



Corporate Actuarial and Advanced Analytics

Report on British Columbia's 2010 Impaired Driving Initiative (IDI)

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Key Findings

- Based on the data reviewed in this report, there is reasonable evidence to suggest that the Impaired Driving Initiative (IDI) has contributed to a reduction in the occurrence of fatal collisions in BC, and possibly to non-fatal collisions as well.
- The IDI was implemented in September 2010 by the Government of BC in an effort to deter drinking and driving and other careless driving behaviours (e.g., excessive speeding, unlicensed, and prohibited driving) and thereby reduce the number of motor vehicle collisions on BC roads.
- Data limitations prevented evaluation of the IDI impact on all collisions. However, using a before – after comparative analysis of IDI- and non-IDI-related fatal collisions, significant reductions in fatal collisions associated with the IDI were obtained. The estimated size of the IDI-related reduction was about 36 fatal collisions per year.
- Based on an estimated reduction of 36 fatal collisions per year, and an average fatal collision cost of \$232,000, ICBC claims savings are best estimated to be approximately \$8.4 million annually.

Executive Summary

On September 20, 2010, the BC Motor Vehicle Act (MVA) was amended by the Government to provide Police with access to a variety of new (or revised) sanctions for impaired driving, excessive speeding and other careless driving behaviours. The 2010 amendments had several components but the main ones included escalating immediate roadside prohibitions (IRPs) for alcohol-impaired drivers, new or revised vehicle impoundments and escalating fees and fines. For simplicity, the full complement of sanctions (alcohol- and non-alcohol-related) that came into force in September 2010 will be referred to in this report as the “Impaired Driving Initiative” (IDI).

A significant component of the IDI was the introduction of IRPs (for time periods beyond the 12- and 24-hour prohibitions already in force) for alcohol-impaired drivers. With the use on an approved blood alcohol content (BAC) screening device police officers are now permitted to issue escalating (3-, 7-, and 30-day) prohibitions for drivers caught driving with a BAC between .05% and .08%, and 90-day prohibitions to drivers with BACs of .08% or greater. Previously, police officers had to detain drivers and

take them to the police station for BAC testing before a 90-day prohibition (called an Administrative Driving Prohibition or ADP) could be issued. Unlike the new 90-day IRP, the 90-day ADP did not begin for 21 days from the offence date and, during this 21-day period, offenders could continue to drive on a temporary licence. With the introduction of the IRP, the 90-day prohibition starts immediately. The immediacy of this penalty is important for the deterrence theory of behaviour change which contends that, to be effective, the consequences of driving infractions must be perceived as immediate, severe, and certain.

The present study was undertaken to determine whether or not anticipated impacts of the IDI on motor vehicle collisions could be estimated (in terms of collision frequency and ICBC claims costs). The first step in this process was to determine whether or not appropriate control data would be available. Control data are required in order to estimate what would have happened to collision frequencies had the IDI not been implemented. Without such data, it would not be possible to say whether any observed changes in collision frequency over time were due to the IDI or to the many other factors (e.g., weather, other road safety enforcement initiatives, traffic density, road improvements, availability of public transportation, etc.). The IDI is a Provincial initiative which means that control data is not available within BC; everyone in the Province has already been exposed to the IDI. No suitable control data, or potential effect estimates based on similar interventions, were found from other jurisdictions.

A second step in determining the feasibility of evaluating the impact of the IDI relates to the availability of required outcome data, collision data in particular. In BC, collision data is available from two sources: the ICBC Claims system and the police-reported Traffic Accident System (TAS). Both of these sources have limitations for evaluating the impacts of initiatives such as the IDI. The Claims system is a better source than TAS for estimating the frequency of collision events in the Province, but does not capture information relating to contributing factors. Consequently, collisions associated with the behaviours targeted by the IDI cannot be identified. In contrast, collisions reported into TAS have contributing factor information, but the total numbers of collisions captured are small, less than a quarter of the counts reported in Claims. Furthermore, police are only required to report on collisions they attend, and attendance can be vulnerable to resource availability, allocation and other operational decisions and policies. As a result, with the exception of fatal collisions, which are almost always attended by police, TAS injury and property damage only collisions cannot be considered representative of the injury

and property damage collisions reported through Claims and, therefore, should not be used to generate effect estimates for Claims crash outcomes.

Based on these two limitations (lack of control data and limited collision data), it was concluded that the conduct of an overall evaluation of IDI impact was not feasible. Instead, a descriptive study was undertaken to review existing sources of data relevant to the effectiveness of the IDI. The main focus of this review was:

- To investigate and document information relating to the implementation, enforcement, communication and public awareness of the initiative;
- To investigate and document information relevant to the driver behaviours that the IDI is designed to deter;
- To investigate and document information relevant to the impact of the IDI on fatal collisions and
- To determine whether there is sufficient evidence to support the estimation of IDI impacts (in terms of reduced collisions and claims costs) for this most severe crash outcome.

Fundamental to the deterrence theory of traffic law enforcement is that sanctions for driving infractions be perceived by the driving public as certain, swift and severe. The IDI was designed specifically to enhance the immediacy and severity of the penalties available for serious driving infractions such as drinking driving and other careless driving offences. To be effective, however, drivers must perceive that the sanctions are immediate and severe, and that they will actually be applied to offenders. To raise such perceptions requires visible police enforcement, communication about the sanctions and the likelihood of offenders getting caught and punished. Based on an assessment of available enforcement, communication and public awareness data, it was found that police officers have been issuing the new sanctions, and that drivers' perceptions of the likelihood of getting caught for drinking and driving and excessive speeding did increase during the time frame of the study.

There are few sources of data available concerning changes in driver behaviour. The prevalence of alcohol-impaired driving is one of the few that has been studied using random roadside BAC testing. Such studies are expensive and difficult to conduct and the estimates obtained in the BC surveys (Beasley and Beirness, 2012) cannot be generalized beyond the communities in which they were carried

out. Nonetheless, in the five communities surveyed, prevalence estimates of night time drinking and driving declined significantly between 2010 (pre-IDI) and 2012 (post-IDI). While the possibility of confounding factors could not be entirely discounted in this study, the results are encouraging. Future surveys will assist in determining whether the observed reductions have been sustained. No prevalence data was found for excessive speeding or any of the other behaviours targeted by the IDI.

In examining fatal collisions, significant reductions were observed for both IDI- and non-IDI related collisions. However, the IDI reduction was larger than that observed for the non-IDI set of collisions. Based on this comparative analysis it was estimated that the IDI likely contributed to a reduction of about 36 fatal collisions. Other factors may also be contributing to this decline (for example, the introduction of the mandatory ignition interlock program in 2009). However, the inclusion of non-IDI-related fatal collisions helps to control for factors such as weather, increasing penetration of in-vehicle safety devices, traffic density, economics and public transit use. Similar significant reductions in fatal collisions have also been reported by McDonald, et. al. (2013) based on a comparative time series analysis using alcohol- and non-alcohol-related collisions extracted from TAS and based on the fifteen year period (1996-2012) and Brubacher et al (2014).

Based on an estimated reduction of 36 fatal collisions per year, at an estimated average cost of \$232,000, a best estimate is that the IDI has contributed to annual claims savings of about \$8.4 million.

Caveats. It should be noted that although the estimated claims savings of \$8.4 million is believed to be a reasonable estimate, based on current data, there are potential issues concerning its accuracy. It was discovered that about 17% of the collisions in the non-IDI group (i.e., the “Other” group in the analysis) had no contributing factors assigned. Given the small number of fatal collisions in the data set, this represents a significant proportion of the sample; the possibility of misclassification effects cannot be discounted. In addition, inconsistencies were found in comparisons of the IDI- and non-IDI-related fatal collision trends by region; an IDI effect was not apparent across all five ICBC regions. However, this could be due to small numbers at this level of disaggregation. There may also be regional differences in the enforcement and prevalence of the targeted behaviours and these may be contributing to the regional differences observed in fatal collisions.

1 Introduction

Drinking and driving is a very dangerous behaviour that can have serious and potentially deadly consequences for all road users. For many years, British Columbia (BC) has been a leader in the development and implementation of legislation, enforcement strategies, driver remediation and other road safety initiatives aimed at deterring drinking and driving and reducing the frequency of the motor vehicle collisions caused by this behaviour. Some of the initiatives introduced over the years include:

- 1997: Administrative Driving Prohibitions (following a 21-day appeal period) for impaired drivers and Indefinite License Suspensions for drivers convicted under the *Criminal Code of Canada*.
- 2004-2005: Responsible Driver Program, Voluntary Ignition Interlock Program, Extended Vehicle Impoundment Program, and Vehicle Impoundment for 24-hour Prohibitions.
- 2009: Mandatory Ignition Interlock Program

On September 20, 2010, the BC Motor Vehicle Act (MVA) was amended by the Government to provide Police access to a variety of new (or revised) sanctions for impaired driving, excessive speeding and other careless driving behaviours. The 2010 amendments had several components but the main ones included escalating immediate roadside prohibitions, new or revised vehicle impoundments and escalating fees and fines. For simplicity, the full list of sanctions (alcohol- and non-alcohol-related) that came into force in September 2010 will be referred to in this report as the “Impaired Driving Initiative”.

2 Impaired Driving Initiative (IDI): Description and Rationale

The use of driving prohibitions, suspensions, and vehicle impoundments for serious driving infractions is not new to BC or to other jurisdictions. Such penalties have been available for use with a variety of serious driving infractions for many years. However, a new and significant element was brought into force with the IDI. This initiative provided Police access to immediate roadside prohibitions (IRPs) for impaired drivers that were considerably longer than the 12- and 24-hour immediate penalties previously permitted under BC law. These penalties along with the other penalties that came into force with the IDI are described below, and a detailed comparison of the sanctions available before and after September 20, 2010 is provided in Appendix A. It should be noted that impaired driving penalties available prior to the implementation of the IDI (for example, 12- and 24-hour prohibitions, 90-day

Administrative Driving Prohibitions, and Criminal Code charges) are still available options for Police. The focus of this report is on the new sanctions.

2.1 Alcohol-Impaired Driving Sanctions (IRP-VIs)

For alcohol-impaired drivers, the length of each driving prohibition/vehicle impoundment combination issued under the IDI varies depending on the driver's offence record. Testing for blood alcohol content (BAC) is done at the roadside by police officers using an approved screening device (ASD). As described on the BC Ministry of Justice, RoadSafetyBC Website (2014), drivers found with a BAC reading in the “**warn**” range (not less than .05%¹) receive:

- an immediate 3-day driving prohibition for a first IRP offence; a \$200 administrative penalty and must apply and pay fees to have the driver license reinstated. The vehicle may be impounded for 3 days.
- an immediate 7-day driving prohibition for a second offence within five years; a \$300 administrative penalty and must apply and pay fees to have the driver license reinstated. The vehicle may be impounded for 7 days.
- an immediate 30-day driving prohibition for a third offence within five years; a \$400 administrative penalty and the driver must apply and pay fees to have his driver license reinstated. The vehicle will be impounded and stored for 30-days at the driver's expense. The driver may also be referred to the Responsible Driver Program and/or to the Ignition Interlock Program.

Drivers found with a BAC of .08% or more (“**fail**” range) or who refuse to provide a breath sample at the roadside may receive:

- an immediate 90-day driving prohibition; a \$500 administrative penalty and the driver is required to apply and pay a \$250 fee to have his driver license reinstated. The vehicle being

¹ Drivers in the Graduated Licensing Program are not permitted to drink any alcohol before driving. They continue to be subject to a 12-hour driving prohibition if tested at roadside and found to have a blood alcohol level between .0% and .049%.

driven at the time is impounded and stored for 30 days at the driver's expense. The driver may be referred to the Responsible Driver Program and/or to the Ignition Interlock Program.

As was the case prior to the implementation of the IDI, police may elect to charge drivers found to have a BAC of .08% or more under the *Criminal Code of Canada*. Such drivers may then receive an immediate 24-hour prohibition, be detained at the police station for additional testing, and thereafter be issued a 90-day ADP. Unlike 90-day IRPs, ADPs do not start until 21 days after the infraction. During this time drivers may appeal the ADP and continue to drive on a temporary licence. Drivers charged under the *Criminal Code* and who are found guilty in federal court may then be assessed a minimum \$1000 fine, an additional driving prohibition and possible jail time. The time delay between the Criminal Code charge and conviction can be many months.

2.2 Non-Impaired-Driving Sanctions (NID-Vis)

As detailed on the Ministry of Justice, RoadSafetyBC Website (2014), the September 20, 2010 changes to the MVA also included new (or revised) vehicle impoundments for a number of other driving offences including:

- Excessive Speeding (driving 40 km/hour over the applicable speed limit),
- Racing,
- Stunt Driving,
- Driving While Unlicensed (this also applies to under-licensed motorcycle riders),
- Driving While Prohibited or Suspended,
- Improperly Seated Motorcyclists.

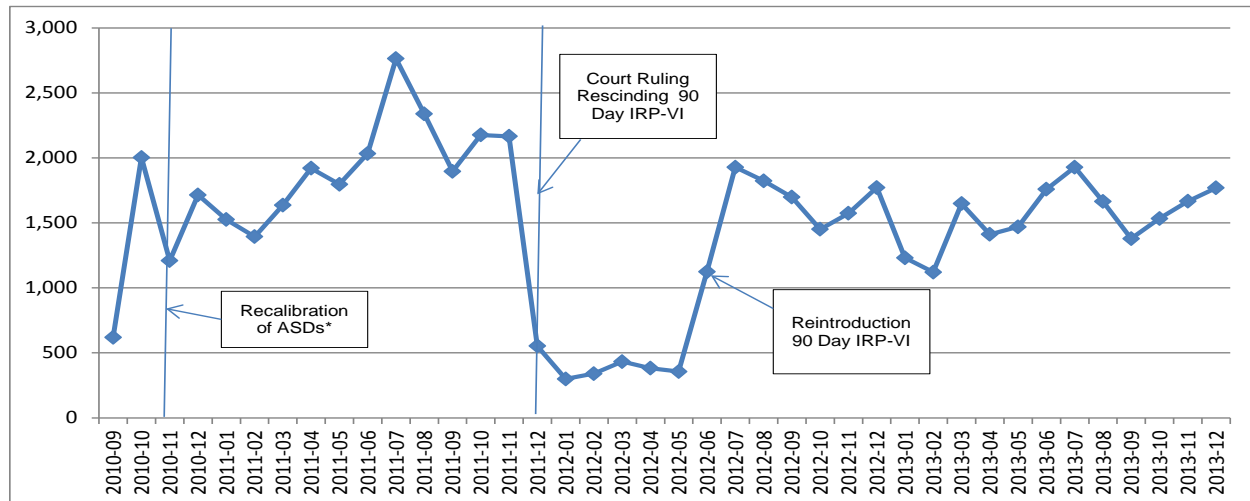
The length and cost of the impoundment depends on the offending driver's record. A vehicle is immediately impounded for:

- 7-days for a driver's first offence. The registered owner is responsible for the cost of towing and storage of the vehicle,
- 30-days for a driver's second offence within a two year period. The registered owner is responsible for the cost of towing and storage,
- 60-days for subsequent offence within a two year period. The registered owner is responsible for the cost of towing and storage.

2.3 Implementation of the IDI

Two issues temporarily disrupted the implementation of the IRP component of the IDI. The first occurred on November 19th, 2010 when the BC Association of Chiefs of Police Traffic Safety Committee announced that 2,200 roadside approved screening devices would be removed from service for recalibration (Globe and Mail, 2010). It was learned that the devices could result in improper roadside prohibitions. The device recalibration was done on a staggered basis between November 19th and December 1st, 2010. The second disruption occurred when the BC Supreme Court, with a decision released on November 30, 2011, found the original 90-day component of the IDI to be unconstitutional under the *Canadian Charter of Rights and Freedoms*. Given the court decision, the Ministry of the Attorney General directed the police to stop issuing IRPs. On May 3, 2012 the BC Ministry of Justice announced that the Government would be introducing changes to the MVA that would address the court's concerns around the 90-day IRP (Ministry of Justice, 2012d). The amendments to the MVA were enacted on June 15, 2012 and required that police officers advise drivers of their right to take a second breath test on a second approved screening device, with the lower test result to prevail. The amendments also gave drivers the ability to challenge the test results through an administrative review. The BC Supreme Court decision was subsequently appealed (Global News, 2013). But, in March 2014 the constitutionality of the 90-day IRP was upheld by the BC Court of Appeal. Figure 1 shows a brief decline in the number of IRP penalties issued in November 2010, during the recalibration period, and the longer decline corresponding to the rescinding of the original 90-day IRP.

Figure 1. Monthly counts of all IRPs (3-, 7-, 30, and 90-day) issued between September 2010 and December 2013



Source: BIW Driver Prohibitions as of November 30, 2014; *ASD=Approved Screening Device

2.4 Rationale and Framework for the IDI

The key elements of the IDI are the immediacy and severity of the penalties that were brought into effect for the driving behaviours included in the legislation. The immediate application of severe penalties is fundamental to the deterrence theory of behaviour change (Davey & Freeman, 2011). By increasing both of these elements the IDI is expected to have a high degree of deterrence value, assuming that visible police enforcement is sufficient to reinforce drivers' beliefs that the likelihood of getting caught and penalized is strong. If so, then the initiative is expected to prompt a decline in the targeted driving behaviours (e.g., drinking and driving, excessive speeding, etc.), and in related motor vehicle collisions, claims crash incidents and, ultimately, ICBC claims costs. A more detailed depiction of the framework (logic model) for the initiative is provided in Appendix B.

3 IDI Evaluation

3.1 Purpose

The IDI was introduced with an expectation that it would contribute to a reduction in motor vehicle collisions. By extension it is also expected to reduce ICBC claims crash costs. Based on this expectation, ICBC and the Government of BC requested that an evaluation be undertaken to estimate any actual claims savings achieved. As will be described in this report, data limitations and an inability to control

adequately for factors other than the IDI prevented the achievement of this goal. Consequently, the objectives of the evaluation were revised as follows:

1. To document why an evaluation of the impact of the IDI on collisions and claims crash costs could not be successfully achieved,
2. To examine relevant collision, driver, enforcement and other data to determine if there exists sufficient evidence to suggest that the IDI likely did contribute to some reduction in collisions and claims crash incidents and, if so,
3. To estimate the magnitude of this reduction and the ICBC claims savings associated with it.

3.2 ICBC Claims Impact Evaluation: Feasibility Assessment

An evaluation that aims to determine the impact of an initiative requires that certain criteria be met if it is to produce reliable and valid results. The most important of these criteria include:

- That appropriate and sufficient data be obtained for all relevant outcome measures (e.g., driver behaviours, collisions and claims crash data and costs)
- Those factors (other than the initiative itself) that could influence the outcomes of interest be taken into account (e.g., general time trends, vehicle and road safety improvements, other interventions). Ideally, for an impact evaluation, this would be accomplished through the random assignment of participants into two groups: one that is exposed to the intervention and one that is not. Another approach is through the use of statistical adjustment. While this second approach can be adequate in some cases, data on all important influential (confounding) factors is not always available, nor are potential confounding factors always known. This can be a serious limitation when the accuracy and precision of an impact estimate is crucial.

For the evaluation of the IDI the most critical outcome measure for determining impacts on claims crash costs are claims crash incidents. With such data, and assuming the availability of appropriate control data, the claims crash incident outcomes of the two groups (before and after the intervention) could be compared and incident cost impacts estimated. Control data is necessary in order to estimate what would have happened to collision frequencies had the IDI not been implemented. With Province-wide interventions such as the IDI it is not possible to identify and/or select a random group of drivers who have not been exposed to the new legislation. Consequently, it is necessary to identify other sources of comparative data.

One way to filter out some of the potentially confounding factors is to focus attention on only those outcomes expected to be directly affected by the IDI, the ones caused by drinking drivers and by drivers who caused collisions when engaged in other IDI-targeted behaviours (e.g., street racing, excessive speeding, etc.). In BC, traffic collision data is available from ICBC's Business Information Warehouse (BIW) based on two data sources: the Traffic Accident System (TAS) of police-reported collision data and the ICBC Claims system of auto insurance claims that have been consolidated into collision incident data. Of the two sources, only TAS contains information on "contributing factors" – factors that police assign based on their assessment of the collision. However, only those collisions resulting in a fatality are well enumerated in TAS, and they comprise only a very small and select fraction of all of the collision incidents reported through Claims (less than 0.6% of Claims incidents involving a casualty and less than 0.2% of all Claims incidents). In fact, injury and property damage only collisions have been poorly enumerated in TAS (relative to Claims) for many years, but in mid-2008 the situation worsened. At that time, an amendment to the MVA changed the reporting requirements for collisions; it became no longer mandatory for drivers to report crashes to police, or for police to submit collision reports into TAS for collisions that were reported by drivers. Police only had to file reports on crashes they attended, and attendance was left to their discretion. Police continue to attend and report on almost all fatal collisions. However, reporting of injury and property damage only collisions has declined. Between 2004 and 2013, the ratio of TAS crashes to Claims crash incidents dropped from about 0.30 to 0.23. Despite this decline, and the large difference in crash counts reported in TAS and Claims, if police attendance at collisions could be considered random, or was required for all collisions identified by a set standard criteria, then extrapolation of findings from TAS to Claims might be justifiable. This is not the case, however. Collision reporting into TAS is vulnerable to police resource availability, as well as resource allocation and other operational decisions and policies. Given this situation, TAS can only be considered a good source for fatal collision data. It is not suitable for use in estimating collision impacts that would be an accurate or transferrable reflection of ICBC claims crash outcomes.

Two other potential sources of data were also considered in assessing the feasibility of estimating the claims crash impacts of the IDI:

- 1) effect estimates produced from evaluations of similar interventions in other jurisdictions, and

- 2) collision data produced by other jurisdictions that could be used as potential control data when examining BC trends.

Neither of these options proved to be viable, however. A scan of studies conducted to estimate the effects of interventions with similar components to those included in the IDI is provided in Appendix C. Based on this review, no estimates were identified that would be applicable, reliable, and transferrable to the IDI in BC in the absence of adequate BC data. Using collision data from other jurisdictions to serve as a control group for the effects of factors other than the IDI in BC was also determined not to be a suitable option for the purposes of this evaluation. No other jurisdiction has a comparable combination of geography, road infrastructure, road safety initiatives, weather, population, legislative and regulatory structure, or history of impaired or dangerous driving legislation as does BC. Hence, there are no other jurisdictions that could be considered an adequate control group for the production of valid and reliable estimates of IDI collision and claims crash savings in this Province.

It is possible that a systemic event (e.g., economic change, weather shifts) may have contributed to the sudden decline in alcohol-related fatal crashes. Notwithstanding the limitations discussed above, some evidence refutes this possibility. Brubacher, et al (2014) examined total fatal crashes and fatal crashes involving alcohol or speeding for Saskatchewan and Washington State, jurisdictions which did not introduce any new alcohol or speed related legislation during the study period. In these jurisdictions there were no declines in fatal alcohol-related crashes. Although other jurisdictions are not precisely comparable, the finding that fatal alcohol-related crashes did not experience the same magnitude of decline found in BC in 2010 supports the conclusion that it was unlikely another significant event contributed significantly to the effect experienced in BC. Furthermore, Brubacher, et al (2014) found smaller reductions in fatal crashes in Alberta during the period of study (only 32.7% compared to 52% in BC). The authors attributed the reductions in Alberta to the media and government attention to British Columbia's sanctions as the Alberta government considered and eventually implemented similar sanctions.

Given the limitations listed above, it was concluded that it is not feasible to estimate the overall ICBC claims crash incident impacts and savings attributable to the IDI. Therefore, the remainder of this report will focus on an assessment of data relevant to the key outputs and short-term outcomes depicted in the IDI logic model: i.e., communication, enforcement, public awareness and driver behaviour (Appendix B). Trends in police-reported fatal collisions before and after the implementation of the IDI

will also be examined. As noted previously, fatal collisions are reported in TAS and have contributing factor data. Furthermore, unlike TAS injury and property damage only collisions, fatal collisions are, for the most part, fully attended by the Police and as such are not as vulnerable to reporting biases.

3.3 Review Methods

Given that a full impact evaluation of the IDI is not feasible, this study was undertaken to investigate and document observed relationships between the IDI and available output (communication and enforcement) and outcome (public awareness, driver behaviours and fatal collisions) data. The primary intent was to determine whether the results of the review would support any conclusions regarding the likely impacts of the IDI, specifically in relation to the subset of fatal collisions available from TAS. An effort was also made to examine a small subset of Claims crash incident data for corroborative trends. This subset was defined using a surrogate measure for alcohol-impaired collisions ($BAC \geq .08\%$) which will be described in more detail later.

3.3.1 Data Sources

Secondary data from ICBC administrative systems (e.g., Traffic Accident System, Drivers, Claims, Contraventions, Prohibitions and Vehicle Impoundments), published roadside and telephone surveys and ICBC online tracking surveys were used in the conduct of this review.

3.3.2 Timeframe

Except as otherwise stated, the time period for the review of data trends was from January 2005 through December 2013. January 2005 was selected as the starting point in order to avoid TAS contributing factor coding changes introduced in 2004. September 2010 was included in the pre-IDI period due to the fact that the legislation was enacted near the end of the month (September 20th). October 2010 represents the first full month during which the new legislation was in force.

3.4 Results of Enforcement, Communication, Public Awareness and Driver Behaviour Data Review

Fundamental to the IDI is the increased immediacy and severity of the sanctions it introduced for drivers caught engaging in a set of specified driving behaviours. Within the context of deterrence theory, conditions for behaviour change will be optimized when the driving public believes they will get caught and immediately and severely penalized for committing an offence (Davey & Freeman, 2011). Such a belief is expected to be reinforced and supported through visible police enforcement, education and

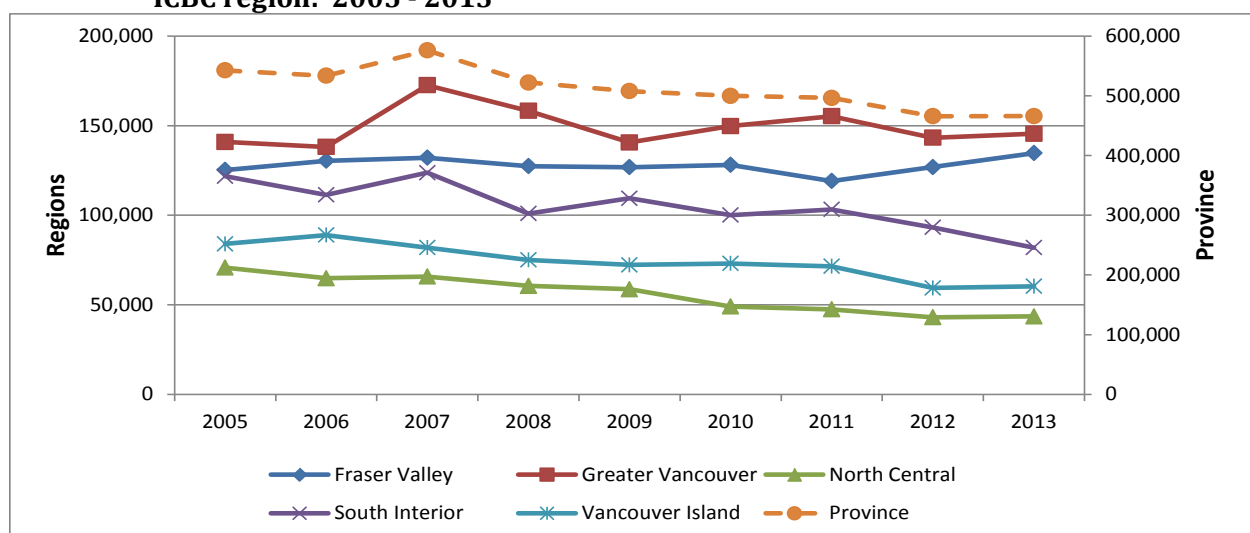
communication. In this section, data relevant to each of these important links to deterrence are examined in relation to the IDI.

3.4.1 Enforcement

Fully informative enforcement data (for example, “boots on ground” enforcement hours by time of day, location and number of officer full time equivalents) is not consistently available in BC. Violation ticket counts are not directly related to the intensity of enforcement activity as they can be influenced by driver behaviour, traffic volume at enforcement locations, and other factors. Nonetheless, they are an important output and indicator of enforcement activity and warrant review here.

All Motor Vehicle Offences. The total number of MVA violation tickets issued between 2005 and 2013 provincially, and by ICBC region, are shown in Figure 2. Regional data were examined in an effort to determine whether enforcement trends over time have been similar throughout the Province or whether they have varied by regional jurisdiction. Figure 2 reveals that, at the provincial level, ticket issuance has generally been declining since 2007 when there was a sharp increase prompted primarily by a surge of ticketing in the Greater Vancouver region. Ticket issuance in the Fraser Valley and Greater Vancouver (since 2009) regions have remained relatively stable through the end of 2013, whereas the other regions have trended downward. However, none of the observed trends suggest changes in enforcement activity (as indicated by ticketing) that relate in any apparent way to the IDI.

Figure 2. Annual counts of Motor Vehicle Act violation tickets issued provincially and by ICBC region: 2005 - 2013

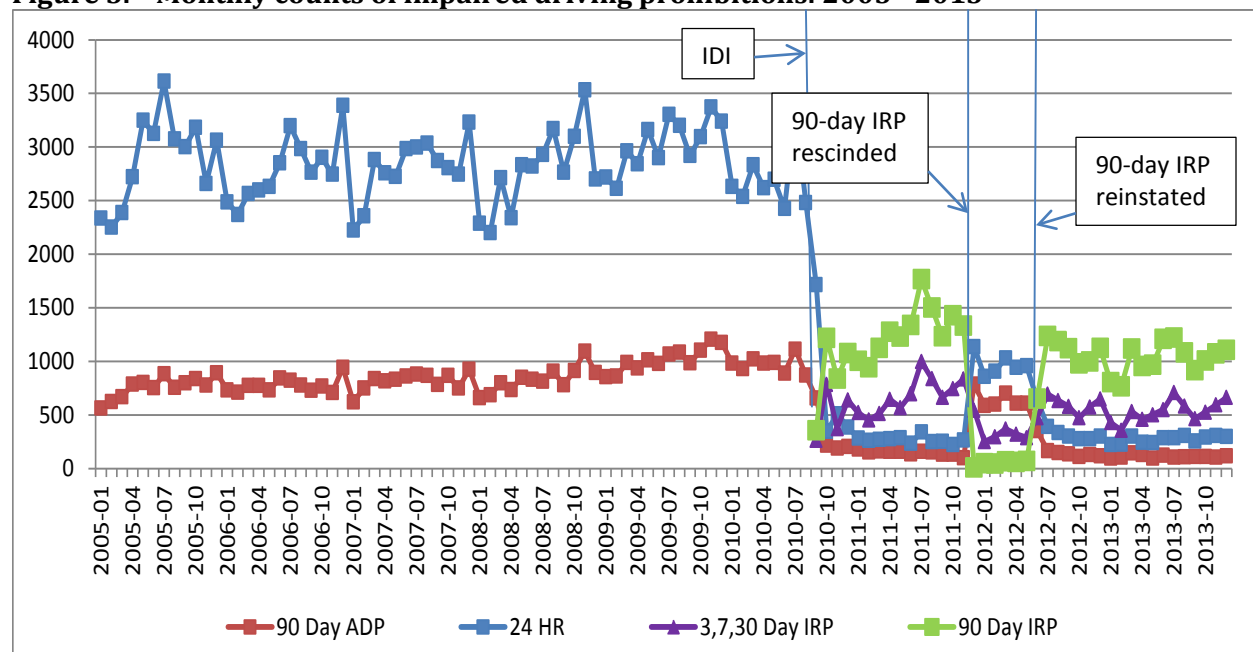


Source: BIW Contraventions as of November 30, 2014; Note: Excludes Intersection Safety Camera tickets

Alcohol-Impaired Driving Offences. A key behaviour targeted by the IDI is drinking and driving. To investigate trends in enforcement aimed at this behaviour, 24-hour and 90-day ADPs were examined before and after the introduction of the IDI. Trends in the use of IRPs in the post-IDI period were also examined. As shown in Figure 3, ADPs and 24-hour prohibitions declined after the introduction of the IDI, replaced to a large extent by the uptake of IRP-VIs. Interestingly, the total combined number of prohibitions issued in the post-IDI period seems to have dropped when compared to the pre-IDI period. The graph also shows the temporary resurgence of the 24-hour prohibition and ADPs, and the decline of the 90-day IRPs, during the period of time when the 90-day IRP law was disallowed by the courts.

Trends were also examined within each of the five ICBC regions (Greater Vancouver, Fraser Valley, North Central, Southern Interior, and Vancouver Island). Although not shown here, these regional counts followed the same basic patterns as seen provincially. Each region showed a similar drop in the number of prohibitions issued and the switch over to the IRP-VIs after September 2010, the escalation in the use of the 90-day IRP, and its recovery after the introduction of the updated IRP-VI sanction in June 2012.

Figure 3. Monthly counts of impaired driving prohibitions: 2005 - 2013



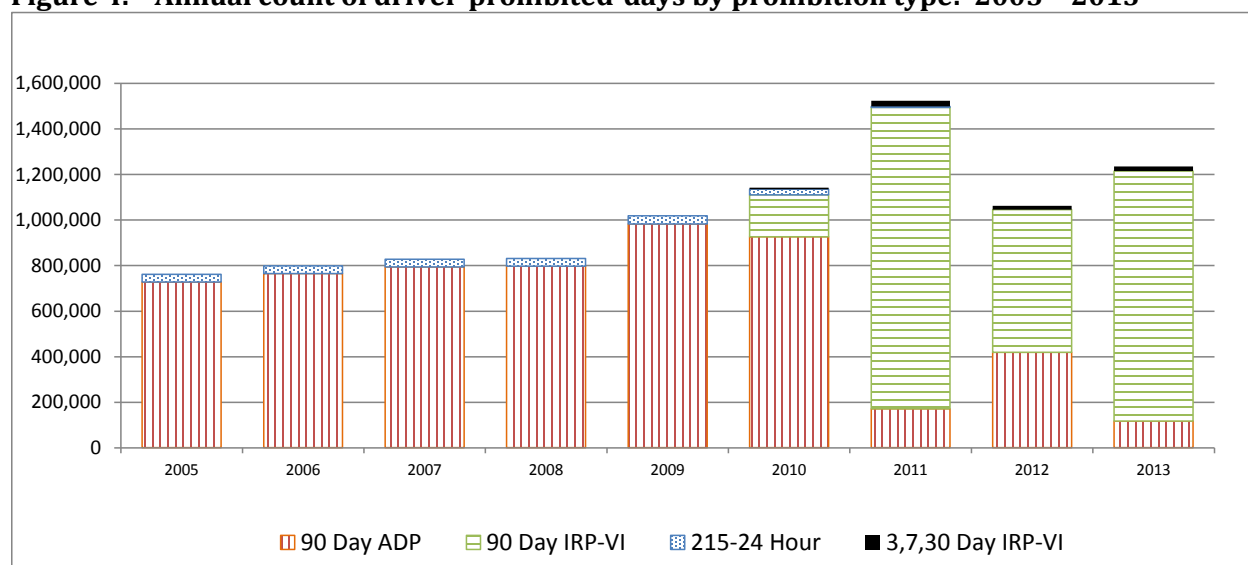
Source: BIW Driver Prohibitions as of November 30, 2014

It is not known exactly why the numbers of short-term prohibitions have declined so dramatically since the introduction of the IDI. However, it may simply reflect the uptake and use of ASDs for BAC testing at

roadside. The immediate 24-hour prohibition remains an option for police (without BAC testing) if they suspect a driver may be impaired. But with the introduction of roadside ASD testing, officers may opt not to issue such a prohibition if the driver is tested and found to have a BAC less than .05%.

Another observation is the increase in the total number of prohibited days accumulated by offenders following the introduction of the IDI. As shown in Figure 4, the decrease in the numbers of short-term prohibitions, and their related prohibited-days, appears to have been more than offset by the increase in 90-day IRPs, which account for most of the driver-prohibited-days from 2011 forward.

Figure 4. Annual count of driver-prohibited-days by prohibition type: 2005 – 2013



Source: BIW Driver Prohibitions as of November 30, 2014

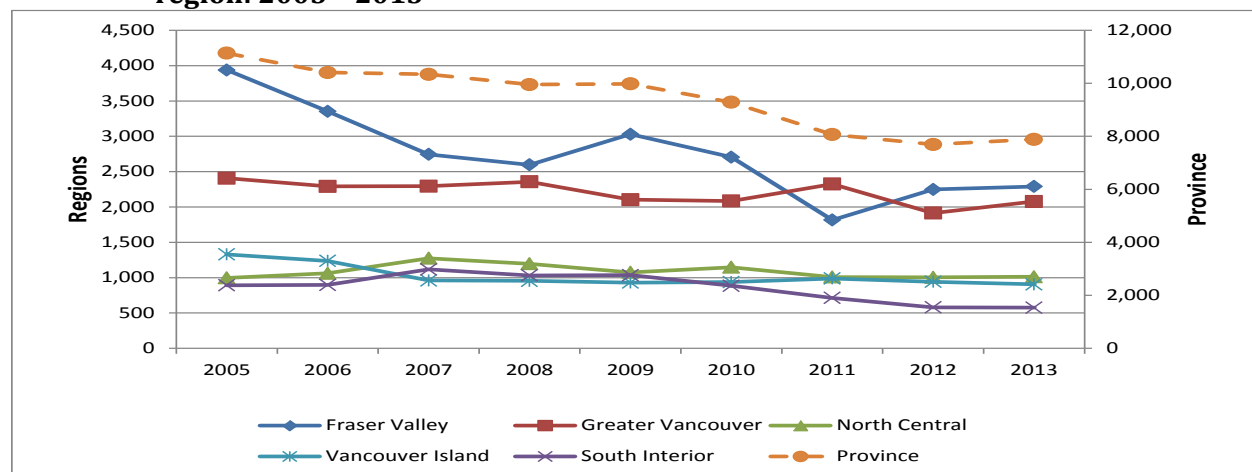
Another option available to police for use with criminally-impaired drivers (those with BAC of .08% or greater) is a charge under the *Canadian Criminal Code (CCC)*. This option was also available prior to the introduction of the IDI. However, as stated in the Crown Counsel Policy Manual, prosecution for a CCC impaired driving offence may not be in the public interest where the accused has been subject to the 90-day IRP, unless there are aggravating factors (Ministry of the Attorney General, 2011). Consequently, it might be expected that CCC charges would decline with the introduction of the IDI. Clearly, one of the potential benefits associated with administrative rather than criminal penalties is the immediacy of the consequences to the impaired driver. For CCC charges, the time to conviction and penalty can be quite long. For example, between 2005 and 2009, the average amount of time from violation date to conviction was eight months for Driving While Ability Impaired (CCC Section 253) and twenty-two

months for Impaired Driving Causing Injury/Death (CCC Section 255). Although CCC convictions are available from the ICBC Contraventions data base, CCC violations are not. Therefore, given the potential lags between violation date and conviction date, conviction trends, particularly those in the most recent years, could be quite misleading. Consequently, it was decided not to include them in this review.

Excessive Speeding and other non-alcohol-related offences. Driving at an excessive speed (40 kph over the speed limit) is another key driving offence targeted by IDI. Under the IDI, vehicles driven at excessive speeds will be ticketed and impounded for at least 7 days (Ministry of Justice, Road Safety Website, 2014); previously such drivers were subject to a violation ticket but no vehicle impoundment.

Figure 5 shows the number of excessive speed violation tickets issued between 2005 and 2013, provincially, and for each of the five ICBC Regions. Similar to the overall trends in MVA tickets (Figure 2), there has been a general decline in the number of excessive speeding tickets issued provincially from 2005 through 2013. In contrast to all MVA tickets, tickets issued provincially for excessive speeding declined sharply between 2009 and 2011 and then remained fairly stable through 2013. This appears to have been prompted primarily by a reduction in ticketing for excessive speed in the Fraser Valley. It is not known whether these reductions reflect a reduction in enforcement in this region, a change in the incidence of excessive speeding, or some combination of both. In general, however, there does not appear to be a consistent trend across all five regions and no indication that the introduction of the IDI may have prompted increased enforcement of this particular driver behaviour.

Figure 5. Annual counts of excessive speed violation tickets issued provincially and by ICBC region: 2005 – 2013



Source: BIW Contraventions as of November 30, 2014

Vehicle impoundments were also examined for drivers ticketed for excessive speeding from September 2010 forward (when this sanction became effective). A clear majority (approximately 85%) of drivers ticketed for driving with excessive speed received a vehicle impoundment for this infraction. As with violation tickets, annual vehicle impoundments issued provincially for excessive speeding remained relatively stable between 2011 and 2013.

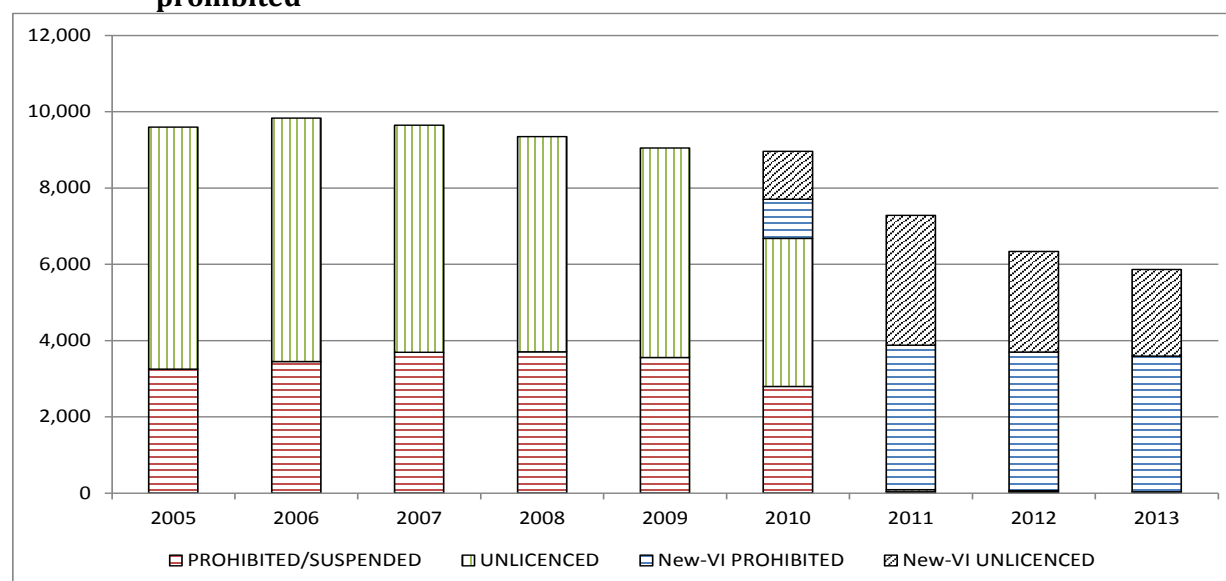
Trends in the violation tickets and prohibitions issued for street racing and stunt driving cannot be monitored as readily as for excessive speed because drivers are not ticketed for these offences under unique MVA sections. Typically, they are ticketed under Section 144.1 (Driving without Due Care) but they can also be ticketed under Sections 146 (driving over the speed limit) and 148 (excessive speeding). Although about 5,500 Driving without Due Care tickets were issued in 2013, only 64 vehicle impoundments were issued for street racing and 205 for stunt driving. Historical data on vehicle impoundments are available for street racing but not for stunt driving and the large number of Driving without Due Care tickets issued precludes their use as an indicator of enforcement for this behaviour. For street racing, the number of impounds fluctuated from a low of 97 in 2005 to a high of 125 in 2011, followed by a drop to 92 in 2012 and to 64 in 2013. How this relates to the number of street racing violations committed and caught by police is unknown.

Not sitting properly astride a motorcycle is also a behaviour targeted by the NID-VI legislation. With no impound data for this behaviour available historically, violation ticket counts were examined. Between 2005 and 2009 the number of tickets issued fluctuated between 9 and 12, dropped to 2 in 2010, 6 in 2011, and then back up to 13 and 11 in 2012 and 2013, respectively.

Figure 6 shows the monthly counts of vehicle impoundments for the final two behaviours included in the non-impaired driving component of the IDI: driving while prohibited and driving while unlicensed. Unlike excessive speeding, these driving behaviours were already subject to vehicle impoundments prior to the IDI. As shown in Figure 6, vehicle impoundments for these two behaviours (when taken together) began to decline after 2006, and this decline steepened after the implementation of the IDI in 2010. Most of the decline appears to be the result of a drop in vehicle impoundments for unlicensed driving.

It is not known whether this reflects a change in police enforcement practices, a reduction in the driver behaviours or a combination of both.

Figure 6. Annual counts of vehicle impoundments for driving while unlicensed or prohibited



Source: BIW Driver Prohibitions as of November 30, 2014

3.4.2 Education and Communication

Mass media has provided considerable coverage of the IDI since the changes to the MVA were first announced by the BC Government. Hailed as “Canada’s toughest impaired driving laws” (CBC News-British Columbia, 2010), media coverage intensified with the news of the recall of the roadside screening devices, the BC Supreme Court ruling and the steps the BC Government took to satisfy the concerns of the court. News media also covered the lobbying of BC’s Restaurant and Food Services Association against the stronger drinking and driving laws up to the time the Association ended its protest in July 2011 (CBC News, 2011).

No paid media campaigns relating to the IDI were undertaken by ICBC or by RoadSafetyBC (formerly known as the Office of the Superintendent of Motor Vehicles) prior to or during the September 2010 introduction of the new legislation (Sheilina Dhanani, (ICBC) and Neil Arason (RoadSafetyBC) personal communication, November 21, 2012). However, the BC Government provided numerous news releases, some with background information, before (starting in April 2010) and after the September 2010 enactment of the new laws (Government of BC, 2013). Background information provided detailed

descriptions of the legislation and notes on the review process and the effect on police. Government press releases were issued when the 90-day IRP prohibition was declared unconstitutional (November 2011), once the updated IRP legislation was introduced (May 2012), and at the passing of the amended 90-day IRP law (June 2012). Detailed information about the new sanctions was also provided on the Office of the Superintendent of Motor Vehicle (now known as RoadsafetyBC) website (Ministry of Justice, 2012b, 2012c), along with a report describing results from the first twelve months after their introduction.

3.4.3 Public Awareness

To examine public awareness of the new laws, survey data from three sources were examined: ICBC *Road Safety Tracking Surveys*, *Alcohol and Drug Use Roadside Surveys* conducted by Beasley and Bierness (2012), and a *Public Attitude Survey* sponsored by the BC Ministry of Justice.

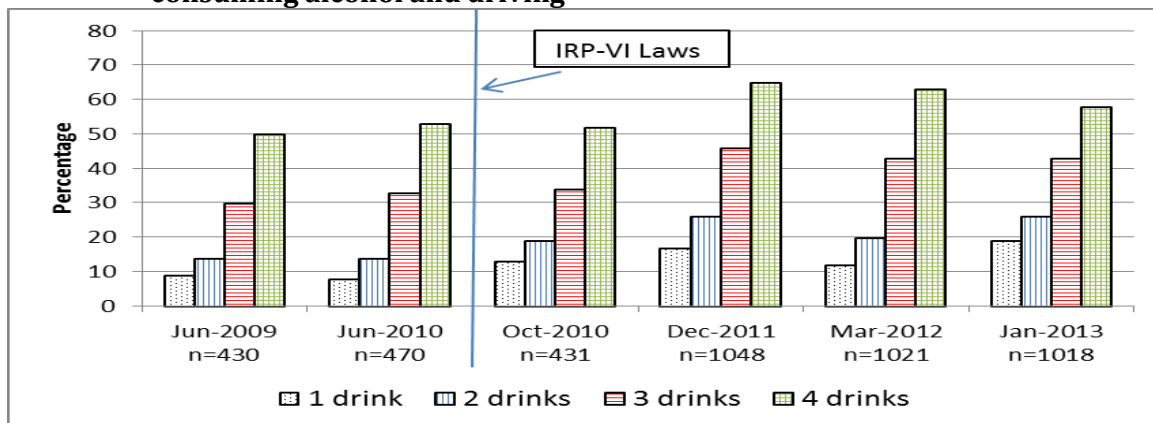
ICBC Road Safety Tracking Surveys (RSTS). Information relevant to the IDI was collected as part of an online tracking survey conducted several times per year for ICBC by Ipos Public Affairs. Questions about drivers' awareness and understanding of the upcoming new impaired driving laws were included in the June 2010 survey. This was three months prior to IDI implementation but after initial information had been released (in April 2010). At that time, only 47% of respondents (n=470)² reported awareness of the proposed changes. Of those (n=223), 73% said they were aware that BC's laws would be the toughest in Canada and 91% understood that the new harsher penalties started with a BAC of .05%.

Surveys conducted before and after the implementation of the IDI also asked respondents how likely they thought it would be for them to be stopped by police for driving within 2 hours of drinking one or more glasses of alcohol. As shown in Figure 7, the percentage of respondents who thought it was likely has increased since June 2010 for all amounts of alcohol consumption considered (even a single glass). Given the timing of the observed increase, it is possible that the IDI and its associated communication and enforcement activities may have been factors contributing to this shift. Of course, other drink driving campaigns and enforcement efforts undertaken since 2010 may also be contributing factors. But, regardless of the underlying cause, the survey results do suggest that respondents' perceptions of

² Survey results are weighted to reflect the age, gender and regional distribution of ICBC customer base aged 16 and over.

risk around getting caught for drinking driving are on the rise. If this trend continues it could be an important step forward in deterring this very dangerous behaviour.

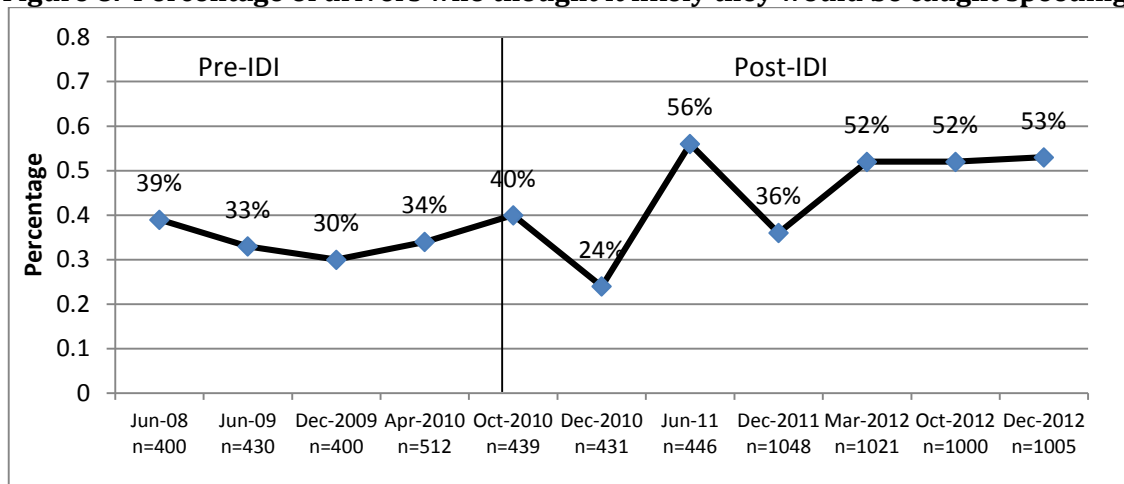
Figure 7. Percentage of drivers who thought they would be stopped by Police after consuming alcohol and driving



Source: January-February 2013 ICBC Ipsos Road Safety Tracking Study

None of the ICBC surveys has tracked driver awareness of the new penalties for excessive speed or any of the other non-alcohol offences included in the IDI. A question was asked concerning drivers' perceptions around getting caught for speeding in general (Figure 8). As with the question asked in relation to drinking and driving there has also been a recent increase in drivers' perceptions around getting caught for speeding. But given the amount of fluctuation in responses from survey to survey, and the lack of direct reference to excessive speed, it is difficult to say whether or not this increase is related in any direct way to the IDI. Nonetheless, in combination with the results concerning drinking and driving, these results may also be indicative of a general shift in drivers' perceptions of the risk of getting caught when engaging in risky driving behaviours.

Figure 8. Percentage of drivers who thought it likely they would be caught speeding



Source: 2011 ICBC Ipsos Road Safety Tracking Study Wave I – Speed;
2012 ICBC Ipsos Road Safety Tracking Study Wave 2, Wave 3 – General Attitudes

Alcohol and Drug Use Roadside Surveys. The Beasley and Beirness (2012) nighttime roadside surveys have been conducted in BC several times since 1995. Their primary purpose is to conduct voluntary BAC testing for impaired driving. However, in June 2010 and in June 2012, more than 2000 drivers from five BC communities were asked about the new impaired driving laws. Of the drivers who completed the questionnaire in June 2010, 57% reported that they were aware of the proposed new impaired driving laws. Of the drivers asked the same question in the June 2012 survey, a much higher percentage (82.5%) reported awareness. The 2012 survey also revealed a general understanding of the severity of the consequences of the IDI, with both the 90-day driver prohibitions and 30-day vehicle impoundment being rated as a “complete inconvenience”. Interestingly, 25% of drivers surveyed in 2012 indicated that they did not have a good understanding of the meaning of a BAC of .05%.

Public Attitude Survey (PAS). The PAS (Ministry of Justice, 2012e) is a random telephone survey conducted annually for the Road Safety Unit of the Police Services Division by an independent research organization. The most recent PAS was done in March 2012 with 953 BC drivers from across the province, and includes questions about drivers’ perceptions of getting caught by police for a variety of driving infractions, and the level of police commitment to traffic law enforcement.

In the 2012 survey, 69% of drivers thought they were somewhat or very likely to be caught if they drove while over the legal alcohol limit. In similar surveys conducted in 2010 (pre-IDI) and 2011 (post-IDI), the percentages were 77% and 78%, respectively. Over the same time period, the percentage of drivers who thought it somewhat or very likely that they would be caught for driving 20kph or more over the speed limit increased from 69% in 2010, to 70% in 2011, to 72% in 2012. These results are inconsistent with the increases observed on the ICBC panel surveys for similar types of questions. The reasons for the inconsistent trends are unknown but may reflect differences associated with the types of surveys and samples used (telephone versus online) or with the ways in which the questions were posed.

Another question on the PAS addressed drivers’ perceptions of police commitment to traffic law enforcement. In 2010 18% of respondents said they believe police are very committed to traffic law enforcement, compared to 40% in 2011 and 38% in 2012.

3.4.4 Driver Behaviour

There is very little information available in BC on the prevalence of drinking and driving, excessive speeding, or any of the other careless driving behaviours targeted by the IDI, and the data that are available are limited in scope and applicability.

One of the most useful approaches for estimating the prevalence of driving behaviours is the random roadside survey. But roadside surveys are expensive and difficult to conduct. Thus, they have tended to be done infrequently, in select locations, and only for behaviours such as impaired driving, cell phone use, and seat belt wearing.

Telephone or online panel surveys have also been used to estimate and track changes in self-reported driving behaviours (such as drinking and driving and speeding). However, the usefulness of self-report data as an indicator of actual driver behaviour and changes in behaviour is limited due to issues such as lack of random selection into survey samples, difficulties with respondent recall, and limited validation of survey responses against actual behaviour.

This section describes the findings of roadside surveys conducted in BC for impaired driving, and of self-report surveys that provide information relevant to both impaired driving and excessive speeding³. No relevant data were found for estimating the prevalence of street racing, stunt driving, or driving while unlicensed, suspended or prohibited.

Impaired Driving. Estimates of the nighttime prevalence of impaired driving have been produced from the driver BAC testing component of the *BC Alcohol and Drug Use Roadside Surveys* (Bierness & Beasley, 2010; Beasley & Bierness, 2012). Drivers were randomly selected from the traffic

³ One potential data source that was considered for tracking excessive speeding in BC was speed loop data collected by the Ministry of Transportation and Infrastructure (MoTI). These data do not, however, provide information directly relevant to the prevalence of excessive speeding (as defined in the MVA), and very few sites were found with complete data spanning the years of interest. Given other issues such as confounding due to differences across sites in weather, traffic density and other factors, it was determined that these data would not provide meaningful information for the purposes of this review.

flow and asked to provide voluntary breath and oral fluid samples for alcohol and drug testing. Approximately 10% of the drivers selected refused to provide a sample for alcohol testing. There have been seven surveys conducted since 1995 with the last one completed in June 2012. The surveys are done in late spring (typically in the month of June) on Wednesday, Thursday, Friday, and Saturday evenings between 9:00 pm and 3:00 am. Originally, only Vancouver and Saanich were included in the surveys. Abbotsford was added in 2003, and Prince George and Kelowna were added in 2010. Thus, data from all five communities are available only for 2010 (pre-IDI) and 2012 (post-IDI).

To obtain the overall estimates for the five communities, the data were weighted by traffic volume at the test sites and community population. In 2012, a total of 2,513 drivers participated in the survey: Vancouver (n=581), Saanich (n=499), Abbotsford (n=473), Prince George (n=454) and Kelowna (n=506). In 2010, the total sample size was 2,785: Vancouver (n=550), Saanich (n=696), Abbotsford (n=520), Prince George (n=492) and Kelowna (n=527).

In June 2012, the percentage of surveyed drivers who tested positive for alcohol was 6.5% which was significantly ($P<0.001$) lower than the 9.9% reported in the 2010 survey. Moreover, only 0.9% of surveyed drivers tested $\geq .08\%$ BAC as compared to 2.2% from the 2010 survey ($P<0.003$). Similar significant reductions were observed for BAC levels $< .05\%$ and between $.05\%$ and $.08\%$. Declines were observed in all five of the participating communities, and across age and gender groups. They were also observed among participating drivers coming from a bar, pub or nightclub. Of these, 34.6% tested positive for alcohol in 2010, while only 14.9% of the drivers did so in 2012.

Beasley and Beirness (2012) suggest that their results may be an indication that driver behaviour changed after the introduction of the IRP sanctions. They reported that: “the typical pattern of increased drinking and driving on the weekend nights was not observed and the prevalence of drinking drivers on the road during late night hours was less than half that found in 2010” (p. v).

While the results of the roadside surveys are certainly encouraging, they are not without limitations. The post-IDI survey was conducted during the same month that the 90-day IRP was being reinstated and this may have confounded the survey results. Additional surveys will be needed to see if the decline was sustained beyond that time period, or if it was a temporary response to increased publicity and focus on the sanctions arising from the reinstatement.

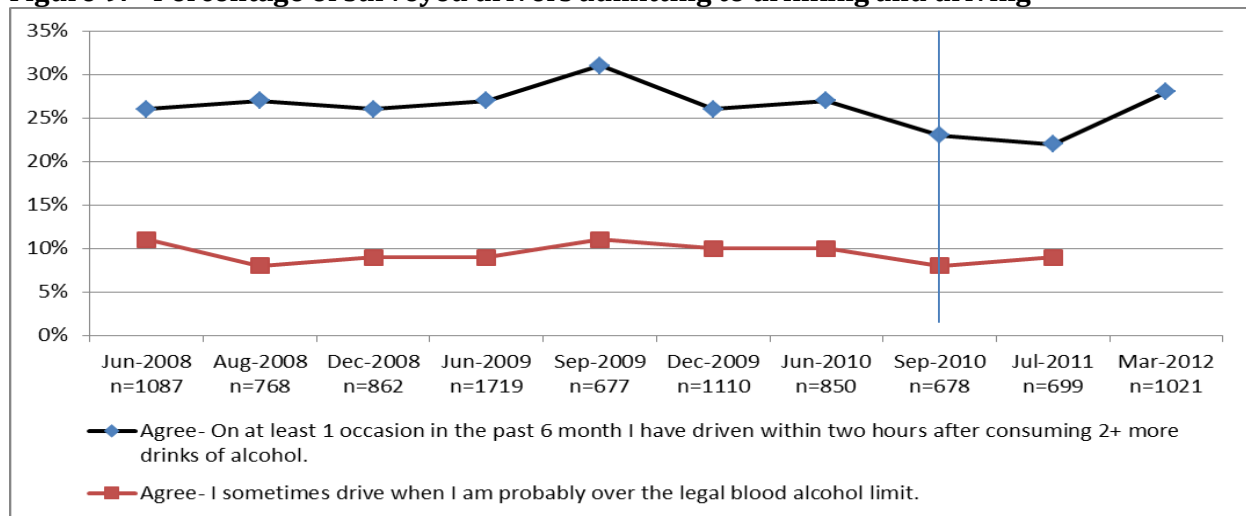
Another limitation of the 2010 and 2012 roadside survey estimates is that they are based on results from only five communities and are representative of night time drivers only. Thus, they only provide estimates for these five communities, individually and in aggregate, and do not address drinking driving prevalence during day time hours.

Looking at the longer-term results from the roadside surveys conducted in Vancouver and Saanich, there has been a consistent downward trend in drinking and driving ($BAC \geq .05\%$) from 2006 forward: 5.1% in 2006, 4.4% in 2008, 3.7% in 2010, 1.6% in 2012. Given this pre-existing downward trend, the potentially confounded time period during which the 2012 survey was done, and the introduction of other impaired driving strategies such as the mandatory ignition interlock in 2009, it is difficult to attribute specific effects to the IDI based on these results. Nonetheless, the findings are certainly suggestive of a positive change in behaviour to which the IDI may well be an important contributing factor.

Two other sources of information on impaired driving are the previously mentioned self-report surveys: the PAS and the ICBC RSTS. Little change was observed in the percentage of respondents who admitted (on the PAS) to having driven a vehicle when they thought they were over the legal alcohol limit. From 2008 through 2010, the percentage was about 6%; it increased slightly to 7% in 2011, and then dropped back to 5% in 2012 (Ministry of Justice, 2012e). This result varied across different areas of BC, but none of the results were indicative of a change similar to the results obtained with the roadside prevalence surveys described above, or that would be indicative of an impact of the IDI.

In contrast to the PAS, the results obtained from the ICBC RSTS suggested a potential but short-term change in self-reported behaviour that that might have been prompted by the implementation of the IDI. As shown in Figure 9, the percentage of drivers who admitted to driving after two or more drinks reached their lowest levels in the September 2010 and July 2011 surveys, but by March 2012 the percentage had returned to pre-2010 levels. The percentage of drivers who reported driving when they thought they were legally intoxicated remained relatively flat at about 10% of respondents throughout the time period surveyed, indicating little shift in this self-reported drink driving behaviour.

Figure 9. Percentage of surveyed drivers admitting to drinking and driving



Source: 2011 ICBC Ipsos Road Safety Tracking Study End of Year 2011 – Impaired Driving
2012 ICBC Ipsos Road Safety Tracking Study Wave I – Impaired Driving

The inconsistencies between the Beasley and Beirness BAC studies and the PAS and RSTS self-report surveys make it difficult to draw any conclusions concerning trends in actual drink driving behaviour. Ongoing monitoring and, if possible, extension of roadside BAC testing will be required to determine whether the very low estimates of night time drink driving prevalence obtained in June 2012 were an anomaly associated with the month selected for the survey or a true indicator of behaviour change.

Excessive Speeding. As noted previously, there are no sources of prevalence data for excessive speeding other than self-report data obtained from the PAS survey (Ministry of Justice, 2012e). On three occasions of the survey (2010, 2011, and 2012) a question was included which asked drivers how often (during the past 3 months) they had driven a vehicle 20 kph over the speed limit. The percentage of drivers who said they would occasionally engage in this behaviour declined slightly, from 47% in 2010, to 45% in 2011 and 44% in 2012. Although reported here as an indicator for excessive speed, this self-reported driver behaviour is an indirect measure that may or may not represent the behaviour of drivers who would drive 40 or more kph over the speed limit.

3.4.5 Summary

In this section data sources relevant to traffic law enforcement, communication, public awareness and driver behaviour were reviewed and trends relevant to the IDI were examined. The primary intent was to investigate whether the IDI had been implemented as intended, that enforcement and communication about the new sanctions was evident, that the public had become aware of the new

laws and sanctions and, further, that they believed that they would be caught if they engaged in IDI-related behaviours. While there were some early disruptions in the implementation of the 90-day IRP, the other components of the IDI legislation appeared to have been implemented and enforced without issue. Communication about the IDI relied primarily upon public media reports and information made available through Government websites. And, although awareness of the new laws was low in the months leading up to the enactment of the legislation, it did increase over time.

One of the critical elements for an effective deterrence initiative is the extent to which the public perceives that their risk of being caught and punished is high. In two of three surveys reviewed, the percentage of respondents who said they would get caught for impaired driving and excessive speeding increased after the IDI was implemented. No data was obtained in relationship to the risk of punishment after being caught. However, the results of the Beasley and Bierness (2012) self-report survey indicated that drivers understood the consequences of getting caught for drinking and driving and indicated that the 90-day IRP/30-day VI would be a “complete inconvenience”.

Although the data on driver behaviour was very limited and do not support definitive conclusions, available estimates of drinking and driving suggest that fewer people may have been engaging in this behaviour since the IDI was initiated. Further research will be required to ensure that reported findings are not a temporary or localized effect, but the result of an actual and lasting change in behaviour. No data relating directly to the prevalence of excessive speeding (as defined in the MVA) was obtained for this review and consequently no conclusions can be drawn about this behaviour in relation to the IDI.

In the next section, two sets of data will be reviewed for evidence of an IDI effect: a surrogate measure for impaired driving collisions applied to claims crash data, and fatal police-reported collisions.

3.5 Results of Traffic Collision Data Review

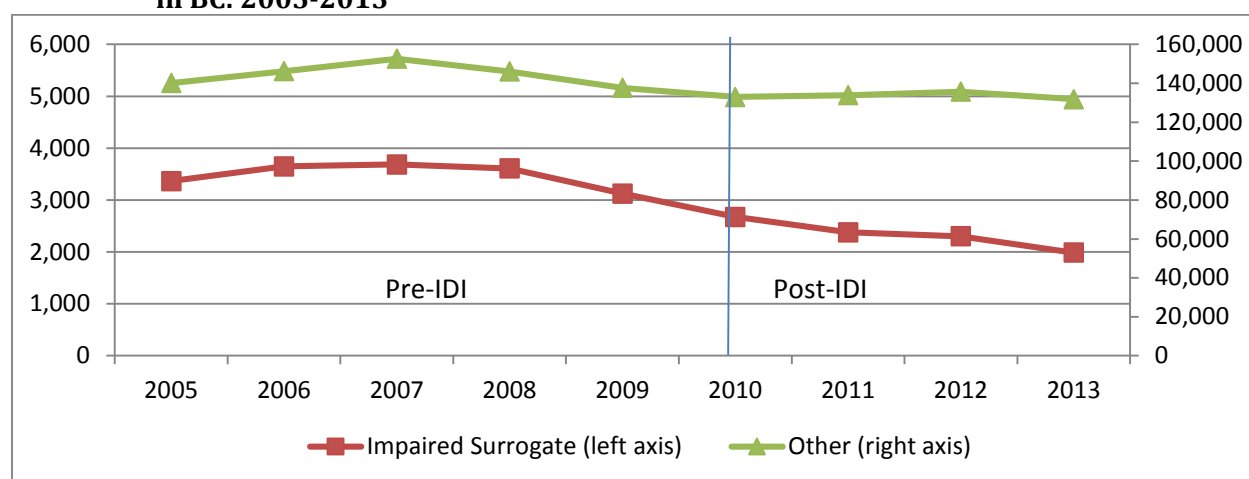
As noted previously it is not possible, given current data limitations in BC, to estimate the overall impact of the IDI on the frequency of claims crash incidents or, by extension, on claims crash costs. There are no appropriate control groups or data that can be used to estimate the frequency of crash claims expected in the absence of the IDI. As well, the ICBC Claims data system does not capture contributing factor data so it is not possible to categorize crash incidents according to their likely relationship to the

IDI. However, there are two small subsets of data that could provide information relevant to the IDI. The first is based on a surrogate measure developed by Voas, Romano and Peck (2009). These authors found that single vehicle, late night (between midnight and 3:00 AM) crashes could be a useful surrogate for alcohol-impaired ($BAC \geq .08\%$) non-fatal collisions. While identifying only a small and very specific subset of those likely to be influenced by the IDI, an exploration of claims crash trends using this surrogate could be informative. Police-reported fatal crashes from TAS will comprise the second data set, and will be the primary focus of this collision review. As noted earlier, these collisions are well ascertained in TAS and they have contributing factor information. The high severity and small numbers (only 247 in 2013) of these collisions, however, preclude extrapolation of findings beyond these data.

3.5.1 Claims-based Impaired Driving (Surrogate) Crash Incidents.

Claims crash incidents were categorized as “impaired-surrogate” or “not impaired” according to the criteria developed by Voas, Romana and Peck (2009). As shown in Figure 10, non-fatal single vehicle, late night (between midnight and 3:00am) collisions in the “impaired” group declined after 2007, while all other non-fatal incidents declined between 2007 and 2010 and then began to level off through 2013. Although the downward trend for the “impaired-surrogate” collisions is quite compelling, particularly in comparison to the trend for the non-impaired group, caution must be exercised in the interpretation of these results. Whether the IDI is contributing to the downturn observed for the “impaired-surrogate” group is difficult to determine. Given the pre-existing downward trend that began to escalate for this group between 2008 and 2010, the results may be influenced by the impact of other penalties to which this illegally impaired group would also be exposed (for example, the mandatory ignition interlock program introduced in 2009). In addition, the category of “impaired-surrogate” crashes is not a direct measure of alcohol-impaired collisions; it is an approximate measure and applies only to those collisions involving illegally impaired drivers ($BAC \geq .08\%$). The observed trend for this group may not reflect what would be seen for non-fatal collisions involving drivers with BACs between 0.05% and 0.08% (many of which would be included in the “not impaired” comparison group). Given these limitations and caveats, these data are not suitable for use in estimating potential claims crash impacts attributable to the IDI. Nonetheless, it remains an interesting observation that late night single vehicle non-fatal collisions continued to decline through 2013, in contrast to the increase observed for other non-fatal collisions.

Figure 10. Impaired-driving (surrogate) non-fatal and other non-fatal claims crash incidents in BC: 2005-2013



Source: BIW as of October 31, 2014 (Excludes parking lot and Out-of-Province incidents).

3.5.2 TAS Fatal Collisions.

Police-reported fatal crash data are reconciled with BC coroner's office data to ensure accuracy of the traffic fatality information and, consequently, are a comprehensive source of information relating to these most severe crashes. The combination of contributing factor information and high ascertainment make this a rich data source for exploring relationships between fatal crashes and a variety of driver behaviours, including drinking and driving and excessive speeding. Contributing factors are not available for the other specific behaviours targeted by the new laws (e.g. stunt driving, street racing, etc.) and, consequently, fatal crashes that may have resulted from such behaviours cannot be isolated for inclusion in this review. Drivers involved in fatal collisions while prohibited or unlicensed have been identified and are included in the IDI fatal collision target group. In total, this group contains:

1. All fatal collisions involving drivers with alcohol and/or excessive speed as contributing factors (whether or not they were prohibited or unlicensed at the time of the crash), and
2. All fatal collisions involving a driver who was prohibited or unlicensed (whether or not alcohol and/or excessive speed were reported as contributing factors) at the time of the crash.

The IDI fatal collision target group was defined this way for three reasons:

1. The new IDI sanctions for each of these behaviours were introduced on the same date (September 20, 2010),
2. Police officers can report up to four contributing factors for each driver involved in a collision. Thus, alcohol and excessive speeding could both be factors in the same fatal collision. No

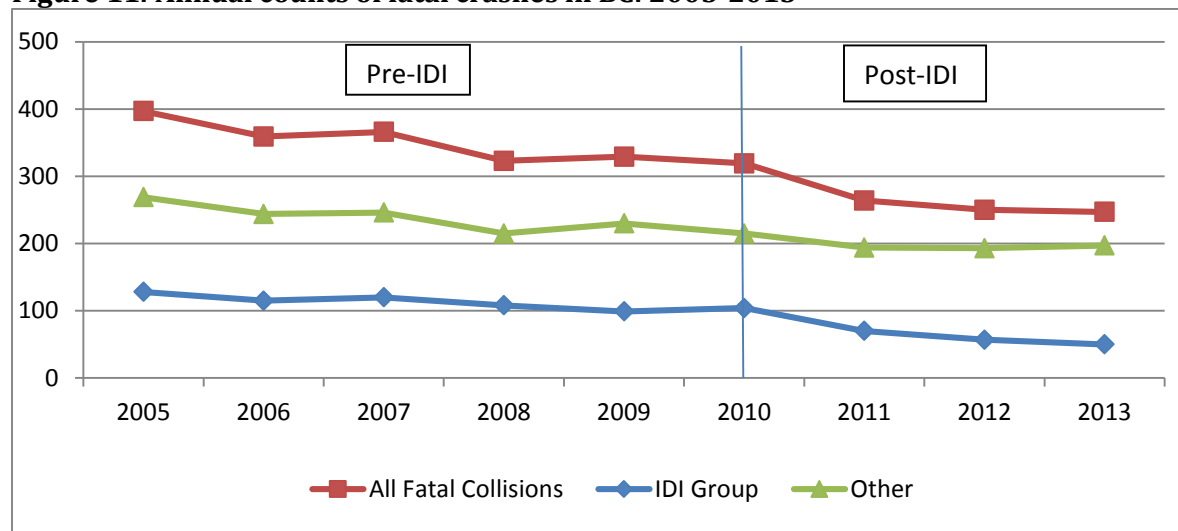
priority ranking is given to the order in which contributing factors are reported so, when both are involved, it is not possible to identify which of the two may have been the primary cause.

3. Unlicensed or prohibited drivers may be involved in fatal collisions that are alcohol-related, excessive speeding-related, or related to other factors. All of these collisions will not be captured if only those involving alcohol and excessive speed are selected.

For ease of reference, this combined set of fatal collisions will be called the “IDI Group”. It is noted that, on a per year basis between 2005 and 2013, about 82% of these collisions involved alcohol as a contributing factor. Although the average percentage of alcohol-involved collisions was slightly lower in the post-IDI period (80.5%) than in the pre-IDI period (82.4%) the difference was minimal.

Figure 11 shows that annual fatal crash counts have generally been trending downward in BC since 2005, and that this trend is similar for both the overall counts of fatal collisions and for the “IDI Group”: i.e., those involving drinking drivers and/or excessive speeders, and/or prohibited/unlicensed drivers. Notably, in both of these groups the steepness of the decline increased from 2010 to 2011 before returning to a more gradual decline between 2012 and 2013. Figure 11 also shows the subset of fatal collisions not included in the IDI Group (shown as the “Other” group). The annual counts for this group also declined over time, but rather than continuing to decline through 2013, they began to flatten out from 2011 onward. These results are in line with what might be expected if the IDI was successful.

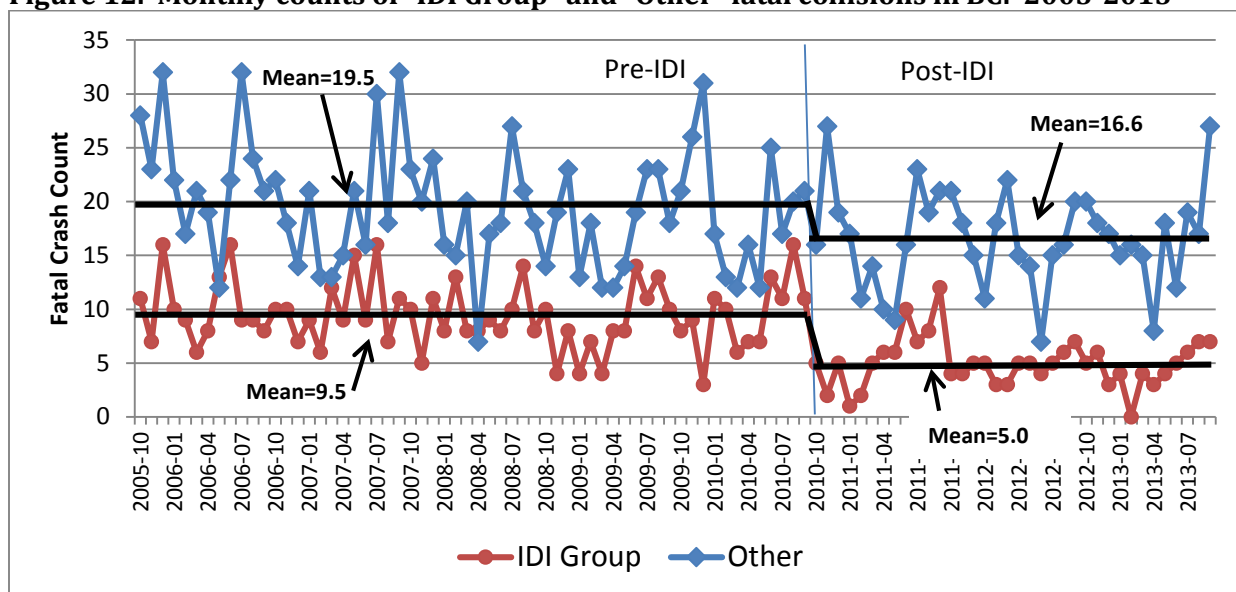
Figure 11. Annual counts of fatal crashes in BC: 2005-2013



Source: BIW as of November 30, 2014

While suggestive, the data shown in Figure 11 provide only a general overview based on aggregated annual counts. To get a better view of trends relating to the IDI, monthly crash counts were computed. For monthly analyses, the time period used was not calendar year but was based on an October - September year; aligning to the timing of the IDI implementation. This was done to account for seasonal effects in the pre- and post-IDI period. These counts are shown in Figure 12. A comparison of the mean proportion of monthly crashes before and after the implementation of the IDI indicated a significant decline ($P < 0.01$) for both groups. The drop in proportion of alcohol-related crashes for the “IDI Group”, however, was larger than that observed for the “Other” group, by about 3.0 fewer fatal crashes per month, or 36 fewer fatal collisions per year.

Figure 12. Monthly counts of “IDI Group” and “Other” fatal collisions in BC: 2005-2013



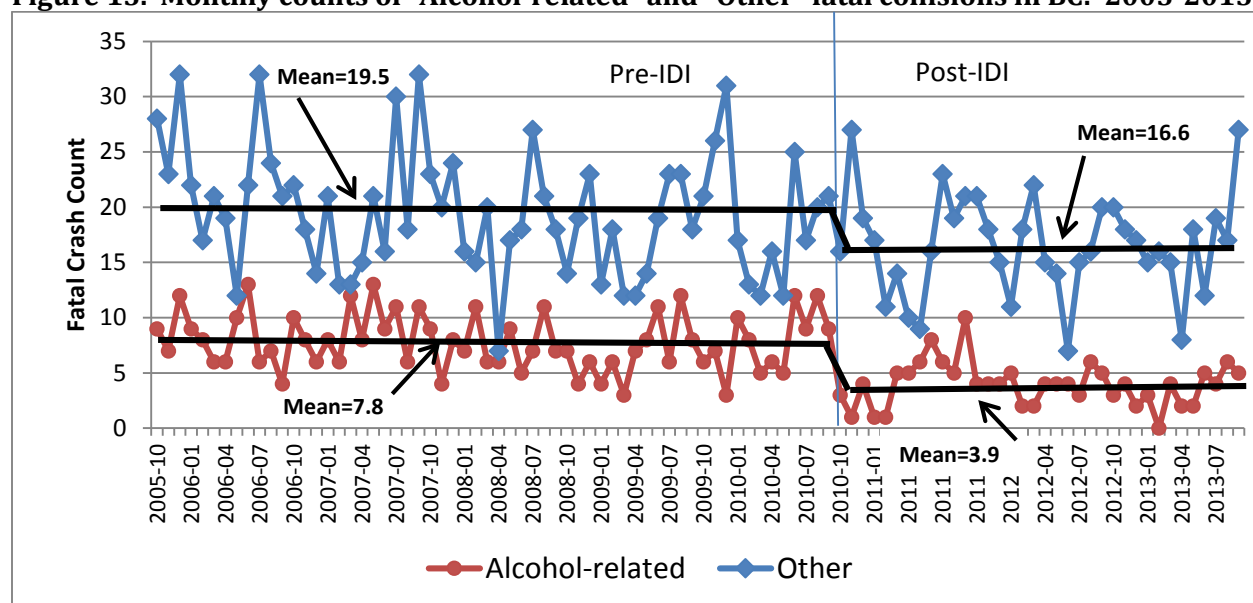
Source: BIW as of November 30, 2014

To try to gain a better understanding of the patterns observed in Figures 11 and 12, the subset of alcohol-related fatal collisions included in the “IDI Group” were extracted and compared to the “Other” group. As noted previously, up to four contributing factors may be for each driver involved in these collisions. As a result, about 24% (on average) of the annual alcohol-related crash counts also involved excessive speed, unlicensed or prohibited drivers– as well as other factors. Consequently, the findings for alcohol-related fatal collisions cannot be completely separated in testing the effects of the alcohol and non-alcohol components of the IDI. Due to the focus of the IDI on drinking and driving and the large

percentage of collisions for which alcohol was a contributing factor, however, it is of interest to look at this group.

Similar to the results obtained for the full “IDI Group”, there was a significant drop in the mean proportion of alcohol-related collisions observed per month (Figure 13) between the Pre- and Post-IDI periods ($P<0.01$). This drop was once again larger than that observed for the “Other” group, although smaller than observed for the full “IDI Group”. After taking into account the drop for “Other” fatal crashes, there were about 2.7 fewer alcohol-related fatal crashes per month, or about 32 fewer per year.

Figure 13. Monthly counts of “Alcohol-related” and “Other” fatal collisions in BC: 2005-2013



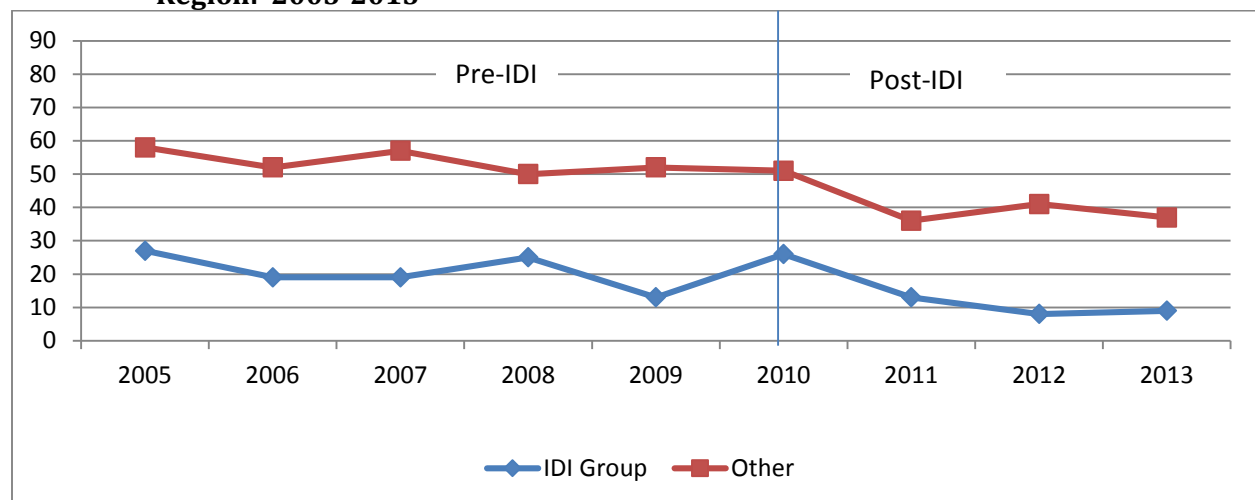
Source: BIW as of November 30, 2014

Although these results are quite compelling it should be noted that there is a limitation in the contributing factor data that was revealed when looking in more detail at the types of fatal collisions combined into the “Other” group. It was found that, on average, about 17% of crashes in this group had no contributing factor information assigned. Although this percentage reached a high of 27% in 2013, year to year fluctuations made it difficult to identify any clear trends. Further investigation will be required to discover why this percentage is so high. The number of collisions with no reported contributing factor information represents an important gap in the fatal collision data, and could affect the results of analyses that rely on this information to identify trends and identify program impacts.

Regional Trends. Given the Province-wide application of the IDI, regional consistency of collision trends could be informative for the attribution of the provincial results to the IDI. This assumes, however, that there were similar levels of the targeted driving behaviours in the pre-IDI period, and similar levels of enforcement of the new laws in the post-IDI period. As discussed in the enforcement section (section 3.4.1), this might not be the case. It should also be noted that the numbers of fatal collisions, when broken down by region and group, become very small. This can make it difficult to draw any inferences from the observed trends, particularly if year to year variability is high. Due to these small numbers, only annual (not monthly) counts are included in this regional review.

Annual fatal collision counts for each of the regions and each of the study groups (IDI and Other) are shown in Figures 14 through 18. What quickly becomes apparent is that there are quite distinct patterns and trends from Region to Region. For example, in the Fraser Valley Region (Figure 14), there appears to have been a general decline in of fatal collisions from 2010 to 2011 followed by relative stability through 2012 and 2013.

Figure 14. Annual counts of “IDI Group” and “Other” fatal collisions in the Fraser Valley Region: 2005-2013

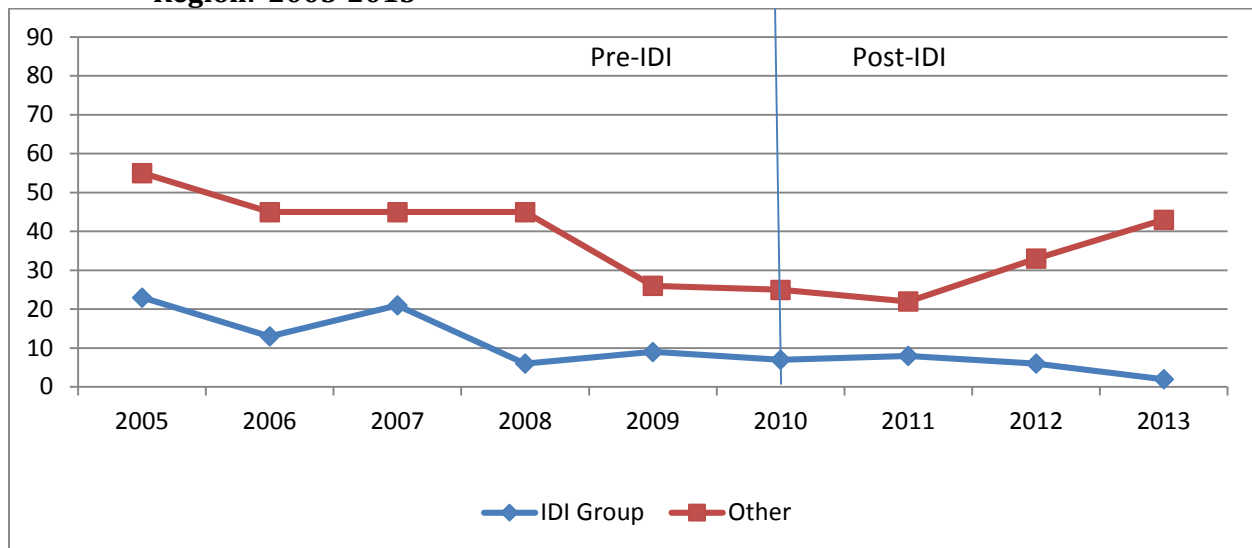


Source: BIW as of November 30, 2014

In the Greater Vancouver Region (Figure 15), the number of IDI-related collisions has been very low since about 2008, and has remained that way through 2013. Although there is a small decline in IDI-related crash counts in 2012 and 2013, there is little evidence of any apparent influence of the IDI in 2011. In contrast, however, the group of “Other” fatal collisions increased sharply after 2011, and

seems to be trending back to levels seen prior to 2009. It may be that, while not reducing collisions in this region (which could be difficult with so few to start with), the IDI may be helping to prevent an increase.

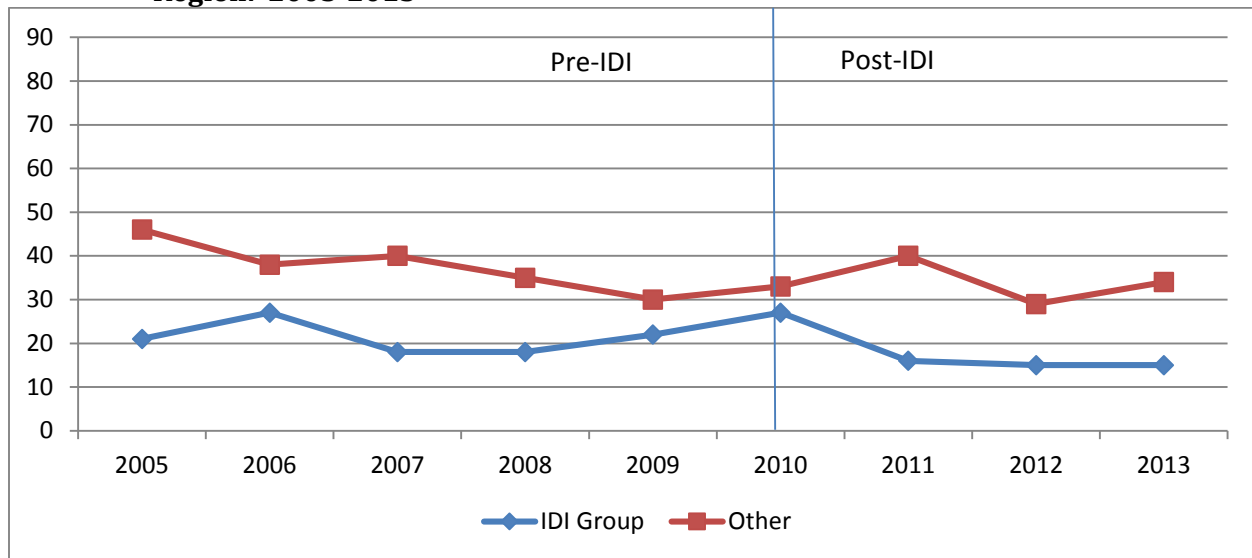
Figure 15. Annual counts of “IDI Group” and “Other” fatal collisions in the Greater Vancouver Region: 2005-2013



Source: BIW as of November 30, 2014

Similar to the results observed for the Fraser Valley Region, the fatal collision trends in the North Central Region (Figure 16) reveal a one-time drop in IDI-related crashes between 2010 and 2011 to a level below that observed in the Pre-IDI period. This level has been sustained through 2013. The pattern for the “Other” group is more difficult to discern, but since 2006 has tended to vary between 30 and 40 collisions per year with little obvious upward or downward trends.

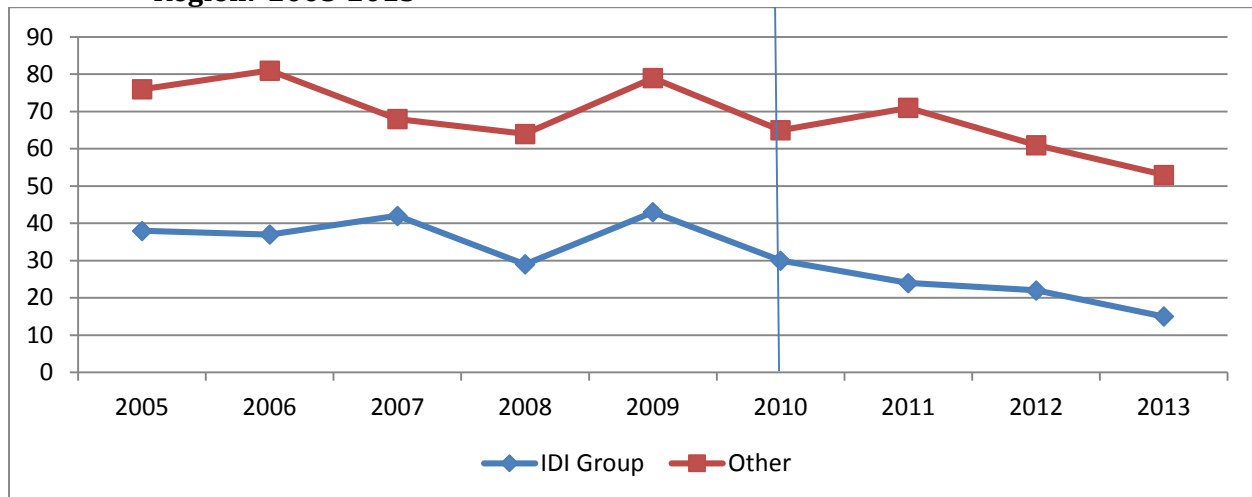
Figure 16. Annual counts of “IDI Group” and “Other” fatal collisions in the North Central Region: 2005-2013



Source: BIW as of November 30, 2014

With respect to the South Interior Region (Figure 17), there is little evidence of any specific influence of the IDI. Both the “IDI Group” and the “Other” group counts have a similar pattern in the pre-IDI period and, with the exception of a slight divergence in 2011, show a similar downward trend in 2012 and 2013.

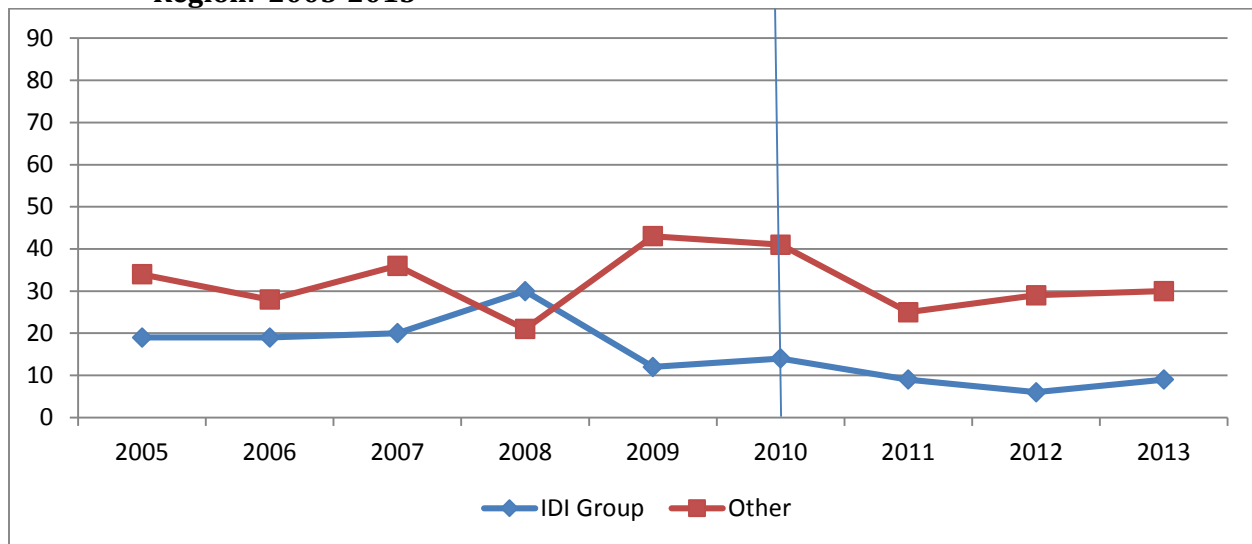
Figure 17. Annual counts of “IDI Group” and “Other” fatal collisions in the South Interior Region: 2005-2013



Source: BIW as of November 30, 2014

Finally, the results for the Vancouver Island Region (Figure 18) reveal no apparent trend for the “Other” group of collisions, while the IDI-related collisions dropped in 2009 and have remained at this lower level since then.

Figure 18. Annual counts of “IDI Group” and “Other” fatal collisions in the Vancouver Island Region: 2005-2013



Source: BIW as of November 30, 2014

3.5.3 Summary

In this section, several subsets of collision data were examined for trends supportive of an IDI effect. A surrogate measure for illegally impaired drivers indicated that single vehicle late night non-fatal claims crash incidents declined during the time period of interest. This decline contrasted sharply with the results observed for the category of all other non-fatal claims crash incidents. Although this surrogate measure is not sufficiently reliable and valid to use in quantifying the impacts of the IDI on impaired driving collisions, the results were in line with findings obtained from police-reported fatal collision data.

The frequency of fatal collision in BC has been reduced dramatically in recent years. An examination of IDI-related fatal crashes (those involving alcohol, excessive speeding, unlicensed and prohibited drivers) and other crashes indicated that reductions associated with the IDI implementation date (September 2010) were common to both groups. However, the magnitude of the reduction was greater for the “IDI Group” of collisions than for the “Other” group. Assuming that the difference in the rate of decline for these two groups can be attributed to the IDI, then it was estimated that between 32 and 36 fatal collisions may have been prevented by this initiative each year. While regional crash trends reveal some inconsistencies, the findings for fatal crashes at the provincial level are compelling. Whether based on the full spectrum of IDI-related fatal crashes or those more specifically related to alcohol involvement,

there are strong indications that the IDI contributed to significant declines in the collisions that were targeted by the September 2010 legislation.

3.6 Estimate of Claims Cost Savings

A third objective of this evaluation was to determine whether it would be possible, based on the evidence, to estimate potential claims cost savings associated with the IDI. While it is clear that data limitations prevent the estimation of overall claims crash impacts, the results of the analysis of TAS fatal collisions, supported by findings relevant to driver awareness and driver behaviour, suggest that the IDI likely did contribute to the observed reduction in these most severe collisions. Exploratory analyses using a surrogate measure for illegally impaired drivers provided additional support for this contributory effect, and suggested that the influence of the IDI might well have extended to non-fatal collisions as well. However, limitations with these data and an absence of true control data makes quantification of this likely effect difficult with any degree of accuracy or precision.

Therefore, based on an estimated reduction of 36 fatal collisions per year, at an estimated average cost of \$232,000⁴, it is best estimated that the IDI contributed to Claims crash savings of about \$8.4 million.

4 Summary

On September 20, 2010, the BC Motor Vehicle Act (MVA) was amended by the Government to provide Police with access to a variety of new (or revised) sanctions for impaired driving, excessive speeding and other careless driving behaviours. The 2010 amendments had several components but the main ones included escalating immediate roadside prohibitions (IRPs) for alcohol-impaired drivers, new or revised vehicle impoundments and escalating fees and fines. For simplicity, the full complement of sanctions (alcohol- and non-alcohol-related) that came into force in September 2010 will be referred to in this report as the “Impaired Driving Initiative” (IDI).

⁴ Average cost was calculated using BIW Incurred Costs for fatal collisions (from 2005-2012), as of August 31, 2013.

A significant component of the IDI was the introduction of IRPs (for time periods beyond the 12- and 24-hour prohibitions already in force) for alcohol-impaired drivers. With the use of an approved blood alcohol content (BAC) screening device police officers are now permitted to issue escalating (3-, 7-, and 30-day) prohibitions for drivers caught driving with a BAC between .05% and .08%, and 90-day prohibitions to drivers with BACs of .08% or greater. Previously, police officers had to detain drivers and take them to the police station for BAC testing before a 90-day prohibition (called an Administrative Driving Prohibition or ADP) could be issued. Unlike the new 90-day IRP, the 90-day ADP did not begin for 21 days from the offence date and, during this 21-day period, offenders could continue to drive on a temporary licence. With the introduction of the IRP, the 90-day prohibition starts immediately. The immediacy of this penalty is important for the deterrence theory of behaviour change which contends that, to be effective, the consequences of driving infractions must be perceived as immediate, severe, and certain.

The present study was undertaken to determine whether or not anticipated impacts of the IDI on motor vehicle collisions could be estimated (in terms of collision frequency and ICBC claims costs). The first step in this process was to determine whether or not appropriate control data would be available. Control data are required in order to estimate what would have happened to collision frequencies had the IDI not been implemented. Without such data, it would not be possible to say whether any observed changes in collision frequency over time were due to the IDI or to the many other factors (e.g., weather, other road safety enforcement initiatives, traffic density, road improvements, availability of public transportation, etc.). The IDI is a Provincial initiative which means that control data is not available within BC; everyone in the Province has already been exposed to the IDI. No suitable control data, or potential effect estimates based on similar interventions, were found from other jurisdictions.

A second step in determining the feasibility of evaluating the impact of the IDI relates to the availability of required outcome data, collision data in particular. In BC, collision data is available from two sources: the ICBC Claims system and the police-reported Traffic Accident System (TAS). Both of these sources have limitations for evaluating the impacts of initiatives such as the IDI. The Claims system is a better source than TAS for estimating the frequency of collision events in the Province, but does not capture information relating to contributing factors. Consequently, collisions associated with the behaviours targeted by the IDI cannot be identified. In contrast, collisions reported into TAS have contributing factor information, but the total numbers of collisions captured are small, less than a quarter of the

counts reported in Claims. Furthermore, police are only required to report on collisions they attend, and attendance can be vulnerable to resource availability, allocation and other operational decisions and policies. As a result, with the exception of fatal collisions, which are almost always attended by police, TAS injury and property damage only collisions cannot be considered representative of the injury and property damage collisions reported through Claims and, therefore, should not be used to generate effect estimates for Claims crash outcomes.

Based on these two limitations (lack of control data and limited collision data), it was concluded that the conduct of an overall evaluation of IDI impact was not feasible. Instead, a descriptive study was undertaken to review existing sources of data relevant to the effectiveness of the IDI. The main focus of this review was:

- To investigate and document information relating to the implementation, enforcement, communication and public awareness of the initiative;
- To investigate and document information relevant to the driver behaviours that the IDI is designed to deter;
- To investigate and document information relevant to the impact of the IDI on fatal collisions and
- To determine whether there is sufficient evidence to support the estimation of IDI impacts (in terms of reduced collisions and claims costs) for this most severe crash outcome.

Fundamental to the deterrence theory of traffic law enforcement is that sanctions for driving infractions be perceived by the driving public as certain, swift and severe. The IDI was designed specifically to enhance the immediacy and severity of the penalties available for serious driving infractions such as drinking driving and other careless driving offences. To be effective, however, drivers must perceive that the sanctions are immediate and severe, and that they will actually be applied to offenders. To raise such perceptions requires visible police enforcement, communication about the sanctions and the likelihood of offenders getting caught and punished. Based on an assessment of available enforcement, communication and public awareness data, it was found that police officers have been issuing the new sanctions, and that drivers' perceptions of the likelihood of getting caught for drinking and driving and excessive speeding did increase during the time frame of the study.

There are few sources of data available concerning changes in driver behaviour. The prevalence of alcohol-impaired driving is one of the few that has been studied using random roadside BAC testing. Such studies are expensive and difficult to conduct and the estimates obtained in the BC surveys (Beasely and Beirness, 2012) cannot be generalized beyond the communities in which they were carried out. Nonetheless, in the five communities surveyed, prevalence estimates of night time drinking and driving declined significantly between 2010 (pre-IDI) and 2012 (post-IDI). While the possibility of confounding factors could not be entirely discounted in this study, the results are encouraging. Future surveys will assist in determining whether the observed reductions have been sustained. No prevalence data was found for excessive speeding or any of the other behaviours targeted by the IDI.

In examining fatal collisions, significant reductions were observed for both IDI- and non-IDI related collisions. However, the IDI reduction was larger than that observed for the non-IDI set of collisions. Based on this comparative analysis it was estimated that the IDI likely contributed to a reduction of about 36 fatal collisions. Other factors may also be contributing to this decline (for example, the introduction of the mandatory ignition interlock program in 2009). However, the inclusion of non-IDI-related fatal collisions helps to control for factors such as weather, increasing penetration of in-vehicle safety devices, traffic density, economics and public transit use. Similar significant reductions in fatal collisions have also been reported by McDonald, et al (2013) based on a comparative time series analysis using alcohol- and non-alcohol-related collisions extracted from TAS and based on the fifteen year period (1996-2012). Brubacher, et al (2014) also found significant reductions in alcohol related fatal collisions and through segmented regression analysis found that alcohol-related fatal crashes began to decline more rapidly in 2010 suggesting a link between the new law and a reduction in fatalities. Their comparisons to neighboring jurisdictions for the same time period found no significant declines in fatal alcohol-related crashes for Saskatchewan and Washington and smaller reductions in Alberta (only 32.7% compared to 52% in BC). The authors attributed the reductions in Alberta to the media and government attention to British Columbia's sanctions as the Alberta government considered and eventually implemented similar sanctions.

Based on an estimated reduction of 36 fatal collisions per year, at an estimated average cost of \$232,000, it is best estimated that the IDI has contributed to annual claims savings of about \$8.4 million.

Caveats. It should be noted that although the estimated claims savings of \$8.4 million is believed to be a reasonable estimate, based on current data, there are potential issues concerning its accuracy. It

was discovered that about 17% of the collisions in the non-IDI group (i.e., the “Other” group in the analysis) had no contributing factors assigned. Given the small number of fatal collisions in the data set, this represents a significant proportion of the sample; the possibility of misclassification effects cannot be discounted. In addition, inconsistencies were found in comparisons of the IDI- and non-IDI-related fatal collision trends by region; an IDI effect was not apparent across all five ICBC regions. However, this could be due to small numbers at this level of disaggregation. There may also be regional differences in the enforcement and prevalence of the targeted behaviours and these may be contributing to the regional differences observed in fatal collisions.

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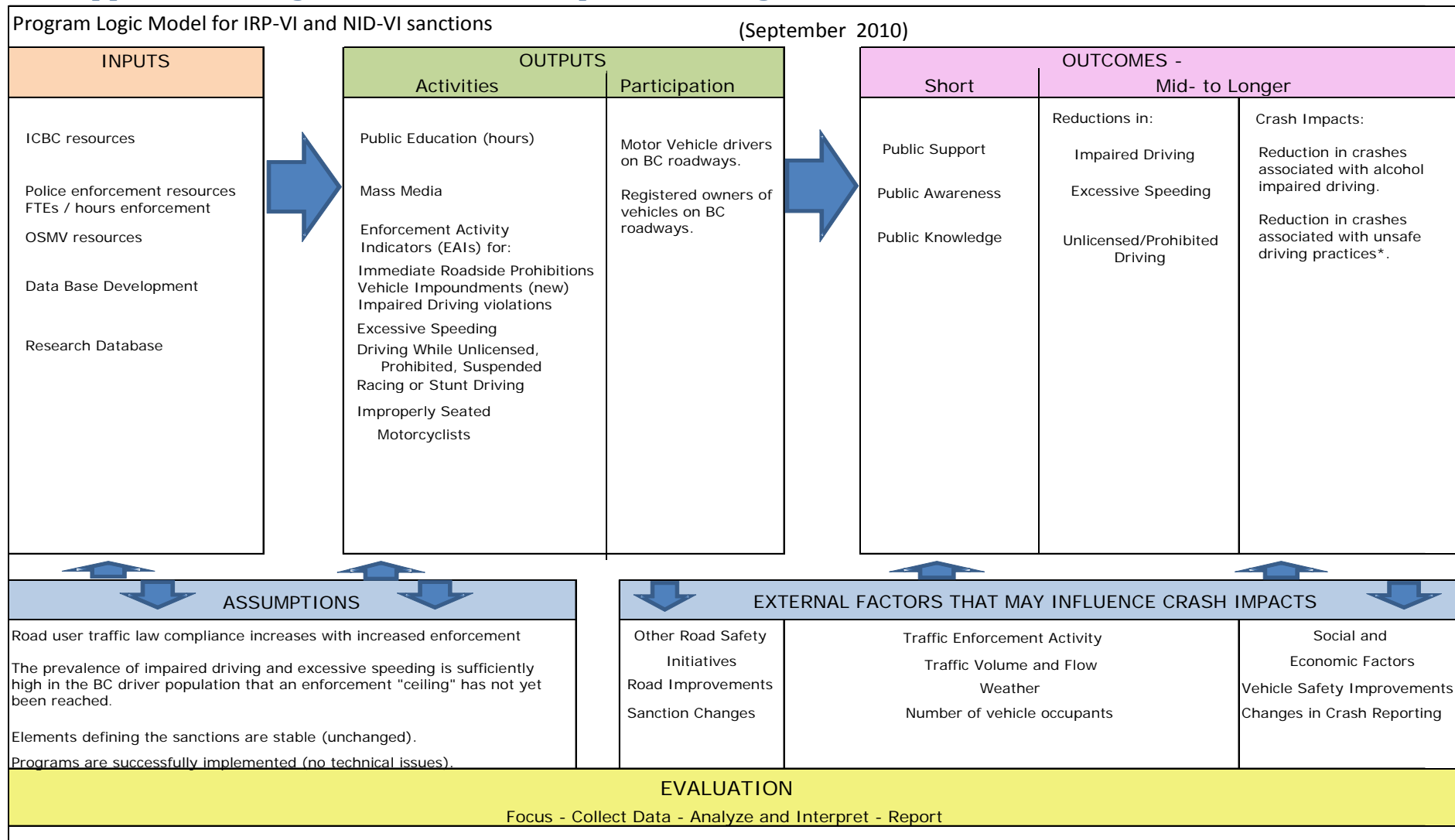
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Appendix A: Alcohol and Non-alcohol Sanctions Before and After September 20, 2010 (fines and fees not included)

Alcohol-related Sanction	Before September 20, 2010	After September 20, 2010
12-hour Suspension	12 hour license suspension for Graduated License Program (GLP) drivers with a BAC greater than 0%.	Still in effect
24-hour Prohibition	24 hour driving prohibition and Vehicle Impoundment for a driver suspected of being impaired by alcohol or drugs.	Still in effect
Administrative Driving Prohibition (ADP)	ADP for drivers with a BAC \geq .08%, or who fail to comply with a breath or blood alcohol test conducted at the Police station. The prohibition starts 21 days after the ADP is served.	Still in effect
Immediate Roadside Prohibition (IRP)	Did not exist	3 Day IRP & VI for 1st offence 7 Day IRP & VI for 2nd offence within 5 years 30 Day IRP & VI for 3rd offence within 5 years Issued for impaired driving with BAC not less than .05%. Issued at roadside by police.
Impaired Driving Prohibition	Did not exist	90-day immediate <u>roadside</u> prohibition for impaired driving with a BAC of not less than .08% or more OR for refusing to provide a breath/blood test. Includes a 30 day VI.
Non-Alcohol VI Sanctions	Before September 20, 2010	After September 20, 2010
Driving While Unlicensed	30 day VI for 1 st offence 60 day VI for 2 nd offence in 2 years	Police issue a minimum of a 7 day VI Non-impaired VI offences are reviewed by the Superintendent of Motor Vehicles and can be escalated if the registered owner has <u>any</u> non-impaired offenses in the past 2 years: 7 days for 1 st VI 30 days for any 2 nd VI 60 days for any 3 rd or subsequent VI
Driving While Prohibited or Suspended	60 day VI for 1 st offence VI for 2 nd offence in 2 years	
Excessive Speeding	No VI penalty	
Driving in a Race or Stunt	Street Racing: 48 hour VI 1 st offence 30 day VI for 2 nd offence in 2 years	
Not Sitting Properly Astride on a Motorcycle	No VI penalty	
Driving a Motorcycle While Unlicensed or Under-licensed	No VI penalty	

Appendix B. Logic Framework for Impaired Driving Initiative



*Unsafe driving includes excessive speeding, racing or stunting, driving while unlicensed/prohibited and being improperly seated while riding a motorcycle.

Appendix C. Review of Data from Other Jurisdictions

In the absence of adequate BC collision data and control data needed to conduct a valid evaluation, a review of the literature was undertaken to determine whether evaluations of administrative penalties in other jurisdictions might be used to estimate the impact of the new sanctions in BC. This was not a comprehensive review but was undertaken to explore the potential that such a review might have for this purpose.

BC is not the only jurisdiction that has introduced administrative penalties for unlawful driving behaviours. Six other Canadian jurisdictions have implemented laws that increase the length of alcohol roadside prohibitions depending on the driver's record: Government of Alberta, 2012; Government of Saskatchewan, 2012; Manitoba Department of Justice, 2012; Ontario Ministry of Transportation, 2012; Community Legal information Association of PEI, 2012; Government of Newfoundland and Labrador, 2010; Government of Nova Scotia, 2012. However, only Alberta has legislation that, similar to BC, includes immediate escalating roadside driving prohibitions along with increasing lengths of vehicle impoundment. Saskatchewan's escalating alcohol-related prohibitions penalties begin at .04% BAC, and as of June 27, 2014, also includes vehicle impoundment for second or subsequent offences. Sanctions against drivers with below criminal code BAC readings (<.08%) exist across most of Canada; however, BC has the strictest penalties in Canada for drivers with a BAC between .05% and .08%.

BC's IRP legislation, with immediate prohibitions and accompanying immediate vehicle impoundments, also has amongst the toughest administrative penalties for drivers with a BAC > .08%,. Most jurisdictions in Canada, as well as in some other parts of the world (eg., New Zealand and some American states) have implemented administrative penalties (prohibitions and impoundments) for drivers with an illegal BAC (Elvik et. al., 2009). However, no other jurisdictions were identified that apply the same combination of penalties and illegal BAC criterion used in BC. Consequently, it is not feasible to use the experience of these other jurisdictions to estimate the impact of BC's legislation.

With respect to excessive speed and other dangerous driving behaviours, vehicle impoundments are also used in jurisdictions outside of BC, but the criteria for impoundments are not consistent. The driver behaviours triggering an impoundment vary as well as the lengths of the impoundments.

To date, none of the Canadian jurisdictions with administrative prohibitions and vehicle impoundments similar to those in BC have published reports on the effectiveness of their sanctions in reducing relevant driver behaviours or collisions. Studies on the use administrative penalties for drinking and driving in countries outside of Canada are limited but have reported associations with lower alcohol-related fatal crashes (Villaveces et al., 2003; Voas et al., 2000; Wagenaar et al., 2007). One such study (Voas, et. al., 2000) found a five percent reduction associated with administrative license suspension laws across 38 states in the US and alcohol-related fatal crashes. It should be noted, however, that this estimate was obtained using evaluation methods that could not establish direct cause and effect. As discussed by Voas et al., the reported results could have been confounded by the impact of other laws, enforcement practices, media attention and the effects of influences not tested in the statistical models. Even if cause and effect were established, however, differences in the specific details of the penalties and regulatory environments of other jurisdictions would limit their applicability in BC.

Reliable and valid estimates of the effectiveness of escalating prohibitions for drink driving are also not currently available. A study by McCartt and Northrup (2003) reported only a small reduction in the number of US drivers with high BAC levels when penalties increased to a mandatory minimum jail sentences for a first offender and the license revocation sanction doubled to 180 days. Elvik et al. (2009) reported on two studies that explored the effects of increasing penalties for drunk driving. One study (Young and Likens, 2000) reported a significant relationship between penalties for drunk driving and the number of alcohol-related driver fatalities, while a second study (Nuestrom and Norton, 1993) reported a reduction in nighttime injury collisions following the introduction of more severe penalties. Nuestrom and Norton cautioned, however, that the observed reduction might be due to other factors beyond the increased penalties, like collision reporting practices. Finally, although not related to drink driving behaviours, a study by Aberg, Nilsson and Engdahl (1989) found no effect attributable to a doubling of penalties for speeding in Sweden in 1982.

In addition to impaired driving, BC recognizes the problem of unlawful vehicle operation by drivers who are prohibited from driving, suspended or unlicensed. This concern is reflected introduction of vehicle impoundments for such behaviour as well as for excessive speeding, stunt driving and racing. A number of studies have shown that vehicle impoundment laws may be associated with reduced recidivism at

least while the vehicle is held (Voas et al., 2004; Voas and DeYoung 2002; Voas, 1997; Voas et al., 1998). Similarly, in a literature review conducted by Wilson (2010), it was reported that vehicle impoundments have been found to be effective in reducing additional driving events amongst offenders for periods up to a year. However, Wilson (2010) found that in BC there was no evidence that the 24-hour prohibition with corresponding vehicle impoundment reduced crashes.

A more comprehensive meta-analysis by R. Elvik et al. (2009) analyzed seven vehicle impoundment studies looking for impoundment effects on crashes. Since the studies all differed in the type of measure used, the selection of drivers and the study time period, no specific estimates of effect could be produced from the analysis. In general, R. Elvik et al. (2009) suggested that the studies showed a reduced crash effect for all drivers during the impoundment period and for varying lengths of time afterward (up to about a year in two studies). A study by Wilson (2010) reported similar findings in her evaluation of an enhanced vehicle impoundment program implemented in BC, in 2005.

Given the many variations in the types of immediate driving prohibitions and vehicle impoundments used in other jurisdictions, and the lack of suitable impact studies designed to estimate their effectiveness, it is not feasible to use estimates from existing external research to estimate the impact of BC's sanctions on driver behaviours and collision outcomes. Although a comprehensive and detailed review of the literature was not conducted for this report, meta-analyses and literature reviews conducted by other researchers did not identify effect estimates that would be both reliable and valid, and transferrable to BC.