe a driver has consumed or is impaired by drugs, an officer may proceed to an arrest, charter, warning, blood demand or DRE.

Standardizing Population Data

DID data could be standardized by age categories, such as those used by the Canadian Council of Motor Transport Administrators (i.e., 16–19 years, 20–24 years, 25–30 years, etc.). This would help compare different populations, particularly higher risk groups such as younger drivers. When insufficient data are available, the data could be aggregated. The responsibility for standardizing methods may also be determined by the agencies that use or report on law enforcement data (e.g., Statistics Canada). Regardless, some collaboration between agencies would be necessary.

DID investigations are also more costly than alcohol investigations. Limited resources mean DID data are often recorded on paper with limited or no electronic system to collect information (e.g., good performances on SFSTs, details of DRE investigations). As with any large agency with multiple locations (e.g., within a city, across rural regions) and jurisdictions (e.g., different provinces or territories; regions within a province or territory; authority depending on the complement of municipal, provincial or federal police), procedures are not always done systematically or in a standardized manner, resulting in differences in data collection and reporting. In some cases,

technology (e.g., devices, computer programs) needs to be updated or revised to collect drug data, as many systems were set up to only collect data related to alcohol impairment.

Implementation Challenges and Suggestions

As many of these indicators are already in use, several of the implementation challenges are easy to address. However, some will need more effort and resources.

Improvements to existing indicators should consider increasing systematization and standardization across Canada. Achieving this across large agencies with multiple people implementing investigative work can be challenging and affects the reliability of the data. To help law enforcement officers follow similar procedures to addressing DID, agencies could regularly review or audit practices to identify where improvements could be made or to identify whether something is disrupting the standard process that needs to be addressed. Law enforcement agencies could use their existing internal and external review and audit procedures as models for developing a review process for standardized DID practices.

Reporting on drivers who receive sanctions will require a process to combine data at the provincial and territorial level. Options could include identifying a centralized individual to collect and report jurisdictional data to the national agency or adapting the Uniform Crime Reporting system (data collection program managed by Statistics Canada) break down sanctions by jurisdiction. These data could be compared with administrative sanctions data from motor vehicle divisions, which might reveal additional insights or opportunities for efficiencies.

Collecting no detection data from ADSE would be relatively easy as the data can be downloaded from the devices. Although, there would need to be a secure place to store these data and a process for deleting personal information (if any was collected), which might require additional work if not automated. It is recommended that an option to record the no detection data should be included in police reporting procedures along with the detection and drug type data.

Possible Solution to Tracking SFSTs

Impirica, an Alberta-based private company, in partnership with a police agency, is developing an app or computer program to ensure officers collect SFST data. When officers open an SFST investigation using their electronic devices, the program requires them to record the test result before closing out or continuing. The test results are captured and uploaded to a server, along with any other investigation details that were entered into the program.

The benefits of this program are that both poor and good SFST performances are captured, and efficiency is increased as officers input information while they complete the testing. This also increases consistency in reporting results as data input is needed to proceed and improves monitoring as all data can be accessed and managed through a dashboard system. Innovations such as these may be useful to other agencies.

Collecting data on poor performance from SFSTs is challenging because the results often proceed to further investigation (e.g., DRE evaluations) that may not be captured by the additional procedures (e.g., reports). In some jurisdictions, such as Ontario and Quebec, poor performance data may only be sent to the toxicology lab. Among law enforcement agencies, a records management form (i.e., data collected by police for their records) may be completed for an SFST by officers, but this is not consistently done and cannot be relied on for tracking SFST results. If a driver performs well, testing generally stops with no further action taken and the pass result is not recorded. One option could be to add SFST results with checkboxes for poor and satisfactory performances on police paper reporting forms. Another could be to use electronic forms that include a mandatory check for SFST results before the officer can move forward with their report, as some agencies have done (see

Possible Solution to Tracking SFSTs text box). Some police agencies have also set up ad hoc systems to collect these data, which may be worth exploring for applicability across Canada.

The process and the tools used for screening for and detecting drug impairment require more time and effort compared with alcohol impairment. As such, an increased number of police trained in DRE, SFST and ADSE procedures is needed. In 2018, the federal government initiated efforts through Public Safety Canada to allocate funding for a five-year term to train more officers in these procedures, among other projects.[8] These efforts are expected to reduce the time-related challenges to addressing DID for law enforcement agencies. Nonetheless, it will be important to monitor if the proposed increases are sufficient and to determine whether additional funding or other types of support will be needed. (See Public Safety Canada, 2020, for the first report monitoring the effects of these efforts.)

When both are present in drivers, the tendency to pursue alcohol investigations or charges over other drugs still meets the main objective of reducing impaired driving. However, it could tell the public, especially drivers, that drug impairment is not a priority and could be easier to get away with it. As with alcohol, it will take time for all agencies to develop DID best practices. It is recommended that when both alcohol and drugs are detected that officers, when possible, should also investigate drugs to improve knowledge on drug use and driving, polysubstance use with alcohol and ensure that DID continues to be viewed as a concern and priority by the public. Officers could also proceed on an alcohol or drug charge and treat the presence of additional substances as an aggravating factor.

The Advisory Committee proposes future opportunities for consideration. One would be to separate commercial driver data from private passenger and light-duty vehicle driver data to better understand risks and effects. Another possibility would be to explore the potential benefits of mandatory toxicology testing for all drivers involved in a collision with a fatality as the results would likely provide a more accurate understanding of the extent and impact of DID.

Improving and expanding data collection as described above only speaks to internal challenges within law enforcement data. Externally, other organizations and agencies (e.g., road safety organizations, health agencies) also need DID incident data, which are difficult to obtain beyond what is provided to Statistics Canada by law enforcement. These processed data are not enough to satisfy the needs of many other agencies. All agencies working together and sharing critical data (anonymized and combined where necessary) will improve co-ordination and knowledge on DID, as well as help reduce the issue.

Increasing Capacity to Test Body Fluids

To help address capacity and wait-time issues when testing driver body fluids for drugs, some jurisdictions have implemented agreements with medical professionals (e.g., paramedics) to collect samples. Jurisdictions may wish to consider discussing a model for a national, standardized approach.

8 For more information see the Government of Canada, Impaired Driving, Funding and Research.

Law Enforcement: Resource Use Data

A significant amount of training, technology and time is invested by law enforcement agencies to address DID. Data on resource use could help better understand the needs and effectiveness of investments. The Advisory Committee recommends four indicators for measuring resource use by law enforcement to respond to DID (Table 4). These indicators either generally already exist (e.g., collecting data on the number of certified DREs) or are new indicators to broaden our knowledge (e.g., collecting data on the number of requests for blood samples).

Table 4: Indicators recommended for law enforcement to measure resources used to manage drug-impaired driving

Data source	Indicator
Existing	Trained frontline[a] officers • Number and percentage of frontline officers trained in SFST • Number and percentage of frontline officers trained in the use of ADSE Certified Drug Recognition Expert (DRE) officers • Number of officers certified as a DRE reported by province and territory
New[b]	Requests for DREs • Number and percentage of requests for DREs filled out of all requests for DREs (requests filled plus not able to be filled) Demands for blood (testing) • Number and percentage of demands for blood testing conducted out of all requests for blood demands (demands conducted plus not able to be conducted)

[a]Frontline officers include uniformed police officers performing general duties, patrol or both, and whose duties include stopping motor vehicles for enforcement purposes, as well as uniformed officers assigned to full-time traffic services duties.

[b]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

Objectives and Need

Law enforcement agencies bear substantial costs and resources to manage and respond to impaired-driving issues. Costs can include equipment (e.g., ADSEs), toxicology tests and officer training. Resource use includes staff time to respond to and conduct DRE evaluations, attend DID court sessions, ability to fill requests for a DRE investigation of suspected impaired drivers and complete initial and ongoing training. The relationship between investment in these resources and their effect on reducing DID can help determine where investment is sufficient, where there may be gaps and where there may be opportunities for improvement.

To understand the effectiveness of investments, data needs to be connected to the resource (e.g., funding, time, equipment) to the outcomes (e.g., number of DID incidents, rate of DID detections, use of DID-related equipment). Not enough DID (outcome) data are collected to be able to accurately measure these potential relationships. For example, does investment in ADSE and officer training in using this tool lead to increased use of ADSE, increased drug detection, increased referral to DREs or increased charges laid? Equally important, does investment help reduce DID by discouraging impaired driving? For example, requests for a DRE to investigate a suspected impaired driver or to conduct a blood demand may not be possible if capacity or resources are too low to respond, such as not enough DREs or available medical staff. Data such as these could help better understand potential relationships between available capacity and resources and DID incidents.

Without consistently collecting these data, it is more challenging to determine where investments are needed, if any. It would also be important to track how many law enforcement officers who are

trained in procedures such as SFSTs are using this tool. Without collecting both good and poor performance data on SFSTs and the number of officers trained, it is difficult to determine whether the tool is being used, it is applicable for the situation, it is being used correctly, it is leading to DRE referrals, and whether there are enough DREs and trained officers available to respond to requests. To truly measure the effects of resource investment, many of the recommended indicators will need to be improved or implemented.

In the meantime, there is an opportunity to begin measuring some resource use data, specifically related to the training and certification of officers in different DID detection and investigative methods. These data are already collected but not yet used to measure against the potential effect on DID. The Advisory Committee recommends reporting on these two indicators to establish baseline data and develop methods to compare these and other types of resource data (e.g., costs for training, expenditures on equipment) with DID data as this latter area improves.

Data Sources and Potential Limitations

Data on officers trained in ADSE and SFST are tracked by their respective agencies while certified DREs are tracked jurisdictionally and reported to the Royal Canadian Mounted Police at the national headquarters. Although useful, the data have some limitations that need to be considered. Knowing the numbers of trained officers provides a starting point for examining investment in resources against impact, but it cannot be used independently of other information. For example, comparing annual changes in the number of certified DREs with the number of DID incidents, arrests or fatalities is not enough to explain potential changes. Instead, it could be more useful to examine the effect of increasing the number of DREs in an area that has higher levels of DID incidents (i.e., potential reduction in incidents).

What Policing Resources Are Needed?

An officer observes a vehicle being driven irregularly down a street. After pulling the vehicle over, the officer notices the driver's mumbling speech, unfocused gaze and unusual behaviour. The officer suspects potential drug impairment but is not carrying drug screening equipment, is not trained to perform an SFST and is not trained as a DRE. The only DRE available during that shift is busy investigating another incident. Lacking these options (resources), the officer will not be able to proceed under their suspicion of potential drug impairment and must use another approach to address the situation.

Some requests for DREs as well as requests to test blood samples (blood demands) go unfilled due to insufficient resources. Although this situation is improving, as of January 2020, in nine of 13 provinces and territories, less than 10% of officers were trained as DREs. For three of these regions, less than 1% were trained as DREs (Public Safety Canada, 2020). Collecting data helps pinpoint needs and where to redistribute resources, as well as produced better value for costs (Veisten et al., 2013).

Differences between jurisdictions (e.g., laws, administrative sanctions, population density, modes of transportation) affect law enforcement resources and ability to measure the effects of DID. It can be costlier and more time-consuming to address DID in rural areas where longer response times, fewer trained officers and other competing needs could skew measurement of resource use and the effect on DID between rural regions and with urban areas. With these key limitations in mind, the recommended indicators will be more beneficial if measured against targeted data that considers regional differences.

Implementation Challenges and Suggestions

Most of the recommended indicators are already actively used. The potential implementation challenge here may be developing a method for centralized reporting to measure against DID. Options could include collecting the data by jurisdiction and reporting to a national source like the Royal Canadian Mounted Police as they already collect jurisdictional and national DRE data. Reporting to Statistics Canada could be another option; however, law enforcement guidance would be needed to avoid the potential of misinterpreting their meaning. Nonetheless, setting up methods and systems for reporting these data requires further discussion by the agencies and decision makers involved, and could have potential funding implications.

Moving forward, measuring the effect of investment on law enforcement resources will need to go beyond tracking the number of officers trained in DID. As data collection in other areas improves, future resource use indicators could include measuring by geographical factors (e.g., population density, DID incident rates, rural or urban area), attrition rates among trained (e.g., SFST) and certified (e.g., DRE) officers, equipment expenditures (to compare with their use and the effect on DID outcomes), costs to train officers, time for officers to respond to DID incidents and referrals from ADSE and SFST detections to DRE investigations. These should be revisited in the future as the recommended indicators are improved on or implemented. This will require greater interagency co-operation and co-ordination, which would be beneficial to better understanding the overall context of DID and the cost and the potential effect of efforts to address the issue.

Judicial: Court Data

Typically, serious DID incidents are addressed through the judicial system. Examining court data could explore the effects of different sentencing mechanisms and better understand which drivers are more likely to be involved in serious incidents. The Advisory Committee recommends three new indicators for measuring court data related to DID (Table 5). They include new indicators to broaden our knowledge (e.g., collecting data on disposition type).

Table 5: Indicators recommended for the judicial system to measure court data for drug-impaired driving (DID)

Data source	Indicator
New[a]	Disposition type (court decision) among drivers • Number and percentage of different court dispositions out of all DID cases Sentencing (type and quantum[b]) data on drivers • Number and percentage of fines issued out of all DID cases • Number and percentage of nonmonetary sentences issued out of all DID cases (e.g., probation, community work, prison) • Number and percentage of driving suspensions issued out of all DID cases Driver demographics • Number and percentage of drivers sentenced for DID across sex (or gender where possible) • Number and percentage of drivers sentenced for DID across standardized age groups[c]

[a]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[b]Quantum refers to the court's punishment, which can be a fine, the length of a sentence or both.

[c]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

Objectives and Need

Data collected from DID court cases can provide information to better understand the spectrum of more serious incidents. Disposition (court outcomes) data can help law enforcement training by comparing arrests, such as providing insights into why some charges lead to convictions and others do not. Data collected on sentencing, fines and suspensions can help identify the potential effectiveness of each individually and different combinations of deterrence approaches. This information could inform future policies to reduce the impact of DID.

Collecting data on drivers who go through the justice system would also contribute to identifying characteristics of potential high-risk DID groups. This information could be used to inform prevention and education activities. Collecting court data may also identify potential system-level issues (e.g., biases related to ethnicity, lower socioeconomic status, education), such as whether certain groups of individuals are overrepresented in DID cases, particularly serious incidents.

Data Sources and Potential Limitations

Disposition, sentencing and fines, and driver demographics data are already collected by the judicial system. However, only disposition data are updated with law enforcement agencies (shared computer program) or reported to motor vehicle licensing divisions. Despite sharing basic information on drivers facing criminal charges, data collection, sharing and updating driver files is inconsistent between the courts and law enforcement agencies and each group experiences gaps in information. Motor vehicle licensing divisions can experience delays from courts in receiving

disposition data. Although some data are reported to Statistics Canada, these are limited in detail. As such, court data are typically not accessible to agencies that may benefit from the information (e.g., public safety agencies, prevention and education organizations).

Prosecutors may pursue cases primarily as an alcohol-impaired driving case even if drugs are involved and contributed to the impairment. This means that court DID data may be underreported where alcohol and drugs are both involved, law enforcement DID investigative efforts are not being fully used and the public may see this as a message that it could be easier to get away with DID.

Learning from Court Data

Court data could be used not only to tell Canada more about the characteristics of drivers more likely to be involved in more serious offences but also could provide insights into which deterrents (e.g., prison sentence, fines, licence suspensions) are more effective for which types of drivers. Research suggests that judicial responses to drug-related criminal acts vary in effectiveness, which may also be true for drivers sentenced with DID (Health Canada, 2004; Weekes & Burke, 2022). For example, do serious incidents involve drivers who are inexperienced or young, risk-takers, affected by problematic substance use issues, or other characteristics? Looking at recidivism (when properly defined for the objectives of reducing impaired driving) and driver demographics together could greatly add to this knowledge.

Knowing more about these aspects could help road safety professionals, judges and other court decision makers and health practitioners decide who and which responses to use for offences, such as improving driver education and training, administering fines or incarceration, or providing treatment, among others.

Criminal impaired-driving offences are established at the federal level. However, differences in the way provinces and territories implement and enforce these laws, the extent they use administrative sanctions and differences between jurisdictional court systems can affect the extent and type of cases that go to court. For example, law enforcement officers in some instances may use short-term administrative sanctions (e.g., fines, vehicle impoundment) to avoid the potentially time-consuming approach of laying criminal charges (Jonah et al., 1999). Caution is needed when combining or comparing jurisdictional court data.

Drug treatment courts (DTCs) are another option for those charged with drug-related offences; however, DTCs are not typically used for DID cases due to the severe nature of the offence. Therefore, little data on DID can be obtained from these settings.

Implementation Challenges and Suggestions

Since these court data are already collected on drivers, the Advisory Committee recommends improvements to ensure data are accurately entered into shared systems within a timely manner, across law enforcement and judicial agencies. Given the value and importance of these data, all groups should consider working together and sharing critical data (anonymized and aggregated where necessary) to improve co-ordination and knowledge on DID, as well as help reduce the prevalence of DID.

As with addressing alcohol-impaired driving, it will take time for prosecutors, courts and others to gain experience conducting DID cases. Therefore, it is recommended that people working in the justice system make efforts to pursue relevant DID cases, rather than de-emphasizing them, to gain this expertise and develop best practices for managing these types of cases. With an increased focus on DID and the new cannabis laws, this co-ordination would prove beneficial.

Despite the independent approaches of provinces and territories in managing DID cases and the potential for wide variations, the data could provide insights into the effectiveness of different jurisdictional approaches. For example, rates of DID may differ between jurisdictions that rely heavily on administrative sanctions (immediate consequences) compared with those that pursue criminal charges (potentially more severe but delayed consequences).

Coroners and Medical Examiners: Fatality Data

Data about drivers who died in potential DID incidents are needed to improve prevention efforts. Knowing the substances present in drivers and driver demographics provides insights into individuals who could be at greater risk of driving impaired. The Advisory Committee recommends four indicators for measuring potential DID among fatally injured drivers (Table 6). They include indicators that already exist (e.g., collecting driver demographics data) and indicators that have been adjusted to improve standardization or clarity (e.g., collecting substance category data).

Table 6: Indicators recommended for coroners and medical examiners to measure fatality data related to drug-impaired driving

Data source	Indicator
Existing	Driver demographics • Number and percentage of fatally injured drivers who tested positive for different substance categories across sex (or gender where possible) • Number and percentage of fatally injured drivers who tested positive for different substance categories across standardized age groups[a]
Adjusted	Substance category[b] and polycategory use among drivers • Number and percentage of fatally injured drivers who tested positive for different substance categories • Number and percentage of fatally injured drivers who tested positive for polycategory, THC and alcohol or THC and other drugs

[a]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

[b]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

Objectives and Need

Coroners and MEs[9] provide a major source of data used about the people who were killed in vehicle crashes to understand and address DID. These data are critical to identifying the type or types of substances present in individuals who were fatally injured and often provide insights into the individuals affected, such as age, sex, medical history, mental health and physical health. Examining coroner and ME data can help identify potentially high-risk drivers, the most commonly mixed drugs found in fatally injured drivers, the typical passengers of drivers who died with cannabis in their system and which impairing prescription drugs are found most often in fatally injured drivers. Knowing this information could help identify how and what prevention activities might be needed to reduce deaths.

To better understand and reduce DID-related deaths, the Advisory Committee recommends that coroner and ME indicators should continue measuring and reporting on the following sources of data for fatally injured drivers:

[9] Some jurisdictions have coroners while others have MEs. Both conduct investigations to determine the cause and circumstances of a death. While coroners can come from various backgrounds, MEs must be medical doctors who may be trained in pathology (Canadian Centre on Substance Use and Addiction, 2018; Statistics Canada, 2012)

- The specific drugs found in toxicology results, which can be collapsed into substance categories according to the DRE Drug Evaluation and Classification Program if needed for comparison,
- Polydrug or category use, and
- Basic driver demographics (i.e., sex or gender and age).

Most of these data are already collected, but polydrug or polycategory substance use tends to be less consistently reported. This would be an adjusted component for those agencies that do not report on polydrug or polycategory use (e.g., an agency may only report on the primary substance present). The Advisory Committee recommends including this data for reporting when multiple substances are detected.

Since coroners and MEs (and most hospitals) are typically the only agencies in Canada that can provide detailed data on drug type, concentration levels, driver demographics and fatalities, their data are highly sought after. As such, it is important to standardize data collection and remove identifying information so the data can be shared among various agencies (e.g., public safety, transportation, law enforcement, road safety professionals, health practitioners) working toward a collective approach to reducing DID deaths.

Data Sources and Potential Limitations

Most recommended coroner and ME indicators are already collected, but there are several limitations to their collection, standardization and reporting.

Collection

Not all fatally injured drivers can be tested for substances and rates differ (e.g., between 36.8% to 96.2% across jurisdictions in 2016 and a national average of 82.7% [Brown et al., 2021]). As well, not all coroners and MEs test for the same drugs. Like law enforcement, when alcohol is detected at impairing levels, some coroners and MEs do not investigate for other drugs. Reasons for not testing include that drug testing is expensive, alcohol testing is easier, situations when other factors appear to be the cause of death and there are not enough qualified toxicologists to conduct testing (Meister & De Moor, 2019). Other challenges include not being able to detect all substances at the time of testing, concentration levels being difficult to interpret as some drugs break down and are absorbed or redistributed (e.g., THC) in the body and some are too new to be detected (e.g., designer drugs). These reasons mean that DID data are likely underreported. Adding to the data collection issue are the delays in receiving data. Investigations into driver history can take months while resource shortages (e.g., insufficient numbers of toxicologists) can add to delays.

Standardization

Due to the jurisdictional nature of coroners and MEs, they have developed their own procedures for conducting investigations into fatalities. Although many procedures are similar, some are not, such as testing for the presence of substances. The lack of standardized practices (Canadian Centre on Substance Use and Addiction, 2018) means that data are not easily comparable across Canada and likely do not give an accurate national picture of the issue. At the jurisdictional level, decisions to address DID may be ineffective or counter-productive if best practices to investigate and collect information on DID fatalities are not universally used.

Reporting

In terms of reporting, coroner and ME data are generally used by three agencies: law enforcement, Statistics Canada and CCMTA to inform the Alcohol and Drug Crash Problem in Canada series.

When investigating possible impaired-driving fatalities, most law enforcement officers will receive data on the substance category and driver demographics (which they may already have) from coroner and ME reports. However, some law enforcement agencies do not receive concentration levels for drugs and may only receive information on the most prevalent drug instead of all detected drugs.

Fatality data reported to Statistics Canada typically are classified by the cause of death (such as driver impact with an object) and not by drugs, which are largely considered a contributing factor. Therefore, DID data are typically not captured through this reporting method, missing an opportunity to provide publicly available data on DID fatalities. Law enforcement agencies report impaired-driving data (e.g., causing death or bodily injury, driving while impaired or failure or refusal to comply) to Statistics Canada through the Uniform Crime Reporting survey. The limitations in determining the cause of death also affects these fatality data with few deaths reported due to potential impairment by alcohol or drugs.[10]

Making a Difference: Impact of Universal and Standardized Testing

In Nova Scotia, most motor vehicle fatalities (drivers and passengers) are tested for drugs using standardized procedures. The benefits have been valuable. Real-time reporting of systematically collected death data can be used for rapid responses to emerging crises, such as new and dangerous drugs. Years of universal and standardized testing has also allowed the creation of a database of drug trends. This allows MEs can look back to see whether there are changes in drug use, such as the onset of the opioid crisis. Standardized practices have also helped MEs identify populations at risk for certain drug use, which supports the development of targeted public health and education activities.

The Canadian Council of Motor Transport Administrators (CCMTA) report provides annual data on impaired-driving fatalities and serious injuries. Some coroners and MEs report the data to the Traffic Injury Research Foundation, which analyzes the data for the CCMTA report. However, for some jurisdictions, the data must be mined from reports, while supplemental data are mined from other reports (e.g., police reports) to verify and fill potential gaps in the coroner and ME data.[11] This can be a large and time-consuming task, particularly as data are not standardized among jurisdictions and some data may not be linked to driving incidents. Additionally, data are sometimes not available for all jurisdictions, the publication of the crash data lags by about five years and the data may only indicate the presence of a drug (and not whether it was impairing).[12] Although the CCMTA report is important for providing some context to DID crashes and fatalities, several limitations affect data collection and underestimate the issue.

There are also other organizations, such as public safety or nongovernment agencies, that use these data to further educate the public and help reduce harms.

[10] The Uniform Crime Reporting survey has limitations. Since not all jurisdictions can use the new Uniform Crime Reporting survey 2, there are differences in interpreting some of the reporting criteria between the two surveys being used. Regardless of the version, the survey only allows reporting on drugs as a single category. Other limitations also exist.

[11] For details on the methods and limitations to the CCMTA data, see the introductory sections of the Alcohol and Drug Crash Problem reports.

[12] For example, data were not available for British Columbia for several years. At the time of writing, the most recent fatality data are from 2016. An additional data limitation is that deaths are only recorded if they occurred within 30 days of the incident, which follows the World Health Organization's Global Health Observatory data collection methods.

Additional Data Limitations

When alcohol and drug test data are collected, only data on fatally injured drivers and pedestrians are reported by coroners and MEs (e.g., CCMTA report). Data on other individuals involved in the crash (e.g., passengers, other drivers, pedestrians, cyclists and other road users who were injured or fatally injured) are either matched by the motor vehicle department or estimated through substitute data in some reporting (e.g., CCMTA report). This is largely because law enforcement officers collect data about the crash, and coroners and MEs collect data about the individual, which are not necessarily interconnected. The lack of interconnected data in and between agencies is an important limitation for measuring the impact of DID on nondriver deaths.

Implementation Challenges and Suggestions

Fatality data are critical components to understanding the serious implications of impaired driving, particularly in understanding the effects of drugs in different combinations and concentration levels on driving. The primary challenge to fully implementing the indicators is to address the limitations. The Advisory Committee provides the following suggestions to help improve full implementation of the recommended indicators:

- Standardize methods for conducting investigations and collecting data in Canada through collaboration among coroners and MEs across jurisdictions (e.g., through the Chief Coroners and Chief Medical Examiners conference).
- Maximize testing for alcohol and drugs in all driver fatalities, consistently report on drug concentration levels and report on polydrug or polycategory drug use as needed. Begin analyzing these data for patterns in drug use and impact on driving when possible.
- Invest in a standardized and linked computer program across coroners and MEs to improve consistency, national data collection and analysis, and faster reporting times.

As with other agencies, interagency co-ordination to address DID fatalities could be improved by jointly investing in an electronic system (e.g., computer program, centralized reporting agency). The system would allow sharing of anonymized data across coroners and MEs, and externally to other relevant agencies and organizations (e.g., law enforcement, road safety organizations, public health). This would improve prevention, reduce harms, improve agency efficiencies and increase understanding of the overall impact of DID on society.

Future recommendations include collecting data on the number and percentage of nondrivers fatally injured in collisions involving a driver who tests positive for any substance. Currently, impaired-driving fatality data typically focuses on the driver. Beyond testing for alcohol, nondriver data would broaden the scope of the effect of DID on society. This would require technological systems that link individuals involved in incidents to each other or to the incident, such as through police reports, further emphasizing the need for interagency linked data. Overall, the lack of interconnected data within and between coroners and other agencies is an important limitation to measuring the impact of DID and impaired-driving deaths.

Hospitals: Injury Data

Individuals who are injured in DID incidents can require various immediate, short-term and long-term medical services. Since data are not typically collected from injured drivers who are hospitalized, it is unclear the extent of the effect and risks across Canadian jurisdictions. The Advisory Committee recommends four new indicators for measuring potential DID among injured drivers (Table 7).

Table 7: Indicators recommended for hospitals to measure injury data related to drug-impaired driving

Data source	Indicator
New[a]	Injury data among drivers • Number and percentage of injured drivers involved in collisions who visit hospitals and test positive for substances Substance category[b] and polycategory use among drivers • Number and percentage of hospitalized drivers who test positive for different substance categories • Number and percentage of hospitalized drivers who test positive for polycategory, THC and alcohol or THC and other drugs THC use (preferably blood test) among drivers • Number and percentage of hospitalized drivers who fall across the different established per se limits[c] for THC or in combination with alcohol Driver demographics • Number and percentage of hospitalized drivers who test positive for different substance categories across sex (or gender where possible) • Number and percentage of hospitalized drivers who test positive for different substance categories across standardized age groups[d]

[a]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[b]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[c]Per se limits refer to the legally allowed concentration limits for different impairing substances. THC has three limits depending on the context.

[d]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

Objectives and Need

Currently, no agency nor organization systematically screens hospitalized drivers for potential drug use or impairment. Most data available in this area are typically from studies on hospitalized drivers (Brubacher et al., 2019; Brubacher et al., 2016). Since serious injuries related to impaired driving far outnumber fatalities (Brown et al., 2021), it is equally important to collect and study data on injured drivers and other injured road users as the ability to connect data between all individuals involved in collisions (e.g., passengers, pedestrians, cyclists) improves. Without these data, a significant gap will continue in Canada's knowledge on the issue and the prevalence and associated risks of DID.

To better understand the extent of impaired driving, injuries and substance use, the Advisory Committee recommends that when collecting blood samples from injured drivers, hospitals should also conduct a toxicology screen (when possible) and record the presence of THC, alcohol and other drugs according to the DRE drug categories (Royal Canadian Mounted Police, 2018). Since THC has legally prohibited thresholds (limits) in blood, these results could be reported according to the thresholds for THC or when combined with alcohol. Sex (gender where possible) and age are already

collected as part of patient data and would need to be connected to the other data. To ensure privacy and confidentiality, these data could be reported in aggregate and anonymized formats, or reporting could be modelled on existing regulations and laws used for collecting and reporting other health data.

Hospital (emergency department) visits and injury data would benefit hospitals and other agencies working to reduce DID. For medical practitioners, toxicology results and other data would be important in the management of trauma patients (e.g., improve the treatment of trauma patients with substances in their systems) and could help identify drivers who might require treatment for a substance use disorder or potential misuse (e.g., of prescription medications). Individuals with substance use disorders could have serious medical conditions. Punitive actions (e.g., fines, criminal charges, vehicle impoundment, licence suspensions, etc.) are not likely to deter someone who is experiencing addiction (Health Canada, 2004; Mullen et al., 2015). If a driver is identified as having a substance use disorder, treatment to address the disorder might be more effective than punitive measures in reducing repeat impaired-driving offences.

Little is known about the effects of medications on drivers and impairment, particularly when individuals take multiple medications, combine medications with recreational drugs or do not use medications as directed (Hetland & Carr, 2014; Rudisill et al., 2016). As such, hospital data could also provide an opportunity to gather driver medical history, including identifying prescription or other medications (where possible) and improve insights into medications, risks and impaired driving.

Injury data are also critical to other agencies working to reduce DID (e.g., public safety, transportation, etc.). These data can be used to raise awareness of the issue beyond criminal (law enforcement) and fatality (coroners and MEs) data and better understand the impact on society. Furthermore, if data can be connected across all individuals affected by a car crash, then broader at-risk groups (e.g., types of passengers riding with drivers affected by different drugs) might be identified. Overall, hospital data on injured drivers would add a tremendous amount of knowledge to understanding DID.

Injury Data Insights

Almost half of injured drivers from 2018 to 2019 in Canada tested positive for impairing substances, according to research examining hospital data (Brubacher et al., 2022). One in six (17%) tested positive for alcohol and two in five (40%) tested positive for one or more other drugs, including cannabis, sedatives, central nervous system stimulants or opiates. The types of substances detected also varied by province. For example, opiates were more prevalent in Saskatchewan, while alcohol and THC were more prevalent in drivers from Atlantic Canada. Having these data can help jurisdictions develop targeted responses and maximize resources for their particular impaired-driving issues.

Data Sources and Potential Limitations

Injury and driver demographic data are already collected by hospitals, but toxicology testing is not routinely performed on injured drivers. When they are, protocols for toxicology testing of trauma patients might be inconsistently conducted (e.g., only some drugs may be screened for), and protocols vary between hospitals. Further, many hospitals do not have laboratory capacity for broad-spectrum toxicology testing in blood or for quantifying THC levels.

Hospitals' capacity, particularly in dealing with trauma patients, may limit the time for investigating potential drug use or impairment through toxicology tests. Data should be collected as close to the time of the collision as possible, such as when an injured driver arrives at the hospital. However, privacy issues may impede this type of data collection. Additionally, a systematic approach will be

needed to identify, differentiate and connect data collected by hospitalized drivers who later die from their injuries with data collected by coroners and MEs on the same fatally injured driver.

Implementation Challenges and Suggestions

It will be necessary to explore different options and approaches to collecting, standardizing and reporting these vital DID injury data, including considerations for anonymizing or maintaining the confidentiality of patients. This means developing a systematic and standardized procedure for collecting and reporting on substances and concentration levels in bodily fluids (preferably blood). To ensure consistency across hospitals and align testing processes with coroners and MEs, one effective option would be working with national organizations or associations from these two agencies to develop joint data collection methods. Additional capacity and financial requirements would likely need to be considered for collecting, testing and recording this data.

Recording and reporting hospital data presents an additional privacy challenge. However, these challenges have already been faced by other agencies that collect personal data and report combined (aggregate) findings on these personal data (e.g., the Canadian Institute for Health Information, Statistics Canada). For example, hospitals often test patients' bodily fluid samples to administer medical care and help with diagnoses. However, some hospitals may be unwilling to run additional tests on bodily fluids of hospitalized drivers to determine potential impairment due to patient privacy concerns. This may require appropriate legal consultations and additional protocols or policies on how the data are used and reported, which involves a discussion beyond the scope of this project. Nonetheless, as with sensitive data collection by other agencies, a balance is needed between individual rights and public safety. Several existing models for sensitive data collection and sharing in Canada and internationally could be considered to implement the hospital indicators for measuring the impact of DID.

A simplified approach to toxicology screening across all hospitals may be to develop a drug testing procedure that follows the one already used for alcohol screening by many hospitals. Another option could be to collect and analyze anonymized or de-identified toxicology data to determine the extent of injuries related to DID collisions and the effects on others involved in these collisions. These data could then be used to help determine the next steps. For example, several recent studies conducted in Canada demonstrate how anonymity has been maintained while testing unused leftover blood samples from drivers treated in emergency departments (Brubacher et al., 2019; Brubacher et al., 2016; Masud et al., 2020). These data have provided important insights into alcohol- and drug-impaired driving, collisions and injuries.

The Advisory Committee also recommends sharing and linking DID injury-related hospital data (anonymized and aggregated where necessary) between agencies. This would help determine the broader effects of crash incidents among potentially impaired drivers, other drivers and nondrivers. It would also reduce the duplication of data between hospital data on injured patients and coroner and ME data on patients who later died due to their injuries.

Finally, as data linking improves, future data considerations should include monitoring substance use in patients injured in collisions due to impaired operation of other transportation methods (e.g., all-terrain vehicles [ATVs], motorized watercraft, snowmobiles). These vehicles offer less protection to drivers and passengers, sometimes results in greater severity of injuries and potentially increases the risk of operators consuming impairing drugs when the vehicles are used for recreational purposes (e.g., bush parties) (Vanlaar et al., 2015).

Roadside Surveys: Passenger and Light-Duty Vehicle Operator Data

Roadside survey data on operators (drivers) of passenger and light-duty vehicles (i.e., typically private passenger vehicles) are one of the best and sometimes only source of information for determining the prevalence of DID. The Advisory Committee recommends four new indicators for measuring the prevalence of impairing drugs present in drivers (Table 8).

Table 8: Indicators recommended to measure the prevalence of impairing drugs present in drivers

Data source	Indicator
New[a]	THC use (oral fluid) among drivers • Number and percentage of drivers who test above 25 ng/ml for THC Date, day of the week and time when driver was stopped • Number and percentage of drivers who tested positive for different substance categories[b] by time periods (e.g., midnight to 3 a.m.), day of the week and date Driver demographics[c] • Number and percentage of drivers who tested positive by different substance categories across sex (or gender where possible) • Number and percentage of drivers who tested positive for different substance categories across standardized age groups[d] Substance category[b] and polysubstance use among drivers • Number and percentage of drivers who tested positive for different substance categories • Number and percentage of drivers who tested positive for polysubstance, THC and alcohol, or THC and other drugs

[a]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[b]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[c]Standardized data collection methods and criteria used across Canada.

[d]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

Objectives and Need

Roadside surveys involve randomly selecting drivers from traffic, asking them to provide a breath sample to test for alcohol and an oral fluid sample for drugs sent to a toxicology lab to test for drugs (Boase, 2012). Drivers are also asked demographic or behavioural questions (e.g., age, if they have consumed a drug). The survey is voluntary and anonymous. These data provide a wide range of information on substances consumed, characteristics of the drivers and the context of when they were driving after having consumed substances. Subject matter experts (typically researchers) collect and analyze the data and report the findings, which are typically publicly available.[13]

Almost all the data in the indicators are already collected during most roadside surveys. However, few roadside surveys have been conducted in Canada and there can be some systematic differences depending on who conducts the survey. Roadside survey data is considered new because so little data has been collected nationally or regularly.

[13] For example, see Beirness, 2018 and Beirness & Beasley, 2017.

One additional indicator is to specifically report on polycategory, THC and alcohol, and THC and other drug use when reviewing the toxicology data. Canada needs to conduct roadside surveys more often and in more jurisdictions to significantly improve our knowledge about who drives impaired by what substance or substances and when.

Data Sources and Potential Limitations

The primary limitation of roadside surveys is financial. Costs include paying for law enforcement officers' time to manage the safety and intake of drivers on roads, costs to operate at multiple locations and costs for running toxicology tests on oral fluid samples. Despite the potential value of roadside surveys, not all jurisdictions have shown an interest or been able to obtain the funding needed to conduct surveys.

Another limitation to roadside surveys is the use of oral fluid instead of a blood sample, which would be ideal for testing. Toxicology tests on blood samples provide broader information and detect more substances than tests on oral fluid or urine samples, limiting roadside survey data to what oral fluid tests can detect. Nonetheless, collecting oral fluid samples is the least invasive and safest method to obtain substance use data from drivers.

Other potential limitations include collecting data on consumption methods as drivers may not remember or be aware of substances that cause impairment (e.g., over-the-counter medications) or may not admit to taking substances (e.g., illicit substances). Some law enforcement agencies have been hesitant to direct traffic for research purposes. Surveys are frequently conducted in cities and sometimes at specified times and days (e.g., not during rush hours), which limits the ability to generalize results.

Identifying Emerging Risks on the Road

Roadside surveys provide a snapshot of driver behaviour — who is driving and the extent of their alcohol or drug use. For example, surveys in British Columbia revealed increases in drug use among older drivers between 2012 and 2018 (Beirness, 2018). The presence of drugs was 1.7 times higher in people aged 55–65 years and 13 times higher in people 66 years and older, compared with these same age groups in 2012. Furthermore, tetrahydrocannabinol (THC) was present in all drivers 66 years and older. These data tell us there is a possible shift happening with older drivers, particularly with cannabis use, that needs to be understood better. Without these surveys, it could take much longer and several crashes later to see emerging risks and address them.

Implementation Challenges and Suggestions

Most experts in the field of impaired driving agree that conducting roadside surveys are critical to better understanding the prevalence of DID. Historically, funding was provided by a combination of organizations, such as federal and provincial agencies, research organizations, public safety groups and law enforcement. To boost the use of roadside surveys, the Advisory Committee suggests a formal funding mechanism be established to begin collecting roadside survey data across all jurisdictions regularly (e.g., every two to five years). Additionally, a nationally standardized set of methods and data collection (e.g., time of day, questionnaire, procedure, etc.) should be used to allow for comparisons across jurisdictions, such as *A Roadside Survey Protocol for Determining the Prevalence of Alcohol and Drug Use by Drivers* (Boase, 2012).

Roadside Surveys: Commercial Vehicle Operator Data

Like passenger roadside surveys, survey data collected from commercial operators (drivers) offers one of the best methods of determining the prevalence of potential DID among this group. The Advisory Committee recommends four new indicators for measuring the prevalence of impairing drugs present in commercial drivers (Table 9).

Table 9: Indicators recommended to measure the prevalence of potentially impairing drugs present in commercial drivers

Data source	Indicator
New[a]	THC use (oral fluid) among drivers • Number and percentage of drivers who tested above 25 ng/ml for THC Date, day of the week and time when driver was stopped • Number and percentage of drivers who tested positive for different substance categories by time periods (e.g., midnight to 3 a.m.), day of the week and date Substance category[b] and polysubstance use among drivers • Number and percentage of drivers who tested positive for different substance categories • Number and percentage of drivers who tested positive for polysubstance, THC and alcohol, or THC and other drugs Driver demographics[c] • Number and percentage of drivers who tested positive for different substance categories[b] across vehicle and trip characteristics[d] • Number and percentage of drivers who tested positive by different substance categories across sex (or gender where possible) • Number and percentage of drivers who tested positive for different substance categories across standardized age groups[e]

[a]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[b]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[c]Standardized data collection methods and criteria used across Canada.

[d]Characteristics might include type of vehicle, type of goods being carried, among others.

[e]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

Objectives and Need

Certain occupations are associated with increased risk of substance use and potential impairment due to their employment conditions or work environment, including drivers in the commercial vehicle industry (Frone, 2006; Girotto et al., 2014). Some of the contributing conditions include shift work, driver fatigue, peer pressure, minimal supervision and irregular sleep settings and patterns. Additionally, less is known about drug use compared with alcohol use across commercial drivers, particularly in Canada. However, research in other countries shows there are differences in use and reasons for use (Davey et al., 2007; Girotto et al., 2014).

Typical Canadian data sources, such as injury or fatality data, may not represent a sufficient picture of DID among commercial drivers because the size and weight of many commercial vehicles reduces the likelihood of these drivers being injured or killed in collisions (Poulsen et al., 2014; Reguly et al.,

2014). Another option for measuring prevalence and risks is to examine roadside survey data from commercial drivers; however, these data are not collected in Canada. The lack of these data represents a significant gap in understanding substance use patterns among a group of drivers that tend to present a higher risk of serious injury or death to other road users (Reguly et al., 2014).

Collecting data on the four recommended indicators would improve the understanding of the prevalence of DID among commercial drivers, the context in which it occurs and the potential effect these drivers might have on DID. If the data can help identify potential areas for improvement, particularly in the development of educational materials and other resources that could help prevent DID incidents, these data might also benefit commercial operators in their efforts to reduce risks and mitigate costs.

Data Sources and Potential Limitations

As with passenger vehicle roadside surveys, data from commercial roadside surveys would be obtained directly from drivers. These surveys would have the same limitations as passenger vehicle roadside surveys (i.e., costs, oral fluid tests, reporting on consumption methods). However, there may be different implementation challenges to conducting surveys with commercial vehicles.

Performance Enhancing Drugs: Are Commercial Drivers at Greater Risk?

Although not enough is known about substance use among commercial drivers, there are concerns from the available data. In 2019, a systematic review of 51 studies conducted in Canada, the United States and other countries found that 1 in 5 truck drivers used amphetamines and 1 in 50 used cocaine, both central nervous system stimulants (Dini et al., 2019). In 2020, there were 55,453 drug and alcohol violations from pre-employment testing, random testing, post-accident testing and reasonable suspicion among American commercial drivers (Federal Motor Carrier Safety Administration, 2020). Drug violations accounted for 98% (54,262) of these violations, with cannabis, cocaine and methamphetamines being the top three drugs.

The effect in Canada could be different and possibly more nuanced if factors such as greater extent of winter driving conditions, remote driving trips or variable geography are considered. Without information about what is happening with commercial drivers in Canada, Canadians do not know what factors could be affecting them, what the best approaches are to supporting them if their work context contributes to these risks or how to reduce crashes involving potential drug use.

Implementation Challenges and Suggestions

One implementation challenge could be the potential implications of handling a commercial driver found to be impaired during the survey. In passenger vehicle roadside surveys, if a driver is found to be impaired, to ensure an accurate and voluntary study, these drivers are not detained nor reprimanded by law enforcement. Instead, they are provided with an alternate way home (e.g., taxi, sober passenger) and leave their vehicle at the location to be picked up later. Although the same procedure could be applied to commercial drivers, questions remain about leaving the vehicle and cargo, moving it to a safe location for later pickup and how to contact the company about the situation.

Aspects that could mitigate these issues include that samples are sent to labs for testing, so results would not be available at the time of the stop. Information that could identify drivers are not

collected, thus it is not possible to attribute the results to a specific driver. If a driver were found to be impaired, commercial roadside surveys could also require more involvement by commercial compliance law enforcement officers. Their expertise could be used to help manage potential impaired situations in the same way they manage collisions or other commercial vehicle road concerns (e.g., safety checks).

Despite these challenges, data on potential impaired driving among commercial drivers are needed to advance Canada's understanding or to address potential issues. The Advisory Committee recommends that national standardized methods and data collection (e.g., time of day, questionnaire, licence class, classification/ differentiation from American drivers operating in Canada, etc.) be developed and used to allow jurisdictions to compare data.[14] It could be modelled on the roadside survey protocol developed for passenger vehicle roadside surveys (see Boase, 2012).[15] During the development of a commercial roadside survey, the commercial driving industry should be consulted for their input and suggestions to ensure any potential concerns or challenges are addressed. Once developed, it is recommended that funding be provided to pilot test the protocol and determine the future role of commercial roadside surveys.

[14] A protocol for commercial roadside surveys is in development but was not yet publicly available at the time of publishing this report.

[15] See Boase, 2012.

Motor Vehicle Divisions: Driver Record Data

Motor vehicle divisions monitor and manage information on individuals' driving records. As such, these agencies house various data that are already connected to a driver, including driving offences, medical reviews and driver demographics. The Advisory Committee recommends five new indicators for measuring drivers and DID-related offences (Table 10).

Table 10: Indicators recommended for motor vehicle divisions to measure drug-impaired driving (DID) offences connected to drivers.

Data source	Indicator
New[a]	Driver demographics • Number and percentage of drivers with DID records across sex (or gender where possible) • Number and percentage of drivers with DID records across standardized age groups[b] Administrative sanctions[c] issued to drivers • Number of DID administrative sanctions issued out of the total number of licensed drivers by jurisdiction DID criminal convictions reported for drivers • Number of DID convictions recorded out of the total number of licensed drivers by jurisdiction Recidivism:[d] DID administrative sanctions among drivers • Number of drivers issued any administrative sanctions two or more times out of all drivers issued sanctions by jurisdiction • Number of drivers issued DID administrative sanctions two or more times out of all drivers issued DID sanctions by jurisdiction • Number of drivers issued alcohol administrative sanctions two or more times out of all drivers issued alcohol sanctions by jurisdictions Recidivism: DID criminal convictions among drivers • Number of drivers issued any impaired-driving criminal convictions two or more times out of all drivers issued convictions by jurisdiction • Number of drivers issued DID criminal convictions two or more times out of all drivers issued DID convictions by jurisdiction • Number of drivers issued alcohol criminal convictions two or more times out of all drivers issued alcohol convictions by jurisdiction

[a]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[b]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

[c]Sanctions are specific to provincial or territorial jurisdictions and often include licence suspensions, fines and vehicle impoundment. Law enforcement can apply these sanctions in different combinations with or without laying criminal charges.

[d]Recidivism rates are the extent to which an individual repeats the same crime.

Objectives and Need

Provincial and territorial motor vehicle divisions (licensing agencies) do not collect direct DID incident data or report on them, but they typically receive some of these data. For example, law enforcement, judicial systems and sometimes medical practitioners report DID driver suspensions, fines, convictions and (to a certain extent) medical information about drivers to motor vehicle offices. Importantly, these data are linked with the driver, including basic driver demographics, and will follow the driver for a certain period. For this reason, data collected from motor vehicle divisions using the recommended indicators are likely to be a more complete record of a driver's

characteristics and history within that jurisdiction. Interconnected data provide a more holistic perspective of individuals involved in DID and, with this knowledge, the potential to improve responses to DID.

Collecting data from driver records could provide new insights into DID. For example, it might be possible to explore whether DID administrative sanctions, criminal convictions, a combination of both or none have different or any deterring effects on individuals. (Some studies have explored the effect of administrative sanctions. However, a national approach using standardized measures across motor vehicle divisions regularly could establish baselines and measure trends over time.) It might also be possible to expand knowledge about driver demographics, such as whether different types of penalties have different effects across age groups or sex and gender. Driver record data could also provide greater insights into general recidivism rates by examining potential commonalities (e.g., age, type of penalty applied) of repeat offences or high-risk drivers, especially as recidivism is not typically tracked.

Reducing Repeat Impaired Driving

Beyond using motor vehicle division data to gain insights into sanctions, convictions and recidivism rates, these data could also help Canadians understand the effectiveness of impaired-driving awareness programs and potentially improve the situation. In some jurisdictions, drivers receiving suspensions or convictions could be required to participate in a program before their licence will be reinstated. However, for a program to be effective, it must be designed to respond to the individual driver, their needs and any potential risks.

A report by Health Canada (2004) found greater reductions in impaired-driving rates among those whose licence reinstatement was contingent on completing a program matched to the driver's level of risk. These programs included education, remedial lessons, opportunities to learn about one's own substance use issues, strategies to avoid impaired driving and therapy or other supports. Motor vehicle data on sanctioned drivers using these programs could help policy makers, public safety practitioners, health practitioners and harm reduction experts working to help high-risk drivers and improve road safety (Health Canada, 2019; McKiernan & Fleming, 2017; Meister et al., 2018).

Data Sources and Potential Limitations

Since motor vehicle divisions receive their DID data from other sources, they can be delayed by an investigation or court case. These can take more than a year and are generally longer than typical annual data collection periods. It could also take time to sort out data if the driver file is complicated (e.g., invalid licence, penalties applied in other jurisdictions, impersonating another individual, multiple infractions applied). Furthermore, most offences are removed from records after a certain period (e.g., six years), limiting the look-back period.

Another limitation to the data is motor vehicle divisions do not receive details, such as drug type. This means that driver record data will be limited to high level information, such as a record of drug impairment or alcohol impairment. Likewise, many of the reporting systems feeding into motor vehicle divisions only allow indicating either drug or alcohol impairment but not both. This means that drug impairment is likely to be underreported as law enforcement, coroners and MEs, and prosecutors tend to pursue the alcohol investigation or charges over drugs.

While driver record data are an important source to monitor recidivism rates, measuring recidivism accurately has some challenges. To determine if an offence is truly a repeat of the same action,

certain details are needed for comparison. For example, if there is more than one DID offence on a driver's record, are they all related to the same drug or was one offence due to cannabis and another due to ecstasy? Is a $1,000 fine a stronger deterrent than a $500 fine or vehicle impoundment? While individual studies have examined deterrent effects, more details collected regularly across jurisdictions and nationally through motor vehicle agencies can help establish baselines and trends. It could also identify links between potential factors that could explain repeat offences by some drivers and not others. As such, driver records might only be able to reveal high level implications in recidivism if details are not recorded.

Driver record data will also reflect jurisdictional differences, such as fine amounts, types of administrative sanctions, application of sanctions or charges and conviction rates. This means that caution must be used when examining and comparing data from motor vehicle divisions.

Implementation Challenges and Suggestions

One of the key implementation challenges to collecting and reporting data from motor vehicle divisions is the lack of detail they receive from agencies that provide the data. As such, the Advisory Committee suggests data collection and reporting from motor vehicle agencies begin at a high level, such as the number of sanctions issued in broad categories (e.g., suspensions, fines, vehicle impoundment), rather than attempt to focus on specific analyses. Knowledge gained from these data could then guide future development and implementation of indicators, and potentially augment data details provided to these agencies.

Although recidivism rates can be difficult to track, they are important. Even tracking general recidivism rates could improve knowledge on the effectiveness of deterrence measures and provide deeper insights into potentially high-risk impaired drivers that we do not have.

Despite jurisdictional differences, which makes comparing data challenging, the data could provide insights into practices that are more effective at reducing DID and an opportunity to share the knowledge between jurisdictions.

When addressing issues about delays and timing of driver record data, it will be important to consider different time frames and approaches for measuring changes for some of the recommended indicators. For example, it may be helpful to track beyond the annual time frame, such as tracking drivers beyond five years. Overall, data from motor vehicle divisions could be more consistent and complete as well as offer opportunities to connect with a larger number of driver demographics.

National Surveys: Driver Knowledge, Attitudes, Perceptions and Self-reported Behaviour Data

To effectively address and reduce DID, Canada needs to have insights into driver knowledge about DID (e.g., are people driving in Canada aware that certain medications might cause impairment?), what their attitudes are toward the issue (e.g., do they think they are a better driver after consuming cannabis?), how they perceive DID (e.g., do they think police cannot tell whether someone has consumed a substance?) and what their own behaviours are (e.g., how long should they wait compared with how long they think others should wait to drive after consuming a substance?). Measuring national self-reported driver information about DID needs a variety of indicators across these four categories (Table 11).

Table 11: Recommendations for measuring driver knowledge, perceptions and self-reported behaviour about drug-impaired driving

Data source	Indicator
New[a]	Driver knowledge, attitudes, perceptions and self-reported behaviour • Various indicators (e.g., driver demographics, substances consumed, driving within two hours of consumption, knowledge about impairment, passenger of impaired drivers)

[a]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

Objectives and Need

Most of the indicators recommended across other agencies measure impaired driving based on incidents, yet tell us little about driver knowledge, attitudes, perceptions and self-reported behaviours related to DID. To develop tools to educate and help prevent DID, it is necessary to understand why certain drivers engage in these dangerous driving habits and why others do not. Is it because some drivers have inaccurate knowledge about drug impairment? Do some believe they will not be caught? Do some drivers not perceive the risks? Are some aware of the risks but choose to drive anyways? Conducting research with drivers is the primary way to find answers to these questions.

Although there are various methods of collecting these data (e.g., interviews, focus groups), surveys are the most common approach because of their relative ease in collecting large amounts of data. Some surveys are conducted before and after an intervention (e.g., impaired-driving awareness campaign) to measure whether the intervention affected driver knowledge, perceptions or behaviour. Other surveys have been used to measure trends in driver knowledge and behaviour and are conducted at regular intervals typically using the same questions.

Surveys are valuable for conducting relatively quick examinations of DID issues, while interviews and focus groups are important to examining reasons and decision making among drivers. Both can be used to develop interventions targeted at potential issue areas, increase the effectiveness of efforts and improve efficiencies and costs in managing DID. As such, a national standardized survey (and focus groups and interviews when possible) on DID that includes indicators across the above four categories should be developed and conducted regularly.

Data Sources and Potential Limitations

Until recently, only one national survey regularly collected limited data on self-reported DID behaviour, the Canadian Alcohol and Drugs Survey (CADS)[16] as well as some questions in the Canadian Student Tobacco, Alcohol and Drugs Survey. Questions on DID in these surveys are valuable (e.g., driving after consuming alcohol or drugs, being a passenger with someone who has consumed alcohol or drugs), yet few questions are asked and much more information is needed (e.g., details on polysubstance use, use of prescriptions, knowledge about risks when driving after consuming drugs). As Canada was preparing to legalize and regulate cannabis, additional surveys were launched to examine cannabis use and included self-reported DID behaviour. For example, the National Cannabis Survey only collects some impaired-driving data at certain intervals and the Canadian Cannabis Survey over samples individuals who consume cannabis, so the results may not be representative of the population. Both these surveys have helped better understand driver and passenger behaviour related to cannabis, as well as cannabis- and alcohol-impaired driving, yet broader and more in-depth information on impaired driving is needed. Additionally, these surveys only examined cannabis and they may not continue to be conducted. Additionally, none of these surveys specifically explored impaired driving as the primary focus, and many additional data should be collected to better understand public perceptions, attitudes, knowledge and self-reported behaviour. Beyond these surveys, there have been studies that have also collected self-reported DID behaviour from time to time.[17]

Cannabis and Driving: Opportunities to Educate

Studies conducted with youth and young adults reveal misperceptions and driving behaviour concerns related to cannabis (Health Canada, 2019; McKiernan & Fleming, 2017; Meister et al., 2018). For instance, some youth report alternating consuming cannabis and alcohol because they believe it is less impairing and safer, but combined use increases impairment. Some also report being a passenger with a driver who has used cannabis because some believe it is safer or less dangerous than alcohol impairment. Many young adults also believe that cannabis makes them better drivers.

Collecting these data are critical to understanding why some people drive after consuming drugs, especially high-risk groups like youth. The information helps us to design tailored prevention and education resources and policies that target misperceptions and gaps in driver knowledge.

Another challenge with surveys is that some lack internal and external standardization of wording and definitions. For example, it is difficult to interpret survey results about cannabis and driver behaviours or impairment risks without clarification on the dosage (e.g., THC concentration), method of consumption (e.g., inhaling, eating) or time between consuming cannabis and driving (e.g., within two hours, three hours, four hours or more). In general, limited self-reported DID data are collected from drivers in Canada.

Implementation Challenges and Suggestions

Without data on driver knowledge, attitudes, perceptions and self-reported behaviour, it is not possible to develop targeted tools and resources to educate drivers on and prevent DID. To ensure that Canada continues to collect regular and consistent publicly available data on drives, the Advisory Committee recommends that, at a minimum, national surveys such as CADS continue to

[16] Before 2019, the CADS was the Canadian Tobacco, Alcohol and Drugs Survey (CTADS).

[17] For example, see Asbridge, et al., 2015.

collect driver self-reported DID data. As a national survey with consistent data collection methods, it is a key source to maintaining trend data on the issue.

Ideally, however, a separate national survey focused on substance use and driving should be developed and maintained regularly to continually monitor the issue at a more in-depth level. One consideration may be to co-ordinate through a national organization (e.g., CCMTA) with funding from jurisdictions proportionate to their licensed driver populations. Part of the development should also consider creating standardized definitions where possible. A separate survey will allow for the examination of a variety of DID-specific issues and possible solutions, as well as be useful in examining future DID issues.

Conclusion and Moving Forward

Canada has an incomplete picture of its DID problem. Although organizations collect some important and useful data on the issue, these data are primarily from criminal and death perspectives, and they miss critical information from multiple other sources. Broadening the scope of data collection (e.g., hospital data, roadside survey data) and improving the methods used to collect them (e.g., standardization, systematization) will provide substantially more insight and help policy makers, decision makers, and road and public safety practitioners in their ongoing work to reduce DID. The Advisory Committee has recommended 34 indicators that could make significant improvements to the way Canada understands and addresses DID.

These indicators are not comprehensive, but they offer a solid foundation to start from. Many others could and should be considered (e.g., more data on various road users affected by DID, such as passengers, cyclists and pedestrians), Although each of the new or revised indicators are essential to implement, the Advisory Committee recognizes that not everything can be implemented at the same time. A starting point could be to explore and implement the indicators for measuring injury data in hospitals and consider piloting a commercial roadside survey to establish baseline data. A national standardized public survey specifically on impaired driving could also be conducted regularly (e.g., every two years) to better understand self-reported impaired-driving behaviour. These areas have little or no existing data collection but represent crucial and potentially large information gaps in DID. For existing indicators, a feasible starting point could be to improve standardizing and systematizing law enforcement and coroner and ME data. This could be done by national committees or other collaborative bodies.

There are some challenges to implementing some of the proposed indicators. The Advisory Committee has provided possible solutions on how to move forward. Critical among the challenges is to develop a data-sharing platform or process between agencies to reduce working in silos, duplicating work and harmonizing collaborative efforts to reduce DID. There are Canadian and international models (e.g., DataBC or New Zealand systems) that could offer solutions to centralizing and sharing data that could benefit various agencies in Canada. Developing systems to share data in this way has the potential to address other issues, including streamlining activities to reduce costs and share resources.

Opportunities exist for using lessons learned from experiences in reducing alcohol-impaired driving. Many of the advances on this issue over the years are in large part due to improved data collection and reporting. These improvements with alcohol-impaired driving suggest that, if similar efforts are put forward for DID, similar effects could be seen on DID. Nonetheless, data collection for alcohol-impaired driving also needs further work and could borrow from some of the measures in this report. Therefore, future work should consider conducting a similar national expert consultative process to identify and enhance existing indicators for measuring alcohol-impaired driving.

The 34 indicators are intended to identify fundamental data that will support the work of policy makers, decision makers, and road and public safety practitioners in better understanding and reducing the negative effects of DID. The Advisory Committee developed them to be standardized across agencies, jurisdictions and nationally through recommended common collection and reporting criteria. As systems improve, the data should be scaled up in detail, and the indicators should be broadened to include more DID data in the future.

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Appendix A: Developing the Indicators — Method

The development of the DID indicators was a multiyear project involving more than 200 experts from across Canada and from numerous organizations, agencies and businesses. Phase 1 of the project began with a national consultation to identify existing measures, recommended measures and potential barriers and solutions to collecting DID data. The full description and results of Phase 1 are described in the report, *Developing National Indicators for Drug-impaired Driving in Canada: Practices in Detection, Monitoring and Reduction* (Meister & De Moor, 2020). Phase 2 of the project involved forming an expert Drug-Impaired Driving Indicators Advisory Committee, developing the indicators and reporting the results.

Forming the DID Indicators Advisory Committee

After completing the national consultations, CCSA invited various experts to join the Advisory Committee. Members did not need to be part of the original consultations and were considered from all areas. It was difficult to select individuals from among the many high-quality DID experts across Canada. Members were selected with the following considerations:

- Most members worked directly with primary data (i.e., collected raw data) and could advise on collection and reporting processes,
- The combined group of experts would sufficiently represent various agencies and organizations involved in DID,
- There would be a reasonable representation of different provinces and territories, and
- Experts could be available for consultations for two years. (However, due to the pandemic, the Advisory Committee graciously made themselves available for one year more than their original commitment.)

Three years is a long commitment, and some of the experts CCSA initially invited changed positions or changed job responsibilities. While this required some to leave the Advisory Committee, they were able to recommend other experts from within their organization to take their place. Overall, there were only a few changes, and the final Advisory Committee was involved throughout most of the process.

The Advisory Committee met in person for a two-day meeting in spring 2019, then online quarterly until spring 2020. With the pandemic, the second two-day in-person meeting scheduled for the spring was cancelled and was replaced by monthly online meetings beginning in fall 2020 through to spring 2021.

Developing the Indicators

During the initial in-person meeting, Advisory Committee members worked together to determine how to develop a set of national indicators to measure DID. To guide the recommendations, the Advisory Committee reviewed the results of the national consultations and brainstormed ideas on potential indicators, data needs and pressing issues related to DID. CCSA also reviewed studies and other literature for more information and work related to measuring impaired driving. After discussion, more than 70 possible indicators were suggested.

To guide the inclusion and exclusion of indicators, as well as their development, the Advisory Committee prioritized DID needs and issues to establish the core set of objectives that the indicators should meet. Several priorities were discussed; however, a handful stood out as essential to forming foundational knowledge and had strong potential to help efforts to address DID. To better

understand and address DID, an indicator should provide data that meets one or more of the following four objectives:

- Measures the prevalence of DID,
- Measures the impact or harms of DID,
- Measures effectiveness of efforts to reduce DID, or
- Increases knowledge of DID issues.

In addition to these core objectives, data from the indicator should also meet basic data collection and reporting requirements (e.g., timely, feasible to collect, relatively standardized). These considerations were particularly important when the Advisory Committee was considering indicators for data not previously collected (e.g., hospital data).

The selection and development of indicators was an iterative process and took more than a year to deliberate and refine. Indicators were modified, added or deleted throughout the process. To ensure the indicators were clearly understood and defined, the Advisory Committee identified specific sources for collecting data (e.g., DRE reports), possible data collection risks (e.g., duplication of data), limitations of any data (e.g., timeliness of toxicology tests) and suggestions for standardization across agencies (e.g., using the age categories defined by CCMTA), among others.

Once the indicators were largely selected and defined, the Advisory Committee reviewed them again to ensure collection and reporting criteria were relatively uniform across agencies (e.g., using DRE drug categories) and jurisdictions. In addition to multiple reviews by the Advisory Committee, this report underwent external review by experts in DID and internal review through CCSA's scientific review process.

Reporting the Results

Developing indicators alone would not be sufficient information for policy makers, decision makers, and road and public safety practitioners to be able to implement. To be useful and clear at agency, jurisdictional and national levels, the indicators were divided by each data source area for this report. (In the case of law enforcement, an additional consideration for resource use given the heavy burden on this agency). Each agency or organization collecting these data have unique advantages and limitations in being able to implement the indicators. Despite the division of the indicators into respective categories for ease of reference and implementation, a robust approach to DID should consider the indicators together through a holistic response across agencies and jurisdictions.

Appendix B: National Drug-Impaired Driving Indicator Recommendations (detailed list)

Law Enforcement: Incident Data

Data source	Indicator
Existing	Driver demographics • Number and percentage of drivers criminally charged or sanctioned (e.g., fined) by substance category (where available) across sex (or gender where possible) • Number and percentage of drivers criminally charged or sanctioned by substance category (where available) across standardized age groups[a] Tetrahydrocannabinol (THC) blood concentration levels among tested drivers • Number and percentage of drivers whose toxicological results fall across different established per se limits[b] for THC
Adjusted	Substance category[c] and polycategory use among drivers • Number and percentage of drivers who tested positive for different substance categories • Number and percentage of drivers who tested positive for polycategory, THC and alcohol, or THC and other drugs
New[d]	Drivers who have received administrative sanctions • Number of drivers who received DID administrative sanctions per capita and per licensed driver by jurisdiction • Number of drivers who received DID administrative sanctions Drivers recommended for criminal charge or charges[e] • Number of drivers recommended for DID criminal charge or charges per capita and per licensed driver by jurisdiction • Number of drivers recommended for DID criminal charge or charges Approved drug screening equipment (ADSE) use and results • Number and percentage of agencies or units that conduct ADSE tests • Number and percentage of ADSE detections (substance present) out of all ADSE results (detections plus no detections) Standardized field sobriety test (SFST)[f] results • Number and percentage of SFST poor performances (likely impairment) out of all SFST results (poor plus satisfactory performances)

Law Enforcement: Resource Use Data

Data source	Indicator
Existing	Trained frontline[g] officers • Number and percentage of frontline officers trained in SFST • Number and percentage of frontline officers trained in the use of ADSE Certified Drug Recognition Expert (DRE) officers • Number of officers certified as a DRE reported by province and territory
New[d]	Requests for DREs • Number and percentage of requests for DREs filled out of all requests for DREs (requests filled plus not able to be filled) Demands for blood (testing) • Number and percentage of demands for blood testing conducted out of all requests for blood demands (demands conducted plus not able to be conducted)

Judicial: Court Data

Data source	Indicator
New[d]	Disposition type (court decision) among drivers • Number and percentage of different court dispositions out of all DID cases Sentencing (type and quantum[h]) data on drivers • Number and percentage of fines issued out of all DID cases • Number and percentage of nonmonetary sentences issued out of all DID cases (e.g., probation, community work, prison) • Number and percentage of driving suspensions issued out of all DID cases Driver demographics • Number and percentage of drivers sentenced for DID across sex (or gender where possible) • Number and percentage of drivers sentenced for DID across standardized age groups[a]

Coroners and Medical Examiners: Fatality Data

Data source	Indicator
Existing	Driver demographics • Number and percentage of fatally injured drivers who tested positive for different substance categories across sex (or gender where possible) • Number and percentage of fatally injured drivers who tested positive for different substance categories across standardized age groups[a]
Adjusted	Substance category[c] and polycategory use among drivers • Number and percentage of fatally injured drivers who tested positive for different substance categories • Number and percentage of fatally injured drivers who tested positive for polycategory, THC and alcohol or THC and other drugs

Hospital: Injury Data

Data source	Indicator
New[d]	Injury data among drivers • Number and percentage of injured drivers involved in collisions who visit hospitals and test positive for substances Substance category[c] and polycategory use among drivers • Number and percentage of hospitalized drivers who test positive for different substance categories • Number and percentage of hospitalized drivers who test positive for polycategory, THC and alcohol or THC and other drugs THC use (preferably blood test) among drivers • Number and percentage of hospitalized drivers who fall across the different established per se limits[b] for THC or in combination with alcohol Driver demographics • Number and percentage of hospitalized drivers who test positive for different substance categories across sex (or gender where possible) • Number and percentage of hospitalized drivers who test positive for different substance categories across standardized age groups[a.]

Roadside Surveys: Passenger and Light-Duty Vehicle Operator Data

Data source	Indicator
New[d]	THC use (oral fluid) among drivers • Number and percentage of drivers who test above 25 ng/ml for THC Date, day of the week and time when driver was stopped • Number and percentage of drivers who tested positive for different substance categories[c] by time periods (e.g., midnight to 3 a.m.), day of the week and date Driver demographics[i] • Number and percentage of drivers who tested positive by different substance categories across sex (or gender where possible) • Number and percentage of drivers who tested positive for different substance categories across standardized age groups[a] Substance category[c] and polysubstance use among drivers • Number and percentage of drivers who tested positive for different substance categories • Number and percentage of drivers who tested positive for polysubstance, THC and alcohol, or THC and other drugs

Roadside Surveys: Commercial Vehicle Operator Data

Data source	Indicator
New[d]	THC use (oral fluid) among drivers • Number and percentage of drivers who tested above 25 ng/ml for THC Date, day of the week and time when driver was stopped • Number and percentage of drivers who tested positive for different substance categories by time periods (e.g., midnight to 3 a.m.), day of the week and date Substance category[c] and polysubstance use among drivers • Number and percentage of drivers who tested positive for different substance categories • Number and percentage of drivers who tested positive for polysubstance, THC and alcohol, or THC and other drugs Driver demographics[i] • Number and percentage of drivers who tested positive for different substance categories[c] across vehicle and trip characteristics[j] • Number and percentage of drivers who tested positive by different substance categories across sex (or gender where possible) • Number and percentage of drivers who tested positive for different substance categories across standardized age groups[a]

Motor Vehicle Division: Driver Record Data

Data source	Indicator
New[d]	Driver demographics • Number and percentage of drivers with DID records across sex (or gender where possible) • Number and percentage of drivers with DID records across standardized age groups.[a] Administrative sanctions[k] issued to drivers • Number of DID administrative sanctions issued out of the total number of licensed drivers by jurisdiction DID criminal convictions reported for drivers • Number of DID convictions recorded out of the total number of licensed drivers by jurisdiction Recidivism[k] DID administrative sanctions among drivers • Number of drivers issued any administrative sanctions two or more times out of all drivers issued sanctions by jurisdiction • Number of drivers issued DID administrative sanctions two or more times out of all drivers issued DID sanctions by jurisdiction • Number of drivers issued alcohol administrative sanctions two or more times out of all drivers issued alcohol sanctions by jurisdictions Recidivism: DID criminal convictions among drivers • Number of drivers issued any impaired-driving criminal convictions two or more times out of all drivers issued convictions by jurisdiction • Number of drivers issued DID criminal convictions two or more times out of all drivers issued DID convictions by jurisdiction • Number of drivers issued alcohol criminal convictions two or more times out of all drivers issued alcohol convictions by jurisdiction

National Survey: Public Data

Data source	Indicator
New[d]	Driver knowledge, attitudes, perceptions and self-reported behaviour • Various indicators (e.g., driver demographics, substances consumed, driving within two hours of consumption, knowledge about impairment, passenger of impaired drivers)

[a]Recommend standardization be based on the Canadian Council of Motor Transportation Administrators age groups (i.e., 16–19, 20–24, 25–34, 35–44, 45–54, 55–64, and 65 years and older).

[b]Per se limits refer to the legally allowed concentration limits for different impairing substances. THC has three limits depending on the context.

[c]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[d]New indicators include nonexistent or not widely used indicators (e.g., some agencies may track some of these data).

[e]Charges by law enforcement agencies only (i.e., does not include court charge data).

[f]SFSTs are a series of behavioural tests (i.e., one-leg stand, walk-and-turn and horizontal gaze nystagmus) to detect impairment, but do not identify substance type. Although the tool was originally developed to detect impairment by alcohol, studies support its use as a screening tool for impairment by drugs in some of the other substance categories (e.g., CNS stimulants, CNS depressants, cannabis or narcotic analgesics) (Papafotiou, Carter, & Stough, 2005; Porath-Waller & Beirness, 2014).

[g]Frontline officers include uniformed police officers performing general duties, patrol or both, and whose duties include stopping motor vehicles for enforcement purposes, as well as uniformed officers assigned to full-time traffic services duties.

[h]Quantum refers to the court's punishment, which can be a fine, the length of a sentence or both.

[i]Standardized data collection methods and criteria used across Canada.

[j]Characteristics might include type of vehicle, type of goods being carried, among others.

[k]Sanctions are specific to provincial or territorial jurisdictions and often include licence suspensions, fines and vehicle impoundment. Law enforcement can apply these sanctions in different combinations with or without laying criminal charges.

[l]Recidivism rates are the extent to which an individual repeats the same crime.

Appendix C: National Drug-Impaired Driving Indicators: Summary

Law enforcement: Incident data
Driver demographics
Tetrahydrocannabinol (THC) blood concentration levels among tested drivers
Substance category[a] and polycategory use among drivers
Drivers who have received administrative sanctions
Drivers recommended for criminal charge or charges[b]
Approved drug screening equipment (ADSE) use and results
Standardized field sobriety test (SFST)[c] results

Law enforcement: Resource use data
Trained frontline[d] officers
Certified Drug Recognition Expert (DRE) officers
Requests for DREs
Demands for blood (testing)

Judicial: Court data
Disposition type (court decision) among drivers
Sentencing (type and quantum[e]) data on drivers
Driver demographics

Coroners and medical examiners: Fatality data
Driver demographics
Substance category[a] and polycategory use among drivers

Hospitals: Injury data
Injury data among drivers
Substance category[a] and polycategory use among drivers
THC use (preferably blood test) among drivers
Driver demographics

National survey: Public data
Driver knowledge, attitudes, perceptions and self-reported behaviour

Roadside surveys: Passenger and light-duty vehicle operator data
THC use (oral fluid) among drivers
Date, day of the week and time when driver was stopped
Driver demographics[f]
Substance category[a] and polysubstance use among drivers

Roadside surveys: Commercial vehicle operator data
THC use (oral fluid) among drivers
Date, day of the week and time when driver was stopped
Substance category[a] and polysubstance use among drivers
Driver demographics[f]

Motor vehicle divisions: Driver record data
Driver demographics
Administrative sanctions[g] issued to drivers
DID criminal convictions reported for drivers
Recidivism:[h] DID administrative sanctions among drivers
Recidivism: DID criminal convictions among drivers

Note. This table does not include the detailed breakdown and explanation of the individual indicators. These are found in the report.

[a]Categories are defined as the seven used by Drug Recognition Experts (Royal Canadian Mounted Police, 2018): central nervous system depressants, inhalants, dissociative anaesthetics, cannabis, CNS stimulants, hallucinogens and narcotic analgesics.

[b]Charges by law enforcement agencies only (i.e., does not include court charge data).

[d]Frontline officers include uniformed police officers performing general duties, patrol or both, and whose duties include stopping motor vehicles for enforcement purposes, as well as uniformed officers assigned to full-time traffic services duties.

[f]SFSTs are a series of behavioural tests (i.e., one-leg stand, walk-and-turn and horizontal gaze nystagmus) to detect impairment, but do not identify substance type. Although the tool was originally developed to detect impairment by alcohol, studies support its use as a screening tool for impairment by drugs in some of the other substance categories (e.g., CNS stimulants, CNS depressants, cannabis or narcotic analgesics) (Papafotiou, Carter, & Stough, 2005; Porath-Waller & Beirness, 2014).

[e]Quantum refers to the court's punishment, which can be a fine, the length of a sentence or both.

[f]Standardized data collection methods and criteria used across Canada (footnote for roadside survey demographics).

[g]Sanctions are specific to provincial or territorial jurisdictions and often include licence suspensions, fines and vehicle impoundment. Law enforcement can apply these sanctions in different combinations with or without laying criminal charges.

[h]Recidivism rates are the extent to which an individual repeats the same crime.