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# Injury in Review

2012 Edition

Spotlight  
on Road and  
Transport Safety



Canada 

*To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.*  
— Public Health Agency of Canada

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## About PHAC's Health Surveillance and Epidemiology Division, and Injury Section.

**The Health Surveillance and Epidemiology Division (HSED) conducts surveillance-related research and knowledge dissemination in several areas. One of HSED's health surveillance initiatives is the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP), delivered and managed by the Injury Section.** The Injury Section collects, analyses, and disseminates information on injuries that result in emergency department visits at the 15 participating CHIRPP hospitals, and from datasets managed by others. More information about CHIRPP can be found in this report under Appendix B Data Sources and Methods.

Collaboration with others also supports and augments injury-related surveillance and research information, and provides value-added evidence on the types of injuries that occur, their circumstances, and risk factors. This information is integrated and shared with injury prevention and safety promotion partners to advance the overall goal of reducing injuries.

For more information, please visit:  
[www.phac-aspc.gc.ca/injury-bles](http://www.phac-aspc.gc.ca/injury-bles)  
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[Injury.Surveillance@phac-aspc.gc.ca](mailto:Injury.Surveillance@phac-aspc.gc.ca).

\* Individuals are listed in alphabetical order of last name.

## About the Road Safety Directorate, Transport Canada

**The Road Safety Directorate works to reduce the number of deaths, injuries, damage to property and the environment, health impairment, and energy consumption resulting from the use of motor vehicles in Canada.**

Road safety is a shared responsibility, and is governed by the Canada Motor Vehicle Safety Act. The Road Safety Directorate works with industry, community groups and government partners to set national safety standards for the design and construction of safe vehicles and safe roads, as well as promote safe drivers and passengers.

For more information, please visit:

[www.tc.gc.ca/eng/roadsafety/menu.htm](http://www.tc.gc.ca/eng/roadsafety/menu.htm) or call 1-800-333-0371.

## About Safe Kids Canada

Safe Kids Canada's mission is to lead and inspire a culture of safety across the country in order to reduce unintentional injuries, the leading cause of death among children and youth in Canada. As a national leader, Safe Kids Canada uses a collaborative and innovative approach to develop partnerships, conduct research, raise awareness and advocate in order to prevent serious injuries among children, youth and their families. Safe Kids Canada's vision is **Fewer Injuries. Healthier Children. A Safer Canada.** Safe Kids Canada is the national injury prevention program of The Hospital for Sick Children.

For more information, please visit:

[www.safekidscanada.ca](http://www.safekidscanada.ca) or call (416) 813-7288.

## About the Traffic Injury Research Foundation

The Traffic Injury Research Foundation (TIRF) is Canada's road safety research institute. **TIRF's mission to reduce deaths and injuries resulting from road collisions is achieved by designing, implementing, evaluating and promoting evidence-based strategies.** TIRF is a world leader in research, program and policy development, evaluation, and knowledge transfer, focusing on the road user and behaviours that result in driver error and account for 80% of road collisions.

A special focus is placed on impaired drivers and young drivers who account for a substantial proportion of fatalities and injuries on our roads. TIRF also has expertise in several other issues ranging from speeding and aggressive driving to driver fatigue and distraction; from driver education and licensing, to commercial drivers and motorcycle safety; and from driver aging and other factors of heightened vulnerability.

For more information please visit:

[www.tirf.ca](http://www.tirf.ca) or call 1-877-238-5235.

# Foreword

## Message from Canada's Chief Public Health Officer



It is my pleasure to introduce *Injury in Review, 2012 Edition: Spotlight on Road and Transport Safety*. In this report, you will find national surveillance statistics on injuries in Canada, highlighting unintentional road- and transport-related injuries among children, youth, and young adults up to 24 years of age. As well, it contains important information and tips for young people, parents, caregivers, and others interested in helping to prevent road- and transport-related injuries. This report is a collaborative effort of the Public Health Agency of Canada, Safe Kids Canada, and the Traffic Injury Research Foundation.

Surveillance statistics show an important decline in the rates of motor vehicle fatalities and injuries over the past three decades. The many road safety and injury prevention innovations that have influenced this trend are one of the most remarkable success stories of injury prevention efforts in Canada. Nevertheless, transport-related incidents remain one of the leading threats to the health of Canada's children youth, and young adults, and further injury prevention efforts are needed.

The report's focus on road safety issues is also timely. The year 2011 was the **National Year of Road Safety** in Canada and the start of the **United Nations Decade of Action for Road Safety**. This report will increase awareness and contribute knowledge to support effective road and transport injury prevention policies and programs, as well as safer behaviours among Canada's road users. Through the collective efforts of all road safety partners, we can help safeguard the health and safety of Canada's children, youth, and young adults.

A handwritten signature in black ink, reading "David Butler-Jones". The signature is fluid and cursive, with a long horizontal line extending from the end.

Dr. David Butler-Jones  
Chief Public Health Officer  
Public Health Agency of Canada

The year 2011 was the **National Year of Road Safety in Canada** and the start of the **United Nations Decade of Action for Road Safety**.



# Executive Summary

Injuries\* are the leading cause of death for Canadians between the ages of 1 and 44 and the fourth leading cause of death for Canadians of all ages. *Motor Vehicle Traffic Collisions*† are the leading cause of *injury-related* death among Canadians 1-24 years of age combined, and the leading cause of death overall for persons 15-24. *Injury in Review, 2012 Edition: Spotlight on Road and Transport Safety* presents statistics on injuries and mortality from the leading causes, including road- and transport-related injury and death in Canada (0-24 years‡), as well as important information for parents, caregivers, and others interested in helping to prevent road- and transport-related injuries. Recommendations and tips for safer road- and transport-related behaviours presented throughout are based on the best available research evidence, and expertise of injury prevention professionals. While *Injury in Review, 2009 Edition* focused on children and youth up to 19 years of age, this report extends the age range up to 24 years because the highest burden of road fatalities in Canada is among older teens and young adults. For additional information on the injury categories used for presenting data as well as data sources and methods, please refer to Appendices A and B.

## Data Sources

This report contains information from multiple data sources that include:

- Statistics Canada's Vital Statistics Death Database.
- The Canadian Institute for Health Information (CIHI), for information on hospitalizations.
- The Public Health Agency of Canada's (PHAC) Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP), for information on hospital emergency department visits.
- Transport Canada's National Collision Database (NCDB), for information from police reports of motor vehicle collisions on public roads in Canada.
- The Traffic Injury Research Foundation's Fatality Database, for information collected from police reports and coroner and medical examiners' files on motor vehicle collision-related fatalities on and off public roads, related to alcohol use. The following agencies have provided funding for the Fatality Database: Health Canada (1973-1982); Transport Canada and the Canadian Council of Motor Transport Administrators (CCMTA) [1984-2010; their funding for the Fatality Database has been in support of the Strategy to Reduce Impaired Driving (STRID) for several years].

The report presents this information in two main parts. The Injury Overview contains information based on the Public Health Agency of Canada's analysis of national mortality and hospitalization data. The second section provides greater detail on Featured Topics related to road- and transport-related injuries and fatalities.

## Injury-related mortality

- Overall, between 1979 and 2007 rates of mortality from the leading injury causes declined.
- *Motor Vehicle Traffic Collisions*† were the leading cause of death throughout this time period, but decreased annually by 4% on average.
- In 2007 there were 770 deaths due to *Motor Vehicle Traffic Collisions*. In relative terms this means that for every 100,000 Canadians under 25 years, 7 were fatally injured in *Motor Vehicle Traffic Collisions*.

\* Throughout this report, injuries are described in the context of excluding those related to adverse effects of medical care.

† Unless otherwise noted, information presented in the Executive Summary and throughout the remainder of the report is for the 0-24 age group.

‡ Throughout this report, usage of italics when referring to *Motor Vehicle Traffic Collisions* (on public roads only; excludes off-road incidents) and other causes of injury-related hospitalization and death, specifically refers to categories of the International Classification of Diseases (ICD-10).

## Injury-related hospitalization

- Overall, between 1994/95\* to 2008/09 hospitalization rates from the leading injury causes declined.
- *Motor Vehicle Traffic Collisions* were the second leading injury cause of hospitalization throughout this time period, but rates decreased annually by 6% on average.
- In 2008/09 there were 4,719 hospitalizations for treatment of injuries associated with *Motor Vehicle Traffic Collisions*. In relative terms this means that for every 100,000 Canadians under 25 years, 46 hospitalizations occurred as a result of injury from *Motor Vehicle Traffic Collisions*.

## Restraint Use

- According to the NCDB, unrestrained occupants of light duty vehicles involved in collisions have a 3 times greater likelihood of being injured and 16 times greater likelihood of fatal injury, as compared to restrained occupants (1998-2008).

## Alcohol-related Deaths

- According to the Fatality Database, for all age groups (including those 25+ years), between 1998 and 2009 there was no significant decrease in the annual proportion of alcohol-related motor vehicle fatalities.
- In 2009, 38% of motor vehicle fatalities involved alcohol use.
- In 2009, males were 2.3 times more likely to die in alcohol-related collisions in contrast to females.

## Bus-related Injuries

- 2,182 injuries related to school buses and 2,271 injuries related to city buses were identified in CHIRPP emergency department data for the period 1990/91 to 2008/09.
- Among injuries related to school buses, the leading cause of injury involved a collision with a motor vehicle (21%), sudden movement of the bus (17%), horseplay/inappropriate activity (16%), and boarding/exiting the bus (16%). Closed head injuries accounted for 19% of injuries related to school buses.
- Among injuries related to city buses, the leading cause of injury was a sudden movement of the bus (25%), a collision with a motor vehicle (14%), and horseplay/inappropriate activity (9%). Closed head injuries accounted for 25% of injuries related to city buses.
- According to the NCDB, between 1998 and 2008, of pedestrians between 0-18 years of age who were struck and killed by a school bus (single vehicle collisions), 77% were between 5-9 years of age.

\* Throughout this report, hospitalization and CHIRPP emergency department statistics are presented according to a 12 month fiscal year beginning April 1 and ending on March 31 the following year. Hospitalization data are traditionally reported as such, and CHIRPP data are also presented by fiscal year to allow for timely reporting on the most recent data available, and for comparability with hospitalization statistics.

## Vulnerable Road Users (VRUs)

### Non-powered

- During the period 1990/91 to 2008/09, 18,542 injuries to pedal cyclists and pedestrians injured in a collision with a motor vehicle were identified in CHIRPP emergency department data. In both circumstances, the most frequent mechanism was being struck while crossing a street/intersection.
- For non-powered VRUs, the rate of pedestrian injuries was highest at 699 per 100,000 CHIRPP records followed by pedal cyclists at 310 per 100,000 CHIRPP records.
- 16.8% of injured pedal cyclists and 19% of pedestrians were admitted to hospital.

### Powered

- During the period 1990/91 to 2008/09, 2,203 injuries involving motorcycles, mopeds and scooters were identified in CHIRPP emergency department data.
- Motorcyclists and moped users were admitted to hospital at a rate of 26%, and powered scooter riders at 20%.
- The most frequent mechanism of injury for motorcyclists was a fall, loss of control, and slide (60%). Fractures accounted for 33% of motorcyclist's injuries.

### Off-Highway Vehicles [OHVs, including all-terrain vehicles (ATVs), snowmobiles, dirt bikes, golf carts and go-karts]

- During the period 1990/91 to 2008/09, 9,791 injuries involving OHVs were identified in CHIRPP emergency department data.
- Injuries related to OHVs have remained steady over time, with the exception of ATVs which have increased linearly between 1992/93 and 2003/04 with an average annual percent increase of 7% (95% CI: 5.1, 8.0). The leading mechanism of injury amongst ATVs, snowmobiles and dirt bikes was ejection off the machine (39%, 36%, and 70%, respectively); 40-45% of these injuries were fractures and 7-8% brain injuries.

Overall, surveillance statistics show an important decline in the rates of motor vehicle-related fatalities and injuries over the past three decades. The many safety strategies that have influenced this trend are among the greatest success stories of Canadian injury prevention efforts. Nevertheless, transport-related incidents remain one of the leading threats to the health of Canada's young people and further injury prevention efforts are needed.

Understanding the magnitude, trends and nature of injury through surveillance is critical for informing injury prevention initiatives. Everyone, however, can make a difference in their daily lives, including practicing and promoting safer driving behaviours. Moreover, the Public Health Agency of Canada continues to work with its partners to further advance knowledge, research, and road safety policies and programs. Together, we can all contribute to making Canada a safer place.

# 1 ◆ Introduction

Injuries\* are a major public health challenge. They are the leading cause of death for Canadians between the ages of 1 and 44 and the fourth leading cause of death for Canadians of all ages.† Injury is the leading cause of hospitalization for Canadians aged 10-24 years and the third leading cause of hospitalization of Canadians of all ages.‡ Many non-fatal injuries result in impairments and disabilities such as blindness, spinal cord injury, and intellectual deficit due to brain injury. Injury impacts not only those injured, but also their families and greater society.

## About This Report

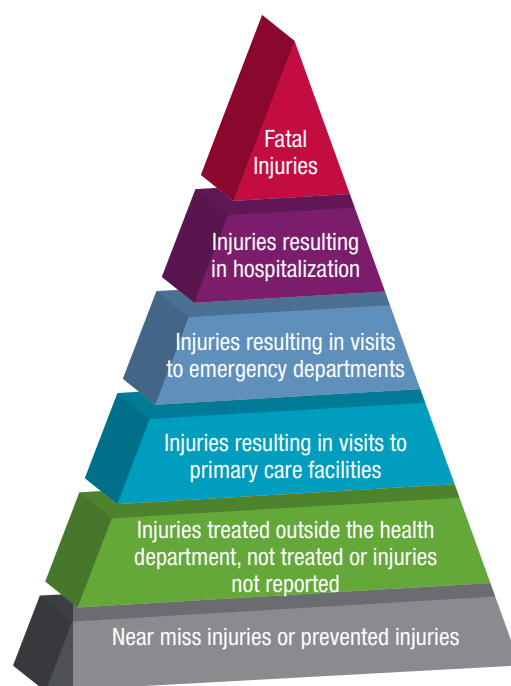
This report is the second in the *Injury in Review* series, with the first being *Child and Youth Injury in Review, 2009 Edition: Spotlight on Consumer Product Safety*.<sup>1</sup> *Injury in Review, 2012 Edition: Spotlight on Road and Transport Safety* presents statistics on injury and death in Canada to children, youth, and young adults up to 24 years of age, with a focus on road- and transport-related incidents, and provides other important information for parents, caregivers, and others interested in helping to prevent road- and transport-related injuries. Recommendations and tips for safer road- and transport-related behaviours presented throughout are based on the best available research evidence, and expertise of injury prevention professionals. While *Injury in Review 2009 Edition* focused on children and youth up to 19 years of age, this report covers up to 24 years because the highest burden of road fatalities in Canada is among older youth and young adults. Also, *Motor Vehicle Traffic Collisions*\*\* are the leading cause of injury-related death among Canadians 1-24 years of age combined, and the leading cause of death overall for persons 15-24 years of age.

The report is presented as follows: **Injury Overview** contains information based on the Public Health Agency of Canada's (PHAC) analysis of the most current national data available on injury-related hospitalization and deaths from the leading injury causes, including *Motor Vehicle Traffic Collisions*.

Statistics and other information is then presented on the following **featured topics**:

- restraint use
- impaired driving
- bus-related injuries
- vulnerable road users such as pedestrians, bicyclists, and motorcyclists
- off-highway vehicles.

### Injury Pyramid



\* Throughout this report, injuries are described in the context of excluding those related to adverse effects of medical care.

† Based on 2007 mortality data, which is the most recent at the time of this report's publication.

‡ Based on fiscal year 2008/09 hospitalization data.

\*\* Throughout this report, usage of italics when referring to *Motor Vehicle Traffic Collisions* (on public roads only; excludes off-road incidents) and other causes of injury-related hospitalization and death, specifically refers to categories of the International Classification of Diseases (ICD-10).

**These analyses are based on data from the following sources:**

- Statistics Canada's Vital Statistics Death Database.
- The Canadian Institute for Health Information (CIHI), for information on hospitalizations.
- PHAC's Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP), for information collected during hospital emergency department visits.
- Transport Canada's National Collision Database (NCDB), for information collected from police reports of motor vehicle collisions on public roads in Canada.
- The Traffic Injury Research Foundation's (TIRF) Fatality Database, for information collected from police reports and coroner and medical examiners' files on motor

vehicle collision-related fatalities on and off public roads, related to alcohol use. The following agencies have provided funding for the Fatality Database: Health Canada (1973-1982); Transport Canada and the Canadian Council of Motor Transport Administrators (CCMTA) [1984-2010; their funding for the Fatality Database has been in support of the Strategy to Reduce Impaired Driving (STRID) for several years].

Detailed information on data sources and methods can be found in Appendix B.

Finally, Concluding Remarks presents recommendations for future injury surveillance and prevention.

## Road and Transport Safety in Canada and Worldwide

The year 2011 was Canada's National Year of Road Safety, and marked the beginning of the UN Decade of Action for Road Safety (2011-2020). Despite declining road fatality rates due in part to significant advances in road and transport safety legislation and child passenger safety over the last few decades, *Motor Vehicle Traffic Collisions* remain a leading cause of unintentional injury and death for Canadian children, youth and young adults. In 2007 over 1,200 Canadians 0-24 years of age died as a result of unintentional injury, and of these 770 were from *Motor Vehicle Traffic Collisions*.<sup>2</sup> Among this age group, older adolescents followed by young adults experienced the highest motor vehicle-related fatality rates.<sup>3</sup> This is especially tragic given that many injuries and their associated costs are preventable through education, enforcement, technology, policy implementation, and changes to behaviour and environment.<sup>4</sup>

According to SMARTRISK's analysis (2009), when considering costs to Canada's health care system and foregone human labour productivity, the economic burden of unintentional and intentional injuries in Canada (all causes and ages combined) was estimated to be \$19.8 billion in 2004 (including both direct and indirect costs\*). The cost of transport-related injuries alone was estimated at \$3.7 billion, which represents 19% of the total economic burden of injury.<sup>5</sup>

Vodden et al.'s (2007) estimates of the social cost of collisions in Canada are much higher, mainly because a welfare economics approach was used to evaluate human consequences (willingness-to-pay to avoid fatalities and injuries). In addition to human consequences which constitute the greater part of the total cost, Vodden et al.'s model includes property damages/insurance claims, hospital/health care costs, first responders (police, fire, and ambulance services), tow trucks, courts, out-of-pocket expenses and traffic delays (time wasted and environmental costs). When considering these costs, the social costs of motor vehicle collisions in Canada in 2004 alone were estimated to be \$63 billion.<sup>6</sup> A benefit-cost analysis of highway travel from 1966 to 1990 in the United States revealed that federal driver and pedestrian safety programs offered net cost savings with a benefit-cost ratio of 53:1, in that for every dollar spent on safety programs, another \$53 in direct and indirect costs to society were saved.<sup>7,8</sup>

Although *Motor Vehicle Traffic Collisions* are still the leading cause of injury death for Canadians under age 25, fatality rates are declining. Between 1970 and 2009, the number of road fatalities in Canada (all ages) decreased by 58%.<sup>3</sup> Canada's 2009 provisional traffic death toll (2,130) was approximately 12% lower than in 2008, which is the lowest death toll in more than 60 years.<sup>3</sup>

\* Direct costs include health care costs arising from injuries. These may include emergency medical care, acute care (in hospital, clinic, and office settings), rehabilitation, follow-up care (including physician, allied health, and mental health care), long-term medical and institutional care, prescriptions, ancillary expenses, and coroner services. Some analyses may also include direct nonmedical costs including police, fire services, criminal adjudication and sanctioning, property damage or loss, travel delay, and work lost by supervisors/coworkers of injury victims (the Canadian economic burden of injury estimates do not include these). Indirect costs include costs related to reduced productivity from hospitalization, disability, and premature death.

**Table 1.1** presents statistics for motor vehicle-related fatalities in Canada between 2000 and 2007. During this period there were on average 777 *Motor Vehicle Traffic-related (MVT)* deaths per year (persons aged 0-24 years). In relative terms, the mortality rate over time showed a slight decrease, with 7.5 *MVT*-related deaths per 100,000 population in 2000 as compared to 7.1 in 2007. The trend is similar when considering the mortality rate per 100,000 registered vehicles.

## How Canada Compares Internationally

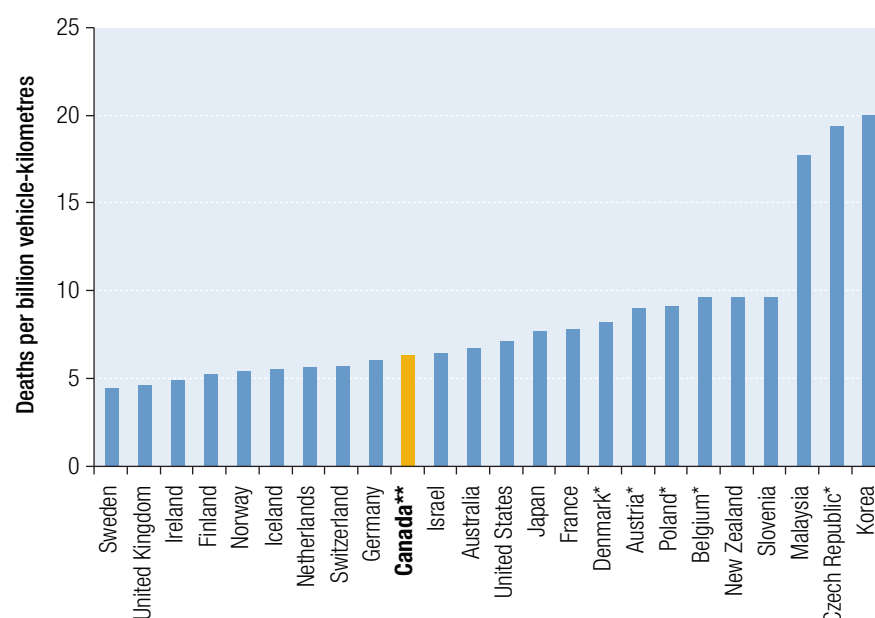
A widely used method of comparing the risk of road travel in different settings considers the number of fatalities over distance travelled. **Figure 1.1** illustrates the risk of road fatalities for select countries, expressed as deaths per billion vehicle-kilometres. In 2009, the top three performing countries were Sweden, the United Kingdom and Ireland, all with recorded risk below 5 deaths per billion vehicle kilometres. The risk of road fatalities in Canada was 6.3 per billion vehicle kilometres.

**TABLE 1.1**  
**Motor vehicle-related mortality, both sexes combined, Canada, 2000-2007, ages 0-24 years**

Indicators	Year							
	2000	2001	2002	2003	2004	2005	2006	2007
Number of Fatalities (0-24 years)	772	734	816	774	765	803	780	770
Deaths per 100,000 population	7.5	7.1	7.8	7.3	7.2	7.5	7.2	7.1
Deaths per 100,000 registered vehicles	4.6	4.3	4.7	4.4	4.3	4.4	4.2	4.0

Sources: Public Health Agency of Canada analysis of data from Statistics Canada's Death Database, 2006 Census, and Canadian Vehicle Survey 2000-2007.

**FIGURE 1.1**  
**Deaths per billion vehicle-kilometres in 2009, by country**



Source: International Road Traffic and Accident Data Base. IRTAD Road Safety 2010. Paris, France: Organisation for Economic Cooperation and Development/International Transport Forum; 2011.

\* 2008 data

\*\* Provisional 2009 data for Canada



Statistics indicate that injury prevention efforts are having an impact, with provisional data for 2009 showing Canada's lowest traffic death toll in several decades. The many road safety and injury prevention strategies that contributed to this decline are one of the most encouraging success stories of injury prevention efforts in Canada. Between 1970 and 1990 there was a 37% decline in road-related mortality rates in Canada. However, in recent years (1995-2009) the 17% decline has not been as dramatic (**Figures 1.2 and 1.3**, respectively). Canada's international ranking has slipped in recent years with the other countries having achieved greater declines. Motor vehicle-related fatalities continue to be a leading cause of death in Canada and stronger road safety measures are warranted.

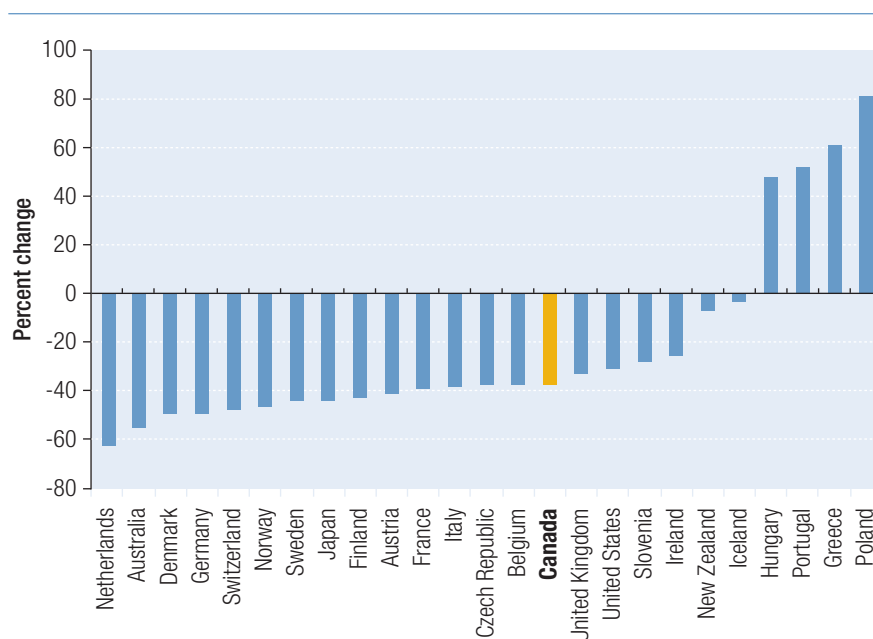
## Taking Action

### The UN Decade of Action for Road Safety

Nearly 1.3 million people die every year on the world's roads, and up to 50 million are injured,<sup>9</sup> with the majority of these deaths happening in developing nations. In March 2010, the United Nations (UN) General Assembly declared the UN Decade of Action for Road Safety, which was officially launched on May 11, 2011. The goal for the Decade is to "stabilize and then reduce the forecast level of road traffic fatalities around the world" by 2020.<sup>9</sup> This goal is driven by the Global Plan for the Decade of Action for Road Safety 2011-2020, comprising:

**FIGURE 1.2**

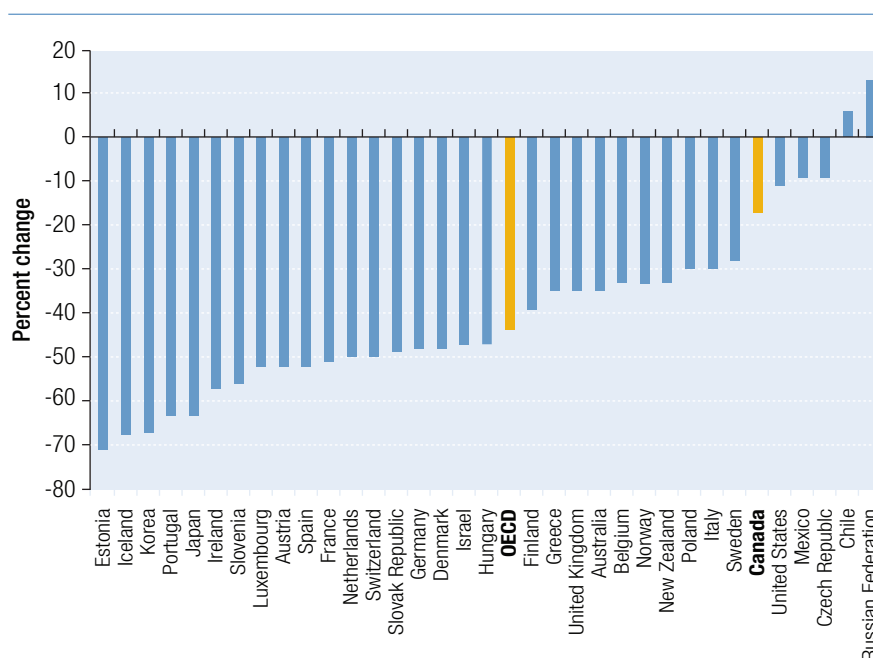
**Percent change in transport-related mortality, by country, 1970-1990, rates/100,000 persons**



Source: Public Health Agency of Canada analysis of data from International Road Traffic and Accident Data Base. IRTAD Road Safety 2010. Paris, France: Organisation for Economic Cooperation and Development/International Transport Forum; 2011.

**FIGURE 1.3**

**Percent change in transport-related mortality, by country, 1995-2009 (or nearest year available), rates/100,000 persons**



Source: Public Health Agency of Canada analysis of data from the Organisation for Economic Cooperation and Development. *OECD Health at a Glance 2011*. Paris: Organisation for Economic Cooperation and Development; 2011

- building road safety management capacity
- improving the safety of road infrastructure and broader transport networks
- further developing the safety of vehicles
- enhancing the behaviour of road users, and
- improving post-crash care<sup>10</sup>

In November 2011, the UN Road Safety Collaboration decided on the theme of pedestrian safety for the Second UN Global Road Safety Week to be held in 2013.<sup>11</sup> For more information on the UN Decade of Action for Road Safety visit [http://www.who.int/roadsafety/decade\\_of\\_action/en/index.html](http://www.who.int/roadsafety/decade_of_action/en/index.html)

## Canada's National Year of Road Safety

The Canadian Global Road Safety Committee, a multi-stakeholder road safety coalition chaired by Transport Canada, declared 2011 to be the National Year of Road Safety. In order to further reduce fatalities and injuries, Transport Canada will continue to collaborate with provincial and territorial governments, road safety partners and other stakeholders on road safety, research, and knowledge sharing initiatives.<sup>12</sup> During the National Year of Road Safety many activities were initiated by organizations and stakeholders including Transport Canada, the Public Health Agency of Canada, the Canadian Council of Motor Transport Administrators (CCMTA), federal, provincial, and territorial governments, and other organizations. Some key activities included:

- Canada Road Safety Week<sup>13</sup> starting on the Monday before the Victoria Day long weekend each year, and
- The 4<sup>th</sup> annual National Day of Remembrance for Road Crash Victims on Wednesday November 23<sup>rd</sup> 2011<sup>14</sup>
- The launch of Canada's Road Safety Strategy 2015.<sup>15</sup>

Road Safety Strategy (RSS) 2015 is Canada's third national road safety program, following Road Safety Vision 2001 and 2010. Since 1996, Canada has adopted a vision of having the "safest roads in the world" and the RSS continues this theme with a framework of best practices in relation to target groups (e.g. young drivers), contributing factors (i.e. collision causes), and many road safety initiatives.<sup>15</sup> It differs from the previous two visions in that it "no longer includes targets set at the national level that then become de-facto targets for each province/territory. Rather, the success of the new framework will be measured by achieving yearly downward trending in fatalities and serious injuries, as reported at the national level."<sup>15</sup> For more information, refer to *Canada's Road Safety Strategy 2015* at <http://www.ccmta.ca/crss-2015/>.

Injury prevention is complex. Road safety relies on the combined efforts of all levels of government, the private sector, non-government organizations, and individuals. Everyone can make a difference by putting into action injury prevention strategies in their daily lives.



*The road safety "Tag", the global symbol of the UN Decade of Action for Road Safety*

Nearly 1.3 million people die every year on the world's roads, and up to 50 million are injured.



*RETHINK Road Safety symbol for Canada's Road Safety Strategy, CCMTA*

1 person dies every 4 hours on Canada's roads.<sup>14</sup> A young life is lost every 12 hours on Canada's roads.



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## 2 ◆ Injury Overview

This chapter presents an overview of the existing and most recent injury statistics based on surveillance data, with an emphasis on *Motor Vehicle Traffic*-related injuries.\* Trends are provided for both unintentional and intentional injury mortality rates from calendar years 1979<sup>†</sup> to 2007, and for hospitalization rates, from fiscal years 1994/1995 to 2008/2009.<sup>‡</sup> Data are also depicted by age group and sex for persons up to 24 years of age.

Injury incidents are classified as either unintentional (those occurring without an intent of harm) or intentional (those occurring with an intent of harm for self or for another).

### Injury Deaths

Injuries<sup>§</sup> are the leading cause of death among Canadians between the ages of 1 and 44 and the fourth leading cause of death among Canadians of all ages (2007). Specifically within injury-related mortality, *Suffocation* is the leading cause among infants (under one year old), *Motor Vehicle Traffic Collisions* lead among those aged 1-24 years, *Suicide* among 25-69 year olds, and *Falls* among Canadians aged 70 years and older (**Table 2.1**). Although both intentional and unintentional injuries are important public health issues, the great majority of injury deaths and serious injuries are unintentional. Unintentional injuries are estimated to account for 81% of total injury costs in Canada.<sup>1</sup>

**TABLE 2.1**

**Leading causes of injury-related mortality in Canada, 2007, both sexes combined, by age group**

Age group	Leading cause of injury death
Infants	Suffocation
1-24	Motor Vehicle Traffic Collisions
25-69	Suicide
70+	Falls

\* Throughout this report, usage of italics when referring to *Motor Vehicle Traffic Collisions* (on public roads only; excluding off-road incidents) and other causes of injury-related hospitalization and death, specifically refers to categories of the International Classification of Diseases (ICD-10).

<sup>†</sup> Figure 2.3 reports mortality trend data from 1950 to 2007, whereas all other mortality trend figures report from 1979 onward.

<sup>‡</sup> Throughout this report, hospitalization and CHIRPP emergency department statistics are presented according to a 12 month fiscal year beginning April 1 and ending on March 31 the following year. Hospitalization data are traditionally reported as such, and CHIRPP data are also presented by fiscal year to allow for timely reporting on the most recent data available, and for comparability with hospitalization statistics.

<sup>§</sup> Throughout this report, injuries are described in the context of excluding those related to adverse effects of medical care.

**Figure 2.1** displays a continual downward trend in overall injury death rates between 1979 and 2007 among Canadians under 25 years of age. This decrease is mainly attributed to the decrease observed in the unintentional injury rates. In contrast, intentional injury death rates have remained relatively stable over the time period.

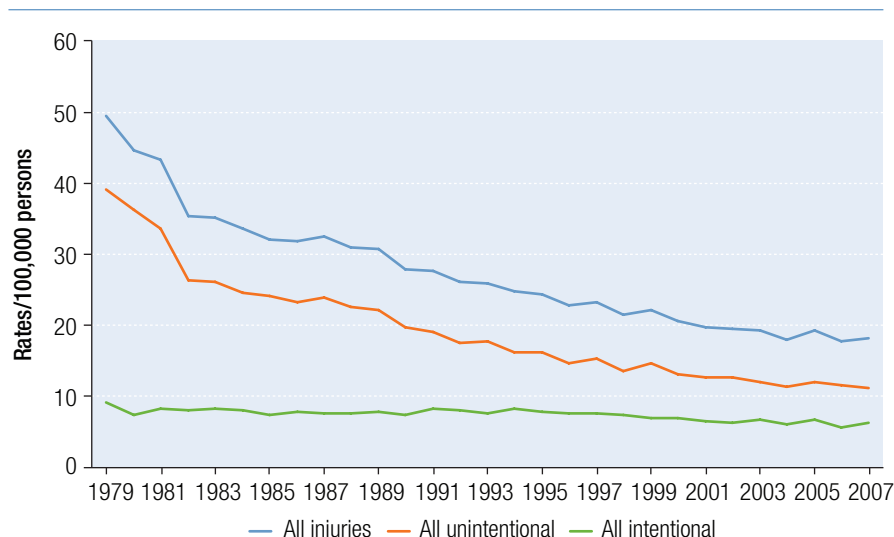
**Figure 2.2** shows trends in mortality for the leading causes of injury among those aged 0-24 years. Between 1979 and 2007, mortality rates decreased among the majority of causes. Mortality rates related to *Motor Vehicle Traffic Collisions, Drowning, Fire/Flame, Suffocation, and Falls* displayed significant decreases over the time period. Rates related to *Poisonings* showed a decreasing trend from 1979-1987, followed by an increasing trend in the last 20 years. *Suicide* rates showed a small but statistically significant decrease between 1979 and 2007, while no significant decrease was observed for *Homicide*.

#### Average annual percent change of death rates, by leading causes (Figure 2.2):

- **Motor Vehicle Traffic Collisions:** Decrease of 4.3% (95% CI: -4.6, -3.9)
- **Drowning:** Decrease of 4.6% (95% CI: -5.0, -4.2)
- **Fire/Flame:** Decrease of 7.6% (95% CI: -8.1, -7.1)
- **Suffocation:** Decrease of 3.2% (95% CI: -3.9, -2.6)
- **Falls:** Decrease of 3.3% (95% CI: -3.9, -2.7)
- **Poisonings:** Decrease of 8.2% (95% CI: -10.5, -6.0), from 1979 to 1987, and from 1988 to 2007, increase of 2.0% (95% CI: -1.0, -3.0)
- **Suicide:** Decrease of 1.3% (95% CI: -1.6, -0.9)
- **Homicide:** No significant decrease observed.

**FIGURE 2.1**

**Injury-related mortality in Canada, 1979-2007, both sexes combined, ages 0-24 years, standardized rates/100,000 persons**

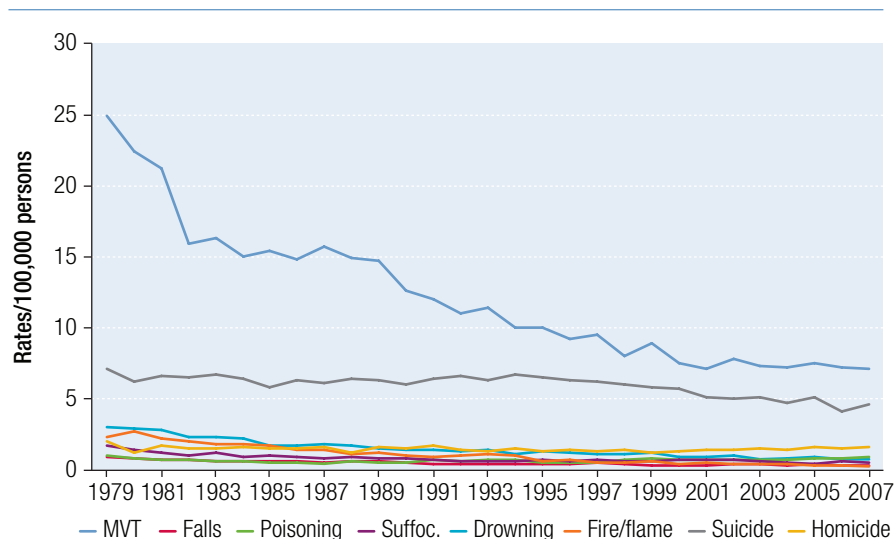


Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

Note: Rates are standardized to the 1991 Canadian population

**FIGURE 2.2**

**Leading causes of injury-related mortality in Canada, 1979-2007, both sexes combined, ages 0-24 years, standardized rates/100,000 persons**



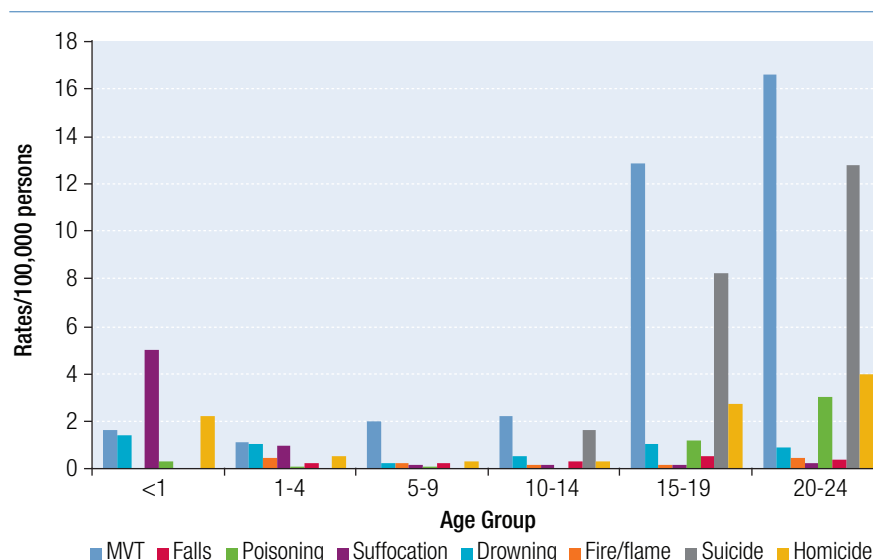
Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

Notes: (1) Rates are standardized to the 1991 Canadian population. (2) Injury causes 'Suicide' and 'Homicide' are intentional-related deaths, while all other causes are unintentional-related deaths.

The leading causes of all injury deaths among children, youth, and young adults (0-24 years of age) in 2007 were *Motor Vehicle Traffic Collisions* followed by *Suicide*, *Homicide*, and *Poisonings* (**Figure 2.3**). The leading causes vary by age and change as children grow into youth, reflecting patterns of development. *Suffocation* rates among infants less than one year of age (e.g. while in a bed/crib, or choking on food) were reported at a rate of 5.0/100,000 persons, which is more than 15 times the rate among persons under 25 years of age combined. *Motor Vehicle Traffic Collisions* were the leading cause of injury death among all ages between 1 and 24 years. While the overall mortality rate due to *Motor Vehicle Traffic Collisions* among those 0-24 years old was 7.6/100,000 persons, the rate among 20-24 year olds was more than twice as high at 16.6/100,000 persons.

**FIGURE 2.3**

**Leading causes of injury-related mortality in Canada, 2007, both sexes combined, by age group, rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

**TABLE 2.2**

**Leading causes of injury-related mortality in Canada, 2007, both sexes combined, ages 0-24 years, rates/100,000 persons**

Cause	0-24 years	
	Deaths/100,000 persons (both sexes)	% Males
All injuries (excluding adverse effects of medical care)	19.4	73.6
All unintentional injuries (excluding adverse effects of medical care)	11.9	72.0
Motor Vehicle Traffic (MVT – All)	7.6	70.6
MVT – Occupant	3.4	70.1
MVT – Pedestrian	0.7	61.4
MVT – Motorcyclist	0.5	94.0
MVT – Pedal cyclist	0.2	73.3
Poisoning	1.0	69.7
Drowning	0.8	82.3
Suffocation	0.5	68.8
Falls	0.3	75.8
Fire/flame	0.3	61.5
All intentional injuries	6.8	75.8
Suicide	5.0	74.2
Homicide	1.8	80.4

Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

**Summary by age group and sex:**

**Less than one year:** Among males, *Suffocation* was the leading cause of injury death, followed by *Motor Vehicle Traffic Collisions*. Among females, *Suffocation* was the leading cause of injury death, followed by *Homicide*.

**One to four years:** Among males, *Motor Vehicle Traffic Collisions* were the leading cause of injury death, while *Drowning* and *Suffocation* were tied as the second leading cause. *Motor Vehicle Traffic Collisions* and *Drowning* were tied as the first leading cause of injury death among females, while *Suffocation* was the second leading cause.

**Five to nine years:** *Motor Vehicle Traffic Collisions* were the leading cause of injury death among males and females. *Drowning* and *Homicide* were tied as the second leading cause for males, but among females it was *Falls*.

**10 to 14 years:** Among both males and females, *Motor Vehicle Traffic Collisions* were the leading cause of injury death, and *Suicide* was the second leading cause.

**15 to 19 years:** *Motor Vehicle Traffic Collisions* and *Suicide* were the first and second leading causes of injury death among both males and females.

**20 to 24 years:** Among both males and females, *Motor Vehicle Traffic Collisions* and *Suicide* were the first and second leading causes of injury death.

## Motor Vehicle Traffic-related mortality

This section examines *Motor Vehicle Traffic*-related (MVT) deaths by age, sex and road user class (i.e., injuries among pedestrians, pedal cyclists, motorcyclists, and vehicle occupants). As in other areas of this report, the MVT statistics presented refer to deaths and injuries deemed as unintentional.

When grouped, the mortality trend over time for 0-24 year olds is similar to the trend for all ages (0-85+ years) (**Figure 2.4**). Among specific age groups, however, there are important differences in mortality patterns, particularly between 0-14 year olds and 15-24 year olds. These differences appear not only in the magnitude of the rates, but also in the trends. Between 1950 and 2007 there was a small but relatively steady decline in mortality among 0-14 year olds. For both the 15-19 and 20-24 year olds, however, mortality rates rose steadily between 1950 and 1970, and then declined dramatically after 1973. It is important to note that this dramatic decline started within two years after the mandatory introduction of seat belts in all new cars in 1971.

In 2007, 770 young people died in *Motor Vehicle Traffic Collisions*. That means, for every 100,000 Canadians aged less than 25 years, 7 were fatally injured in *Motor Vehicle Traffic Collisions*.

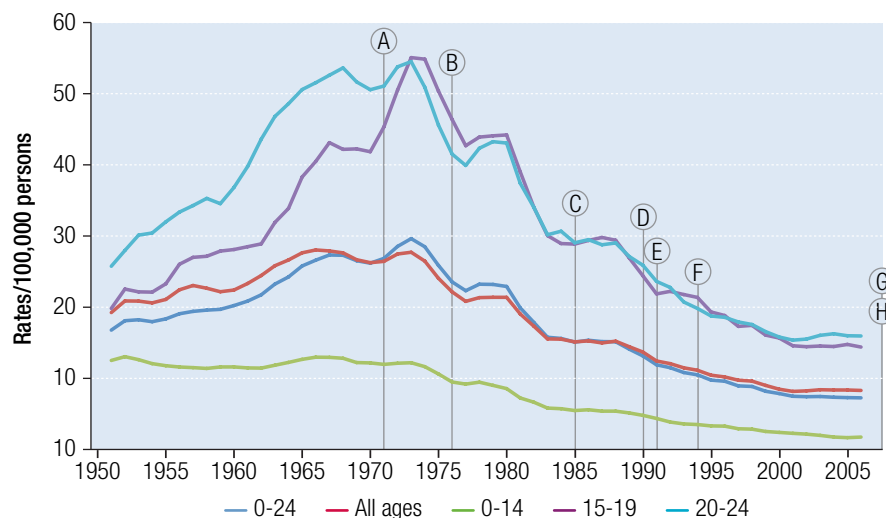
### Benchmarks of select road safety legislation in Canada

- A 1971:** Seat belts required in all new vehicles<sup>2</sup>
- B 1976:** Ontario is the first jurisdiction to pass the mandatory seat belt law<sup>3</sup>
- C 1985:** Amendments to the Criminal Code resulted in tougher penalties for impaired drivers<sup>4</sup>
- D 1990:** Canadian Motor Vehicle Safety Standard 108 (CMVSS 108) requires daytime running lights on all vehicles made or imported after January 1st, 1990<sup>5</sup>
- E 1991:** Seat belt legislation enacted in all jurisdictions<sup>6</sup>
- F 1994-2005:** Graduated licensing programs introduced in most Canadian jurisdictions<sup>7,8\*</sup>
- G 2008:** New Criminal Code provisions on impaired driving give police better tools to detect and investigate alcohol- and drug-impaired driving. These changes increase the maximum sentences and toughen mandatory penalties.<sup>9</sup>
- H 2010:** By 2010, hand-held cell phone use while driving banned in: British Columbia, Saskatchewan, Ontario, Quebec, Prince Edward Island, Nova Scotia, and Newfoundland and Labrador<sup>10</sup>. Canada Motor Vehicle Safety Standard 126 requires Electronic Stability Control on all passenger cars, multi-purpose vehicles, trucks and buses with a Gross Vehicle Weight Rating of 4536 kg or less, and manufactured on or after September 1<sup>st</sup>, 2011.<sup>11</sup>

**Figure 2.5** illustrates deaths associated with all *Motor Vehicle Traffic Collisions* by age group and sex, between 1979 and 2007. It is evident that males between the ages of 15 and 24 years are at higher risk of death from a *Motor Vehicle Traffic Collision* than other groups.

**FIGURE 2.4**

**Motor vehicle traffic-related mortality in Canada, 1950-2007, selected age groups, standardized rates/100,000 persons**

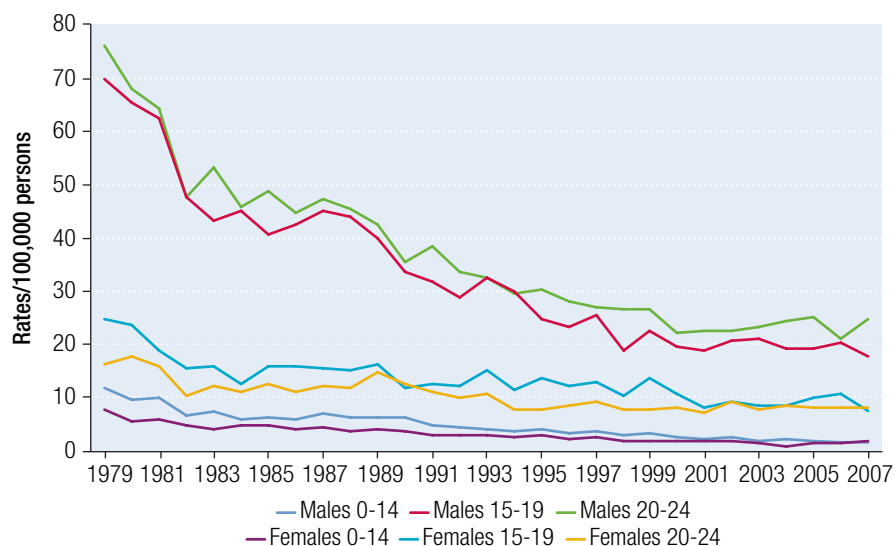


Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

Note: Rates are standardized to the 1991 Canadian population, and adjusted with a three-point central moving average.

**FIGURE 2.5**

**Motor vehicle traffic-related mortality in Canada, 1979-2007, by age group and sex, standardized rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

Note: Rates are standardized to the 1991 Canadian population.

\* Nunavut does not have a graduated driver licensing program.

**Figure 2.6** presents the Canadian trend in *Motor Vehicle Traffic*-related mortality among persons 0-24 years of age between 1979 and 2007, by road user class. While mortality rates decreased overall during this period, rates were highest among *Occupants of Motor Vehicle Traffic Collisions*, followed by *Pedestrians*, *Motorcyclists*, and *Pedal cyclists* respectively.

#### Average annual percent decrease of Motor Vehicle Traffic-related deaths (Figure 2.6)

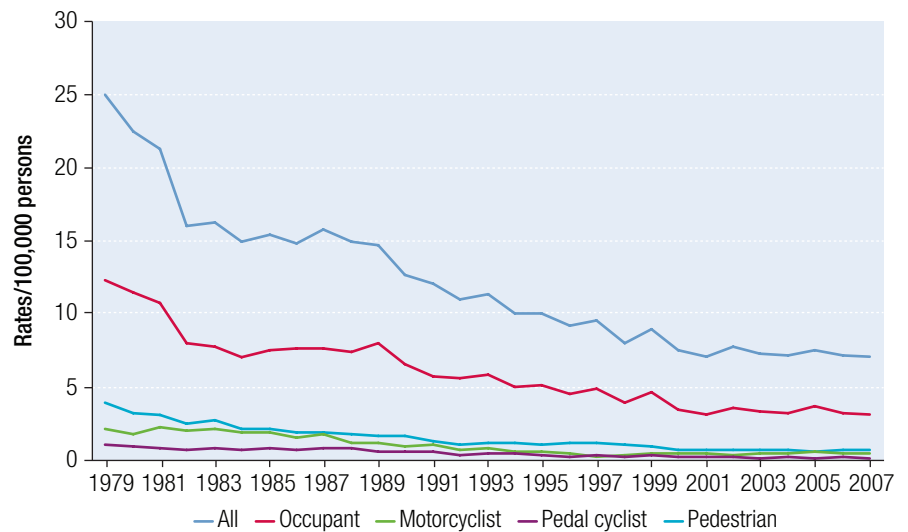
- **MVT – Occupant:** Decrease of 4.6% (95% CI: -5.1, -4.1)
- **MVT – Motorcyclist:** Decrease of 7.2% (95% CI: -8.5, -5.9)
- **MVT – Pedestrian:** Decrease of 6.1% (95% CI: -6.6, -5.6)
- **MVT – Pedal Cyclist:** Decrease of 7.1% (95% CI: -8.2, -6.1)

**Figure 2.7** compares *Motor Vehicle Traffic Collision* deaths in 2007 among children (0-14 years), youth (15-19 years) and young adults (20-24 years), by road user class. *Pedestrian* mortality increased with age, and when examined by age group, *Occupants* were the leading group within all *Motor Vehicle Traffic Collision* deaths across all 3 age groups, as follows: 0.7 deaths per 100,000 among children (0-14 years), 6.3 per 100,000 among youth (15-19 years) and 7.3 per 100,000 among young adults (20-24 years).

Patterns of mortality change as children grow into youth and adults. These changes reflect a number of factors including use and exposure to each road user class, risks inherent to each class, protective features of vehicles and equipment used (e.g., child car seats) and personal risk behaviours. To some extent the mortality rates based on overall

**FIGURE 2.6**

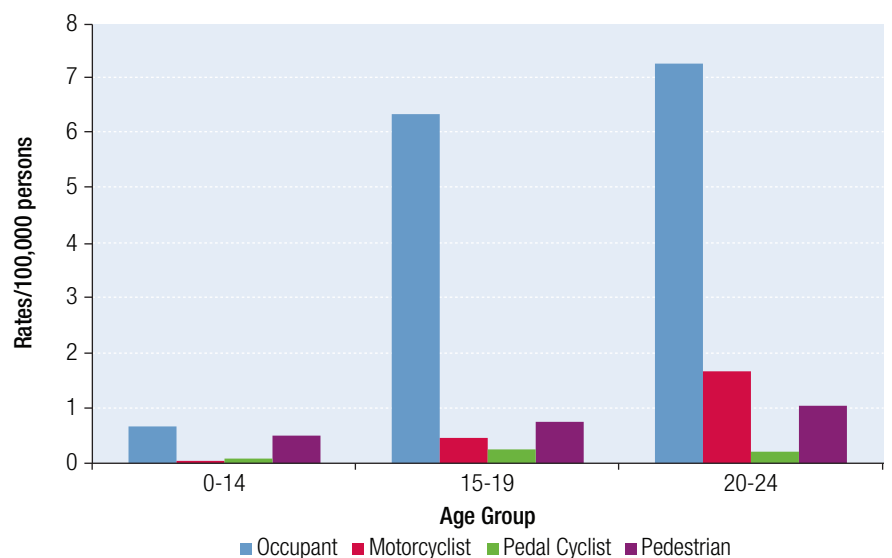
**Motor vehicle traffic-related mortality in Canada, by road user class, 1979-2007, both sexes combined, ages 0-24 years, standardized rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.  
Note: Rates are standardized to the 1991 Canadian population.

**FIGURE 2.7**

**Motor vehicle traffic-related mortality in Canada, 2007, by road user class and age group, both sexes combined, rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.



population, presented in Figures 2.6 and 2.7, reflect exposure to various means of transportation as well as the comparative risks. For instance, while most 0-24 year olds routinely travel as an occupant (e.g., in light duty vehicles such as cars and light trucks) relatively few travel by motorcycle.

In 2007, within the 20-24 year old age group, *Motor Vehicle Traffic*-related deaths were three times higher among males than females, at a rate of 24.7/100,000 persons compared to 8.1/100,000 persons (**Figure 2.8**).

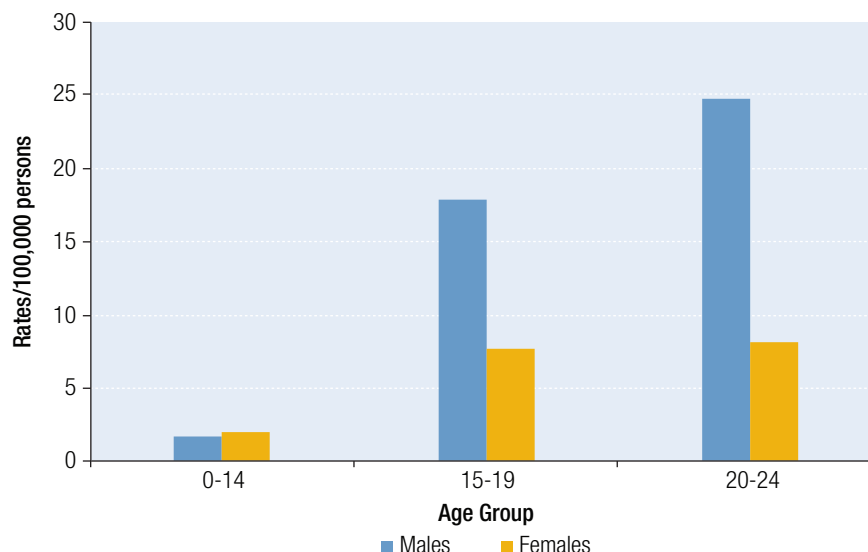
## Injury Hospitalization

Injury\* is the leading cause of hospitalization among Canadians aged 10-24 and the third leading cause of hospitalization for Canadians of all ages (for fiscal year 2008/2009\*\*). Specifically within injury-related hospitalization, *Falls* are the leading cause among all age groups except for the 15-19 year olds, where *Intentional Self-harm* is the leading cause followed closely followed by *Falls*. For every 100,000 Canadians under 25 years, 418 hospitalizations occurred as a result of injury, 46 of which were from *Motor Vehicle Traffic Collisions*.

**Figure 2.9** displays a downward trend for hospitalization rates of all injuries among Canadians aged less than 25 years, during the 15 year time period of fiscal years 1994/95 to 2008/09. The decreasing overall trend is mainly attributable to declines in unintentional injury hospitalization. Hospitalization rates due to intentional injuries declined over the time period, although to a much smaller extent.

**FIGURE 2.8**

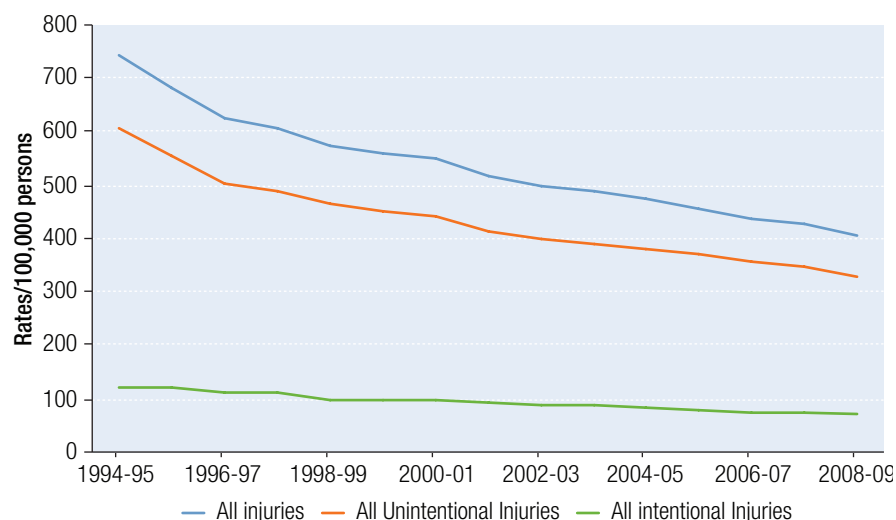
**Motor vehicle traffic-related mortality in Canada, 2007, by age group and sex, rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Statistics Canada mortality data.

**FIGURE 2.9**

**Injury-related hospitalization in Canada, 1994/95-2008/09, by intent, both sexes combined, ages 0-24 years, standardized rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data.  
Note: Rates are standardized to the 1991 Canadian population.

\* Throughout this report, injuries are described in the context of excluding those related to adverse effects of medical care.

\*\* Throughout this report, hospitalization statistics are presented according to a 12 month fiscal year beginning April 1 and ending on March 31 the following year. Hospitalization data are traditionally reported as such.



**Average annual percent decrease, leading causes of injury hospitalization (Figure 2.10):**

- **Motor Vehicle Traffic Collisions (All):** Decrease of 6.2% (95% CI: -6.8, -5.6)
- **Struck by/against:** Decrease of 3.2% (95% CI: -4.0, -2.5)
- **Poisonings:** Decrease of 3.8% (95% CI: -4.6, -3.0)
- **Fire/hot object/substance:** Decrease of 4.6% (95% CI: -5.3, -4.0)
- **Suffocation:** Decrease of 6.5% (95% CI: -7.8, -5.1)
- **Falls:** Decrease of 3.1% (95% CI: -3.4, -2.7)
- **Drowning:** Decrease of 4.4% (95% CI: -5.4, -3.4)
- **Intentional self-harm:** Decrease of 5.5% (95% CI: -6.1, -4.8)
- **Assault:** Decrease of 1.2% (95% CI: -1.9, -0.5)

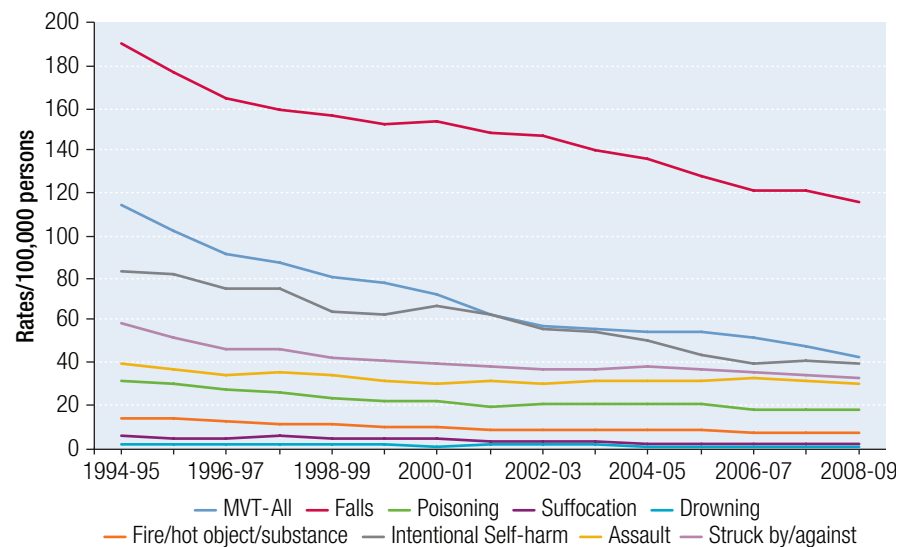
**Figure 2.10** illustrates a decline in hospitalization rates among 0-24 year olds for all major causes. Although the decline varied by cause, all were statistically significant over the 15 year period.

Among all children, youth and young adults combined (0-24 years of age), *Falls* were the leading cause of injury hospitalization for 2008/09, followed by *Motor Vehicle Traffic Collisions*, *Intentional Self-harm*, *Struck by/against*, and *Assault*.

**Figure 2.11** illustrates leading causes of injury hospitalization rates by age group, both sexes combined. *Falls* were the leading cause within each of the age groups, except for the 15-19 year olds for whom *Intentional Self-harm* was the leading cause. Hospitalization rates related to *Motor Vehicle Traffic Collisions* increased with age.

**FIGURE 2.10**

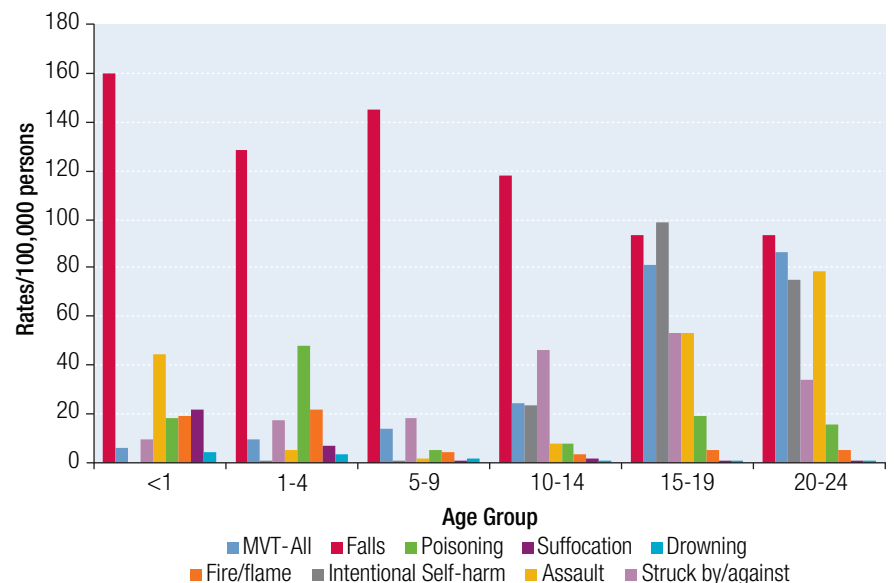
**Leading causes of injury-related hospitalization in Canada, 1994/95-2008/09, both sexes combined, ages 0-24 years, standardized rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data. Notes: (1) Rates are standardized to the 1991 Canadian population. (2) Injury causes 'Intentional self-harm' and 'Assault' are intentional, while all other causes are unintentional.

**FIGURE 2.11**

**Leading causes of injury-related hospitalization in Canada, 2008/09, both sexes combined, by age group, rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data. Note: Injury causes 'Intentional self-harm' and 'Assault' are intentional, while all other causes are unintentional.

**TABLE 2.3**

**Leading causes of injury-related hospitalization in Canada, 2008/09, both sexes combined, ages 0-24 years, rates/100,000 persons**

Cause	0-24 years	
	Hospitalizations/ 100,000 persons (both sexes)	% Males
All injuries (excluding adverse effects of medical care)	418.2	65.1
All unintentional injuries (excluding adverse effects of medical care)	332.6	67.6
Falls	114.7	64.3
Motor Vehicle Traffic (MVT – All)	46.4	65.2
MVT – Occupant	31.6	61.5
MVT – Pedestrian	6.6	63.7
MVT – Motorcyclist	4.6	83.6
MVT – Pedal cyclist	2.6	82.8
Struck by/against	34.7	80.4
Poisoning	17.8	50.9
Fire/hot object/substance	7.8	66.1
Suffocation	2.7	62.2
Drowning	1.4	60.7
All intentional injuries	77.5	55.6
Intentional self-harm	43.6	32.6
Assault	33.9	85.0

Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data

### **Summary by age group and sex:**

**Less than 1 year:** Among both males and females, *Falls* were the leading cause of injury hospitalization, followed by *Assault*.

**1 to 4 years:** Among both males and females, *Falls* were the leading cause of injury hospitalization, followed by *Poisoning*.

**5 to 9 years:** Among both males and females, *Falls* were the leading cause of injury hospitalization, followed by *Struck by/against*.

**10 to 14 years:** Among both males and females, *Falls* were the leading cause of injury hospitalization. *Struck by/against* was the second leading cause of injury hospitalization among males, while *Intentional Self-harm* was second among females.

**15 to 19 years:** Among males, *Falls* were the leading cause of injury hospitalization, followed by *Motor Vehicle Traffic Collisions*. Among females, *Intentional Self-harm* was the leading cause of injury hospitalization, followed by *Motor Vehicle Traffic Collisions*.

**20 to 24 years:** Among males, *Assault* was the leading cause of injury hospitalization, followed by *Falls*. Among females, *Intentional Self-harm* was the leading cause of injury hospitalization, followed by *Falls*.

*Intentional Self-harm* is the only major cause of hospitalization involving more females than males. This report focuses on unintentional injury; additional information on patterns of suicide and self harm is available from other resources.<sup>12,13</sup>

## Motor Vehicle Traffic-Related Hospitalization

This section examines *Motor Vehicle Traffic*-related hospitalization by age and sex, and road user class (i.e., injuries among pedestrians, pedal cyclists, motorcyclists, and vehicle occupants). As in other areas of this report, all *Motor Vehicle Traffic*-related statistics refer to those deemed unintentional.

Gender differences in *Motor Vehicle Traffic*-related hospitalization rates are greater with age (**Figure 2.12**).

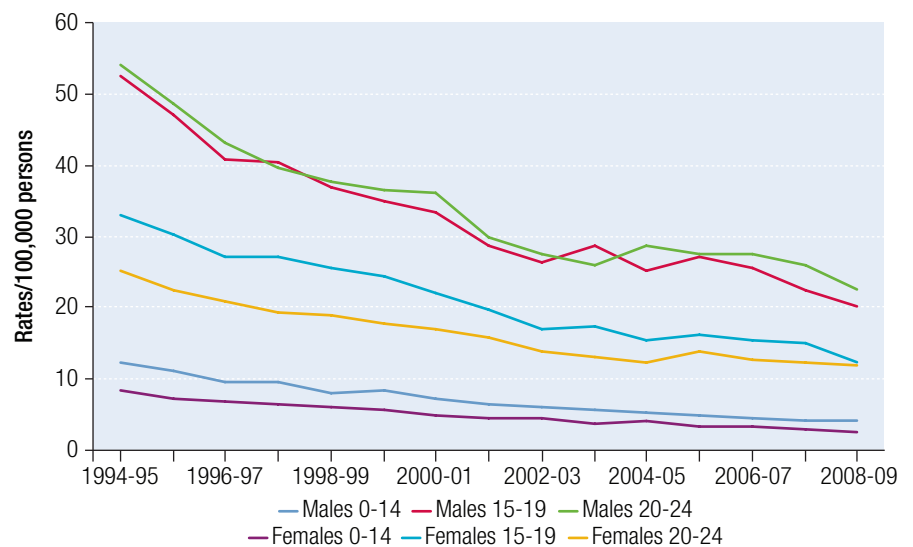
**Figure 2.13** illustrates the hospitalization rate trends for persons injured in *Motor Vehicle Traffic Collisions*, by road user class, among under 25 year olds. All classes showed significant and similar percentage decreases over the 15 year period.

### Average annual percent decrease, MVT-related hospitalizations (Figure 2.13)

- **MVT – Pedestrian:** Decrease of 6.3% (95% CI: -6.9, -5.6)
- **MVT – Motorcyclist:** Decrease of 5.9% (95% CI: -7.5, -4.2)
- **MVT – Pedal Cyclist:** Decrease of 5.8% (95% CI: -7.1, -4.5)
- **MVT – Occupant:** Decrease of 5.7% (95% CI: -6.3, -5.1)

**FIGURE 2.12**

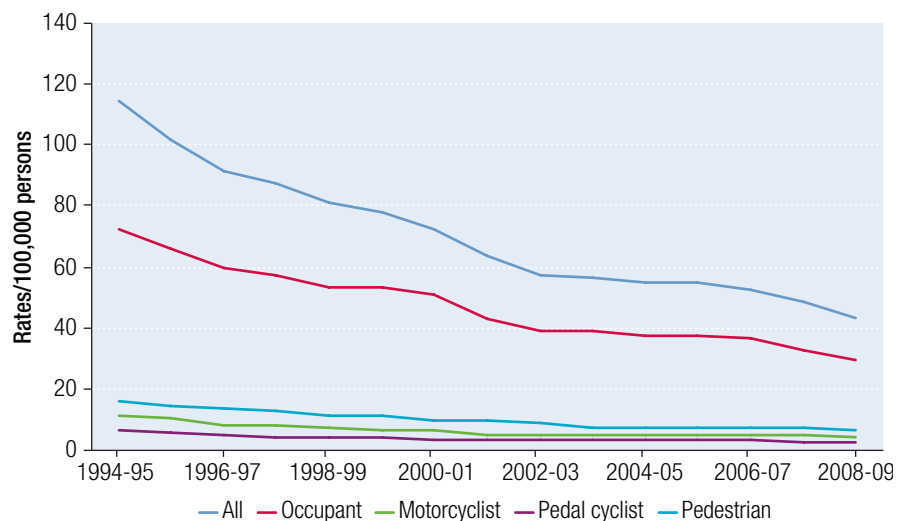
**Motor vehicle traffic-related injury hospitalization in Canada, 1994/95-2008/09, by age group and sex, standardized rates/100,000 persons**



Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data.  
Note: Rates are standardized to the 1991 Canadian population.

**FIGURE 2.13**

**Motor vehicle traffic-related injury hospitalization in Canada, by road user class, 1994/95-2008/09, both sexes combined, ages 0-24 years, standardized rates/100,000 persons**

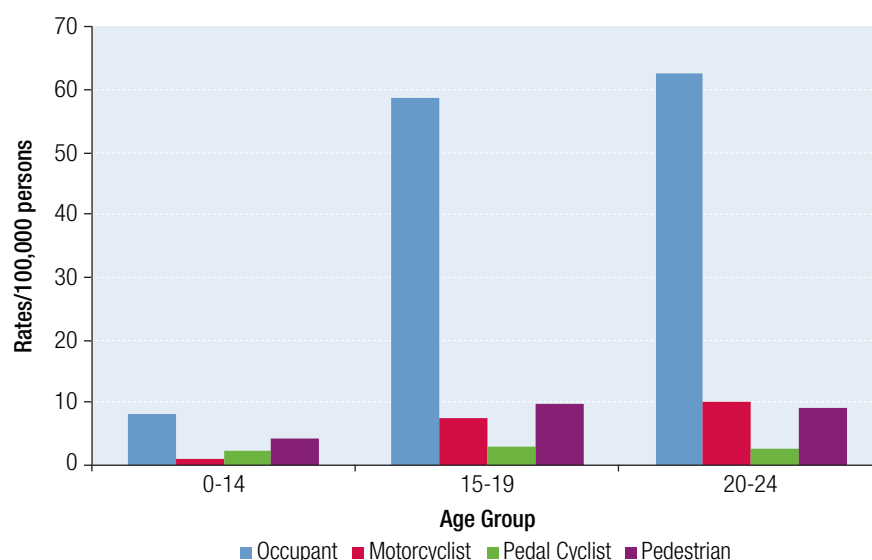


Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data.  
Note: Rates are standardized to the 1991 Canadian population.

In 2008/09, for persons 0-24 years of age there were 4,719 hospitalizations related to *Motor Vehicle Traffic Collisions*. That means, for every 100,000 Canadians under 25, 46 hospitalizations occurred as a result of *Motor Vehicle Traffic Collisions*.

*Motor Vehicle Traffic Occupants* sustained the highest rate of injury hospitalization among all age groups examined (**Figure 2.14**). This likely reflects greater exposure of vehicle occupants, in relation to the other road user classes.

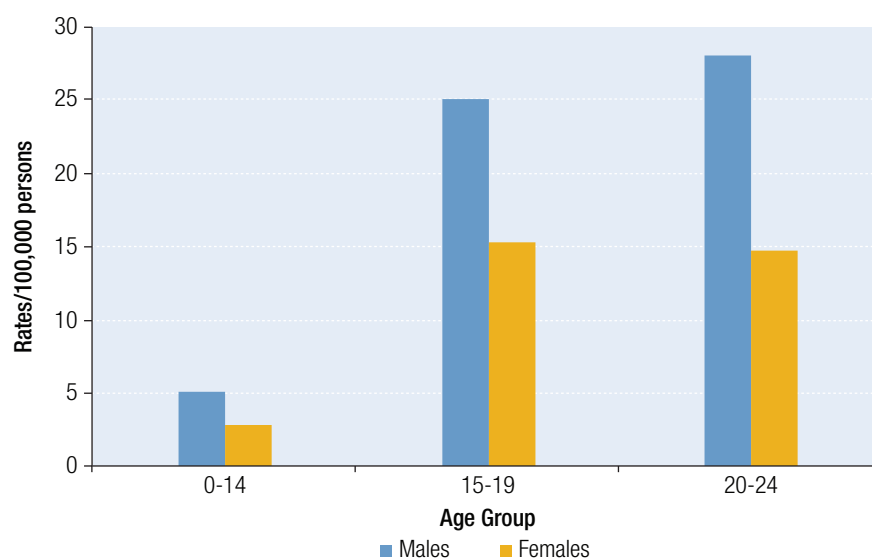
**FIGURE 2.14**  
Motor vehicle traffic-related injury hospitalization in Canada, 2008/09, by road user class and age group, both sexes combined, rates/100,000 persons



Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data

**Figure 2.15** illustrates that in 2008/09, males had the highest hospitalization rates of *Motor Vehicle Traffic* injury among the age groups examined. For the 20-24 year olds, males were twice as likely to be hospitalized in contrast to females (ratio of 1.9).

**FIGURE 2.15**  
Motor vehicle traffic-related injury hospitalization in Canada, 2008/09, by age group and sex, rates/100,000 persons



Source: Public Health Agency of Canada analysis of Canadian Institute for Health Information hospitalization data

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## 3 ♦ Restraint Use

Despite the contribution of proven road and vehicle safety legislation and programs in recent decades, *Motor Vehicle Traffic Collisions* rank first among all causes of death for persons 15-24 years of age, and are the leading cause of injury death among those 1-24 years of age.

Child restraints (car seats and booster seats) and seat belts make road travel safer for children and youth,<sup>1,2</sup> and evidence also shows that seat belts are the most effective way of reducing injury severity among adults during a collision.<sup>3</sup> Legislation mandating seat belt use is lauded for its significant contribution in preventing road-related injuries.<sup>4-6</sup>

Through the National Occupant Restraint Program (NORP), the Canadian Council of Motor Transport Administrators has championed efforts to increase and maintain wearing rates and proper use of seat belts and child restraints in Canada. Each year, the NORP Task Force requests input from all jurisdictions and reports child passenger safety legislation, enforcement, and education strategies. The Task Force monitors progress and reviews the strategy on a regular basis, and makes recommendations for improvements. The NORP 2010 goal to achieve and/or maintain a 95% seat belt wearing rate by all vehicle occupants and proper use of child restraints by 2010 has largely been attained. Refer to the information box titled “The National Occupant Restraint Program” for more information about NORP.

During a collision, improperly fitted restraints can cause serious injury. A study of Canadian child passengers showed the risk of injury to inappropriately restrained children to be nearly twice as high as appropriately restrained children.<sup>7</sup> Seat belt injuries to children are often characterized by abdominal or thoracolumbar spine injuries.<sup>7</sup>

In addition to the obvious health and safety benefits of proper restraint use, there is evidence of the economic savings related to improved passenger safety. For

instance, a benefit-cost analysis of child passenger safety showed that expenditures on programs to promote car seats, their correct installation and use, and to improve their design have a benefit-cost ratio of 81:1. For every \$7 spent nearly \$600 in costs to society are saved.<sup>8\*</sup>

### Methods

Records of injuries and fatalities according to restraint use were extracted from the National Collision Database (NCDB). More information about the NCDB can be found in Appendix B Data Sources and Methods.

### What the data show

Between 2000 and 2008, as expected, the average mortality rate for unrestrained occupants was much higher at 3.4 per 10,000 registered vehicles, in contrast to a rate of 0.7 among occupants wearing restraining devices.<sup>\*\*</sup> Although the overall percentage of unrestrained occupants of light duty vehicles in Canada is small, non-restraint use is over-represented among vehicle occupants who died in a crash.

Injury outcomes of occupants 0-24 years of age, in collisions involving light duty vehicles in Canada between 1998 and 2008 are illustrated in Figure 3.1. Only 0.2% of restrained occupants involved in collisions died, in contrast to 3.3% of unrestrained occupants. Among restrained occupants in collisions, 32.4% sustained injuries as opposed to 58.8% of unrestrained occupants. This translates to unrestrained occupants being 3 times more likely to be injured, and 16 times more likely to die, than restrained occupants (ratios of 3.4 and 15.7, respectively).

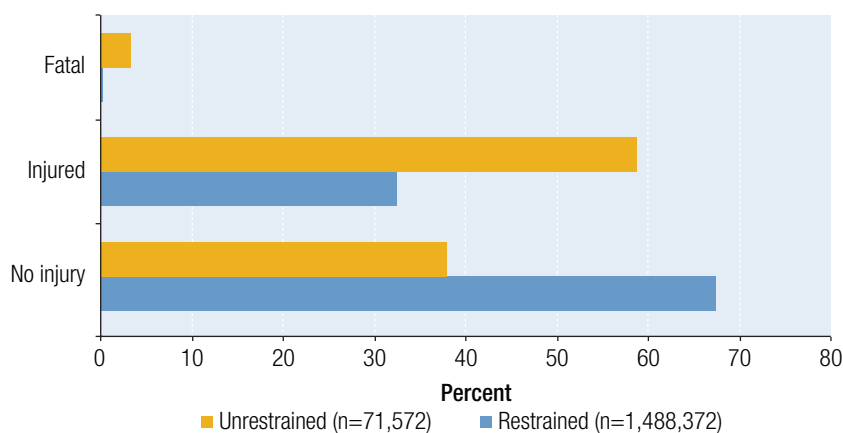
\* Benefit-cost ratio: A benefit-cost ratio expresses the total benefits in saved medical and other direct and indirect costs compared to the costs of the intervention. The ratio is calculated for each intervention by dividing the total savings, including the value of preserving quality of life and preventing pain and suffering, by the unit cost of the intervention. A cost-effective benefit-cost ratio is greater than 1. The nearly \$600 savings versus \$7 in costs translates into the benefit-cost ratio of 81 as follows: 81 multiplied by 7 = \$567 (rounded to \$600).

\*\* Public Health Agency of Canada analysis of Statistics Canada's Canadian Vehicle Survey data (2000-2008), Transport Canada's Rural and Urban Survey of Seat Belt Use 2009-10 (all occupants), and Transport Canada's National Collision Database. Data are reported beginning in 2000 due to the data coverage of the Canadian Vehicle Survey.

The protection gained by vehicle occupants using seat belts and other restraint systems is well established. Use of these devices is one of the most important factors in reducing the risk of death and injury. But unlike adults there are more factors than simple use to consider in correctly restraining infants and children. These factors include choosing a restraint that is appropriate for weight and height, best location for placement within the vehicle, correct installation, anchoring and tethering, and correct fitting of the harness to the child. For additional information on these factors see the Opportunities for Action – Child Restraint Use and Appendix C.

**FIGURE 3.1**

**Injury outcome by occupants' restraint use, light duty vehicle\*\* collisions, Canada, National Collision Database, 1998-2008, ages 0-24 years**



Source: Public Health Agency of Canada analysis of Transport Canada's National Collision Database.

\*Unrestrained includes both unrestrained and vehicle not equipped. Restrained includes seat belt, child seat, booster seat, or other device

\*\*Includes passenger cars, light trucks, vans and SUVs

### ***The National Occupant Restraint Program (NORP)***

In 1989, Canada's Council of Ministers Responsible for Transportation and Highway Safety set out to achieve 95% seat belt use by the end of 1995. As such, between 1989 and 1990 the Canadian Council of Motor Transport Administrators (CCMTA) developed and implemented a National Occupant Restraint Program (NORP). The first cycle of this program first strove to achieve 80% restraint usage by the end of 1990, and 95% usage by the end of 1995. In 1996, the CCMTA and the Council of Ministers updated NORP 2001 goals to achieve and maintain the 95% restraint usage target for light-duty vehicles (passenger cars, passenger vans and light trucks) in each jurisdiction to the year 2001.

The NORP 2010 strategy was then developed and aimed to achieve and/or maintain a 95% seat belt wearing rate by all vehicle occupants and proper use of child restraints by 2010. Transport Canada's most recent Rural and Urban Surveys of Seat Belt Use in Canada (2009-2010) found that overall in Canada, 95% of all occupants of *light duty vehicles* wore their seat belt, although lower usage rates were reported among rural communities (92%), occupants of pick-up trucks (92%), back seat occupants (89%), and

male drivers (94%). Variations were also observed across provinces and territories, with British Columbia showing the highest overall seat belt usage rate at 97% (rural and urban combined), and the Yukon showing the lowest at 78%. The 2010 Canadian National Survey on Child Restraint Use also found that 95.8% of the child passengers were restrained, although survey researchers estimate that child safety seats are used correctly only 64% of the time.

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## OPPORTUNITIES FOR ACTION

### Child Restraint Use<sup>9-16</sup>

- Keep children in each seating stage as long as possible in accordance with their height and weight. Evidence shows that keeping children in rear-facing seats (when appropriate to their height and weight) can increase protection.
- Consult the car seat and vehicle manuals for correct installation, including information on properly anchoring and tethering the car seat. Products not included with a new car seat (e.g. seat belt adjusters, bunting bags) should be avoided because they could hamper effectiveness.
- Front passenger air bags can cause death or severely harm children. Child safety advocates strongly recommend that children under 13 years of age ride in the back seat because they are more vulnerable to severe injury than adults (and the overall risk of injury is lower in the back seat for all occupants, including adults). An important exception to these recommendations is compact extended cab pick-up trucks, where children are safer in the front rather than the second row.
- Ensure that rear-facing car seats are always in the back, and with the baby's position angled at 45 degrees to reduce the risk of infant neck flexion and airway restriction. Infants under one month old should never spend over an hour at a time in a car seat; after the first month the risk of airway restriction is reduced because the baby's neck is stronger.

**Compliance and Enforcement:** Child restraints sold in Canada have been tested to meet specific government standards. Every car seat offered for sale in Canada and made after March 15, 1998 should have a National Safety Mark (top right) to reflect standards compliance and an expiry date.



**Regulatory Initiatives:** Between May 12, 2010 and December 31, 2011 all manufacturers with child seats on the Canadian market must have completed the testing, research, design and certification of their child seats to conform to the Government of Canada's new

Motor Vehicle Restraint Systems and Booster Seats Safety Regulation. Any child seat with a manufacturing date of January 1, 2012 or later will meet the new requirements, including increasing both the width of car seats and the amount of padding. The rules also raise the weight limit for all infant seats to 10 kg from 9 kg, and for all booster seats up to 30 kg from 22 kg. Transport Canada will also require car seats to be tested using larger crash test dummies, which reflects the fact that many Canadian children are heavier than in the past. Although the rules regarding the manufacture of car seats changed on January 1, 2012, it is important to note that parents and caregivers do not need to replace their child's current car seat if it is in good condition and is designed for their child's height and weight. British Columbia, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador all have booster seat legislation for older children; Manitoba introduced new booster seat legislation in the spring of 2012, which will come into force later this year. Child safety advocates recommend that the remaining provinces and territories amend their legislation to require that children of 18 kg to 36 kg be properly secured in booster seats in the back seat when traveling in a vehicle, to reduce the risk of injury or death.

More information on child restraint use can be found in Appendix C.

**The following links also provide more information about child restraints:**

Transport Canada, Safe Drivers and Passengers <http://www.tc.gc.ca/eng/roadsafety/safedrivers-menu-39.htm>

Canadian National Survey on Child Restraint Use <http://www.tc.gc.ca/eng/roadsafety/resources-researchstats-child-restraint-survey-2010-1207.htm>

Safe Kids Canada, *Child Safety Good Practice Guide* <http://www.safekidsCanada.ca/Professionals/Documents/34968-GoodPracticeGuide.pdf>

Canadian Council of Motor Transport Administrators, National Occupant Restraint Program (NORP) [http://www.ccmta.ca/english/committees/rsrp/norp/pdf/norp\\_report09.pdf](http://www.ccmta.ca/english/committees/rsrp/norp/pdf/norp_report09.pdf)





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## 4 ◆ Impaired Driving

Impaired driving is most commonly associated with alcohol use; however, drug use, driver fatigue, distraction, and other factors can also impair a driver's judgment, reaction time, and motor skills. Less information is available on drug use and fatigue while driving due to difficulties in assessing fatigue and measuring levels of various drugs.<sup>1</sup> Furthermore, standards (maximum allowable limits for the many substances that cause impairment) have yet to be established for individual drugs or in combination. When testing is done, the circumstances that require testing and the rate of testing for drug impairment in motor vehicle collisions vary widely across jurisdictions.

Between 1995 and 2009 in Canada, there were an estimated 13,786 motor vehicle-related deaths involving a drinking driver, with 714 of those in 2009.<sup>2</sup> Driving while one's ability is impeded by alcohol or drugs is a crime under the Criminal Code of Canada. Furthermore, most jurisdictions have implemented lower limit penalties under their respective highway traffic acts.<sup>3</sup> Alcohol- and drug-related impaired driving laws apply to all motorized vehicles including boats, snowmobiles, all-terrain vehicles and airplanes, and to those on private property. The national legal Blood Alcohol Concentration (BAC) limit is 80 milligrams of alcohol in 100 millilitres of blood (0.08), and it is an offence to have care or control of a motor vehicle if your BAC exceeds this limit.<sup>4</sup>

Body type/weight and sex influence BAC. A female who drinks the same amount of alcohol as a male over the same time period often has a higher BAC because females tend to have more fatty tissue; in fatty tissue, which contains less water than muscle tissue, alcohol does not dilute as quickly. It takes the body about two hours to process and rid itself of one serving of alcohol, however if over the legal limit, it takes about six hours or longer to clear alcohol from the body, depending on the BAC.<sup>5</sup> Only time will lower BAC.

Evidence suggests that adolescents and young adults may be more vulnerable than adults to the effects of impairment. According to a 2006 expert workshop on adolescence,

"[s]tudies ... indicate that responsiveness to sensory cues to limit intake – such as perceptions of motor impairment or the sedative effects of alcohol – are weaker [during adolescence]" compared to other ages.<sup>6</sup> The combined risks of alcohol impairment, little driving experience, behavioural disposition towards risk taking, and other factors can also increase the likelihood of a fatal collision in this age group.<sup>7</sup> Mayhew et al. found that a 35 year old driver with a BAC between .08 and .099, is four times more likely to die in a crash than if sober. A driver aged 19 with the same level of alcohol in their system is 20 times more likely to be killed.<sup>8</sup> All provinces and territories have zero tolerance alcohol levels for young and new drivers.<sup>3</sup>

In addition to the obvious health and safety benefits of driving sober, the economic advantages of preventing impaired driving are significant. A cost-outcome analysis of enforcing zero-alcohol tolerance for drivers under 21 years of age in the United States revealed a benefit-cost ratio of 25, in that for every \$39 (2009 USD) spent per driver, an estimated \$960 in costs to society are saved.<sup>9</sup> Accordingly, laws and programs have been established in an effort to reduce impaired driving, such as lowering and enforcing BAC limits, and license suspension and revocation for impaired drivers.<sup>10</sup> Canada's Strategy to Reduce Impaired Driving (STRID) recommends numerous initiatives to reduce impaired driving. See the information box titled Strategy to Reduce Impaired Driving (STRID) for more information.

The following analyses focus on alcohol-related deaths.

## Methods

Records of alcohol-involved motor vehicle-related fatalities were extracted from the Traffic Injury Research Foundation's (TIRF) Fatality Database. In the database, fatalities are considered to be alcohol-involved if the fatally injured person was a drinking driver or drinking pedestrian, or if at least one driver involved in the collision had been drinking; passenger fatalities are also considered to be alcohol-involved if one of the *drivers* involved had been drinking.\* The database includes fatally injured drivers, pedestrians, and passengers of motorized vehicles on both public roads and in off-road locations (e.g. snowmobiles, ATVs). More information about the Fatality Database can be found in Appendix B Data Sources and Methods.

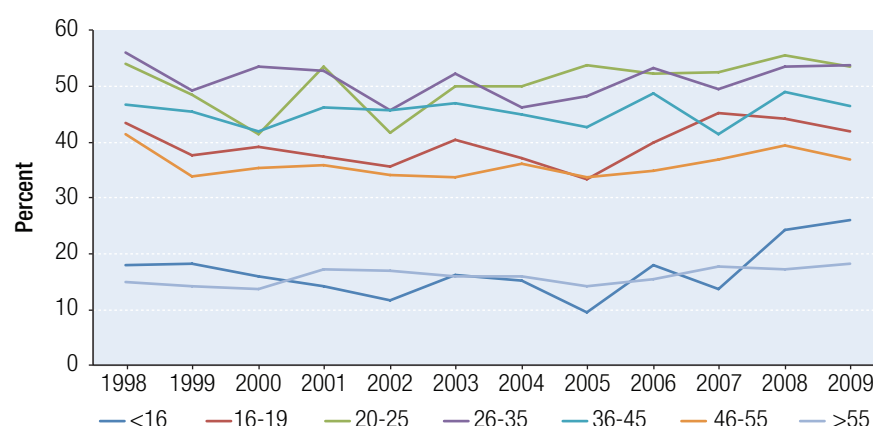
## What the data show

**Figure 4.1** presents the percentage of alcohol-involved motor vehicle-related fatalities in Canada from 1998 to 2009.

Between 1998 and 2009 there was no significant decrease for any age group in the annual proportion of alcohol-related motor vehicle fatalities in Canada; furthermore, the under-16 year old age group displayed an upward trend in recent years. Note that there is a consistent trend over the years where individuals between 20 and 45 years of age have the highest proportion of motor vehicle alcohol-related fatalities, followed by 16-19 and 46-55 year olds. In 2009, 38% of motor vehicle-related fatalities involved alcohol use, with males more than twice as likely to die in alcohol-related collisions than females (ratio of 2.3).

**FIGURE 4.1**

**Proportion of alcohol-involved\* motor vehicle-related fatalities in Canada, Fatality Database, 1998-2009, both sexes combined, by age group**

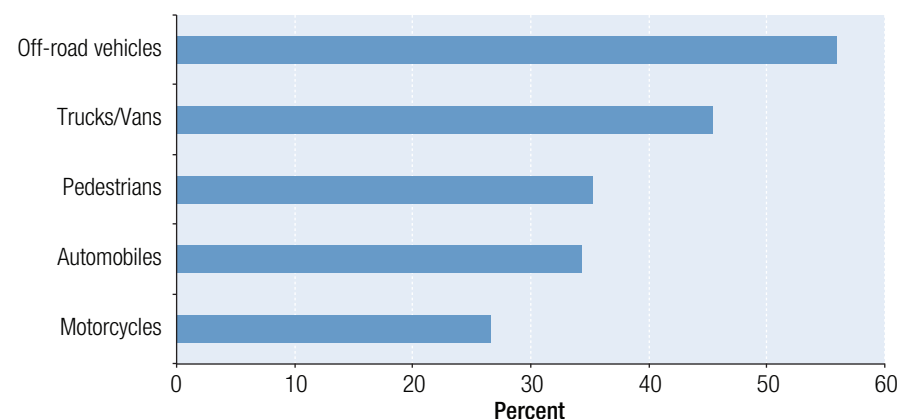


Source: Public Health Agency of Canada analysis of data from the Traffic Injury Research Foundation's Fatality Database, co-sponsored by Health Canada (1973-1982) and CCMTA and Transport Canada (1984-2010).

\*Fatalities were considered to be alcohol-involved if there was at least one drinking driver or one drinking pedestrian in the fatal collision. The percentage is calculated from the number testing positive among those tested for alcohol. This includes drivers, pedestrians, and passengers of motorized vehicles on both public roads and in off-road locations (e.g. snowmobiles, ATVs).

**FIGURE 4.2**

**Proportion of alcohol-involved\* motor vehicle-related fatalities in Canada, Fatality Database, 2009, by means of transportation, all ages**



Source: Public Health Agency of Canada analysis of data from the Traffic Injury Research Foundation's Fatality Database, co-sponsored by Health Canada (1973-1982) and CCMTA and Transport Canada (1984-2010).

\*Fatalities were considered to be alcohol-involved if there was at least one drinking driver or one drinking pedestrian in the fatal collision. The percentage is calculated from the number testing positive among those tested for alcohol. This includes drivers and passengers of motorized vehicles on both public and in off-road location (e.g. snowmobiles, ATVs).

\* The percentage of alcohol-involved fatalities is calculated from the number of deceased persons categorized as an alcohol-involved fatality, divided by the total number of cases where alcohol involvement in the collision was known. In the Fatality Database, a motor vehicle-related fatality "is defined as... as any person dying within 12 months as a result of injuries sustained in a collision involving a motor vehicle."<sup>2</sup>

The proportion of alcohol-involved fatalities varied widely by type of vehicle. More than 50% of Off-road Vehicle-related fatalities involved alcohol, which is higher than for on-road vehicles (**Figure 4.2**).

The risks of impaired driving, especially due to alcohol, are well-known; however, the annual proportion of alcohol-related motor vehicle fatalities has showed little decline in Canada since 1998. As recent as 2009, 38% of motor vehicle-related fatalities involved alcohol use, with males showing twice the risk of dying in alcohol-related collisions than females. Driving while impaired by alcohol or drugs is a criminal offence under the Criminal Code of Canada. Laws and programs have been established in an effort to reduce impaired driving, including lowering and enforcing BAC limits, and other measures such as those recommended in Canada's Strategy to Reduce Impaired Driving.



### **Strategy to Reduce Impaired Driving (STRID)**

In 1990, the Canadian Council of Motor Transport Administrators (CCMTA) developed the Strategy to Reduce Impaired Driving (STRID). Under STRID 2010, a number of initiatives aimed at hardcore drinking drivers, new/young drivers, social drinkers, and first sanctioned drivers are being undertaken by the various jurisdictions in partnership with interested stakeholders.

Through education and awareness, policing, policy and legislation, health promotion, research, and collaborative efforts among stakeholders, the STRID 2010 goal was to achieve a 40% reduction in persons dying or seriously injured in alcohol-related road collisions, between baseline years 1996-2001 and 2008-2010. Data for 2010 will be available in 2012.

#### **Sources:**

Canadian Council of Motor Transport Administrators. *Canada's Road Safety Strategy 2015*. Canadian Council of Motor Transport Administrators Web site. [http://www.ccmta.ca/crss-2015/\\_files/road\\_safety\\_strategy\\_2015.pdf](http://www.ccmta.ca/crss-2015/_files/road_safety_strategy_2015.pdf). Published 2011. Accessed November 16, 2011.

Mayhew DR, Brown SW, Simpson HM (Traffic Injury Research Foundation). *Alcohol-Crash Problem in Canada: 2009*. Ottawa, ON: Canadian Council of Motor Transport Administrators Standing Committee on Road Safety Research and Policies and Transport; 2011.



### **Drugs and Driving**

The dangers of drug impaired driving (from both illicit drugs and medications) are like those of alcohol impaired driving. The penalties for a conviction are the same as well. Studies show drugs are found in up to 30 percent of drivers killed in collisions.

Drugs can make it more difficult to steer, react, judge distances, make decisions, stay in the correct lane, and/or maintain a steady speed. The combined effects of even a small amount of alcohol and drugs can be much greater than the effect of either one alone.

On July 2, 2008, a new law gave Canadian police officers more power to deal with drug-impaired drivers. If an officer thinks a driver is impaired by any drug, they will ask the driver to take a Standardized Field Sobriety Test. During this roadside test, the officer will check the driver's eyes and balance. If the driver seems impaired, the officer will take them to the police station for expert assessment of coordination and other functions. Refusing to comply with the officer's request is a criminal offence.

#### **Source:**

Transport Canada. *Smashed: A Sober Look at Drinking and Driving*. Transport Canada Web site. <http://www.tc.gc.ca/eng/roadsafety/safedrivers-impaireddriving-smashed-index-580.htm>. Published 1999, Revised 2009. Updated January 20, 2010. Accessed May 18, 2011.



## Distracted Drivers

Distracted driving involves diversion of the driver's attention while driving. Attention to the road can be affected by passengers, eating/drinking, navigation systems, cell phones, and other devices or factors. These distractions make the driver less aware of road activity, and slow reaction time. Distraction can be visual (taking your eyes off the road), manual (taking your hands off the wheel), and cognitive (taking your mind away from driving). Research shows this can happen even when using hands-free phones. According to surveys conducted by the Traffic Injury Research Foundation between 2001 and 2010, use of cell phones while driving is on the rise, in spite of strong evidence pointing to the danger of doing so.

### When you drive:

- NEVER talk or text on your cell phone while driving; before you drive, turn off your phone or set the ringer to “mute” and put your phone away.
- Use a navigation system responsibly, and follow the manufacturer's installation instructions. Do not change settings or input information while driving.

- Do not radio/CD channel surf, eat, drink, or attend to grooming while driving.
- Always follow the driving laws related to distraction where you drive.
- Set a good example for your friends and family.
- Drive defensively. Even if you are not distracted, others may be.

**Regulation and Policy:** Distracted driving can result in a criminal charge under the Criminal Code of Canada (section 249). Most provinces and territories have regulations under their traffic acts to reduce distraction. The best known is the limitation of cell phone use to hands-free only. As well, many employers, including Transport Canada, have policies banning the use of communication devices while driving.

### Sources:

Traffic Injury Research Foundation. *The Road Safety Monitor 2010: Distracted Driving*. Ottawa, ON: TIRF; 2011.

Transport Canada. Major Distractions. Transport Canada Web site <http://www.tc.gc.ca/eng/roadsafety/safedrivers-major-distractions-1073.htm>. Accessed May 18, 2011.



## Drowsy/Fatigued Driving

### According to a survey about drowsy driving...

- Nearly 60% of Ontario drivers surveyed admit that they have driven while fatigued or drowsy at least sometime.
- 14.5% of Ontario drivers surveyed say they actually fell asleep or nodded off while driving at least once in the past year.
- Among those 1,280,000 drivers who fell asleep or nodded off while driving, about 105,000 of them did so more than five times.
- Collectively, these drivers account for about 5.5 million trips in Ontario during which they fell asleep/nodded off.
- During 573,000 of these trips the driver had to brake or steer to avoid being in a collision.
- The total number of Ontario drivers who were involved in at least one crash in the past year due to fatigued or drowsy driving may be as high as 167,000.

Although **the most effective tactic to overcome fatigue or drowsiness while driving is stopping to nap or sleep**, it is not the one used most often by Ontario drivers. Conversely, the most popular tactics are ineffective, and some can even be dangerous and illegal such as talking on a cell phone. These include:

- Opening windows or turning on air conditioning or a fan
- Stopping to eat, exercise, or relax but without napping/sleeping
- Changing the music or increasing its volume; singing to music
- Ingesting caffeine or another stimulant (only a temporary measure, as it only delays the onset of drowsiness/fatigue)
- Eating or drinking
- Moving around or shaking one's head
- Talking to passengers, or on a cell phone
- Pouring water on one's face or neck or slapping/hitting/pinching oneself

### Source:

Traffic Injury Research Foundation. *Fatigued and Drowsy Driving: Attitudes, Concerns and Practices of Ontario Driver*. Ottawa, ON: TIRF; 2007.

## OPPORTUNITIES FOR ACTION

### Drinking and Driving<sup>11-14</sup>

- If you have been drinking, do not drive, and assign a designated driver when socializing in a group.
- Make use of ride programs such as Operation Red Nose, or take a taxi.
- Set a good example for young drivers. A recent American study found that adolescents living with a parent who drives impaired are at increased risk for impaired driving themselves.
- Prohibit underage drinking and remind teens that it is against the law.
- Ask teens how they would get around if they could not drive, and how they would feel if they caused a crash – especially if someone were hurt or killed. Graduated licensing means they can lose their license after just one drink.
- Encourage teen drivers to think about activities they could do besides drinking on graduation night and at other events, and tell them they can call you anytime they need a safe ride home, and to be prepared with taxi fare just in case.
- Understand that being a passenger in a car with an impaired driver is just as dangerous as driving impaired.

**Compliance and Enforcement:** In Canada, a driver is not over the legal limit until he or she has reached a BAC of more than .08. Many provinces have adopted tougher measures to help take more

drinking drivers off the roads. Almost every Canadian jurisdiction has chosen to set a lower BAC limit and it ranges from 0.04 to 0.08. Drivers who register a BAC from 0.04 to 0.08 (known as the “warn range”) lose their license at roadside for 3, 7 or 30 days. Consequences also get tougher for repeat occurrences, and all provinces/territories have zero alcohol levels for young and new drivers. If they are caught on the road with any amount of alcohol in their systems, they may be fined and lose their license. Police officers often use a breathalyzer to measure BAC.

**Regulatory Initiatives:** Governments are continuing to strengthen policies and programs to address impaired driving with medical assessment and treatment, alcohol ignition interlocks, administrative licence suspensions and vehicle impoundment. For example, in December 2011 Alberta strengthened its impaired driving legislation, by targeting repeat offenders, building on existing penalties (for BACs in the .05 to .08 range), and tightening rules for new drivers.<sup>14</sup> The Criminal Code of Canada has been amended to increase the penalties under the Criminal Code, streamline the law, and authorize the use of Drug Recognition Experts (DRE) to deal with drug impairment. On July 2, 2008, new Criminal Code provisions on impaired driving came into force in Canada, which gave police better tools to detect and investigate alcohol- and drug-impaired driving. These changes increase the maximum sentences and toughen mandatory penalties.



**Information on provincial/territorial, and criminal code penalties (respectively), and other strategies for reducing impaired driving can be found at the following links:**

<http://www.tc.gc.ca/eng/roadsafety/safedrivers-impaireddriving-smashed-table1-807.htm>

<http://www.tc.gc.ca/eng/roadsafety/safedrivers-impaireddriving-smashed-table2-909.htm>

[http://www.changetheconversation.ca/drinking\\_and\\_driving\\_facts/canada\\_strategies.php](http://www.changetheconversation.ca/drinking_and_driving_facts/canada_strategies.php)



## References

- 1 Traffic Injury Research Foundation (TIRF). *Drugs Among Fatally Injured Drivers: 2000-2008*. Ottawa, ON: Traffic Injury Research Foundation; 2010.
- 2 Mayhew DR, Brown SW, Simpson HM (Traffic Injury Research Foundation). *Alcohol-Crash Problem in Canada: 2009*. Ottawa, ON: Canadian Council of Motor Transport Administrators Standing Committee on Road Safety Research and Policies and Transport; 2011.
- 3 Transport Canada. Table 1.1 – Provincial/Territorial Penalties for Impaired Driving Offences. Transport Canada Web site. <http://www.tc.gc.ca/eng/roadsafety/safedrivers-impaireddriving-smashed-table1-807.htm>. Update February 6, 2012. Accessed February 15, 2012.
- 4 Ministry of Transportation of Ontario. Impaired Driving. Ministry of Transportation of Ontario Web site. <http://www.mto.gov.on.ca/english/safety/impaired/>. Updated December 29, 2010. Accessed July 18, 2011.
- 5 Transport Canada. Smashed: A Sober Look at Drinking and Driving. Transport Canada Web site. <http://www.tc.gc.ca/eng/roadsafety/safedrivers-impaireddriving-smashed-index-580.htm>. Published 1999, Revised 2009. Updated January 20, 2010. Accessed May 18, 2011.
- 6 Beatty A, Chalk R, Program Committee for a Workshop on the Synthesis of Research on Adolescent Health and Development, Board on Children, Youth, and Families, Division of Behavioral and Social Sciences and Education. *A Study of Interactions: Emerging Issues in the Science of Adolescence Workshop Summary*. Washington, DC: The National Academies Press; 2006.
- 7 Robertson, R. The Facts about Impaired Driving in Canada. TIRF Web site [http://tirf.ca/media/news\\_show.php?nid\\_id=92&lid=1](http://tirf.ca/media/news_show.php?nid_id=92&lid=1). Accessed December 12, 2011.
- 8 Mayhew, DR, Donelson, AC, Beirness, DJ, & Simpson, HM. Youth, alcohol and relative risk of crash involvement. *Accident Analysis and Prevention*. 1986;18:273-287.
- 9 Children's Safety Network, Pacific Institute for Research and Evaluation. *Injury Prevention: What Works? A Summary of Cost-Outcome Analysis for Injury Prevention Programs (2010 update)*. Newton, MA: Education Development Centre; 2010.
- 10 World Health Organization. *World Report on Child Injury Prevention*. Geneva: World Health Organization; 2008.
- 11 Traffic Injury Research Foundation, arrive alive DRIVE SOBER, The Student Life Education Company. Drinking and Driving Facts. Change The Conversation Web site. [http://www.changetheconversation.ca/drinking\\_and\\_driving\\_facts/index.php](http://www.changetheconversation.ca/drinking_and_driving_facts/index.php). Accessed May 18, 2011.
- 12 Road Safety Canada Consulting. *Road Safety in Canada*. Ottawa, ON: Government of Canada; 2011
- 13 Center for Behavioral Health Statistics and Quality, Department of Health and Human Services. Adolescents Living with a Parent Who Drives Under the Influence Are at Increased Risk for Driving Under the Influence Themselves. *Data Spotlight*. December 6, 2011.
- 14 Government of Alberta. At a Glance – Strengthening Alberta's approach to impaired driving. Government of Alberta Web site. <https://www.transportation.alberta.ca/impaireddriving.htm>. Accessed December 9, 2011

## 5 ◆ Bus-Related Injuries

The patterns of injury are likely to be different in a school bus compared to a city bus since there more children and fewer standing passengers.

### City Buses

Even though public transit buses log a large number of kilometres, most city bus (North American, European) passenger injuries are non-collision related. They are due to falls while boarding or exiting or as a result of acceleration/deceleration. Safety research has focused on vehicle design and driver training.<sup>1,2</sup>

### School Buses

School bus safety is a high profile issue. Lapner et al (2003)<sup>3</sup> analysed the most common type of school bus crash resulting in injury and death – the rollover. Crash reconstruction of a single event involving 12 children (1 death) showed mostly head, neck and shoulder injuries. A U.S. study in 2006<sup>4</sup> estimated an annual average of 17,000 school bus-related injuries treated in emergency departments (for 2001 to 2003, at a rate of 21.0 per 100,000 children aged 0-19 years). Children 10-14 years of age accounted for the greatest proportion (43%). Collisions with other motor vehicles accounted for 42.3% of all injuries. The second most frequent mechanism was boarding/exiting the school bus (23.8%). In spite of the unfortunate injuries that do occur, traveling by school bus is among the safest forms of road transportation. Yang et al<sup>5</sup> found crash fatality and injury rates for school bus travel that were 3.5 and 5.4 times lower, respectively, than for vehicle travel generally. Efforts to improve the safety of school buses continues and much of the current discussion focuses on the installation and use of seat belts.<sup>5,6</sup>

Analyses of city bus-related injuries in this report are based on emergency department surveillance data from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP). School bus-related analyses are based on both CHIRPP data and police reports data from the National Collision Database (NCDB); each database provides a different perspective of school bus-related injuries.

### Emergency Department Data – CHIRPP Analyses

#### Methods

Records of school and city bus-related injuries including motor vehicle collisions (MVCs) and non-MVC incidents (e.g. sudden movement of the bus) were extracted from the CHIRPP database using CHIRPP factor codes and narrative fields. Foot pedestrians (including, but not limited to, those boarding or exiting the bus), and other vulnerable road users are included. Occupants of non-bus vehicles (passenger cars, trucks, vans) involved in collisions with buses were excluded, as were cases involving maintenance (occupational), tour buses, motor coaches, subway trains, and individuals waiting for a bus or injured while running to catch a bus. Time trend graphs cover the complete history of the CHIRPP database (for those under 25 years of age) spanning fiscal years 1990/91 to 2008/09 (April 1 to March 31). In-depth CHIRPP analyses were completed for the most recent fiscal year available (April 1, 2008 to March 31, 2009). More information about CHIRPP and data analysis methods can be found in Appendix B Data Sources and Methods.



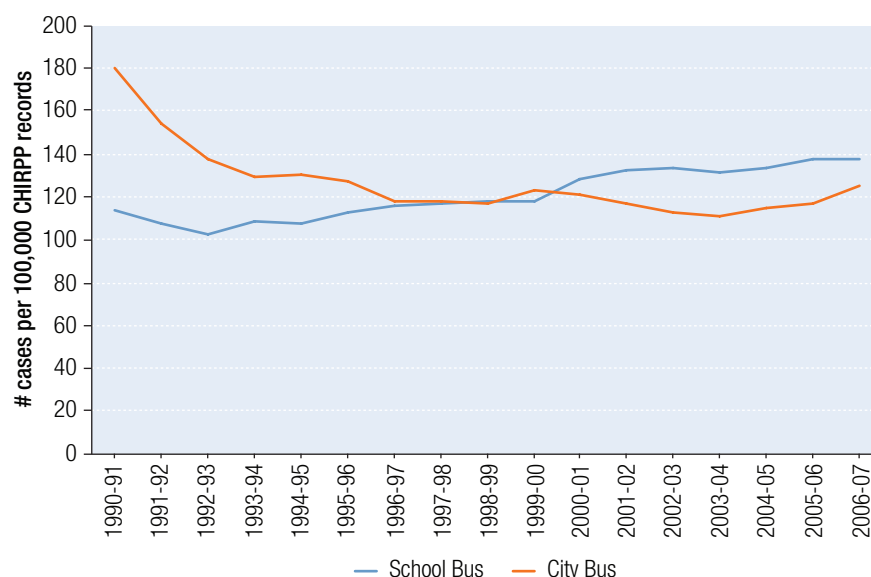
### What the data show

There were 2,182 school bus-related cases and 2,271 city bus cases identified for the period between 1990/91 to 2008/09. **Figure 5.1** depicts the annual trend for this 19 year period. Since 2000/01 there has been an increase in school bus-related injuries reported to CHIRPP (OR=1.18 (95% CI: 1.09, 1.29),  $p<0.0001$ ), while reported city bus-related injuries have declined (OR=0.87 (95% CI: 0.80, 0.95)  $p<0.05$ ).

Overall 116 school bus- and 125 city bus-related cases were identified for 2008/09. As expected, the age distribution differed in each type of bus (**Figure 5.2**). For school bus cases, most (79%) of the injured persons were under 14 years of age [median = 11.5 years; interquartile range (IQR) 7.5-13.5]. Among the school bus cases, children 10-14 years of age were injured most often at 201.4/100,000 CHIRPP records. For city bus incidents, although 61.6% involved children under 14 years of age (median = 12.8 years; IQR 6.3-15.4) after normalizing for uneven age distributions the most frequently injured age group was 15-19 year olds (242.9/100,000). **Table 5.1** details the specific mechanisms involved. School buses were involved in more MVCs than city buses (20.7% vs. 14.4%) while incidents involving city buses were more frequently related to boarding/exiting or sudden movement of the bus (48.8% vs. 22.7%).

**FIGURE 5.1**

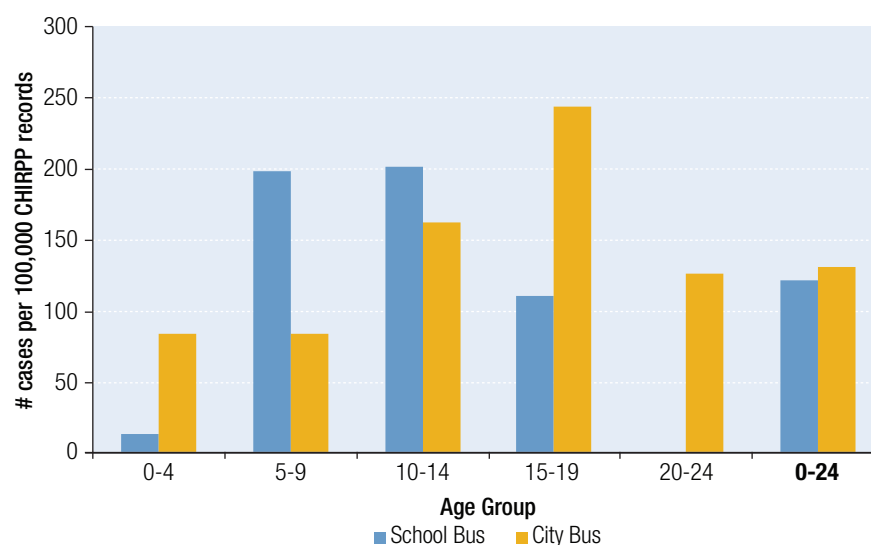
**Normalized annual proportion\* of school and city bus-related injury cases, CHIRPP, 1990/91-2008/09, ages 0-24 years**



\*The annual number of cases was first normalized by dividing by the annual total number of CHIRPP records, and then a three-point central moving average was applied to the normalized data (see Appendix B).

**FIGURE 5.2**

**Normalized age distribution of school and city bus-related injury cases, CHIRPP, 2008/09, per 100/000 records**



Note: Age counts are normalized by dividing by the total number of same-aged individuals in the entire database. This normalization accounts for the uneven distribution due to the large proportion of paediatric hospitals in the database (see Appendix B).

For school and city bus cases, the sex distribution was similar. For children under 10 years old, boys were more frequently injured in both school buses (68.2%) and city buses (58.1%). For those 10 and older, a higher proportion of females, 62.5% (school bus) and 58.6% (city bus), were injured.

**Figures 5.3 and 5.4** show the nature of injury distribution. Closed head (brain) injuries accounted for about one-fifth of all school bus cases and one-quarter of all city bus incidents.

## National Collision Database (NCDB) Analyses

### Methods

Records of injuries related to school bus collisions were also extracted from the NCDB. Statistics are presented for children and youth up to 18 years of age (and not 24 years as in other areas of this report) because cases aged 19 years and over are combined in the NCDB school bus data. In contrast to the CHIRPP database (with data from selected hospitals only), the NCDB gathers information from police reports of motor vehicle collisions on public roads in Canada. The data are provided annually to Transport Canada by the thirteen provincial and territorial jurisdictions. More information on the NCDB can be found in Appendix B Data Sources and Methods.

**TABLE 5.1**

**Mechanism of bus-related injuries, CHIRPP, 2008/09, ages 0-24 years**

Mechanism	(%)	
	School Bus	City Bus
Bus involved in Motor Vehicle Collision (MVC) *	20.7	14.4
Sudden movement of bus *	17.2	24.8
Horseplay, inappropriate activity *	16.4	8.8
Boarding/exiting	15.5	24.0
Pedestrian †	6.9	8.0
Body part/clothing caught *	5.2	6.4
Struck against interior bus structure *	5.2	4.0
Injured while walking/standing in bus *	1.7	4.8
Other ‡	11.2	4.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>

\* Collisions with other vehicles and single vehicle rollovers

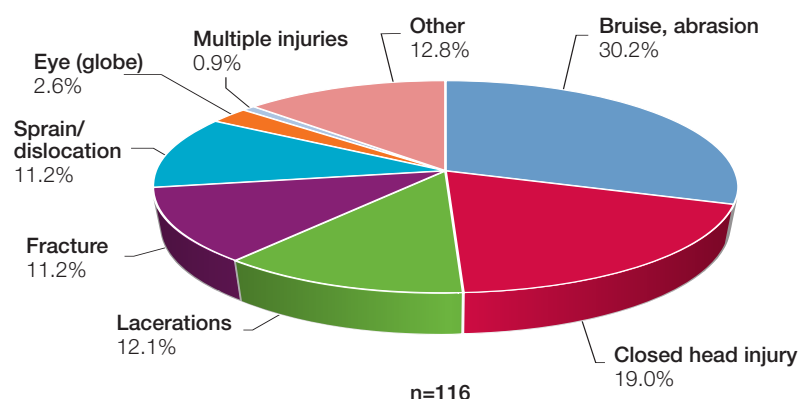
• Non-MVC

† Including previous occupants

‡ Including person falling on patient and wheelchair-related

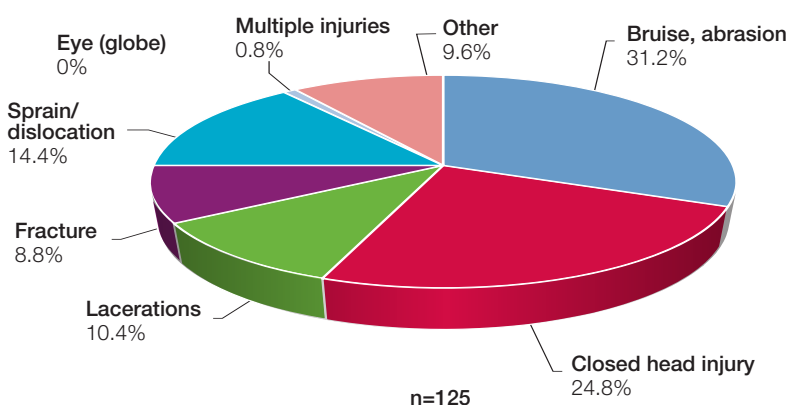
**FIGURE 5.3**

**Nature of school bus-related injuries, CHIRPP, 2008/09, ages 0-24 years**



**FIGURE 5.4**

**Nature of city bus-related injuries, CHIRPP, 2008/09, ages 0-24 years**



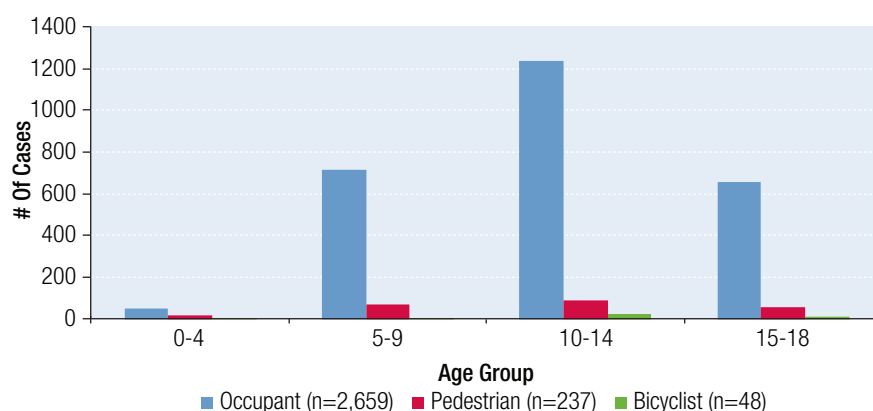
### What the data show

**Figure 5.5** presents statistics based on the NCDB, for injuries occurring during school bus collisions between 1999 and 2008, among children and youth 0-18 years of age. When considering injured persons' activities during incidents, school bus occupants were most common across all age groups by a considerable margin (90%, or n=2,659), and nearly half of injured occupants were 10-14 years of age (n=1,237, or 47%). The proportions of injured school bus occupants aged 5-9 years and 15-18 years were similar at 27% and 25%, respectively.

Statistics for school bus collision-related fatalities between 1999 and 2008, among children and youth up to 18 years of age are presented in **Figure 5.6**. When considering persons' activities during a school bus collision, school bus occupants shared the greatest proportion of *injuries*, while pedestrians were most common among fatalities at 67% of total *fatalities* (in contrast to occupants at 25%).

**FIGURE 5.5**

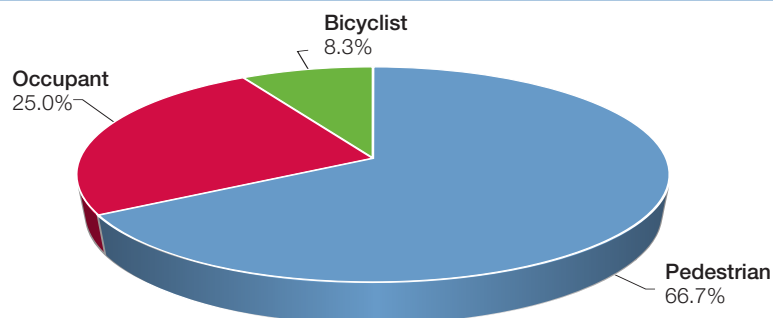
**School bus collision-related injury cases, by road user class and age group (0-18 years), Canada, National Collision Database, 1999-2008**



Source: Public Health Agency of Canada analysis of data from Transport Canada's National Collision Database.  
Note: Includes multiple vehicle incidents.

**FIGURE 5.6**

**School bus collision-related fatalities, by road user class, Canada, National Collision Database, 1999-2008, ages 0-18 years**



Source: Public Health Agency of Canada analysis of data from Transport Canada's National Collision Database.  
Note: Includes multiple vehicle incidents.

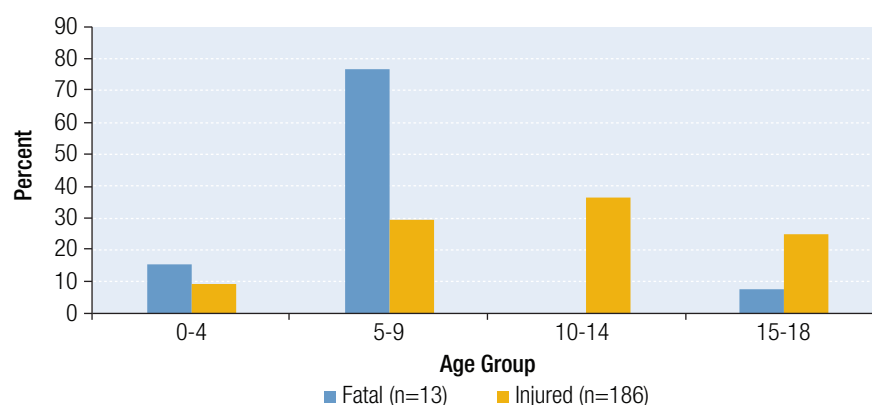
**Figure 5.7** presents the age distribution of pedestrians 0-18 years of age who were injured or killed from being struck by a school bus in Canada between 1998 and 2008 (single vehicle collisions only). Nearly 80% of total fatalities were among children 5-9 years of age. There were no pedestrian fatalities among 10-14 year olds.

**Table 5.2** details the specific mechanisms of injury to pedestrians 0-18 years of age who were struck by a school bus. Over 30% of pedestrian collisions with school buses occurred while the pedestrian was crossing at an intersection or crosswalk (including with and without pedestrian right-of-way), while over 15% of pedestrians were on the road, including behind a parked car while they were struck. Getting on or off the bus was the pedestrians' activity in 11% of incidents.

The age distribution of persons with injuries related to school versus city buses varies; however, the mechanisms of injury are similar across both types of buses. While infrequent, pedestrian injuries sustained in school bus collisions are often fatal, with the majority of pedestrian collisions occurring in intersections or crosswalks. Child safety advocates recommend that children are taught safe pedestrian behaviour, including when entering and exiting a school bus.

**FIGURE 5.7**

**Age distribution of pedestrians struck by a school bus, by injury outcome, Canada, National Collision Database, 1999-2008, ages 0-18 years**



Source: Public Health Agency of Canada analysis of data from Transport Canada's National Collision Database.  
Note: Excludes multiple vehicle incidents.

**TABLE 5.2**

**Mechanism of injuries to pedestrians struck by a school bus, Canada, National Collision Database, 1999-2008, ages 0-18 years**

Mechanism	#	%
Crossing at an intersection or crosswalk	58	31.2
On road or behind parked car	28	15.0
Other	28	15.0
Unknown	28	15.0
Getting on or off the school bus	20	10.8
On roadside or sidewalk	19	10.2
Getting in or out of another vehicle	5	2.7
<b>Total</b>	<b>186</b>	<b>100.0</b>

Source: Public Health Agency of Canada analysis of data from Transport Canada's National Collision Database.  
Note: Excludes multiple vehicle incidents.

## OPPORTUNITIES FOR ACTION

### School Bus Safety<sup>7-12</sup>

- Children are rarely injured while riding in a school bus in Canada. Children are at much higher risk of being struck by a car while boarding or exiting the school bus.
- School bus seats are designed to protect children using “passive protection”. The back of each seat is padded and is a specific distance from the seat behind it. If the bus stops suddenly, the padded seat back absorbs the forward energy of the child seated behind.
- Child safety advocates recommend that while riding in a school bus, infants, toddlers and preschoolers be properly restrained in the appropriate child seat for their height and weight. School buses manufactured after March 2007 have a minimum number of lower anchorage systems in place, and tether straps for those car seats that require them.
- Parents can find tips on keeping kids safe on and around school buses at: [www.mto.gov.on.ca/english/safety/schoolbus/smarts.shtml](http://www.mto.gov.on.ca/english/safety/schoolbus/smarts.shtml)

**Compliance and Enforcement:** Across Canada, motorists are required by law to stop for a stopped school bus with its upper red lights flashing and/or extended stop signal; failure to do so can result in fines ranging from \$400 to \$2000 and other penalties such as demerit points.

In Canada, the school bus design is governed by approximately 40 federal regulations and by Canadian Standards Association standard D250. These requirements cover such things as the colour of the bus, interior and exterior body design, mirrors, lighting systems and seat design. In addition, provincial and territorial regulations, bus company rules and local school board policies apply to the operation of the vehicle; the bus routes and stops; requirements, if any, for attendants on the bus; hours of operation; and licensing requirements for drivers.

**Regulatory Initiatives:** In 1998, federal requirements for school bus mirrors were updated to enhance the field-of-view around the bus. Along with the amendment, Transport Canada, in association with the Ministère des Transports du Québec, prepared school bus mirror adjustment procedures, which operators use to maximize the benefits of the new mirror systems. As of 1 April 2007, all newly built school buses are required to have a minimum number of seating positions equipped with lower and tether anchorages for child seats based on the number of designated passenger seating positions available. The lower anchor allows for the base of a child seat to be secured to the bus, while the tether anchor allows the top of a child seat to be attached to the school bus seat. Regulations related to school bus use and maintenance, including any associated retrofitting, is a provincial/territorial matter.



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## 6 ◆ Vulnerable Road Users

Vulnerable road users (VRUs) are defined as roadway users who are unprotected by any vehicle structure and in the event of a crash are susceptible to injury or death due to this minimal protection and mass differential. They can be classified into powered and non-powered VRUs, which will be discussed in the following sub-sections.

### Non-powered vulnerable road users

#### Pedestrians

A pedestrian is defined by the World Health Organization (WHO)<sup>1</sup> as: “any person involved in an accident who was not at the time of the accident riding in or on a motor vehicle, railway train, street-car or animal-drawn or other vehicle, or on a pedal cycle or animal”. Included in this definition are: person changing tire of vehicle, making adjustment to motor vehicle, or on foot. Further, users of a pedestrian conveyance are also included: baby carriage/stroller, ice-skates, perambulator, push-cart, push-chair, roller-skates, scooter, skateboard, skis, sled, and wheelchair.

Pedestrian-related injury is an extensively researched area. Due to the dynamic nature of our society, pedestrian injury research has evolved, and has currently had input from a variety of scientific disciplines including epidemiology, psychology, biomechanics and road/traffic engineering.<sup>2-5</sup> Current research focuses on topics such as distracted walking,<sup>6,7</sup> built environments and urban change.<sup>8-10</sup>

#### Bicycles

Similarly, bicycle injuries have been thoroughly researched, especially with respect to helmet use.<sup>11</sup> Most deaths from bicycling-related injuries are caused by collisions with motor vehicles. As Rivara and Sattin have indicated: “The burst of research during the 1980s and 1990s on bicycle related injuries has made a difference in decreasing the injury toll. However, the magnitude of the injury problem remains sizeable and is likely to increase, with greater emphasis on promotion of physical activity”.<sup>12</sup> As with pedestrian-related injury, bicycling-related injury research is evolving.<sup>13-19</sup>

#### Back-overs

A special case of non-powered VRU incidents involves back-overs. These cases are low speed collisions involving a motor vehicle backing over a pedestrian or other non-powered VRU. There is a sense that these incidents are more of a concern because of the current popularity of sport utility vehicles (SUVs), which have a large rear blind spot.<sup>20</sup>

### Emergency Department Data – CHIRPP Analyses

#### Methods

Records of injuries to non-powered VRUs were extracted from the CHIRPP database using CHIRPP factor codes and narrative fields. Included in the analyses are pedal cyclists and pedestrians on foot, in strollers, on skateboards, rollerblades or push scooters involved in a collision with a motor vehicle, including off-highway recreational vehicles. Cases involving sleds (recreational), skis, snowboards and ice skating (colliding with motor vehicles) were not included due to their very low frequency. Time trend graphs cover the complete history of the CHIRPP database (for those under 25 years of age) spanning fiscal years 1990/91 to 2008/09 (April 1 to March 31). In-depth CHIRPP analyses were completed for the most recent fiscal year available (April 1, 2008 to March 31, 2009). More information about CHIRPP and data analysis methods can be found in Appendix B Data Sources and Methods.

#### What the data show

In total, 18,542 cases of non-powered VRUs were identified for the 19 year period 1990/91 to 2008/09 in CHIRPP emergency department surveillance data.

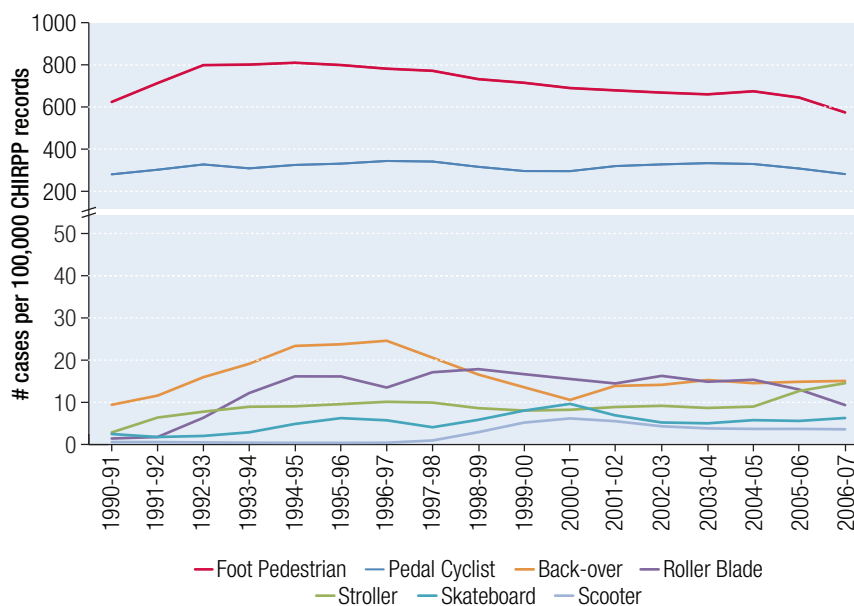


**Figure 6.1** shows the annual trend by VRU type including a category for the back-over mechanism\* (note the interrupted rate axis is used to demonstrate patterns in both high and low frequency categories). Foot pedestrians and pedal cyclists accounted for more than 70.7% and 26.5% of injuries among unpowered vulnerable road users with rates of 699 and 301/100,000 CHIRPP records, respectively.

Comparing the period 1993/94-2000/01 to 2001/02-2008/09, injured foot pedestrians have decreased in frequency in recent years (1993/94-2000/01),  $OR=0.79$  (95% CI: 0.82, 0.85),  $p<0.0001$ . Rates of injuries to pedal cyclists involved in motor vehicle collisions have varied over the 19 year period without any significant decline overall. Among injured pedal cyclists involved in motor vehicle collisions treated in CHIRPP emergency departments, 16.8% were admitted to hospital compared to 19.4% among foot pedestrians. CHIRPP provided information on the use of helmets for 205 of the 256 (80%) pedal cycle-Motor Vehicle Collision (MVC) cases; 37.6% were wearing helmets.

**FIGURE 6.1**

**Injury cases, non-powered Vulnerable Road Users, CHIRPP, 1990/91-2008/09, ages 0-24 years, per 100,000 records**



Notes: 1) The back-over (all types) category represents injuries involving any VRU with a motorized vehicle moving backwards. 2) The annual number of cases was first normalized by dividing by the annual total number of CHIRPP records, and then a three-point central moving average was applied to the normalized data (see Appendix B). 3) Foot pedestrian n=12,478; pedal cyclist n=5,534; back-over n=290; roller blade n=223; stroller n=166; skateboard n=94; scooter n=47.

\* The back-over is a mechanism and applies to pedal cyclists and all pedestrian types. All pedestrians, n=13,008; pedal cyclists, n=5,534.

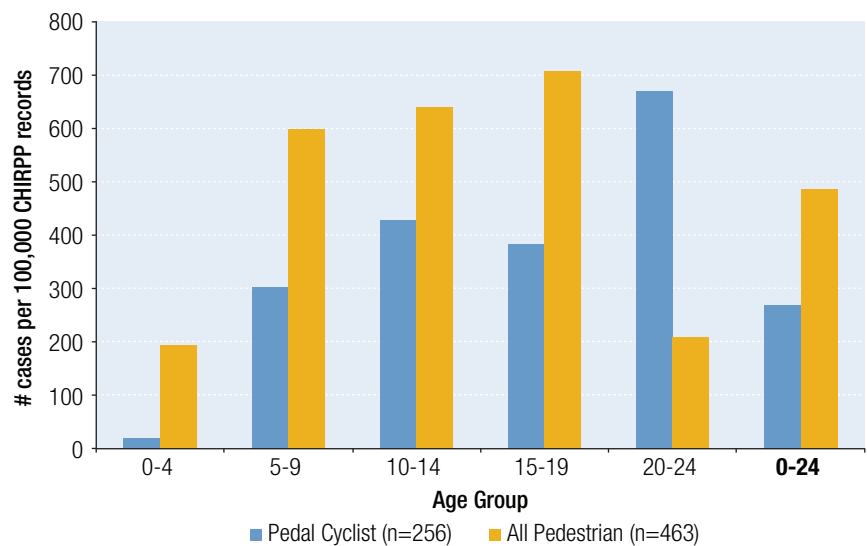
The remaining four categories of non-powered VRUs accounted for 2.8% of injuries. Varying trends of injury are seen for these categories. There were very few injuries during the earlier years, then as rollerblades, skateboards, and later micro scooters gained popularity, injuries increased over the mid range years and have leveled off or declined in recent years. It is important to note that the low rates among these categories do not indicate less risk but are more likely to reflect reduced exposure. Far fewer people travel by stroller, skateboard or scooter compared to those on foot or bicycles.

Overall, there were 290 back-over incidents. Their frequency peaked in 1996/97 at 31.7/100,000 CHIRPP records then declined slowly until 2001/02 after which they leveled off to current levels of 14.6/100,000 CHIRPP records.

**Figures 6.2 and 6.3** show the age and sex (male) distribution of injured pedal cyclists and all categories of pedestrians. After normalizing for overall age distribution, pedestrian injuries were more frequent among all age groups except 20-24 years. The median age among injured pedal cyclists was 12.8 years [interquartile range (IQR) 9.5 to 15.1], similar to 12.1 years (IQR 7.3 to 14.8) among injured pedestrians. Males were overrepresented among injuries sustained by both pedal cyclists (75.8%) and pedestrians (55.7%). For both injury categories males predominated in all age groups except 20-24 years.

**FIGURE 6.2**

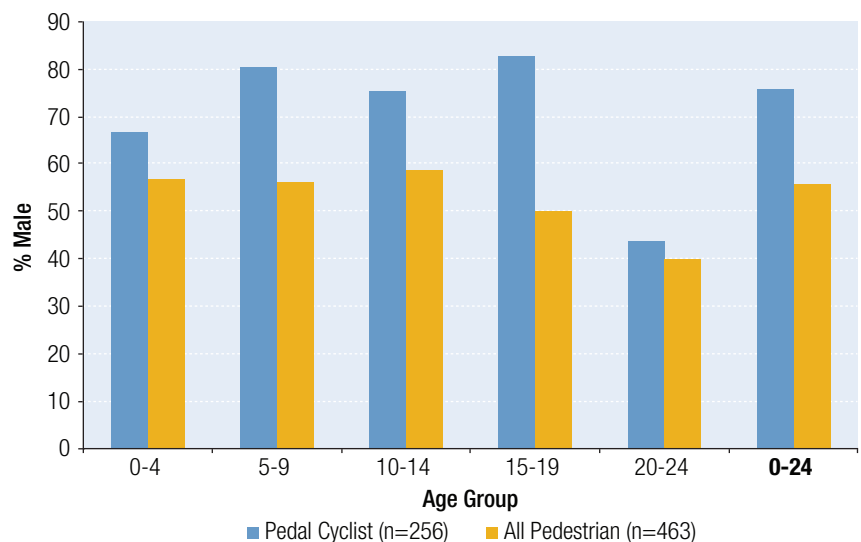
**Normalized age distribution of injury cases, pedal cyclists and pedestrians, CHIRPP, 2008/09, per 100,000 records**



Notes: 1) All pedestrians include foot pedestrians; users of strollers, skateboards, or rollerblades; and persons injured in back-over incidents. 2) Age counts are normalized by dividing by the total number of same-aged individuals in the entire database. This normalization accounts for the uneven distribution due to the large proportion of paediatric hospitals in the database (see Appendix B).

**FIGURE 6.3**

**Percentage of injury cases to male pedal cyclists and pedestrians, CHIRPP, 2008/09, by age group**



Note: All pedestrians include foot pedestrians; users of strollers, skateboards, or rollerblades; and persons injured in back-over incidents.

**Table 6.1** details the specific mechanisms involved in pedal cyclist-MVC incidents. A total of 256 cases were identified in CHIRPP emergency department data. Among the cases with detailed information on the circumstances of the collision, approximately a third of injured persons reported being struck while crossing an intersection or while in a pedestrian area (n=46).

**Tables 6.2 to 6.5** present information from CHIRPP on the mechanism, pedestrian type, and impacting vehicle, as well as distance thrown/dragged for pedestrian-MVC incidents. Of the 463 pedestrian-MVC incidents, specific detail on the mechanism was reported for 238 incidents, among which 18% (n=43) involved the patient running into the street without looking (**Table 6.2**). Most of the pedestrians were on foot and were struck by a passenger car, van or light truck. The thrown/dragged distance was reported for 41 cases, among which 24.4% of injured pedestrians were thrown/dragged 25 feet or more.

**TABLE 6.1**  
**Mechanism of pedal cyclist injuries, CHIRPP, 2008/09, ages 0-24 years**

Mechanism	# Cases	%
Struck while crossing intersection	37	14.5
Struck by slow-moving vehicle	32	12.5
Lost control of bike, veered into traffic	13	5.1
Rode into a moving vehicle	13	5.1
Rode into a stopped vehicle	12	4.7
Struck by vehicle turning corner	11	4.3
Side-swiped by vehicle	10	3.9
Struck while in pedestrian area (sidewalk, crosswalk)	9	3.5
Struck by vehicle leaving driveway*	5	2.0
Back-over	5	2.0
Foot run-over	2	0.8
Struck by vehicle, not further specified	102	39.8
<i>passenger car, light truck, van</i>	96	-
<i>bus</i>	3	-
<i>off-highway vehicle</i>	3	-
Other	5	2.0
<b>Total</b>	<b>256</b>	<b>100.0</b>

\* Excluding back-overs

Note: Insufficient detail was provided in 102 cases, for the determination of a specific mechanism [Struck by vehicle, not further specified, N=102, (Passenger car, truck, light van n=96; Bus n=3; Off-highway vehicle n=3)].

**TABLE 6.2**  
**Mechanism of pedestrian injuries, CHIRPP, 2008/09, ages 0-24 years**

Mechanism	# Cases	%
Crossing street, struck by vehicle, not further specified	225	48.6
Ran into street without looking*	43	9.3
Foot run-over, mirror impact**	40	8.6
Walking on side of road, side-swiped	33	7.1
Struck while exiting a vehicle	26	5.6
<i>by same vehicle†</i>	20	-
<i>by other vehicle‡</i>	6	-
Back-over	21	4.5
Struck while in crosswalk	19	4.1
Struck by turning vehicle	14	3.0
Vehicle ran red light or stop sign§	10	2.2
Vehicle jumped curb	7	1.5
Patient darted out from between two cars	7	1.5
Pedestrian was intoxicated	2	0.4
Car surfing	1	0.2
Other	15	3.2
<b>Total</b>	<b>463</b>	<b>100.0</b>

\* While playing - running after a ball or running to catch the bus

\*\* Not a full impact, i.e. vehicle ran over foot or individual struck by side mirror of vehicle

† Pedestrian exited vehicle and subsequently struck by the same vehicle; includes cases where patient was "half-way" out when driver started to move

‡ Pedestrian exited vehicle and was subsequently struck by another passing vehicle

§ Includes cases where brakes apparently failed



The following Safe Kids Canada resources and links provide additional information about child pedestrian safety:

<http://www.safekidscanada.ca/Parents/Safety-Information/Pedestrian-Safety/Index.aspx>

*Child Pedestrian Injuries Report 2007-2008.* Toronto, ON: Safe Kids Canada; 2008.

*Child Safety Good Practice Guide: Good investments in unintentional child injury prevention and safety promotion – Canadian Edition.* Toronto, ON: Safe Kids Canada; 2011.

*Making it Happen. Pedestrian Safety – A Guide for Communities.* Toronto: Safe Kids Canada; 2004.

**TABLE 6.3**

**Pedestrian injuries by pedestrian type, CHIRPP, 2008/09, ages 0-24 years**

Pedestrian type	# Cases	%
On foot	424	91.6
Non-powered small wheel*	15	3.2
Stroller	15	3.2
Carried child†	5	1.1
Sled‡	3	0.6
Other	1	0.2
<b>Total</b>	<b>463</b>	<b>100.0</b>

\* Includes rollerbladers, skateboarders and those on push scooters

† Child carried by adult either manually or with a harness

‡ Includes only cases where the child was being pulled in a sled by an adult; excludes recreational sledding

**TABLE 6.4**

**Pedestrian injuries by impacting vehicle type, CHIRPP, 2008/09, ages 0-24 years**

Impacting vehicle type	# Cases	%
Passenger car, van, light truck	413	89.2
Bus, heavy truck	41	8.9
Off-highway vehicle*	8	1.7
Other	1	0.2
<b>Total</b>	<b>463</b>	<b>100.0</b>

\* Includes ATVs, snowmobiles and dirt bikes

**TABLE 6.5**

**Pedestrian injuries by distance dragged or projected, CHIRPP, 2008/09, ages 0-24 years**

Distance dragged or projected* (feet)	# Cases	%
3-6	13	31.7
8-15	18	43.9
25-30	5	12.2
40-45+	5	12.1
<b>Total</b>	<b>41</b>	<b>100.0</b>

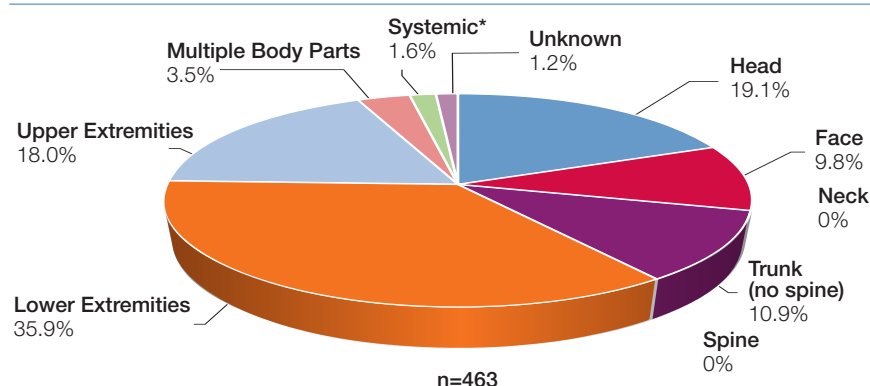
\* Where reported, n=41

**Figures 6.4 and 6.5** highlight the distribution of body regions injured among pedestrians and pedal cyclists. Pedestrians sustained more lower extremity injuries (43.4% vs. 35.9%,  $p < 0.05$ ) and bicyclists more upper extremity injuries (18.0% vs. 11.2%,  $p < 0.05$ ). The percentage of head injuries sustained by both pedestrians and pedal cyclists was 19%. However, as a proportion of all head injuries intracranial injuries were more frequent for bicyclists (22.5% vs. 8.0%; OR=2.92 (95% CI: 1.04, 8.46),  $p < 0.05$ ). Concussions and skull fractures were similar for both groups (approximately 23% and 6%, respectively).

The majority of injuries to vulnerable road users (non-powered) were sustained by foot pedestrians struck by a vehicle while crossing the street. Further research into geographic and behavioural risk factors (e.g., rural versus urban injury distribution, not crossing at a crosswalk or intersection, vehicle speeding, etc.) is needed to better understand possible measures to reduce these preventable injuries.

**FIGURE 6.4**

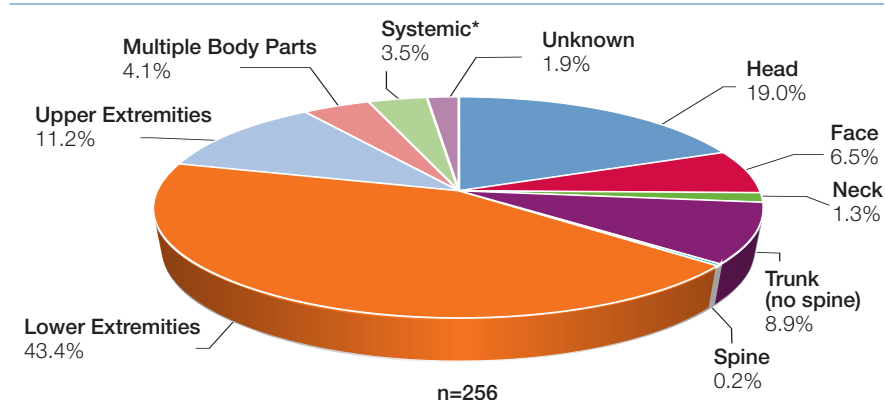
**Distribution of pedestrian injuries, by body region, CHIRPP, 2008/09, ages 0-24 years**



\* Note: Systemic injuries include bodily conditions not manifesting as a physical injury, for example, hyperventilation, shock, or elevated heart rate.

**FIGURE 6.5**

**Distribution of pedal cyclist injuries, by body region, CHIRPP, 2008/09, ages 0-24 years**



\* Note: Systemic injuries include bodily conditions not manifesting as a physical injury, for example, hyperventilation, shock, or elevated heart rate.

## Pedestrian Safety

- Distractions such as walking in a group or using cell phones while walking are dangerous and increase the risk of being hit by a vehicle.
- Child-centered pedestrian safety programs which include parental involvement are more likely to be successful.
- A child should walk with an adult or older responsible child until they are at least 9 years of age, but they may not be ready to be fully independent until they are 10 or 11 years of age.
- Children may be ready to walk without adult supervision when they are able to choose a safe crossing route, understand the speed of oncoming vehicles, and judge safe gaps in traffic.

- When teaching children about pedestrian safety, beginning with simple information can be very effective; for example a toddler can understand that cars belong on the road and people belong on the sidewalk.

### Sources:

Safe Kids Canada. Parents and Caregivers – Walking and Talking. Safe Kids Canada Web site. <http://www.safekidscanada.ca/Parents/Safety-Information/Pedestrian-Safety/Tips/Pedestrian-Safety-Tips.aspx>. Published May 28, 2010. Accessed May 17, 2011.

Harborview Injury Prevention and Research Center. *Best Practices*. Seattle: University of Washington; 2001.



## OPPORTUNITIES FOR ACTION

### Bicycle Safety<sup>21-24</sup>

- Adults and children alike should use appropriate safety products such as helmets, reflective clothing, bells, and front and rear lights. Research has shown that if a parent wears a helmet, their child is more likely to wear a helmet.
- Ensure helmets meet safety standards such as the Canadian Standards Association (CSA), Consumer Product Safety Commission (CPSC), Snell or ASTM.
- Helmet straps should fit snugly around the ears in a “V” shape, and only one finger should fit under the buckled chin strap. The helmet should be level, cover the top of the forehead, rest 2 fingers’ width above the eyebrows, and not move when the head is shaken. Evidence shows that correctly fitted bicycle helmets reduce the risk of head and brain injury by as much as 85%.
- Children under five years of age require helmets with more cushioning at specific impact points because their heads are smaller, still growing, and are not rigid. Helmets which meet safety requirements for children under five have a permanent yellow label informing consumers of their suitability for this age group.
- Replace any helmet that has been in a crash.
- Child safety advocates recommend that children under 10 years of age refrain from riding their bicycles on the road because they do not have the physical or cognitive skills to handle their bikes safely in traffic. Children over 10 should practice with an adult before they ride on the road.

**Compliance and Enforcement:** The vast majority of bicycle helmets sold in Canada meet the legislated requirements in the United States, the Consumer Product Safety Commission (CPSC) standard. The CPSC standard is virtually identical to the voluntary ASTM International Standard Safety Specification (formerly the American Society for Testing and Materials). There is a Canadian Standards Association (CSA) standard (CSA D113.2.) for bicycle helmets, but there are currently no helmet manufacturers that have helmets certified under this standard.

It is mandatory for riders of all ages to wear a bicycle helmet in British Columbia, New Brunswick, Nova Scotia and Prince Edward Island; in Alberta and Ontario it is mandatory for those 17 years of age or younger. There is currently no legislation for the wearing of bicycle helmets while cycling in the remaining provinces and territories. Safety advocates recommend that everyone riding a bicycle be required to wear a helmet certified to meet one of the standards mentioned above. Laws should be accompanied by enforcement and public education, which have been shown to increase helmet use.

**Regulatory Initiatives:** Provinces and territories regulate use of bicycle helmets. Statutes may be found in respective provincial/territorial highway traffic acts.



## Powered Vulnerable Road Users

Powered vulnerable road users (VRUs), sometimes referred to as powered two-wheelers include motorcycles, mopeds and scooters.<sup>25</sup> Powered VRUs are similar to non-powered VRUs in that the user is minimally protected by any vehicle structure, with one added element – the potential for higher speeds. Powered VRUs are disproportionately injured or killed relative to their numbers on the road.<sup>26</sup>

Mopeds and powered scooters are becoming more popular around the world. Mopeds and scooters generally have a maximum engine cylinder capacity of 50 cc and a maximum speed of 50 km/hr, but the definition may vary by jurisdiction.<sup>27-29</sup> Motorcyclists frequently sustain severe injuries and a large body of research exists on a variety of characteristics such as severity, use patterns, kinematics and risk factors.<sup>30-35</sup>

### Emergency Department Data – CHIRPP Analyses

#### Methods

Records of injuries to powered VRUs were extracted from the CHIRPP database using CHIRPP factor codes and narrative fields. Included in the analyses are motorcycles (including side-car types), mopeds/motorized bicycles and powered scooters. New models of three-wheeled motorcycles have entered the market recently and are also included. Mobility aids such as motorized wheel chairs are excluded. Time trend graphs cover the complete history of the CHIRPP database (for those under 25 years of age) spanning fiscal years 1990/91 to 2008/09 (April 1 to March 31). In-depth CHIRPP analyses were completed for the most recent fiscal

year available (April 1, 2008 to March 31, 2009). More information about CHIRPP and data analysis methods can be found in Appendix B Data Sources and Methods.

#### What the data show

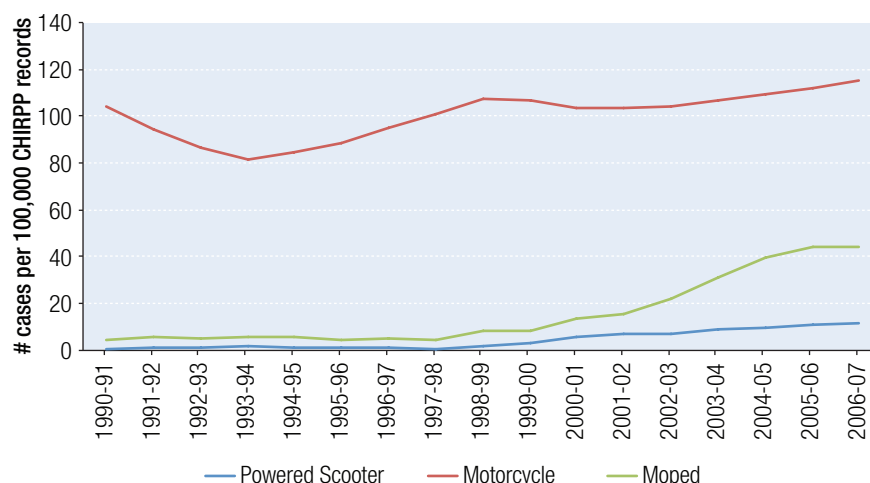
Overall 2,203 cases were identified in CHIRPP emergency department data from 1990/91 to 2008/09. **Figure 6.6** shows the normalized annual trend for the powered VRUs. Injuries related to powered scooters followed a similar trend to the one seen for unpowered scooters, rising steadily in the late 1990s. Moped-related injuries presenting to CHIRPP emergency departments also started to increase at the end of the 1990s. Their rates rose quite sharply for most of the next decade before leveling off to some extent in recent years. There is no reason to believe that the risks associated with using these vehicles have increased in the last decade compared to earlier years. The increasing trend in injuries associated with mopeds and scooters is likely due to increasing sales and popularity during this period.

One quarter (25.5%) of people who presented at CHIRPP hospitals with motorcycle-related injuries were admitted to hospital. Among injured moped and scooter riders, 25.9% and 20.0% were admitted to hospital, respectively. Among cases with detailed information, 78.1% of injured motorcyclists were drivers and 69.4% were wearing a helmet. Where known, moped and scooter users were wearing a helmet in 76.2%, and 63.9% of incidents, respectively.

As a proportion of all injuries, closed head injuries (concussion, intracranial, minor closed head injury) accounted for 11.5% of injuries among motorcyclists and 3.7% among moped riders. Fractures made up 32.7% and 40.7% of injuries to riders of motorcycles and mopeds, respectively.

**FIGURE 6.6**

**Injury cases\*, powered Vulnerable Road Users, CHIRPP, 1990/91-2008/09, ages 0-24 years**



\* The annual number of cases was first normalized by dividing by the annual total number of CHIRPP records, and then a three-point central moving average was applied to the normalized data (see Appendix B).



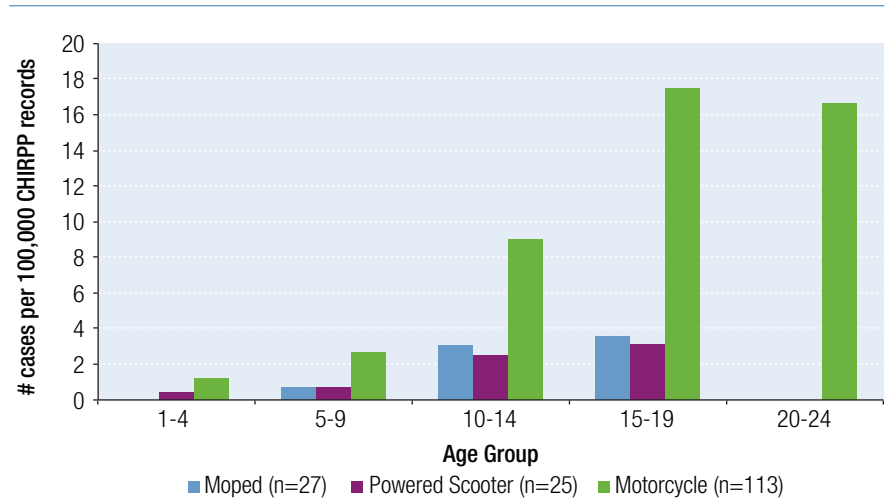
**Figure 6.7** shows the normalized age distribution of the three powered VRU types. As expected motorcycles were more frequent, particularly in the 15-24 year age group. Most (80%) of the motorcycle and scooter riders were males whereas only 59% of moped riders were male.

**Table 6.6** details the mechanisms involved. Even though the vehicles are different, the proportion of falls/lost control (60.2%) and MVC-related (16.8%) were similar.

Motorcycles and mopeds continue to be associated with an increasing number of severe and fatal injuries. Drivers and passengers have limited protection given the absence of a vehicle enclosure, and are often traveling at high speeds (especially motorcyclists). The most frequent mechanisms of injury are falling, loss of control or sliding. Efforts are needed to enforce and reduce the speeds at which motorcycles/mopeds are traveling, and increase their safety features including visibility.

**FIGURE 6.7**

**Normalized age distribution of injury cases, powered Vulnerable Road Users, CHIRPP, 2008/09**



Notes: Age counts are normalized by dividing by the total number of same-aged individuals in the entire database. This normalization accounts for the uneven distribution due to the large proportion of paediatric hospitals in the database (see Appendix B).

**TABLE 6.6**

**Mechanism of injury, powered Vulnerable Road Users, CHIRPP, 2008/09, ages 0-24 years, percentage of cases**

Mechanism	(%)		
	Motorcycle	Moped	Scooter
Fell, lost control, slide	60.2	63.0	60.0
Involved in MVC	16.8	18.5	16.0
Impact with fixed structure	8.8	0.0	4.0
Injured while on vehicle	11.5	14.8	4.0
Pedestrian*	2.7	3.7	16.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\* In this analysis, pedestrian includes foot pedestrians, pedal cyclists, or users of a stroller, skateboard, or rollerblades, struck by a motorcycle, moped or powered scooter.



## Motorcycle Usage and Safety

Motorcycle drivers and passengers are far more vulnerable to road hazards than occupants of enclosed vehicles, and are more likely to be injured or killed in a collision. Some risk factors include high speed, reduced stability, reduced visibility to other drivers, and a lack of safety features such as restraints and airbags found in other vehicles.

The number of motorcycle registrations in Canada is on the rise. According to Transport Canada's National Collision Database, in 1990 there were 359,000 motorcycles registered in Canada, and by 2009 there were 595,000. For all ages combined, the motorcyclist fatality rate in Canada also steadily increased between 2002 and 2005, with only a modest decline in 2006. However, a notable decline was observed for those aged 16-24.

According to a 2008 public opinion survey conducted by the Traffic Injury Research Foundation (TIRF):

- 80.4% of motorcyclists are male.
- The age distribution of Canadian motorcyclists is: under 21: 9.1%, 21-29: 15.2%, 30-39: 20.9%, 40-49: 24.6%, 50-59: 21.2%, and 60+: 8.7%.

- 25.5% of Canadian motorcyclists admitted to driving well above the speed limit.
- 9% of Canadian motorcyclists admitted to frequent, unsafe passing of other vehicles.
- 3.1% of respondents admitted to frequently riding a motorcycle without wearing a helmet.
- 8.9% of respondents admitted to talking on their cell phone for at least one minute, while operating a motorcycle.

### Sources:

Motorcycle & Moped Industry Council (MMIC) and Canadian Off Highway Vehicle (COHV) Distributors Council. *Motorcycle & All-Terrain Vehicle Annual Industry Statistics Report*. Toronto, ON: MMIC and COHV; 2007.

Traffic Injury Research Foundation. *The Road Safety Monitor 2008: Motorcyclists*. Ottawa, ON: Traffic Injury Research Foundation; 2009.

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# 7 ◆ Off-Highway Vehicles

Off-Highway vehicles (OHVs) include all-terrain vehicles (ATV), snowmobiles, dirt bikes, golf carts and “go-karts”. These vehicles are designed primarily for off-road use although they are involved in road collisions.

## All Terrain Vehicles (ATVs)

ATVs are three- and four-wheel motorized vehicles designed for use on unpaved terrain. These recreational vehicles are also used as a primary means of transportation in rural and remote areas and in a variety of occupational settings such as agriculture. They have large low-pressure tires, handlebars and motorcycle-type engines. Engine sizes range from 50 to 750 cc (cm<sup>3</sup>) of displacement and vehicle weights range from approximately 100 to over 600 pounds with youth models weighing as much as 240 pounds.<sup>1,2</sup>

The popularity of ATVs has greatly increased over the last 25 years, and with increased use, ATV-related injuries and deaths have also risen.<sup>1</sup> Regulatory action in the United States (U.S.) from 1988-1998, appears to have played a role in reducing the rates of injury.<sup>3</sup> Despite this reduction, the number of injuries and deaths remains high, particularly among children under 16 years of age. Since 1998, there have been a large number of studies focusing on different aspects of ATV injuries including risk factors, injury severity, anthropometry, biomechanics, public opinion, paediatric usage, exposure, helmet use, economic burden and safety behaviours.<sup>4-19</sup>

In Canada, similar increases in ATV-related deaths and hospitalizations have been observed.<sup>20,21</sup> Both The Canadian Paediatric Society<sup>22</sup> and the Canadian Association of Paediatric Surgeons have published position statements advocating safety provisions including (but not limited to) the harmonization of provincial/territorial off-road vehicle legislation for a minimum operator age of 16 years; restricting the number of passengers to that for which the vehicle was designed; mandatory helmet use with no exemptions; mandatory training, licensing and registration; and a ban on the use of three-wheeled vehicles.<sup>23</sup> As of 2009 only Newfoundland/Labrador and Quebec had safety legislation which was considered good (both require mandatory helmet use and vehicle training) – with the rest of the provinces and territories rated poor to fair.<sup>24</sup> A number of provincial studies have also been conducted on the nature and prevention of ATV-related injuries, including through legislative action.<sup>25-28</sup>

## Snowmobiles

Snowmobiling is a popular form of wintertime recreation in the Northern U.S. and Canada but with increasing popularity there has also been an increase in injuries and fatalities.<sup>29</sup> Similar to ATVs, these machines can weigh as much as 600 pounds and attain speeds up to 110 mph. U.S. data indicate that blunt impact with a stationary object is the most frequent (over 40%) cause of death.<sup>30</sup> A wide range of injuries has been reported with respect to snowmobiles – facial fractures, lower extremity fractures, dental, internal injuries, burns, drowning, hypothermia, spinal injuries, amputations (including decapitation), and head injuries.<sup>31-37</sup>

## Dirt Bikes

Dirt bikes are designed for use on unpaved roads and other terrain.<sup>38</sup> They are also used in motocross competition.<sup>39-42</sup> There is emerging evidence that dirt bike-related injuries are on the rise in a number of countries including Canada, and can be quite serious in nature.<sup>2,43,44</sup>

## Golf Carts

Golf carts are another form of off-road transport. Their use is not limited to golf courses and has spread to other indoor and outdoor settings including farms and on neighbourhood streets. Golf cart-related injuries in the U.S. have increased dramatically over the past decade, and are a growing problem among all ages. In a 2008 U.S. study of golf cart-related injuries, about 31% of persons injured were under 16 years of age and fractures accounted for 22% of injuries.<sup>45</sup>

## Go-karts

Similar to dirt bikes, go-karts are also used in a variety of settings including paved and unpaved roads and tracks on private property, in commercial settings (such as go-kart rental facilities), and even on public roads. Fractures account for up to 31% of all injuries and internal organ injuries are common.<sup>12,46,47</sup>

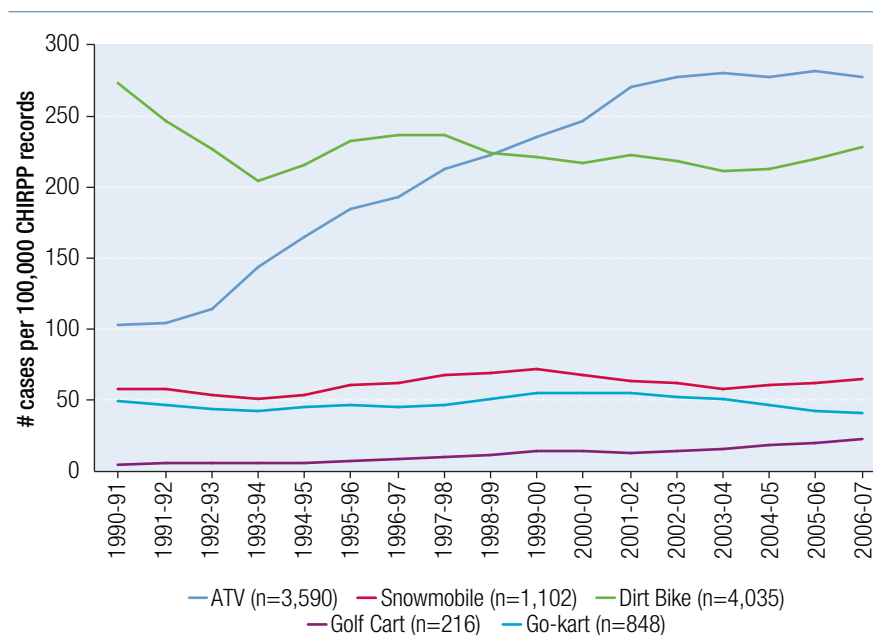
## Emergency Department Data – CHIRPP Analyses

### Methods

Records of injuries related to OHVs were extracted from the CHIRPP database using CHIRPP factor codes and narrative fields. The CHIRPP database provides information on injuries associated with all off-highway vehicles including 3- and 4-wheel ATVs, dune buggies, snowmobiles, dirt bikes and trail bikes as well as go-karts and golf carts. All locations (public roads, private property, and recreational areas) are included. Vehicle-related injuries to bystanders and incidents involving towing behind vehicles are included, but injuries sustained during vehicle maintenance activities are excluded. Time trend graphs cover the complete history of the CHIRPP database (for those under 25 years of age) spanning fiscal years 1990/91 to 2008/09 (April 1 to March 31). All OHVs were included in the time trend analyses, whereas in-depth analyses completed for the most recent fiscal year available (April 1, 2008 to March 31, 2009) cover ATVs, snowmobiles and dirt bikes only (except for figure 7.3). More information about CHIRPP and data analysis methods can be found in Appendix B Data Sources and Methods.

**FIGURE 7.1**

**Injury cases\* related to Off-Highway Vehicles, CHIRPP, 1990/91-2008/09, ages 0-24 years, per 100,000 records**



\* The annual number of cases was first normalized by dividing by the annual total number of CHIRPP records, and then a three-point central moving average was applied to the normalized data (see Appendix B).

**TABLE 7.1**

**Mechanism of injury, Off Highway Vehicle-related cases, CHIRPP, 2008/09, ages 0-24 years, percentage of cases**

Mechanism	Off-Highway Vehicle (OHV) Type (%)		
	ATV	Snowmobile	Dirt Bike
Ejection	38.5	35.5	70.1
Rolled/tipped	30.4	14.5	5.1
Crashed into fixed structure	12.1	17.7	10.3
Injured while on vehicle	5.8	6.5	5.6
Other MVC†	4.7	12.9	6.5
Being towed	3.9	6.5	0.5
By stander	0.8	3.2	0.0
Other/unknown	3.9	3.2	1.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

† Involved in a crash with other off-road vehicle (ATV, snowmobile, dirt bike) or passenger car, van, truck

### What the data show

A total of 9,791 cases were identified in CHIRPP emergency department data from 1990/91 to 2008/09. **Figure 7.1** shows the annual trend for all OHV cases. Except for ATVs, all other OHVs showed persistence over time. ATV-related injuries identified in CHIRPP increased linearly from 1992/93 to 2003/04, with an average annual percent increase of 6.5% ( $p < 0.0001$ ) and have leveled out in recent years. During this period, the number of injuries reported in CHIRPP increased by almost 3-fold for ATVs.

Among the 82% of injured ATV riders reporting on helmet use, 73.9% were wearing helmets when injured. Of the 79% of injured snowmobile riders who reported helmet use, 73% were wearing helmets.

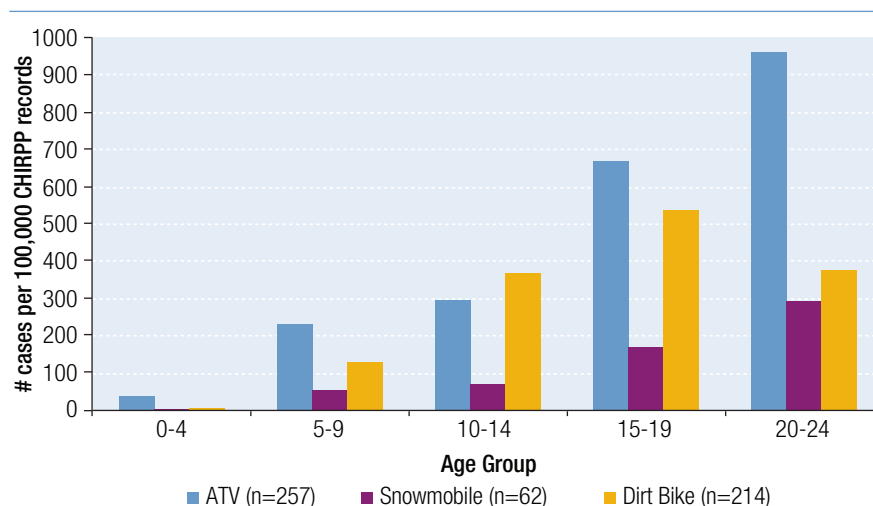
**Table 7.1** shows the mechanism of injuries for injuries related to ATVs, snowmobiles and dirt bikes. Those riding dirt bikes were ejected most frequently.

**Figure 7.2** shows the age distribution for injuries related to ATVs, snowmobiles and dirt bikes. Compared to dirt bikes and ATVs, snowmobile-related injuries were less frequent among all ages. For 20-24 year olds, the number of ATV-related injuries was more than twice that of dirt bike usage.

**Figure 7.3** displays the hospital admission rate for OHV-related injuries for 0-24 year olds. Hospital admission status is used as an approximate measure of injury severity. Except for go-karts, all other OHV-related cases had a relatively high hospital admission rate compared to the database average of 6.2%, and even surpassed the hospital admission rate specific to the motor vehicle-related injuries reported in the CHIRPP database (i.e., 13.8%).

**FIGURE 7.2**

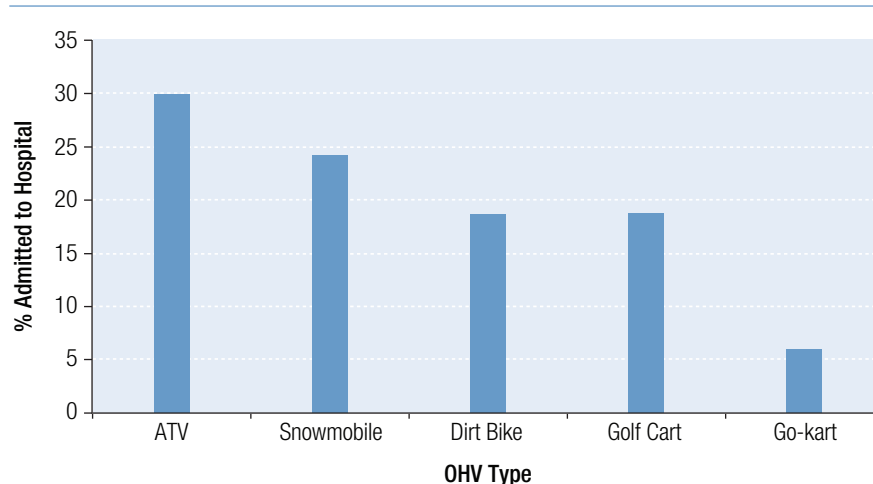
**Normalized age distribution of injury cases related to ATVs, snowmobiles and dirt bikes, 2008/09, ages 0-24 years, per 100,000 records**



Note: Age counts are normalized by dividing by the total number of same-aged individuals in the entire database. This normalization accounts for the uneven distribution due to the large proportion of paediatric hospitals in the database (see Appendix B).

**FIGURE 7.3**

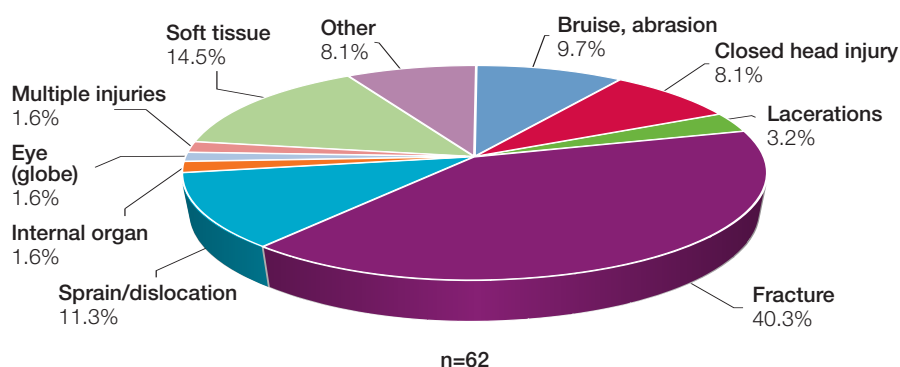
**Hospital admission rate of injury cases related to Off Highway Vehicles, CHIRPP, 2008/09, ages 0-24 years, per 100,000 records**



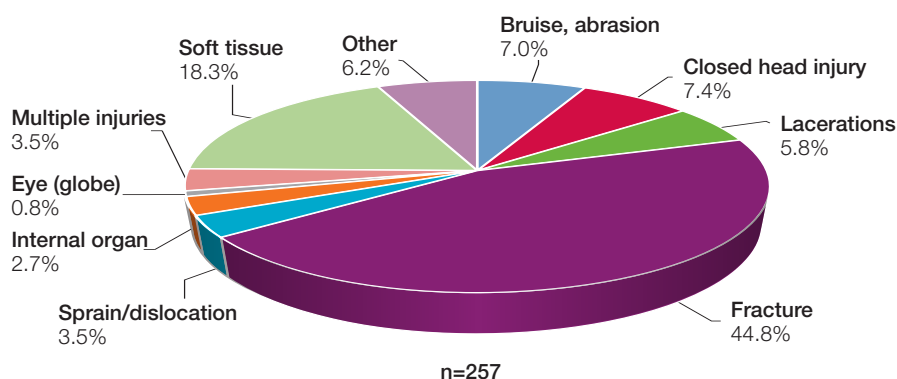


Figures 7.4 to 7.6 show the injury distribution for snowmobiles, ATVs and dirt bikes. All three OHVs had a similar proportion of fractures and brain injuries (closed head injuries), with almost half of the injuries being fractures. Dirt bikes were associated with a higher percentage of internal injuries ( $p<0.05$ ).

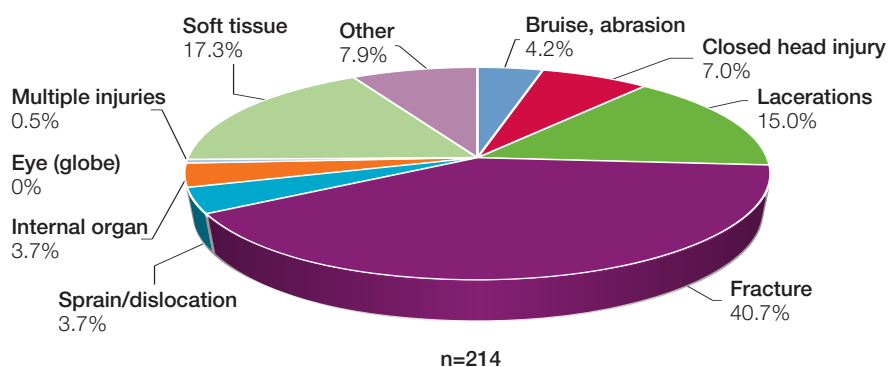
**FIGURE 7.4**  
Snowmobile-related injury distribution, CHIRPP, 2008/09, ages 0-24 years



**FIGURE 7.5**  
ATV-related injury distribution, CHIRPP, 2008/09, ages 0-24 years



**FIGURE 7.6**  
Dirt-bike-related injury distribution, CHIRPP, 2008/09, ages 0-24 years



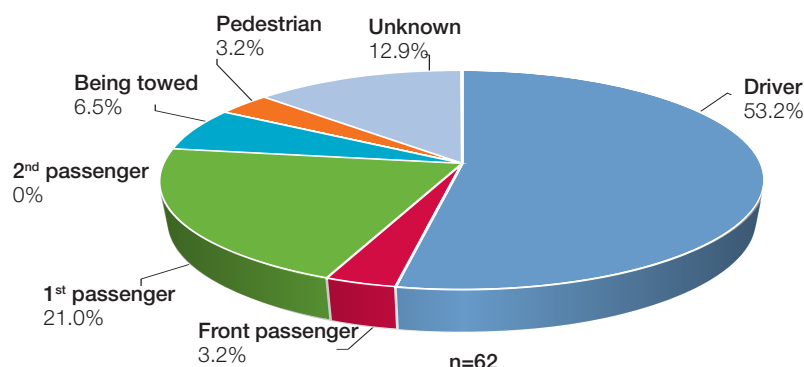


**Figures 7.7 to 7.9** show the seating position for the three main OHVs. For ATV and snowmobile-related injuries observed in the 0-24 year olds, the proportion of drivers was similar (59% and 53%, respectively), while the proportion was much higher for dirt bike-related injuries (90%). It is of interest to note that for youth (specifically, 11-15 years olds), the proportion of cases injured in the driver seating position was 60% for ATV-related injuries, 48% for snowmobile, and 92% for dirt bike, which are close to the corresponding proportions observed for the 0-24 year olds. Furthermore, among children under 10 years of age with ATV-related injuries, 44% were in the driver seating position, whereas there were relatively fewer injured children under 10 years of age who were driving snowmobiles and dirt bikes.

Increases in injuries related to off-highway vehicles have been observed in both the United States and Canada in recent years, particularly injuries associated with all-terrain vehicles (ATVs). Ejection and roll-overs were the most common mechanism of injury and occur in high proportions among drivers under the legal motor vehicle driving age (under 16 years). Child safety advocates recommend that provinces and territories introduce and enforce off-road vehicle legislation that require: minimum age of 16 years to operate an ATV; restricting passengers numbers to that for which the vehicle was designed; compulsory helmet use; mandatory training, licensing and registration; and banning the use of three-wheeled vehicles, among other safety recommendations.

**FIGURE 7.7**

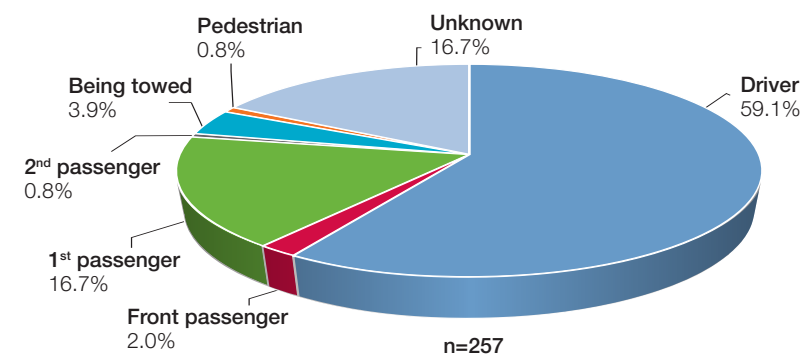
**Seating position\* of persons with snowmobile-related injuries, CHIRPP, 2008/09, ages 0-24 years**



\* Note: Front passenger is in front of the driver (usually small children), 1st passenger is directly behind the driver and the 2nd passenger is behind the first passenger.

**FIGURE 7.8**

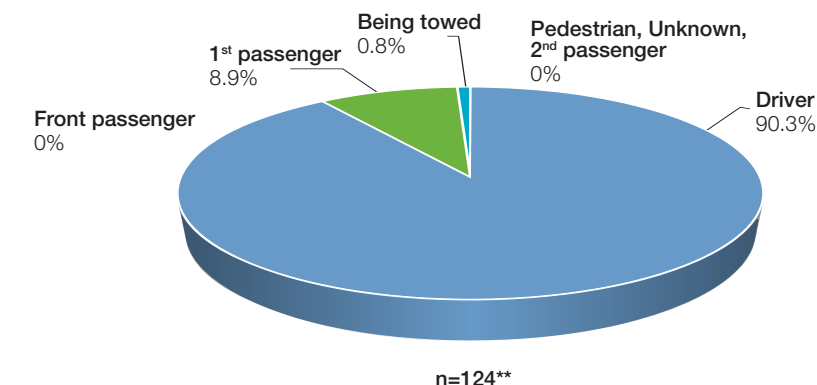
**Seating position\* of persons with ATV-related injuries, CHIRPP, 2008/09, ages 0-24 years**



\* Note: Front passenger is in front of the driver (usually small children), 1st passenger is directly behind the driver and the 2nd passenger is behind the first passenger.

**FIGURE 7.9**

**Seating position\* of persons with dirt bike-related injuries, CHIRPP, 2008/09, ages 0-24 years**



\* Note: Front passenger is in front of the driver (usually small children), 1st passenger is directly behind the driver and the 2nd passenger is behind the first passenger.

\*\* In 90 cases the seating position was unknown. Due to the large number of missing cases (compared to ATVs and snowmobiles), percentages were calculated excluding these records.

## OPPORTUNITIES FOR ACTION

### All Terrain Vehicles (ATVs)<sup>48,49</sup>

- ATV safety is a major area of concern in the injury prevention and safety promotion community. Recommendations about their safe operation are evolving and vary across organizations.
- **Children under 16 should never operate ATVs because they do not have the physical development or cognitive ability to safely control these machines.** ATVs are motorized vehicles that require adult skills and judgment to operate safely.
- **The majority of ATVs are designed for a single rider.** Passengers are not recommended because they can affect the balance and make it difficult for the driver to stay in control. **Children younger than 16 years old should never ride as passengers on ATVs.** Young children especially lack the strength to hold on for any length of time.
- **Refuse to carry a passenger unless the manufacturer specifies that the specific model of ATV was designed for a passenger.**
- Take an ATV training program with a qualified instructor. Practice safe riding techniques at all times, and use the ATV within the safe limits of driving abilities.
- Read the owner's manual and follow all of its instructions, warnings, weight restrictions, and passenger limits. Inspect the ATV before riding, as advised in the owner's manual.
- Wear protective gear and a helmet that is up to the standard recommended for motorcycles.
- Excessive speed is a major risk factor for ATV-related deaths. The rise in popularity of ATVs has been accompanied by a rise in catastrophic injury. ATVs can travel up to speeds of 105 Km/h and can weigh up to 273 kg, approximately 600 lbs.

**Compliance and Enforcement:** The provinces and territories regulate vehicle and driver licensing, and vehicle operation, including ATVs.

**Regulatory Initiatives:** Transport Canada sets and enforces the safety standards required for new and imported vehicles. Transport Canada is also currently evaluating additional safety standards for ATVs (specifically, the American National Standard for Four Wheel All-Terrain Vehicles) and examining various options, including regulations. Safety legislation varies across provinces and territories. There is no minimum age to operate ATVs in British Columbia, Alberta, Manitoba, Ontario, Yukon, Northwest Territories, and Nunavut; the minimum driver age and conditions of supervision vary in the other provinces. The wearing of a helmet while operating or riding an ATV on public or private land is mandatory in Nunavut, Northwest Territories, Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, and Quebec; legislation for the wearing of a helmet while operating or riding on an ATV varies in the other provinces and territories.

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## 8 ◆ Concluding Remarks

*Injury in Review, 2012 Edition: Spotlight on Road and Transport Safety* presents statistics on injuries and mortality from the leading causes in Canada, among children, youth and young adults. This report also provides more detail on the patterns and causes of road- and transport-related injury and death among young Canadians, and relevant information on specific issues including the use of seat belts and car seats, impaired driving, and injuries to pedestrians, cyclists, motorcyclists and those using off-highway vehicles.

One of Canada's greatest successes in injury prevention has been in the area of road and transport safety. We have seen important and significant declines in the rates of motor vehicle-related injuries and fatalities over the last few decades. Sustained road safety efforts over this period have saved thousands of lives and reduced the number and severity of injuries.

This report presents some of the positive trends that have contributed to this success. For example national surveys confirm that in 2009-2010 more than 95% of Canadians are using seat belts and child restraints when travelling in light duty vehicles. The remaining unrestrained occupants are about 16 times more likely to die in a collision. There has been a modest reduction in death rates of pedestrians involved in collisions during the last fifteen years, but little change in death rates for pedal cyclists in the same period.

Unfortunately, not all of the trends reported in this report correspond to positive advances in transport safety.

The annual proportion of alcohol-related motor vehicle fatalities has not declined significantly since the 1990s and we are starting to track impairments due to other factors including fatigue and the use of medications and illicit drugs. Driver distraction, notably related to use of cell phones and other interactive electronic devices, is another risk that has emerged in recent decades and it is one that disproportionately affects young drivers. The rising popularity of off-highway vehicles has been accompanied by rising rates of associated injuries and deaths.

Although we have achieved considerable success in reducing collisions and their consequences, motor vehicle collisions and mishaps remain a leading cause of death and injury for Canadians of all ages, and especially for children, youth and young adults. There is more work to be done and everyone has a role in making transportation safer.

# Appendix A

## External Cause of Injury Groupings

Based on the International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> Revision (ICD-10)<sup>1</sup>

**TABLE A1**  
**External Cause of Injury Groupings**

External Cause of Injury	ICD-10 Code
All Injuries	V01-Y89
All Injuries (excluding adverse effects of medical care)	V01-Y36, Y85-Y87, Y89
Unintentional Injuries (excluding adverse effects of medical care)	V01-X59, Y85-Y86
Motor Vehicle Traffic (MVT – All) (Occurring on a public highway or street)	V02-V04 (.1), V02-V04 (.9), V09.2, V12-V14 (.3-.9), V19 (.4-.6), V20-V28 (.3-.9), V29 (.4-.9), V30-V79 (.4-.9), V80 (.3-.5), V81-V82 (.1), V83-V86 (.0-.3), V87 (.0-.8), V89.2
MVT – Occupant	V30-V79 (.4-.9), V83-V86 (.0-.3)
MVT – Pedal Cyclist	V12-V14 (.3-.9), V19 (.4-.6)
MVT – Pedestrian	V02-V04 (.1, .9), V09.2
MVT – Motorcyclist	V20-V28 (.3-.9), V29 (.4-.9)
MVT – Other and Unspecified	V80 (.3-.5), V81-V82(.1), V87 (.0-.8), V89.2
Falls	W00-W19
Poisonings	X40-X49
Suffocation	W75-W84
Fire/Hot substance	X00-X09, X10-X19
Fire/Flame	X00-X09
Drowning	W65-W74
Struck by/Against	W20-W22, W50-W52
Intentional Injuries	X60-X84, X85-Y09, Y87.0
Intentional self-harm	X60-X84, Y87.0
Assault	X85-Y09, Y87.1
Undetermined Intent	Y10-Y34, Y87.2, Y89.9
Legal intervention/war	Y35-Y36, Y89 (.0-.1)
Adverse effects of medical care	Y40-Y84, Y88

### Source

- 1 World Health Organization. *International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> rev.* Geneva: World Health Organization; 1996.



# Appendix B

## Data Sources and Methods

### Emergency Department Data (CHIRPP)

The Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) is an emergency department based injury surveillance program operated by the Public Health Agency of Canada, in which there are currently 11 children's and four general hospitals participating<sup>1</sup>. Data collection began in April 1990 at the paediatric hospitals and between 1991 and 1995 in the general hospitals. Since then, almost two million records have been collected nationally, more than 80% of which involve children and youth 19 years of age and younger. Three CHIRPP narrative fields allow a detailed level of classification and identification of very specific injury circumstances. CHIRPP records are identified using CHIRPP codes and extensive bilingual (English and French) narrative searches.

A limitation of CHIRPP is that the injuries described do not represent all injuries in Canada, but only those seen at the CHIRPP hospitals. Since most of the data come from the paediatric hospitals, which are located in major cities, injuries to the following people are under-represented in the CHIRPP database: older teenagers and adults who are seen at general hospitals; and people who live in rural and Northern areas including First Nations, Métis and Inuit people. Fatal injuries are also under-represented in the CHIRPP database because many victims die at the scene and are not transported to hospital. CHIRPP only records fatalities for victims who are dead on arrival, or die during treatment in the emergency department.

In this report, the following four case types were extracted from the database using CHIRPP factor codes and narrative fields.

- Buses: city, school
- Vulnerable Road Users (VRU)
  - Non-powered (only Motor Vehicle Collision cases): foot pedestrian, pedal cyclist, infant/child in stroller, skateboard, rollerblade and push scooter
  - Powered (only Motor Vehicle Collision cases): motorcycle, moped and powered scooter

- Off-Highway Vehicles (OHV), all cases: ATV, snowmobile, dirt bike, go-kart and golf cart

Water transport cases were not included in the analyses for this report – these will be the focus of a separate report.

Passenger car, truck and van occupant injuries are not included because data from the National Collision Database (Transport Canada), Statistics Canada, and the Canadian Institute for Health Information (hospitalization) were used for these analyses.

Because CHIRPP is a dynamic database, results are reported with respect to an extraction date. All CHIRPP data in the following report were extracted on February 11, 2011.

Time trend graphs cover the complete history of the database (for those under 25 years of age), spanning fiscal years 1990/91 to 2008/09 (April 1 to March 31). The counts are normalized to the total number of cases for that fiscal year (number per 100,000; see below) and expressed as a three-point central moving average (hence the first and last points, 1990/91 and 2008/09 are undefined). In-depth analyses were completed for the most recent fiscal year available, 2008/09 (April 1, 2008 to March 31, 2009).

### Normalized Proportions

Since CHIRPP is not population-based, data are usually presented in terms of proportions rather than strict counts. Age and year counts were normalized to the total numbers in the database (presented as the number per 100,000 CHIRPP cases in the given age group or year) according to the following expressions:

$$\text{Normalized age proportion} = \left( \frac{n_{\text{age}}^{\text{transport}}}{n_{\text{age}}^{\text{CHIRPP}}} \right) * 100,000$$

Where  $n_{\text{age}}^{\text{transport}}$  is the number of transport-related cases (for example, ATVs) for the given age group and  $n_{\text{age}}^{\text{CHIRPP}}$  is the total number of cases in CHIRPP for the same age group.



$$\text{Normalized annual proportion} = \left( \frac{n_{\text{year}}^{\text{transport}}}{n_{\text{year}}^{\text{CHIRPP}}} \right) * 100,000$$

Where  $n_{\text{year}}^{\text{CHIRPP}}$  is the number of transport-related cases (for example, city buses) for the given year and  $n_{\text{year}}^{\text{transport}}$  is the total number of cases in CHIRPP for the same year.

CHIRPP data support injury prevention initiatives of injury prevention centres, safety organizations, consumer organizations, and government departments engaged in injury prevention activities across the country. CHIRPP data are also frequently used to provide evidence in support of improved product regulations, standards and compliance, and enforcement policies. For additional information on CHIRPP data, please visit: [www.phac-aspc.gc.ca/injury-bles/chirpp/index-eng.php](http://www.phac-aspc.gc.ca/injury-bles/chirpp/index-eng.php)

## Hospitalization Data

Data were accessed from the Hospital Morbidity Database (HMDB), and are available beginning in 1994/1995 (fiscal year April 1, 1994 to March 31, 1995). The HMDB contains administrative, clinical and demographic information on hospital in-patient events from Canadian acute care hospitals, and provides national separation statistics by diagnoses and procedures. Separation statistics, which consider the number of hospital in-patients who leave the hospital through discharge or death, are often used to study the morbidity of various conditions. It is important to note that the number of separations are not the number of diseases or injuries requiring hospitalization, nor the number of ill or injured people admitted to hospital. Furthermore, for the analyses of injuries, hospitalization statistics are based on the separations at acute care hospitals only (i.e., chronic care separations are not included), and measure injuries occurring on public roads only (not incidents occurring on private property or off-road).

The International Statistical Classification of Disease and Related Health Problems, 10<sup>th</sup> Revision<sup>2</sup> (ICD-10) is an international standard for classifying diseases and external causes of injury. There was a staggered implementation of ICD-10-CA (the enhanced version for use with morbidity classification in Canada) by provinces/territories between 2001 and 2006. Where necessary, data classified according to the International Classification of Diseases, 9<sup>th</sup> Revision (ICD-9) were converted to ICD-10 based on a transition matrix developed by the Injury Section, Public Health Agency of Canada, which can be found at: [dsol-smed.phac-aspc.gc.ca/dsol-smed/is-sb/chirpp/ICD10-ICD9TransitionMatrixISOL.pdf](http://dsol-smed.phac-aspc.gc.ca/dsol-smed/is-sb/chirpp/ICD10-ICD9TransitionMatrixISOL.pdf).

## Mortality Data

Mortality data from Statistics Canada have been classified using ICD-10 beginning in calendar year 2000, and measure injuries occurring on public roads only (not incidents occurring on private property or off-road). ICD-9 groupings were used for mortality data for the years before 2000. A description of the ICD code groupings used and information on the implementation of ICD-10 can be found at: [dsol-smed.phac-aspc.gc.ca/dsol-smed/is-sb/icd10\\_e.html](http://dsol-smed.phac-aspc.gc.ca/dsol-smed/is-sb/icd10_e.html). Use and reporting of mortality data is limited in that there is a lag time of approximately two to three years in the availability of mortality data, due mainly to collection and refinement issues associated with the provinces and territories, Statistics Canada and the Public Health Agency of Canada.

## Police Reports Data

Transport Canada's National Collision Database (NCDB) contains data for over 80 variables, based on information from police reports of motor vehicle collisions on public roads in Canada. The data are provided annually to Transport Canada by the thirteen provincial and territorial jurisdictions.<sup>3</sup> NCDB data were used to analyse school bus-related injuries, and restraint use among child and youth occupants of light duty vehicle collisions. The NCDB is limited in that these collisions are, in general, all those deemed reportable, i.e. they occur on public roads and they incur bodily harm or property damage exceeding a stipulated dollar threshold, determined independently for each province and territory (personal communication, July 12, 2011).

## Alcohol-related crash data<sup>4</sup>

The Traffic Injury Research Foundation (TIRF) develops and shares knowledge on the human causes and effects of road collisions, providing objective and scientific information to support the development, implementation and evaluation of road safety programs, effective advocacy and consultation. TIRF compiles information from police reports, and coroner and medical examiners' files on persons fatally injured in motor vehicle collisions. In general, both sources must be accessed to obtain complete data on victims, collisions, vehicles, toxicology (results of toxicological tests for alcohol in the blood of fatally injured drivers and pedestrians), and for alcohol involvement. Data from the Fatality Database (1998-2009) were used to analyse fatalities in alcohol-related collisions in this report.

In the Fatality Database, fatalities are considered to be alcohol-involved if the fatally injured person was a drinking driver or drinking pedestrian, or if at least one driver involved in the collision had been drinking; passenger fatalities are also considered to be alcohol-involved if one of the drivers involved had been drinking. The Fatality Database includes fatally injured drivers, pedestrians, and passengers of motorized vehicles on both public roads and in off-road location (e.g. snowmobiles, ATVs). The percentage of alcohol-involved fatalities is calculated from the number of deceased persons categorized as an alcohol-involved fatality, divided by the total number of cases where alcohol involvement in the collision was known. In the Fatality Database, a motor vehicle-related fatality is defined as any person dying within 12 months as a result of injuries sustained in a collision involving a motor vehicle.

Given a high alcohol testing rate in all jurisdictions, particularly among fatally injured drivers, the Fatality Database has proven to be a valid and reliable source of descriptive data on the magnitude and characteristics of the alcohol-fatal crash problem, a means for monitoring changes/trends in the problem, and a valuable tool for research on alcohol-impaired driving. The database is unique in that the number of fatalities in the database may differ slightly from those reported by official sources, due to variations in the definitions used by coroners and medical examiners, versus how they are defined in the data capture procedures and in the database. It also contains a higher number of fatalities than would be obtained by adding together the fatalities officially reported in each jurisdiction in Canada, because it also includes victims of motor vehicle collisions that occurred off-road (e.g. ATV, snowmobile), on private property (e.g. farm or industrial vehicles), and in fatalities occurring within one year of the collision (as opposed to within 30 days). Such cases are not routinely collected by transportation agencies. The following agencies have provided funding for the Fatality Database: Health Canada (1973-1982), Transport Canada and the Canadian Council of Motor Transport Administrators (1984-2010; their funding for the Fatality database has been in support of the Strategy to Reduce Impaired Driving (STRID), for several years).

## Rates

Standardized rates per 100,000 population were used in charts that compare rates over time. In preparing the standardized rates, the direct method was used.

Presented are summary adjusted rates that represent what the crude rates in the populations studies would be if their age (and sex) distributions were the same as that of a selected standard population. The standard population used is the 1991 Canadian population.

Standardized rates are useful for comparing the rates of injury or disease in populations that might have different age (and sex) distributions (such as populations of different jurisdictions, or of the same jurisdiction in different years). Nevertheless, it is important to be aware that the summary measures produced by standardization may mask important differences in the age- (and sex-) specific rates of the populations being compared. For comparisons to be meaningful, the same standard population must be used in the calculation of all standardized rates being compared. Age and sex standardized rates are based on the age- and sex-specific rates in the population studied and the age and sex distributions of the standard population. They are only calculated for both sexes combined.

Crude rates were used in the charts and tables that present rates for a single year or fiscal year. Crude rates are the number of new cases or deaths per 100,000 persons per year. Age and sex distributions are not taken into account in the calculation.

Throughout the report, rates associated with infrequent injuries where annual counts are less than five have been suppressed and not reported.

## Year versus Fiscal Year

Data for mortality (Vital Statistics, Statistics Canada), collisions (NCDB, Transport Canada), and impaired driving (TIRF) are presented for calendar years (e.g., January 1<sup>st</sup> – December 31<sup>st</sup>). CHIRPP emergency department data and hospitalization data (CIHI) are presented for fiscal years (e.g. April 1<sup>st</sup> – March 31<sup>st</sup>) and follow the annual reporting period for health administration information.

## Adverse effects of medical care

These conditions include the following conditions from the International Classification of Diseases 10<sup>th</sup> Revision<sup>2</sup>: Y40-Y84 Complications of medical and surgical care, and Y88 Sequelae with surgical and medical care. They differ from most injuries, both in their nature and in the types of measures that might be considered appropriate to prevent them.

## Average Annual Percent Change

The average annual percent change (AAPC) statistic provides a summary measure of the trend over a pre-specified fixed interval. It is the average of the annual percent changes over a period of multiple years.

## Confidence interval (CI)

A range of values, calculated from the sample observations that are believed, with a particular probability, to contain the true parameter value. A 95% confidence interval, for example, implies that were the estimation process repeated again and again, then 95% of the calculated intervals would be expected to contain the true parameter value.

## External Cause of Injury

A term of associated with the International Classification of Diseases; a classification system of the World Health Organization and used internationally. External cause classification includes the intent of injury, mechanism of injury, object/substance producing the injury, place of occurrence, activity when injured (including sports/recreation or other activities), violence, alcohol use, psychoactive drug or substance use.<sup>5</sup>

## Interquartile Range (IQR)

A measure of spread given by the difference between the first and third quartiles (or 25<sup>th</sup> and 75<sup>th</sup> percentiles) of a sample. In this report, the values of the quartiles are given rather than the value of the difference.

## Unintentional versus intentional injury

Unintentional injuries include those related to: transportation, falls, drowning, fire/burns, unintentional poisoning, sport, and other unintentional causes. Intentional injuries include those resulting from suicide/self-harm and violence.<sup>6</sup>

## References

- 1 Public Health Agency of Canada. Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP). PHAC Web site <http://www.phac-aspc.gc.ca/injury-bles/chirpp/index-eng.php>. Updated April 22, 2009. Accessed March 15, 2011.
- 2 World Health Organization. *International Statistical Classification of Diseases and Related Health Problems, 10th rev.* Geneva: World Health Organization; 1996.
- 3 Canadian Council of Motor Transport Administrators. *NCDB Data Dictionary*. Ottawa, ON: Canadian Council of Motor Transport Administrators; 2009.
- 4 Mayhew DR, Brown SW, Simpson HM (Traffic Injury Research Foundation). *Alcohol-Crash Problem in Canada: 2009*. Ottawa, ON: Canadian Council of Motor Transport Administrators Standing Committee on Road Safety Research and Policies and Transport; 2011.
- 5 WHO Collaborating Center for the FIC in the Netherlands. International Classification of External Causes of Injuries. WHO-FIC Web site <http://www.rivm.nl/who-fic/ICECleng.htm>. Updated July 2010. Accessed July 12, 2011.
- 6 SMARTRISK. *The Economic Burden of Injury in Canada*. Toronto, ON: SMARTRISK; 2009.

# Appendix C

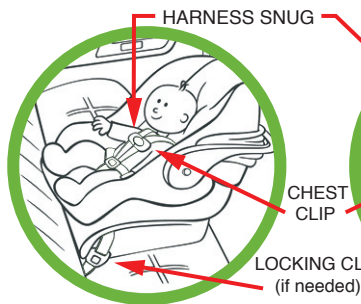
## Additional Injury Prevention Information

### Child restraint stages

Car seat laws in Canada vary slightly between provinces and territories. The recommendations below will allow parents to meet or exceed the law in any Canadian province or territory, and provide maximum protection for children travelling in vehicles.

#### Rear-Facing

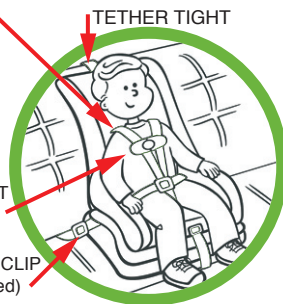
##### Infants



- Always in the back seat.
- Infant babies to at least 22 lbs (10 kg). Some seats are designed for up to 40 lbs
- Best until child is at least 1 year old.
- Harness slots at or below shoulders
- Infant reclined to 45 degree angle
- Infants should remain in a rear-facing seat for as long as possible, because it is the most protective design for vulnerable bodies.

#### Forward-Facing

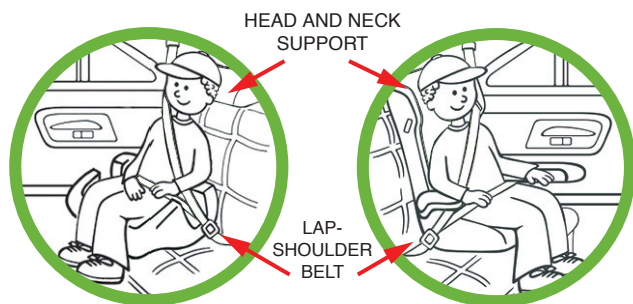
##### Toddlers



- Always in the back seat.
- 22 lbs to at least 40 lbs (10-22 kg)
- Best if child is at least 1 year old
- Harness slots at or above shoulders
- Parents are encouraged to choose a forward-facing car seat that accommodates a wider range of height and weight, so that a child can use it for a longer period of time.

#### Booster Seat (Backless, or High Back)

##### Children



- Booster seats should NEVER be put in the front seat. The front seat air bags pose a high risk of injury to children, even if they are in a booster seat.
- Transport Canada recommends keeping all children under 13 years of age in the back seat.
- Best if child is < 8 years old, 40-80 lbs, and < 4'9" (145 cm)
- For children who have outgrown their forward-facing car seat and have a standing height of less than 4'9" tall (145 cm)
- The middle of the child's ear should not be above the back of the vehicle seat, headrest, or booster seat
- The lap belt should sit low on the child's hips, and the shoulder belt must rest in the middle of the child's shoulder without touching the neck area

## When is a child ready for a seat belt?

Seat belts are designed for adult bodies. For this reason, it is important that parents check where the lap and shoulder belt rest on their older child's body. **Children are ready for a seat belt alone only when they pass the seat belt test.**

■ **Shoulders:** Does the vehicle shoulder belt lie in the middle of the shoulder and across the middle of your child's chest, without touching the neck? It is dangerous for the seat belt to touch the neck because it can easily be injured in a crash.

■ **Hips:** Does the vehicle lap belt rest low on your child's hips, under the belly area? The seat belt should lie on the hip bone area, not on your child's internal organs.

■ **Standing height:** Is your child at least 4'9" tall (145 cm)? If seated, your child's height should be 25 inches (63 cm) from their tailbone to the top of their head.

■ **Knees:** Do your child's knees bend comfortably over the edge of the vehicle seat without causing them to slouch forward in their seat? This helps the child stay comfortable, which prevents slouching.

**Sources:** Graphic courtesy of Safe Kids Canada.

Safe Kids Canada. Child Passenger Safety. Safe Kids Canada Web site <http://www.safekidscanada.ca/Parents/Safety-Information/Car-Seats/Index.aspx>. Published July 6, 2011. Accessed September 13, 2011.

Transport Canada. Keep Kids Safe. Transport Canada Web site <http://www.tc.gc.ca/eng/roadsafety/safedrivers-childsafety-car-time-stages-1083.htm>. Updated April 12, 2011. Accessed May 18, 2011



## Restraining premature or low birth weight infants

1. Safety car seat selection. Select...

- An infant-only car seat with a five-point harness, for the best fit and positioning, and do not select a car seat with a shield, abdominal pad or armrest.
- A car seat according to infant's recommended weight and height. Most conventional seats have a lower weight limit of 2.3 kg and that many premature infants are discharged home before reaching this weight.
- A car seat with a distance of less than 14 cm from the crotch strap to the seat back, and with a distance of less than 25.4 cm from the lower harness strap to the seat bottom. This will reduce the chances of the infant slouching forward and the chances that the harness straps will cross the infant's ears, respectively. If the harness crosses over the ear area or is above the infant's shoulders it cannot be used in the rear-facing mode.

2. Make sure that the infant's hips and back are flat against the back of the car seat.

3. To support the head and neck, blanket rolls or towels may be placed on both sides of the infant. Do not use head support cushions or padding that did not come with the car seat because they can interfere with the harness straps.

4. In rear-facing car seats, shoulder strap slots for the harness should be at or below the infant's shoulders, and fit snug. The top of the chest clip should be positioned at the armpit level to avoid contact with the neck.

5. The car seat should be reclined at a 45-degree angle in the vehicle to minimize neck flexion and airway restriction

**Restraining children with special needs:** For infants and children with special needs who are unable to use conventional car seats, there are two options: the use of production restraints or custom restraints. These two types of restraints are manufactured for children with special needs. It is vital that parents are informed about production and custom restraint options in order to avoid the use of substandard products, makeshift restraint systems, or unsafe methods of securing children in motor vehicles. For more information on transporting children with special needs, refer to *Transporting Infants and Children with Special Needs in Personal Vehicles: A Best Practices Guide for Healthcare Practitioners*, available from <http://www.tc.gc.ca/eng/roadsafety/tp-TP14772-menu-155.htm> (Transport Canada 2008).

**Source:**

Transport Canada. *Transporting Infants and Children with Special Needs in Personal Vehicles: A Best Practices Guide for Healthcare Practitioners*. Ottawa, ON: Transport Canada; 2008.





## Senior Drivers

Senior drivers aged 65 and older are overrepresented among collisions and road fatalities when distance travelled is considered. This is partly due to the greater likelihood of cognitive and/or physical challenges associated with aging, including (but not limited to) illnesses, decreased strength, and increased fragility. Seniors, and other medically-at-risk drivers may require medications or other treatments that can impact judgment, reaction time, attention, and other important factors of safe driving. Together, these factors increase seniors' risk of collision as well as the risk of injury and death resulting from involvement in a collision.

To mitigate these safety concerns, some jurisdictions enforce conditional or graduated de-licensing for at-risk drivers. Conditional licenses restrict driving to specific situations or environments, such as driving during daylight hours. A few jurisdictions have mandatory refresher courses for licensed drivers once they reach a specified age.

### Injury Prevention for Older Drivers:

<http://www.olderdriversafety.ca>

### Medical Standards:

<http://www.ccmta.ca/english/produstandservices/publications/reportcentre.cfm#medicalstandards>

### Jurisdictional Licensing:

<http://canada.seniordrivers.org/lpp/>

### CANDRIVE:

Canadian Institutes for Health Research funded research team:  
<http://www.candrive.ca>

### Canadian Council of Motor Transport Administrators Aging Drivers Strategy:

[http://www.ccmta.ca/english/pdf/aging\\_driver\\_strategy.pdf](http://www.ccmta.ca/english/pdf/aging_driver_strategy.pdf)

### Source:

Road Safety Canada Consulting. *Road Safety in Canada: A Booklet for the 2011 Year of Road Safety*. Ottawa, ON: Public Health Agency of Canada; 2011.

## Winter Driving Tips

- Always keep the gas tank at least half full, and add gasoline antifreeze to every second tank.
- Top up antifreeze, transmission, brake and windshield-washer fluids.
- Use a matching set of all-season or snow tires that meet standards.
- Make sure that tire valves are equipped with caps to keep out snow and ice.
- Wear warm clothing and check local weather and road conditions before leaving.
- If possible, tell someone where you are going and when you expect to arrive.
- Bring a cell phone and a map and be prepared to take an alternative route.
- Carry a winter emergency kit that includes:
  - Extra car fluids (antifreeze, windshield-washer)
  - Flashlight and extra batteries
  - Blankets, extra hats and mitts
  - Candles, matches
  - Hazard markers or flares
  - Snow shovel
  - Snacks (non-perishables like chocolate or granola bars).



Symbol for winter tire traction

In February 1999, Transport Canada announced the introduction of a new industry standard to help Canadian consumers identify and buy snow tires that provide a higher level of traction for Canada's harsh winter conditions. This standard is now being implemented by

North America's tire manufacturers, and is being monitored by Transport Canada. The tires are marked on at least one sidewall with a pictograph of a mountain and snowflake.

This design indicates that tires have met specific snow traction performance requirements, and have been designed specifically for use in severe snow conditions.

More information on driving and other road safety information is available through Transport Canada's Road Safety information line at 1-800-333-0371.

### Source:

Transport Canada. Winter Driving. Transport Canada's Web site <http://www.tc.gc.ca/eng/roadsafety/safevehicles-safetyfeatures-winterdriving-index-693.htm>. Accessed June 4, 2012

