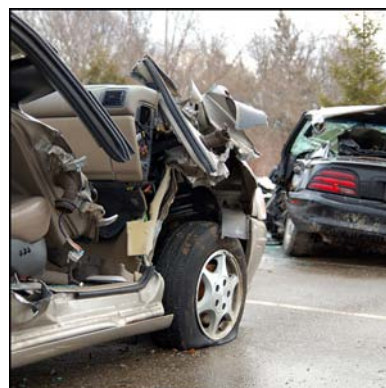


Article

Motor vehicle accident deaths, 1979 to 2004

by Pamela L. Ramage-Morin

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Abstract

This article reviews motor vehicle accident (MVA) deaths from 1979 through 2004, with a more in-depth look from 2000 onwards. The data are from the Vital Statistics Death Database. Crude and age-standardized death rates were used to examine mortality over time. Average annual death rates were compared by age, sex and other selected characteristics. The average daily number of deaths was used to show seasonal fluctuations. Deaths resulting from motor vehicle accidents declined from 25 deaths per 100,000 population in 1979 to 9 deaths per 100,000 population in 2004. Despite this decline, motor vehicle accidents remain a leading cause of death for young people. From 2000 through 2004, MVA deaths accounted for 1.3% of all deaths Canada, but 17.3% of all deaths among people younger than 30. Males consistently had higher MVA death rates than did females

Keywords

Mortality, motor vehicle accidents, vital statistics

Author

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In 2004, there were 21.6 million licensed drivers in Canada¹ among a population of 25.8 million people aged 16 or older.² They operated over 25 million registered vehicles.³ Most of these vehicles (76%) were cars, trucks, buses and motorcycles for on-road use, while a smaller proportion were farm, construction and off-road vehicles.

Despite the ever-increasing number of drivers and vehicles, fatal collisions and those resulting in personal injury have steadily declined over the past 20 years.¹ Even so, motor vehicle accidents remain a leading cause of death for young people.

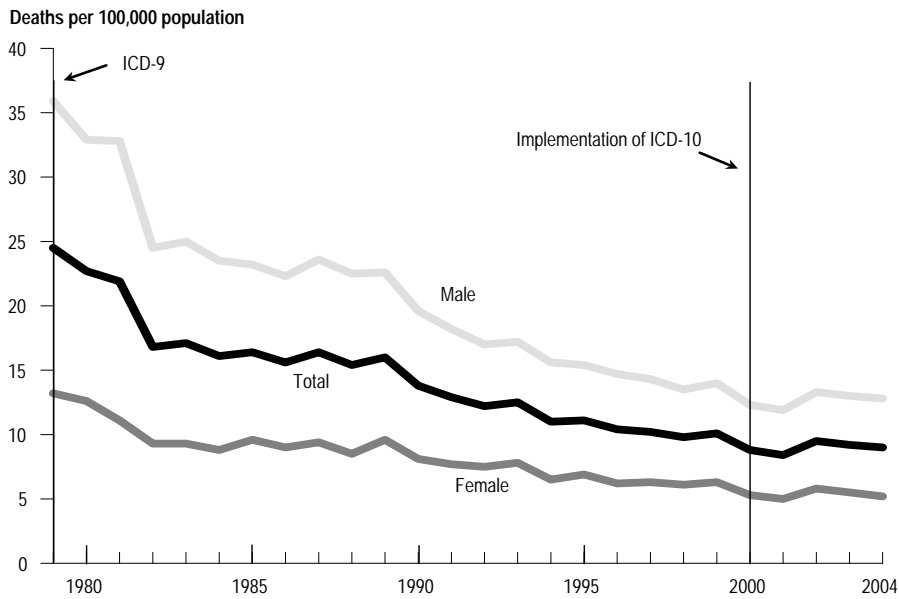
From 2000 through 2004, there were 44,192 accidental deaths in Canada; 32% of them (14,082) were the result of motor vehicle accidents (MVAs). In the 15 to 24 age group, MVA deaths (3,417) accounted for 70% of all accidental deaths (4,895).

Many competing factors increase or decrease the risk of motor vehicle accidents and injuries. Technological advances such as anti-lock braking, airbags, improved seat belts and child restraints make vehicles safer.⁴⁻⁶ Legislation and enforcement of speed limits, blood alcohol levels, seat belt use, bicycle helmets for children, and other safety measures are intended to protect vehicle occupants, pedestrians

and cyclists.⁷ Changing social norms discourage drinking and driving.⁸

However, the motor vehicle safety picture is not entirely positive. While seat belt technology has improved and legislation mandates their use, many adults still fail to “buckle up”—themselves or their children.⁹ Related problems include car and booster seats that are incorrectly installed or placed in high-risk positions (front passenger seat, for example), and children who are not using age- or size-appropriate restraints.⁵ The widespread use of cellphones, navigation systems and other telematic devices add to driver distraction.^{10,11} Driving under the influence of alcohol, although declining, continues to be a problem, particularly among young drivers.¹² Driving under the influence of cannabis is a related concern.¹³ Rural roads pose another threat—in 2004, 62% of collisions resulting in a fatality were in rural areas.¹ Weather frequently plays a part in motor

Figure 1
Crude death rate for motor vehicle accident, by sex, Canada, 1979 to 2004



Source: Canadian Vital Statistics - Death Database.

vehicle accidents, as does human error such as fatigued and drowsy driving.¹⁴ “Road rage,” a term first coined in 1988,¹⁵ which describes “uncontrolled anger that results in violence or threatened violence on the road,”¹⁶ reflects an extreme form of human error.

This study reviews motor vehicle accident deaths in Canada from 1979 through 2004, with a more in-depth look from 2000 onwards. Data are from the Canadian Vital Statistics - Death Database which is composed of information from death certificates. Pedestrian and pedal cyclist fatalities are included if a motor vehicle was involved in the accident. Traffic and non-traffic (off-road) deaths are reported in the study.

Decline since 1979

Over the past 25 years, the annual number of Canadians who died from

Table 1
Number and rates (crude and age-standardized) of motor vehicle accident deaths, by sex, Canada, 1979 to 2004

	Both sexes			Males			Females		
	Number	Deaths per 100,000 population		Number	Deaths per 100,000 population		Number	Deaths per 100,000 population	
		Crude	Standardized		Crude	Standardized		Crude	Standardized
1979	5,933	24.5	24.5	4,327	35.9	35.9	1,606	13.2	13.2
1980	5,560	22.7	22.7	4,014	32.9	32.9	1,546	12.6	12.5
1981	5,443	21.9	21.9	4,054	32.8	32.8	1,389	11.1	11.1
1982	4,232	16.8	16.9	3,061	24.5	24.5	1,171	9.3	9.3
1983	4,334	17.1	17.2	3,153	25.0	25.1	1,181	9.3	9.3
1984	4,133	16.1	16.3	2,995	23.5	23.7	1,138	8.8	8.8
1985	4,234	16.4	16.5	2,980	23.2	23.4	1,254	9.6	9.7
1986	4,072	15.6	15.9	2,891	22.3	22.7	1,181	9.0	9.1
1987	4,342	16.4	16.8	3,093	23.6	24.1	1,249	9.4	9.5
1988	4,133	15.4	15.9	2,985	22.5	23.1	1,148	8.5	8.6
1989	4,376	16.0	16.4	3,053	22.6	23.1	1,323	9.6	9.8
1990	3,824	13.8	14.2	2,691	19.6	20.2	1,133	8.1	8.2
1991	3,612	12.9	13.4	2,522	18.2	18.9	1,090	7.7	7.8
1992	3,456	12.2	12.6	2,389	17.0	17.7	1,067	7.5	7.5
1993	3,573	12.5	13.0	2,445	17.2	18.0	1,128	7.8	8.0
1994	3,195	11.0	11.4	2,246	15.6	16.4	949	6.5	6.6
1995	3,256	11.1	11.5	2,238	15.4	16.1	1,018	6.9	7.0
1996	3,088	10.4	10.8	2,157	14.7	15.2	931	6.2	6.4
1997	3,055	10.2	10.7	2,110	14.3	14.9	945	6.3	6.5
1998	2,947	9.8	10.0	2,016	13.5	14.0	931	6.1	6.1
1999	3,084	10.1	10.4	2,110	14.0	14.4	974	6.3	6.4
2000	2,696	8.8	9.0	1,871	12.3	12.6	825	5.3	5.3
2001	2,617	8.4	8.6	1,835	11.9	12.2	782	5.0	4.9
2002	2,988	9.5	9.5	2,063	13.3	13.3	925	5.8	5.7
2003	2,906	9.2	9.3	2,034	13.0	13.2	872	5.5	5.3
2004	2,875	9.0	9.1	2,035	12.8	13.0	840	5.2	5.1
Total	97,964	69,368	28,596

... not applicable

Notes: Ninth Revision of the International Classification of Diseases from 1979 to 1999; Tenth Revision from 2000 to 2004. Age-standardized to 1981 Canadian population. Includes deaths coded as “late effects or “sequelae” of MVAs.

Source: Canadian Vital Statistics - Death Database.

motor vehicle accidents dropped by 52%, from 5,933 in 1979 to 2,875 in 2004 (Table 1). There were 97,964 MVA deaths over this period, the majority (71%) involving males.

In 1979, the MVA crude death rate was 24.5 deaths per 100,000 population, 35.9 and 13.2 deaths per 100,000 for males and females, respectively (Table 1, Figure 1). By 2004, these rates had dropped drastically to 12.8 per 100,000 population for males and 5.2 for females, for an overall rate of 9.0 deaths per 100,000 population. The close correspondence between the crude and age-standardized rates (Table 1) indicates that factors other than the changing age structure of the Canadian population between 1979 and 2004 account for the decline.

Death rates by province and territory

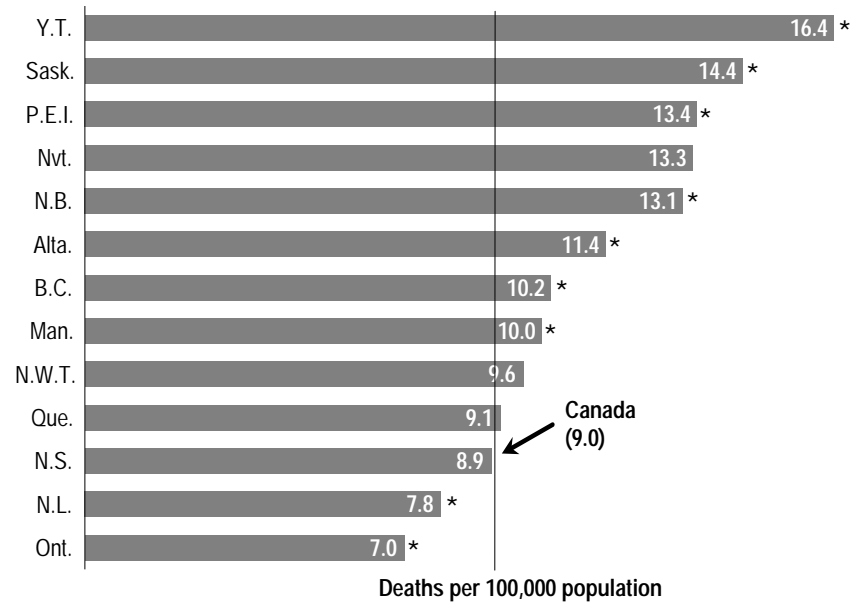
From 2000 through 2004, there were 14,082 MVA deaths in Canada, for an average annual average death rate of 9.0 per 100,000 population (Figure 2). Rates varied across the country, with the highest in the Yukon (16.4 per 100,000 population). Prince Edward Island, New Brunswick, Manitoba, Saskatchewan, Alberta and British Columbia also had rates above the national figure. Only Ontario and Newfoundland and Labrador had rates below the Canada level, at 7.0 and 7.8 per 100,000 population, respectively.

A leading cause of death for teens and young adults

From 2000 through 2004, MVA deaths accounted for 1.3% of all deaths in Canada. However, almost one in five deaths (17.3%) of people younger than 30 resulted from a motor vehicle accident.

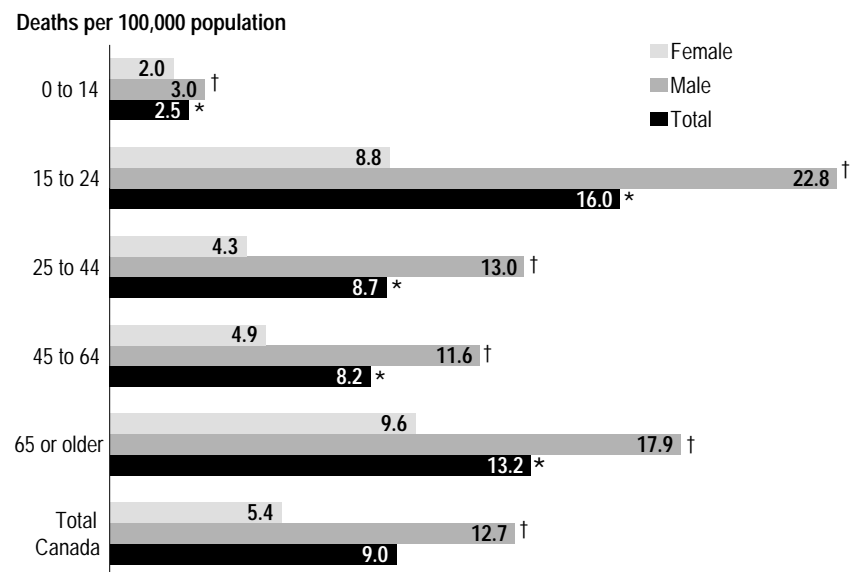
The average annual MVA death rate for 15- to 24-year-olds was 16 deaths per 100,000 population, significantly higher than the rate for all age groups combined (9 deaths per 100,000 population) (Figure 3). Seniors (65 or older) also had a rate above the national level at 13 deaths per 100,000

Figure 2
Average annual rate of death from motor vehicle accident, by province or territory, Canada, 2000 to 2004



* significantly different from estimate for Canada ($p < 0.05$)
Source: Canadian Vital Statistics - Death Database.

Figure 3
Average annual rate of death from motor vehicle accident, by age and sex, Canada, 2000 to 2004



* significantly different from rate for Total Canada ($p < 0.05$)
† significantly different from rate for females ($p < 0.05$)
Source: Canadian Vital Statistics - Death Database.

The data

Results for this study are based on Statistics Canada's Vital Statistics - Death Database, accessed through the Information Retriever/Metainformation Administrator (IRMA) software (July 2007). Data are extracted from death certificates submitted by the provinces and territories to Statistics Canada. Cause of death is coded according to World Health Organization's *International Statistical Classification of Diseases and Related Health Problems (ICD)*.

Deaths resulting from *motor vehicle accidents (MVA)* are defined by groups of codes from the International Classification of Diseases (ICD).¹⁷⁻¹⁹ The Ninth Revision was in use from 1979 to 1999, after which ICD-10 was implemented.

ICD-9 codes: E810-E825, E929.0 (late effects of motor vehicle accident)

ICD-10 codes: V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1, V83-V86, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2, Y85.0 (sequelae of motor-vehicle accident)

These codes include *traffic deaths*, which are those that occurred on public streets and highways, and *non-traffic deaths*, which occurred elsewhere. The codes reflect the victim's mode of transport, including *occupants* of cars, buses and other street vehicles, motorcycle riders, and operators of farm, construction and recreational vehicles such as snowmobiles and four-wheelers. Deaths of *pedestrians, pedal cyclists, riders of animals and occupants of animal-drawn vehicles* are included if the accident involved a motor vehicle. Appendix Table A contains a more detailed list of codes for mode of transport.

Sequelae of motor vehicle accident include conditions reported as such, or occurring as "late effects" one year or more after the originating event.

Implementation of the ICD-10 in 2000 has the potential to disrupt trends in the underlying cause of death statistics. A Statistics Canada study dual-coded 1999 deaths to the Ninth and Tenth Revisions of the ICD and generated comparability ratios.²⁰ The comparability ratio for MVAs is 0.9813 (95% CI: 0.9705, 0.9922) signifying that for 1999, 1.9% fewer deaths are classified to this group in ICD-10 than in ICD-9. Consequently, the disruption in the trend of MVA deaths is believed to be minimal.

The study is limited to Canadian residents. Of the 99,583 MVA deaths between 1979 and 2004, 1,619 (2%) involved non-residents, most of whom (981) were from the United States. These non-resident deaths are excluded from this study. Deaths of Canadian residents occurring in the United States are included, as these deaths are reported to provincial registrars under a reciprocal agreement.²¹ However, deaths of Canadian residents occurring in other countries are not reported and are, therefore, excluded from this study.

The mortality data do not contain information about road conditions, the use of seat belts or child restraints, alcohol or drug use, driver distractions, or other circumstantial risk factors. In addition, analysis by mode of transport is limited, as a third of death certificates did not provide sufficient detail to be classified. A death resulting from a collision between a car and an off-road vehicle, for example, would be "unspecified" unless the death certificate specified whether the person was an occupant of the car or the driver of the off-road vehicle. This lack of information prevented a more detailed analysis by province.

population. Rates were lower for the remaining age groups, especially those younger than 15 (3 deaths per 100,000 population). Regardless of age group, males consistently had higher death rates than did females.

Most deaths vehicle occupants

From 2000 to 2004, more than a third (38%) of MVA deaths were occupants (drivers or passengers) of a car, van, truck, bus or other motor vehicle. Pedestrians accounted for 12% of MVA deaths, followed by motorcyclists (6%) and drivers of all-terrain or other off-road vehicles (5%). Pedal cyclists and operators of agricultural vehicles made up 2% and 1% of deaths, respectively. For the remaining third of the MVA deaths that occurred in that period

(4,705), the deceased's mode of transport was not specified in the death certificate.

Looking specifically at the 5,388 deaths among occupants of motor vehicles, 1,499 (28%) were to people aged 15- to 24-years. Between 2000 and 2004 the average annual rate for this cause was over 3 deaths per 100,000 population (Figure 4). However, the rate for 15- to 24-year-olds was 7 deaths per 100,000, significantly higher than for any other age group. Young men were particularly at risk, with a rate of 10 deaths per 100,000, compared with 4 per 100,000 for women of the same age (data not shown).

Deaths of senior pedestrians

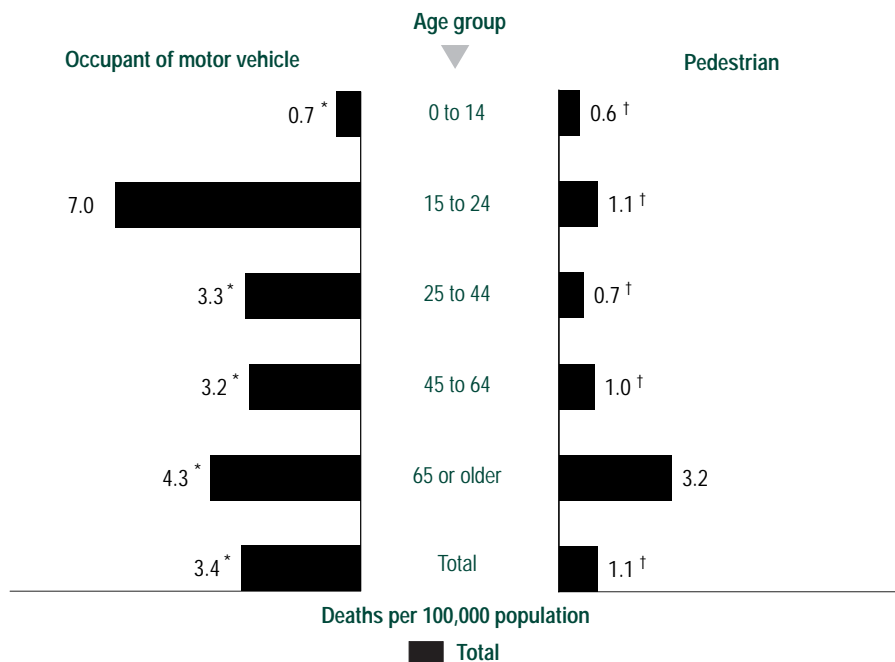
A relatively large proportion of pedestrians killed in MVAs were seniors. Between 2000 and 2004, 1,746

pedestrians died in accidents involving motor vehicles; over a third of them (636) were 65 or older. Seniors' average annual death rate from this cause was over 3 per 100,000 population, compared with less than 1 per 100,000 for people in the under-65 age range (Figure 4).

Deaths peak in warmer months

From 2000 to 2004, an average of just under 8 Canadians died each day in motor vehicle accidents (Figure 5). However, the daily number of MVA deaths fluctuated across the seasons. For the most part, the daily average rose during the warmer months and was lowest from January through April. Deaths peaked in August 2004, with an average of more than 10 fatalities each day. The lowest number in any

Figure 4
Average annual rate of death as occupant of motor vehicle or pedestrian, by age group, Canada, 2000 to 2004



* significantly different from rate for 15-to-24 age group (p < 0.05) (occupants of motor vehicles)

† significantly different from rate for 65 or older age group (p < 0.05) (pedestrians)

Source: Canadian Vital Statistics - Death Database.

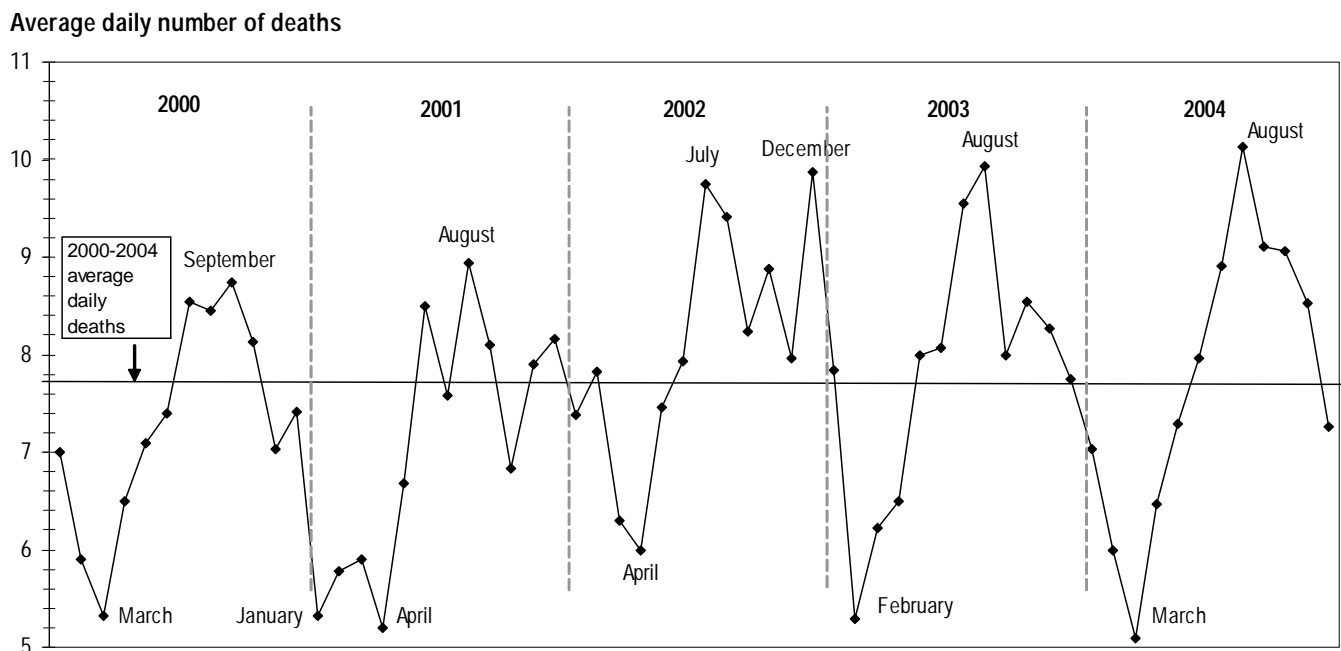
month was in March of the same year, with a daily average of 5 fatalities.

Conclusion

Deaths resulting from motor vehicle accidents have declined since 1979. Despite this, they remain a leading cause of death for young people.

There are opportunities to lower the risk of motor vehicle accidents and the injuries and deaths that result. Measures that help prevent accidents and those that minimize harm in the event of an accident are two approaches. Strategies that fall in the first category include reducing distractions from cell phones and other telematic devices, as well as addressing driving under the influence of alcohol and drugs. Adult seat belt use and age- and size-appropriate restraints for young people fall in the second category. Many strategies aimed at motor vehicle occupants could also benefit more vulnerable road users such as pedestrians and cyclists. Younger and older motorists, as well as senior pedestrians, are particularly at risk with higher than average death rates.

Figure 5
Average daily number of deaths from motor vehicle accident, by month, Canada, 2000 to 2004



Note: Excludes sequelae of MVAs (172 cases).

Source: Canadian Vital Statistics - Death Database.

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Table A
ICD-10 codes for motor vehicle accidents, by mode of transport

Motor vehicle occupant (includes three-wheeled motor vehicle, car, pick-up truck or van, heavy transport vehicle, and bus)

V30 - V79
V87.0, V87.2 - V87.5
V88.0, V88.2 - V88.5

Pedestrian (includes person making adjustment to a motor vehicle, changing wheel of vehicle, or using a pedestrian conveyance such as a baby carriage, push cart, roller-skates, scooter, skateboard, or wheelchair)

V02 - V04
V09.0
V09.2

Motor cyclist (includes moped, motorcycle with sidecar, motor scooter, motorized bicycle)

V20 - V29

Pedal cyclist (includes bicycle and tricycle)

V12 - V14
V19.0 - V19.2
V19.4 - V19.6

All terrain (ATV) and other off-road vehicles (includes snowmobile)

V86

Agricultural vehicles (includes motor vehicles for use in farming such as combine harvester, tractor and trailer, and other motor vehicles designed specifically to work the land, tend and harvest crops, and transport materials on the farm)

V84

Other vehicles (includes rider/occupant of animal-drawn vehicle, occupant of railway train, streetcar, industrial, and construction vehicles)

V80.3 - V80.5
V81.0 - V81.1
V82.0 - V82.1
V83
V85

Unspecified vehicle (traffic and non-traffic, mode of transport unspecified)

V87.1, V87.6 - V87.8
V88.1, V88.6 - V88.8
V89.0
V89.2
