FATIGUE-RELATED FATAL COLLISIONS IN CANADA, 2000-2016

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Introduction

Fatigue is a significant factor in motor vehicle collisions across Canada. Behaviours associated with fatigued driving that can increase crash risk include inconsistent speed, frequent lane changes or weaving, not respecting road signs and other traffic control devices, sudden braking, and speeding (Robertson et al. 2009). In a survey of Canadian motorists in 2011, 18.5% of respondents admitted that they had fallen asleep or nodded off while driving in the past year (Marcoux et al. 2012).

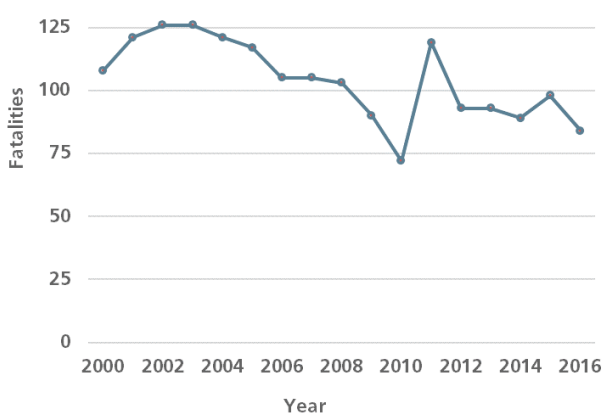
This fact sheet, sponsored by Desjardins, summarizes the characteristics of fatally injured victims involved in fatigue-related collisions in Canada from 2000 to 2016. Data from TIRF's National Fatality Database (Simpson et al. 1978) were used to prepare this fact sheet which explores trends in the role of driver fatigue among fatally injured victims, and the characteristics of fatally injured fatigued drivers.[1]

The objective of this fact sheet is to provide a review of the magnitude and trends of fatigue-related motor vehicle crashes in Canada using indicators such as driver age and sex, vehicle type, alcohol and drug use, time of crash and number of occupants. Fatigue-related crashes are defined as those in which either police-reported collision data or coroner/ medical examiner information cites fatigue as a factor for one of the parties involved in the collision.

Trends in fatigue-related fatalities

The total number of fatigue-related fatalities from 2000 to 2016 is shown in Figure 1. These data included persons who died in a collision where at least one of the drivers was considered to be fatigued. The number of fatigue-related fatalities in Canada rose from 108 to 126 between 2000 and

Figure 1: Fatigue-related fatalities, Canada, 2000-2016

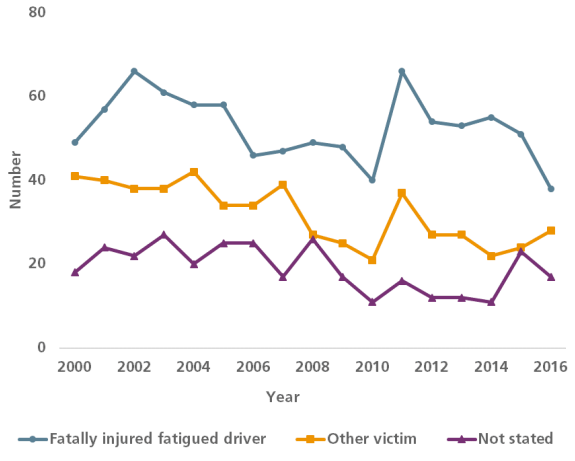


2002, decreased to 72 in 2010 before rising to 119 in 2011. Since then, the number of fatigue-related fatalities declined to 86 in 2016.

The number of fatigue-related fatalities from 2000 to 2016 is presented in Figure 2 according to three categories of fatigue-related fatalities. These include cases in which:

- The fatally injured victim was the fatigued driver ("fatally injured fatigued driver");
- The fatally injured victim was not the fatigued driver ("other victim"). These victims include non-fatigued drivers colliding with a vehicle driven by a fatigued driver, passengers dying in a crash where at least one of the drivers was fatigued, or pedestrians who were struck by a fatigued driver; or,
- It cannot be determined which driver was fatigued or which person in the vehicle was the fatigued driver ("not stated").

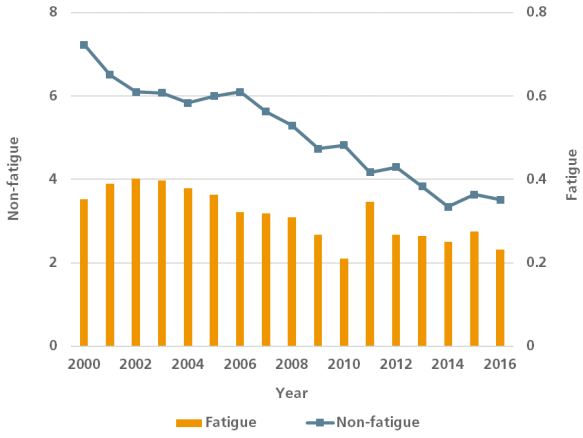
Figure 2: Number of fatigue-related fatalities by fatigue type - Canada, 2000-2016



On average, fatally injured drivers have represented half of the fatigue-related fatalities during this 17-year period. The number of fatally injured fatigued drivers decreased from 49 in 2000 to 40 in 2010, rose to 66 in 2011 before falling to a low of 38 in 2016. The other victims have accounted for almost a third of fatigue-related fatalities. The number of persons dying in fatigue-related collisions generally decreased from 41 in 2000 to 21 in 2010, rose to 37 in 2011, and stabilized at 28 fatalities in 2016. Lastly, the number of fatigue-related fatalities in which the fatigue-related driver was undetermined rose from 18 to 27 between 2000 and 2003, decreased to 11 in 2010, then eventually rose to 17 in 2016.

The rate per 100,000 population for both fatigue and non-fatigue-related fatalities in Canada from 2000 to 2016 is shown in Figure 3. Non-fatigue-related fatalities are represented by the solid line and plotted against the axis on the left while fatigue-related fatalities are represented by the vertical bars and plotted against the axis on the right. The rate of fatigue-related fatalities between 2000 and 2002 rose from .35 persons per 100,000 population to a peak of .4, steadily decreased to a low of .21 in 2010, before stabilizing at .25 in 2016. Non-fatigue-related fatalities per 100,000 population decreased from 7.2 persons in 2000 to 3.34 in 2014, before rising slightly to 3.51 in 2016. There were decreases in the rate of both fatigue and non-fatigue-related fatalities from 2002 to 2010. In 2011, the rate of fatigue-related fatalities increased sharply, then generally decreased until 2016. However, for non-fatigue-related fatalities the rate has decreased more consistently between 2000 and 2016. Thus, the rate of fatigue-related fatalities per 100,000 population has not decreased as systematically as the rate of non-fatigue related fatalities.

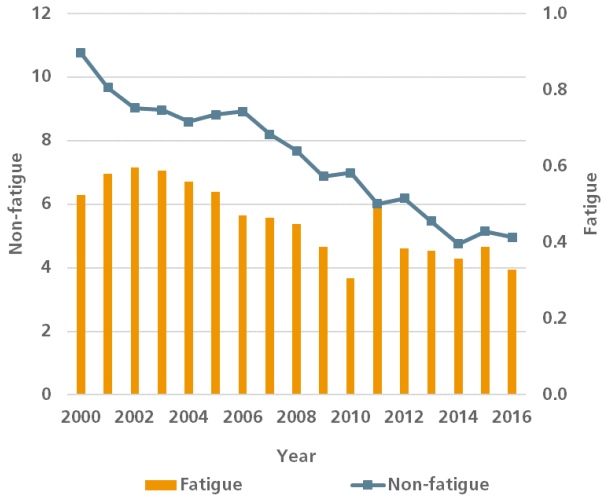
Figure 3: Fatigue and non-fatigue related fatalities per 100,000 population - Canada, 2000-2016



A similar means of comparing fatigue and non-fatigue-related fatalities is to base the fatality rate upon the number of licensed drivers. Rates of both fatigue and non-fatigue-related fatalities per 100,000 licensed drivers from 2000 to 2016 are shown in Figure 4. Once again, non-fatigue-related fatalities are represented by the solid line and plotted against the axis on the left while fatigue-

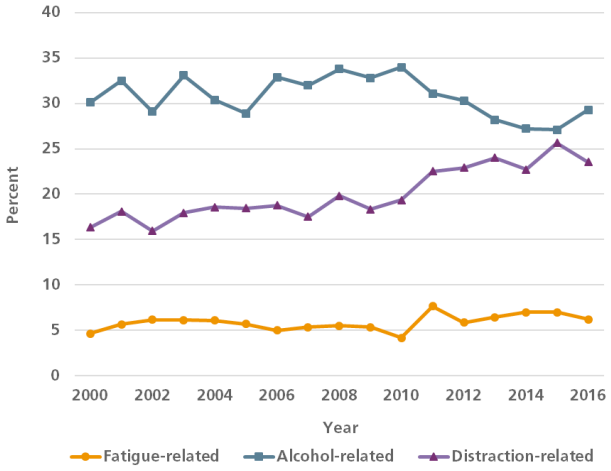
related fatalities are represented by the vertical bars and plotted against the axis on the right. The rate of fatigue-related fatalities per 100,000 licensed drivers decreased from 0.52 persons in 2000 to a low of 0.31 in 2010, and stabilized at 0.33 in 2016. In comparison, the rate of non-fatigue-related fatalities per 100,000 licensed drivers decreased from 10.8 persons in 2000 to 4.76 in 2014, before settling at 4.96 in 2016. Similar to Figure 3, there was a general decrease in both fatigue and non-fatigue-related fatalities between 2000 and 2016 but it was more pronounced for non-fatigue-related fatalities.

Figure 4: Fatigue and non-fatigue related fatalities per 100,000 licensed drivers - Canada, 2000-2016



A comparison of the prevalence of the role of fatigue, alcohol, and distraction in motor vehicle fatalities from 2000 to 2016 is shown in Figure 5. Overall, the percentage of fatalities that were fatigue-related are relatively low when compared to other contributing factors such as distraction or alcohol use. However, it is worth noting that there are challenges in determining the role of fatigue in fatal crashes. For example, if there are no eyewitnesses to confirm that fatigue played a role, other contributing factors (e.g., alcohol, drugs, distraction, inexperience) may take precedence in police reports. In 2000, 4.6% of fatalities were fatigue-related compared to 2011 where 7.7% of all fatalities were fatigue-related. This percentage gradually decreased to 6.2% in 2016. By comparison, the percentage of fatalities that were alcohol-related has decreased from 30.1% to 29.3%, while the percentage of fatalities that are distraction-related has increased from 16.3% to 23.5% during this 17-year period.

Figure 5: Percentage of total fatalities that were related to fatigue, alcohol use, and distraction - Canada, 2000-2016



Characteristics of fatally injured drivers who were fatigued

In this section, driver characteristics such as age, sex, type of vehicle driven, alcohol and drug use of fatally injured drivers is examined in order to determine whether there is any variation among these variables during a five-year period (2012-2016). The percentage of fatally injured male and female drivers who were fatigued during this period is shown in Figure 6. Among fatally injured male drivers, 6.4% were fatigued compared to 4.3% of fatally injured female drivers.

Figure 6: Percentage of fatally injured fatigued drivers by sex - Canada, 2012-2016

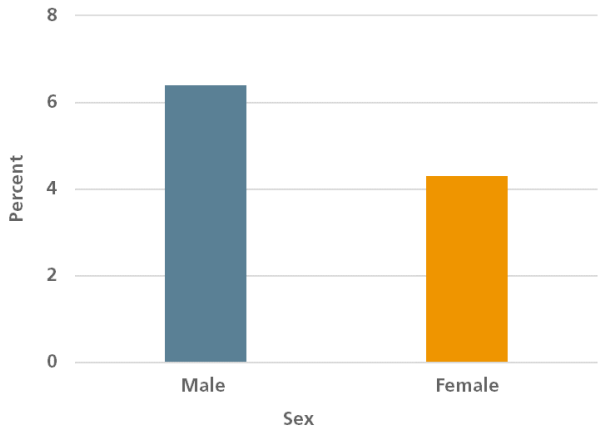
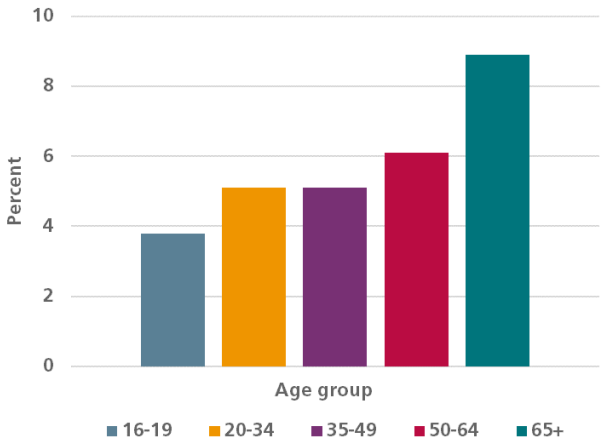
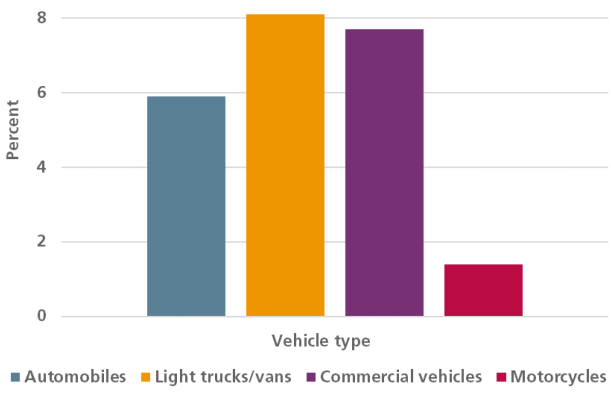


Figure 7: Percentage of fatally injured drivers who were fatigued by age group - Canada, 2012-2016



Fatally injured drivers are divided into five different age groups: 16-19, 20-34, 35-49, 50-64, and 65+. Figure 7 shows the percentage of fatally injured drivers in each of these age groups who were fatigued during the 2012-2016 period. Generally speaking, the prevalence of fatigue among fatally injured drivers appears to increase with age. To illustrate, only 3.8% of fatally injured drivers aged 16-19 were fatigued, compared to 5.1% of 20-34 and 35-49 year olds, and 6.1% of 50-64 year olds. Among fatally injured drivers aged 65 and over, 8.9% were considered to be fatigued.

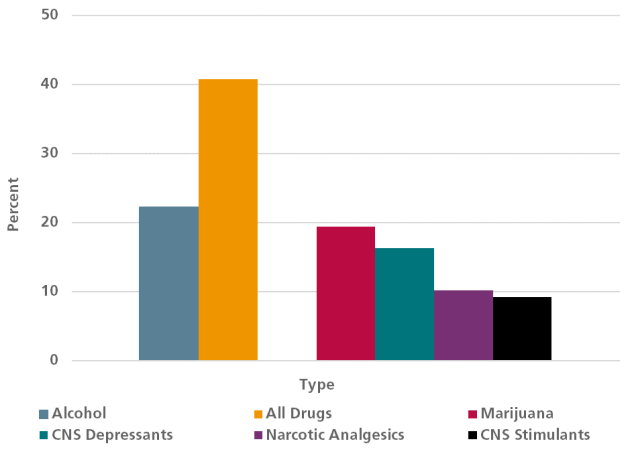
Figure 8: Percentage of fatally injured drivers who were fatigued by vehicle type - Canada, 2012-2016



In Figure 8, the percentage of fatally injured drivers of different vehicle types is shown. Fatally injured drivers of trucks/vans were the most likely to have been fatigued at 8.1%. Among fatally injured drivers of commercial vehicles (heavy trucks and tractor-trailers), 7.7% were fatigued. By comparison, 5.9% of fatally injured automobile drivers were fatigued. The group of fatally injured drivers that were the least likely to be fatigued was motorcyclists at only 1.4%.

To examine the prevalence of alcohol and drugs among fatally injured fatigued drivers, the data in Figure 9 are presented differently than the previous figures in this section. Figure 9 shows the percentage of fatally injured fatigued drivers who tested positive for these substances. It should be noted that drugs include prescription and over-the-counter medications as well as illicit substances. As can be seen, 40.8% of fatally injured fatigued drivers tested positive for drugs compared to 22.2% of those drivers who tested positive for alcohol. If one looks at the the drug categories most commonly found in fatally injured fatigued drivers, 19.4% tested positive for marijuana, 16.3% for CNS depressants, 10.2% for narcotic analgesics, and 9.2% for CNS stimulants. It should be noted that the percentages for these four drug categories do not add up to 40.8% (the percentage for all drug categories) since some drivers may have tested positive for more than one category of drugs. Although not shown in this figure, 11.4% of fatally injured fatigued drivers tested positive for both alcohol and drugs.

Figure 9: Percent of fatally injured fatigued drivers testing positive for alcohol and drugs - Canada, 2012-2016

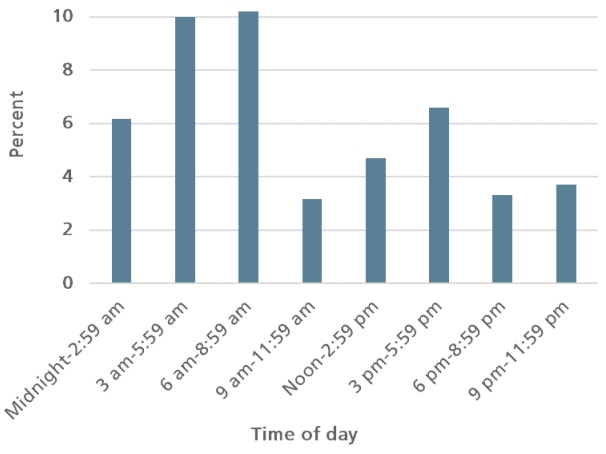


Collision characteristics of fatigue-related fatalities

This section examines collision characteristics of fatigue-related fatalities. Fatigue-related fatalities are those where at least one of the drivers was fatigued. The collision characteristics that are reviewed include time of day, day of week, season, and number of occupants in the vehicle. Similar to previous sections, data are analyzed for persons dying in collisions during the past five years (2012-2016).

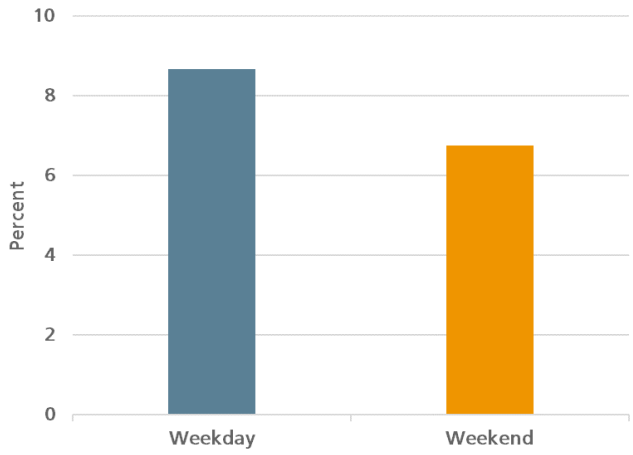
Figure 10 compares the percentage of fatalities that are fatigue-related by time of day that the crash occurred. The time of day has been aggregated into three-hour increments (e.g., midnight to 2:59 am). Persons dying in crashes which occurred between 6 am-8:59 am and 3 am-5:59 am were the most likely to die in fatigue-related crashes (10.2% and 10.0, respectively). On the other hand, only 3.2% of persons dying in crashes between 9 am-11:59 am died in a fatigue-related crash. To summarize, fatigue appears to play a greater role in early morning fatal crashes than in crashes at other times of the day. Fatal collisions involving fatigue decrease in the early afternoon, rise during the late afternoon, and diminish again in the evening.

Figure 10: Percentage of fatalities that were fatigue-related by time of day - Canada, 2012-2016



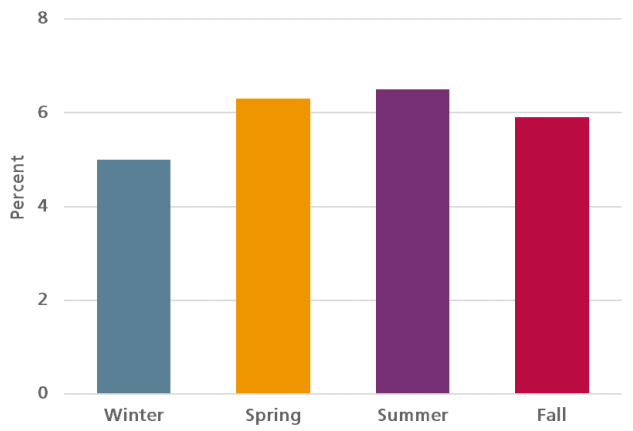
The percentage of fatalities involving fatigue can also be analyzed by comparing fatalities resulting from collisions that occur on weekends (between 6 pm Friday and 5:59 pm on Sunday) as opposed to weekdays (from 6 pm Sunday to 5:59 pm on Friday). Figure 11 shows that 8.7% of victims dying in crashes on weekdays died in a fatigue-related crash compared to 6.8% of victims who died in weekday crashes.

Figure 11: Percentage of fatalities that were fatigue-related during weekends and weekdays - Canada, 2012-2016



In order to examine whether there is any seasonal variation in the prevalence of fatigue among fatalities, collision dates have been recoded into spring (March-May), summer (June-August), autumn (September-November), and winter (December-February). Figure 12 shows the percentage of fatalities in each season that involved fatigue. Among those who died in crashes in the summer, 6.5% were in a fatigue-related crash which is slightly more than the 6.3% of victims who died in fatigue-related crashes during the spring. Among persons who died in the autumn, 5.9% were involved in a

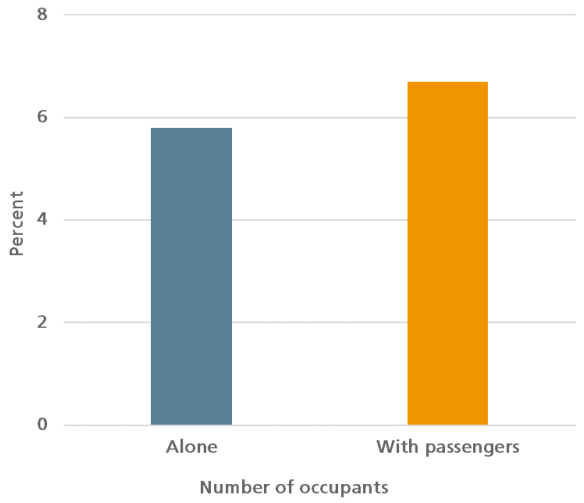
Figure 12: Percentage of fatalities that were fatigue-related by season of crash - Canada, 2012-2016



fatigue-related crash compared to 5.0% of victims who died during the winter.

Lastly, a comparison of the percentage of fatalities that were fatigue-related was made between victims who were the only occupants of their vehicle with victims who were in a vehicle with two or more occupants. Figure 13 shows that 6.7% of persons who died in a vehicle with two or more occupants were in a fatigue-related crash as opposed to 5.9% of lone vehicle occupants.

Figure 13: Percentage of fatigue-related fatalities by number of occupants - Canada, 2012-2016



Conclusions

According to TIRF's National Fatality Database, there was a downward trend in the number of fatigue-related fatalities in Canada between 2000 and 2016. However, this downward trend was not as pronounced as the trend for fatalities where fatigue was not a contributing factor during this same 17-year period. Fatally injured drivers who were fatigued accounted for the largest number of fatigue-related fatalities of the three types of victims. This is similar to the role of alcohol where most alcohol-related fatalities are the drinking driver but unlike the role of distraction where most distraction-related fatalities are not the distracted driver.

Since 2000, there has been a general decrease in the percentage of fatalities that are alcohol-related while the percentage of distraction-related fatalities has increased. Meanwhile, the percentage of fatalities that are fatigue-related, while lower in number, has remained relatively stable during this period.

A higher percentage of fatally injured male drivers than female drivers were fatigued. Within the various age groups, fatally injured drivers aged 16-19 are the least likely to be fatigued. The percentage of fatally injured drivers within each age group increases and drivers aged 65 and over are the most likely to be fatigued. This may be due to nighttime driving restrictions on novice drivers that limit their exposure to crashes. Another possibility is that older drivers experiencing medical events are being coded as fatigued. The highest percentage of fatally injured drivers to be fatigued based upon vehicle driven was drivers of light trucks and vans, followed by drivers of commercial vehicles. Although commercial vehicle drivers represent a smaller segment of vehicles on the road, they may be more prone to fatigue since they generally travel greater distances and drive more often at night.

When looking at fatally injured fatigued drivers as a subset, a larger percentage of them tested positive for drugs than alcohol. There may be certain combinations of alcohol and drugs that contribute to fatigue.

As earlier data from TIRF's National Fatality Database and research literature has shown (TIRF 2016, Vanlaar et al. 2008), fatigue-related fatal collisions occurred more frequently in the early morning and late afternoon. These findings reinforce the veracity of the fatality data. Other characteristics of fatigue-related fatal collisions persist. These include the increased likelihood for these crashes to occur on weekdays than on weekends. Summer continues to be the most common season for fatigue-related fatal collisions, perhaps due to greater distances being travelled as a result of better driving conditions or longer days with more daylight.

However, unlike previous research, lone occupants of vehicles seem to be less likely to die in fatigue-related collisions than drivers who are accompanied by other occupants. This characteristic may require further monitoring since it would be expected that passengers can keep drivers engaged in conversation or vehicle occupants can take turns driving on a long trip.

There are still some limitations associated with the reporting of the role of fatigue in collisions in general and fatal collisions in particular. Under-reporting of the role of fatigue can be due to a lack of firm evidence, the reluctance of surviving drivers to acknowledge that they were tired, and the presence of alcohol or drugs in a fatally injured driver

which may result in investigating officers indicating alcohol or drug use as a contributing factor in a collision report, but not fatigue. However, it has also been argued that the role of fatigue can be over-reported in collisions since it is not considered to be as socially unacceptable as alcohol use, drug use, speeding, or distraction (NHTSA 2011).

In conclusion, while the data show there has been a decrease in fatigue-related fatalities since 2000, this decrease has not kept pace with decreases in non-fatigue-related fatalities. Furthermore, the data suggest that two-fifths of fatally injured drivers who were fatigued also tested positive for drugs. Further monitoring of this issue will be crucial in this regard.

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[1] Fatality data from British Columbia from 2013 to 2016 were not available at the time that this fact sheet was prepared. As a result, Canadian data presented have been re-calculated to exclude this jurisdiction and make equitable comparisons.

Traffic Injury Research Foundation

The mission of the Traffic Injury Research Foundation (TIRF) is to reduce traffic-related deaths and injuries. TIRF is a national, independent, charitable road safety research institute. Since its inception in 1964, TIRF has become internationally recognized for its accomplishments in a wide range of subject areas related to identifying the causes of road crashes and developing programs and policies to address them effectively.

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