

**Technical report: Deaths due to falls among Canadians
age 65 and over**

**an analysis of data from the
Canadian Vital Statistics
as presented in:**

Report on Seniors' falls in Canada (section 2.4)

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Introduction

For all ages, unintentional falls were the leading cause of injury-related hospitalization in Canada in 2001/02, accounting for 57% of all injury admissions (Canadian Institute of Health Information, 2004). Among those aged 65 years and older, 85% (N = 67,876) of all injury hospital admissions were for falls.

Among all ages hospitalized for an injury in 1999/2000 in Canada, 3.4% (6,663) died as a result of their injuries and 75 % (5,045) of in-hospital deaths were due to injuries from a fall (Canadian Institute of Health Information, 2002). The remaining causes of in-hospital injury deaths include motor vehicle collisions (10.9%), intentional injuries (4.3%) and other causes (9.1%).

A Canadian study of causes of severe injury – defined as those suffered by persons with an Injury Severity Score (ISS) of greater than 12 who were admitted to hospital, treated and released from an emergency department (ED), or died in an ED from their injuries – showed that falls accounted for 29% of severe injuries for all ages (Canadian Institute of Health Information, 2003). Falls were second only to motor vehicle collisions at 47% of all severe injuries. Almost half (47%; N = 1,242) of all falls resulting in severe injuries occurred among those aged 65 years and older. The most common cause of severe injury due to a fall among those aged 65 years and over was a fall on or from stairs or steps (23%). Of those who died as a result of sustaining a severe injury, 32% died as a result of a fall-related injury and the mean age of those who died as a result of a fall was 69 years.

While the above statistics provide highlights of fall-related injury and death in Canada, these findings are imbedded within larger reports that do not focus on the scope and nature of the problem specifically for those aged 65 years and older. Existing reports are also limited to reporting fall-related deaths that occur in a specific setting, such as those that occurred in hospital (Canadian Institute of Health Information, 2004), or those that occurred from specific types of injuries, such as those from severe injuries (Canadian Institute of Health Information, 2003).

This report presents data from **Canadian Vital Statistics** on all direct deaths due to falls among those aged 65 and over and includes differences by place of occurrence, type of fall, gender, and age groups, as well as trends over time.

Methods

The information in this report is based on data from Statistics Canada's Vital Statistics Death Database for 1997/99 through 2000/02. Data were requested for Canadians age 65 years and older for deaths due to unintentional falls. Data requested did not contain any personal identifiers.

Data on deaths were affected by the changes in the coding structure from ICD 9 to ICD 10 that occurred in the year 2000. In particular, 'accidental falls' is a 'cause of death' category that was dramatically affected by the implementation of the ICD 10. Included under the ICD 9 group of codes for accidental falls is a code for "fracture, cause unspecified." This external cause of death is not included in the ICD 10 category of codes for falls but rather is included as a code under another category, "exposure to unspecified factor." Consequently, for this analysis, the ICD 9 code for "fracture, cause unspecified" was not included as it could not be matched with the ICD 10 codes.

Data provided were aggregated by age group (five-year age groups from 65-69, 70-74, 75-79, 80-84, and 85+), gender, (male, female, unknown), place of injury and ICD code. The combination of changes in coding and the limited cell sizes resulted in the need for a two pronged data request as follows:

ICD 9 codes for accidental falls (E880-E886 and E888), (E880-E884), (E885-E886), (E888), for Canada, by place of injury, sex (male, female, both), 5-year age groups (65-69, 70-74, 75-79, 80-84, 85+) for 1997 to 1999.

ICD 10 codes for falls, (W00-W19), (W05-W17), (W00-W03), (W04, W18 and W19), Canada, by place of injury, sex (male, female, both), five-year age groups (65-69, 70-74, 75-79, 80-84, 85+) for 2000 to 2002.

The cause of death coded and tabulated is the underlying cause of death. Underlying cause of death is defined as "(a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury." Underlying cause of death is selected from a number of conditions listed on the medical certificate of death.

Deaths included only those for which a fall was the direct cause of death (equivalent to the underlying cause of death or what the person actually died of). Deaths for which a fall was an indirect cause of death (contributing, associated, or antecedent causes to the underlying cause of death) were not included.

Data obtained was managed and analyzed using SAS and MS Excel.

This report:

- includes data on direct deaths, equivalent to the 'underlying cause of death' as indicated on the medical certificate of death;

- excludes indirect deaths, where a fall may have eventually led to death but was not the underlying cause of death;
- presents data for age groups of 65-69, 70-74, 75-79, 80-84 and 85 years and over;
- excludes deaths of non-residents of Canada, deaths of residents of Canada with unknown province or territory of residence, and deaths for which age of deceased was unknown; and
- shows 95% confidence intervals where appropriate.

Note: The figure numbers in this document refer to the figures in the *Report on Seniors' falls in Canada*.

Findings

Figure 17 shows that, for the six years examined, more than 7,000 Canadians age 65 and over died as a direct result of a fall. This number increased from 3,209 in the 1997-1999 period to 4,110 in the 2000-2002 period. It also shows rates of deaths. On an age-standardized basis, there was a statistically significant increase ($p < 0.01$) in the rate of deaths due to falls from 8.1 per 10,000 population in the 1997-1999 period to 9.4 per 10,000 population in the 2000-2002 period.

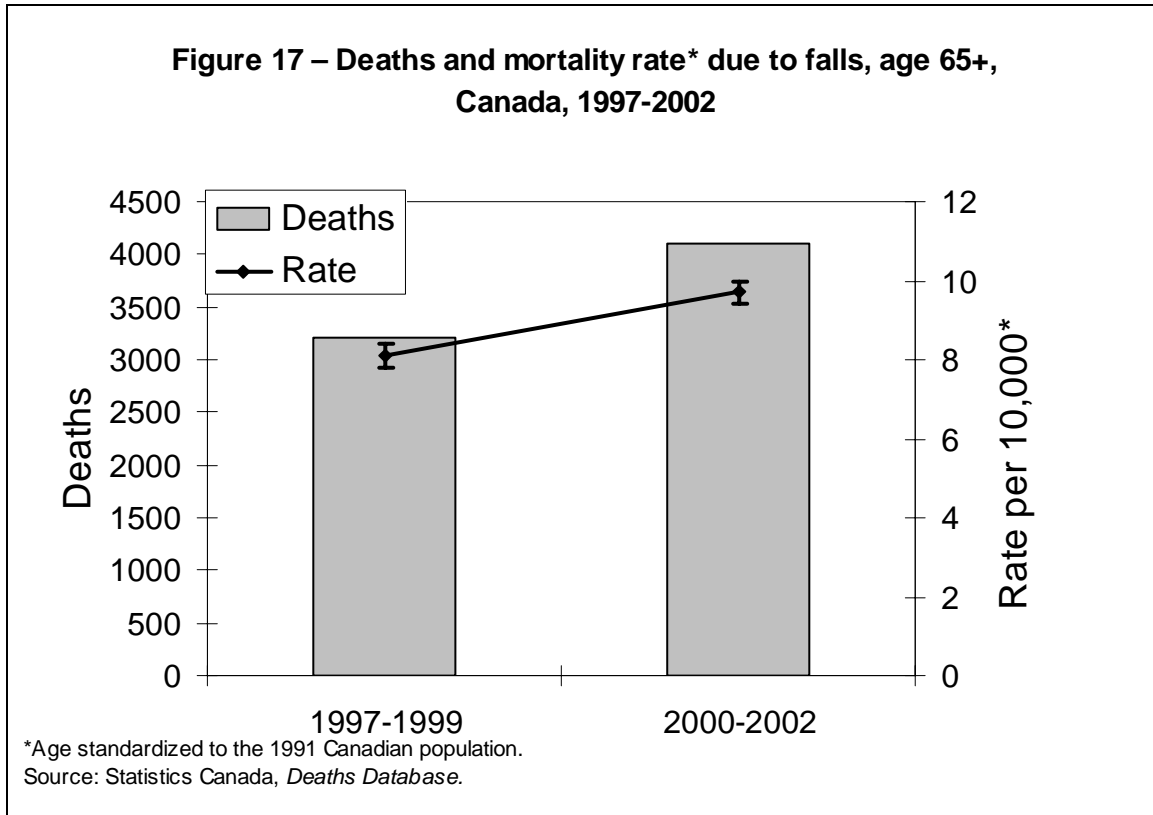


Figure 18 shows the number of deaths by age group for the two three-year periods. For both periods, the number of deaths increased with age, rising from fewer than 300 in the 65-69 age group, to more than 2,000 in the 85 and over age group for the second period.

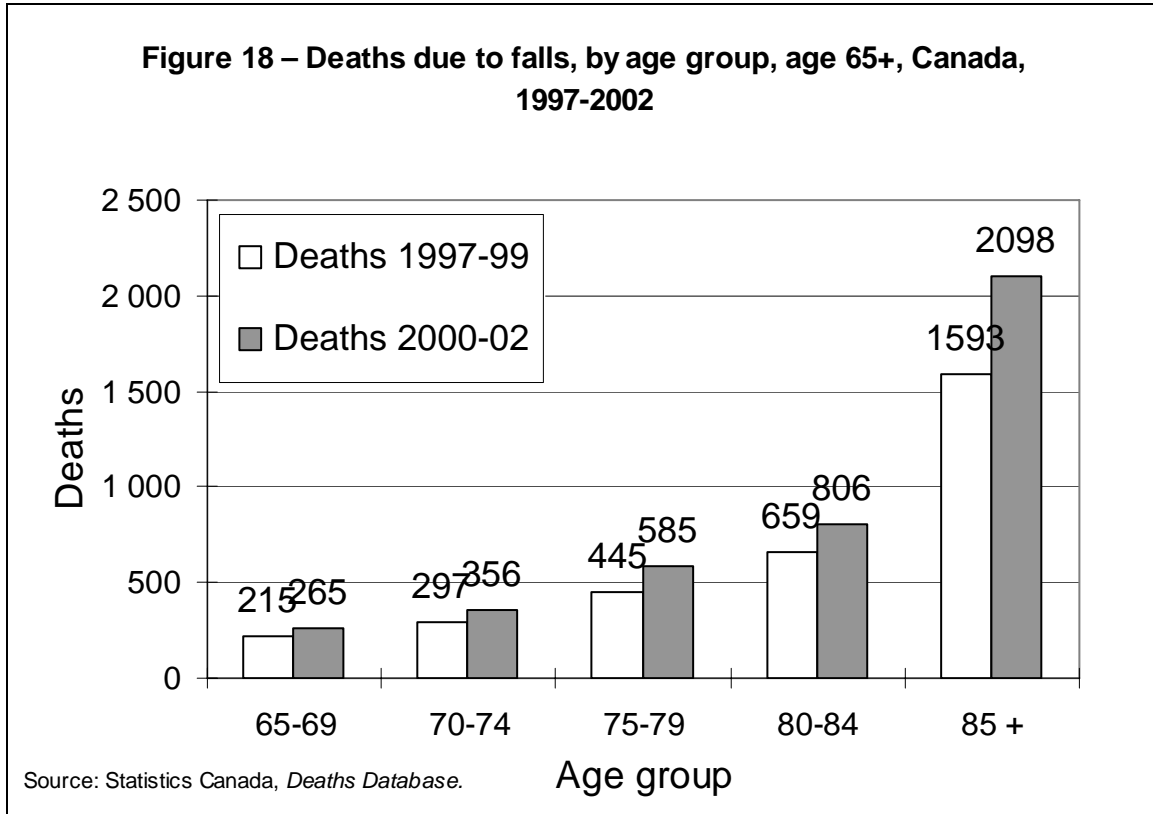


Figure 19 indicates that the incidence of deaths due to falls increased with age from fewer than 10 deaths per 10,000 population in the youngest age group to over 50 deaths per 10,000 in the oldest age group. A significant increase in the rates from the first period to the second was seen in all age groups.

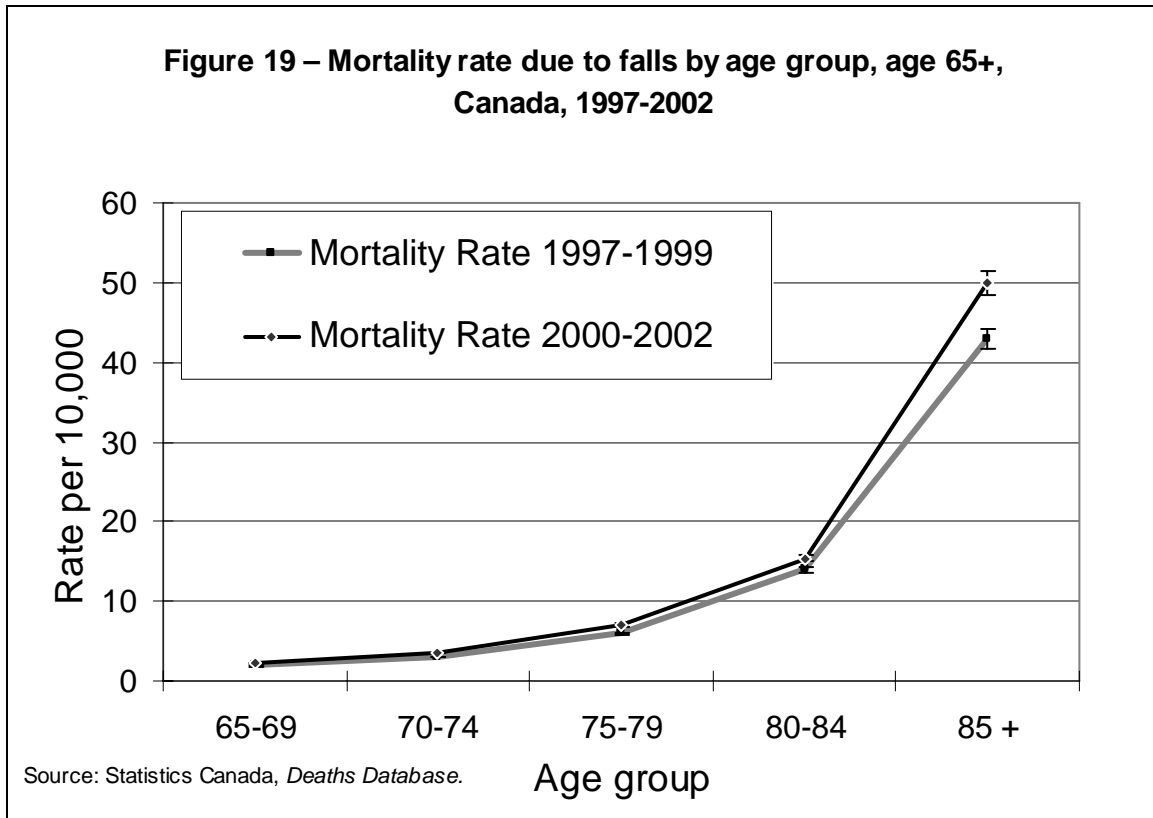
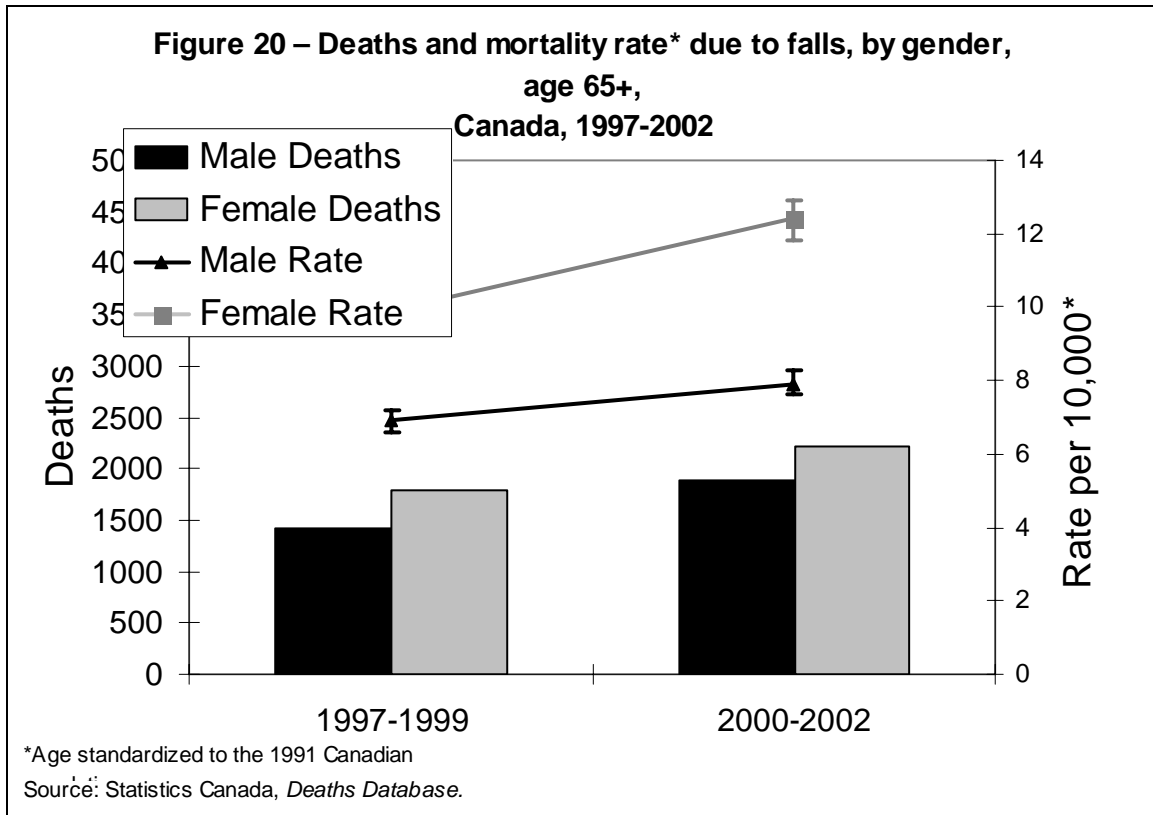
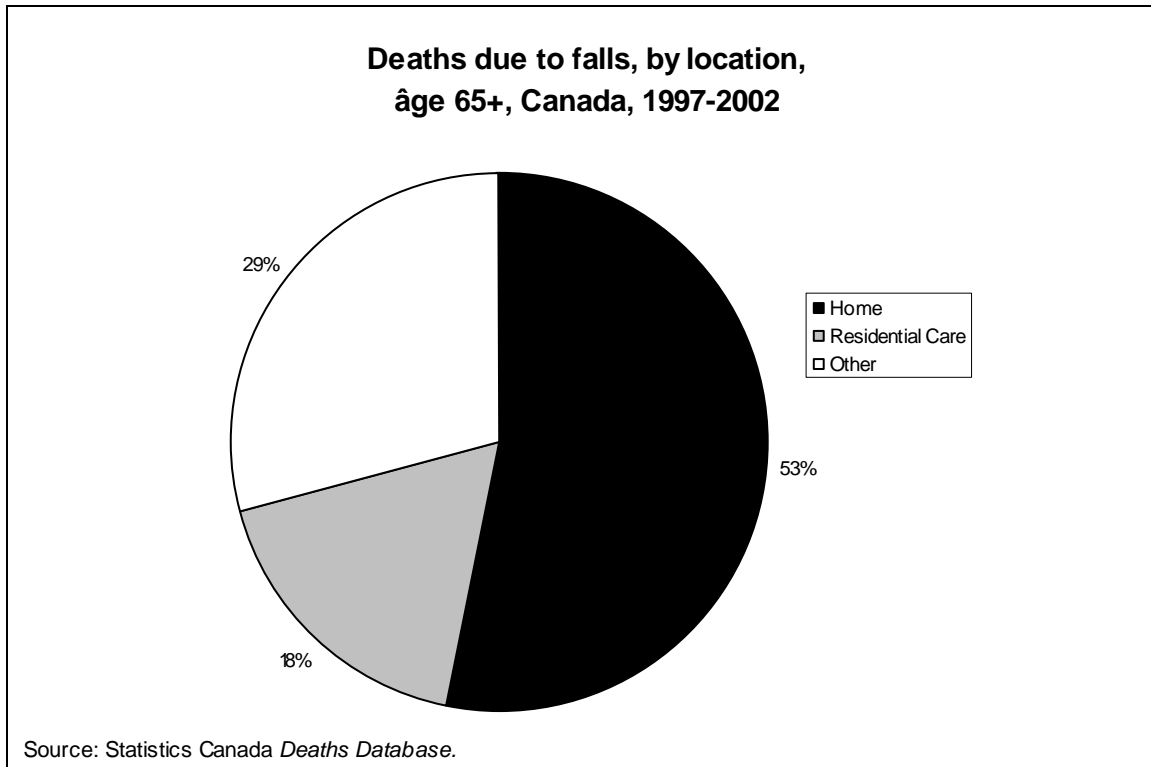


Figure 20 shows deaths due to falls by gender for Canadians age 65 and over. Deaths due to falls among women rose from approximately 1,797 in the 1997-1999 period to 2,224 in the subsequent period. This translates into an age-standardized rate of 9.9 deaths per 10,000 in the first period and 12.4 deaths per 10,000 in 2000-2002. This increase was statistically significant ($p < 0.05$).

Deaths due to falls among men increased from 1,412 to 1,886 over the same period and the age-standardized rate for men increased from 6.9 to 7.9 deaths per 10,000 population. However, this increase was not statistically significant.



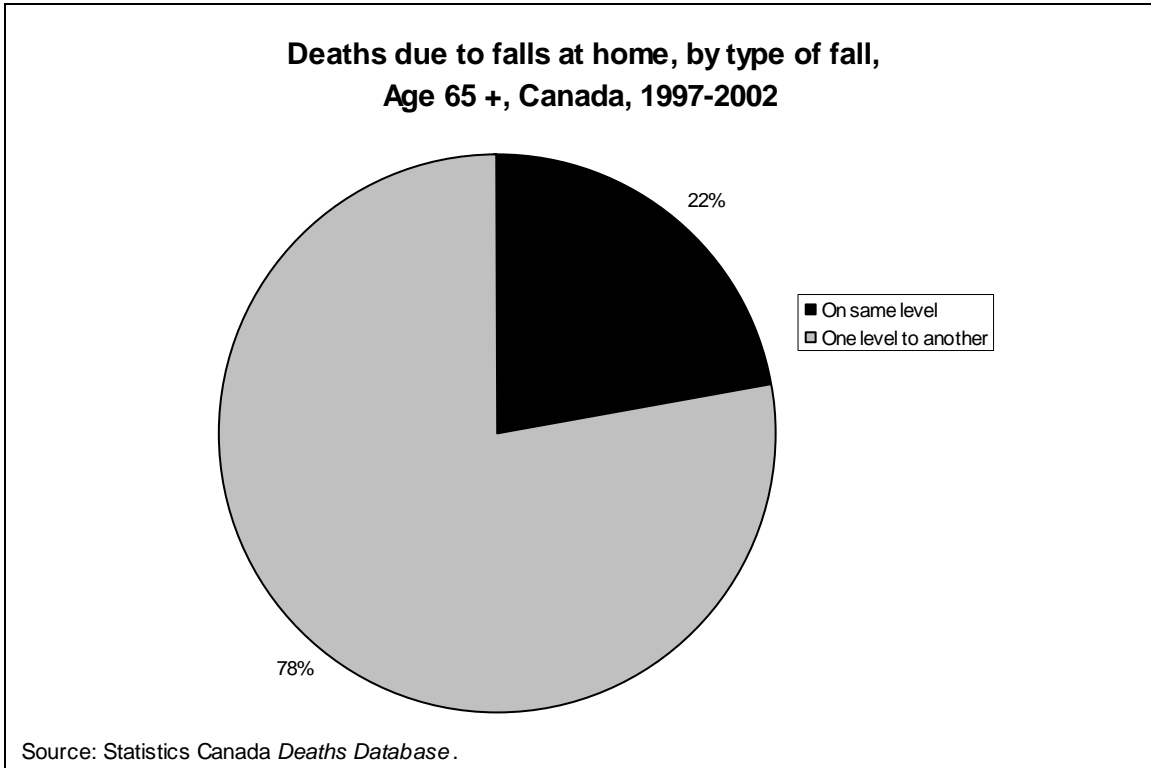
The **supplementary figure** below shows that, where the location of a fall resulting in death was known, over 53% occurred in a private home environment, 18% in residential care facilities, and 29% in other locations such as public buildings, on the street, in a commercial or service area, in a recreation or sport area and on a farm.



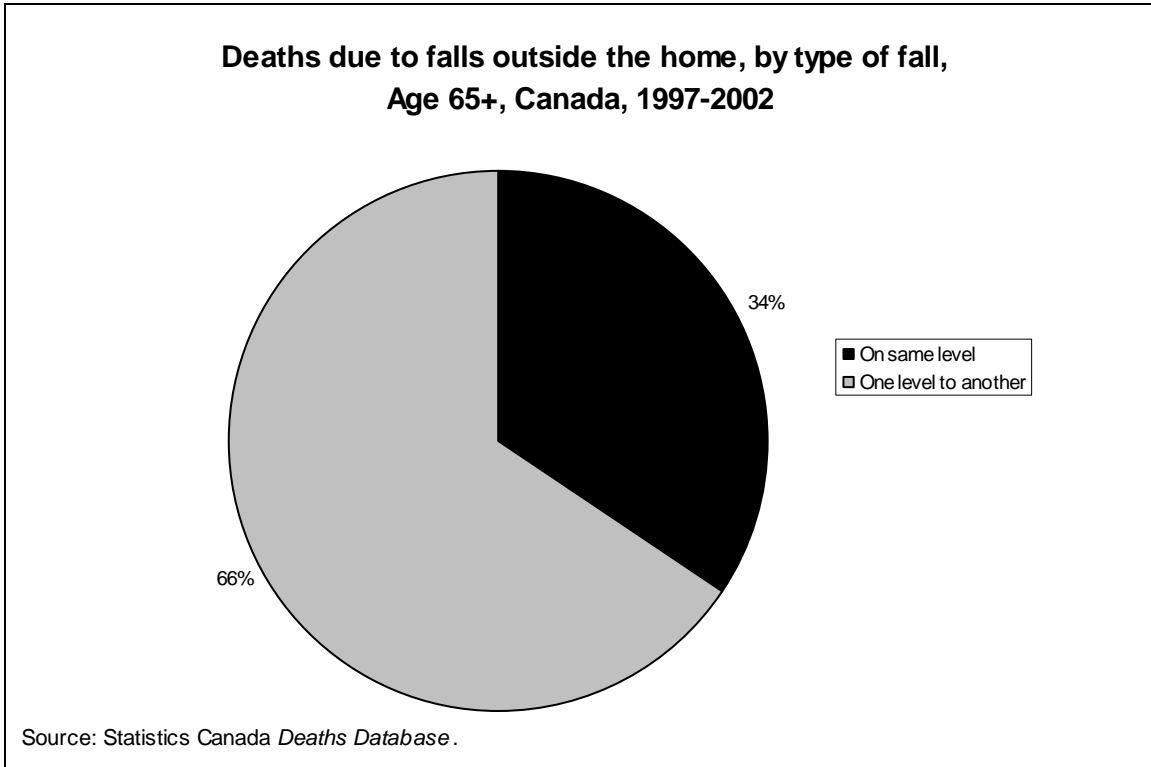
Note: For this figure, the ‘place of occurrence’ category definitions were as follows:

1997-1999: ICD 9	2000-2002: ICD 10
Home (0)	Home (0)
Farm (1)	Residential institution (1)
Mine or quarry (2)	School, other institution/public admin area (2)
Industrial site and premises (3)	Sports and athletics area (3)
Site of recreation and sport (4)	Street and highway (4)
Street and highway (5)	Trade and service area (5)
Public building (6)	Industrial and construction area (6)
Residential institution (7)	Farm (7)
Other specified site (8)	Other specified locality (8)
Unknown site (9)	Unknown locality (9)
<i>Note:</i> <i>1 to 6, & 8 were grouped as "other"</i>	<i>Note: 2 to 8 were grouped as "other"</i>

The figure below shows the distribution of the type of fall for deaths resulting from a fall among seniors where the fall occurred at home. Of these deaths, 78% were the result of a fall from one level to another and 22% were due to falls on the same level.



The figure below shows that, by comparison, where a fall occurred outside the home (but not including residential care facilities), 66% were the result of a fall from one level to another and 34% were due to falls on the same level. Significantly more falls from one level to another occurred in the home environment than outside the home.



Discussion

This report shows the mortality data from Statistics Canada for all direct deaths due to falls among those age 65 and over, for the years 1997 to 2002. The analyses include differences by place of occurrence, type of fall, gender, and age group. During these years, more than 7,000 Canadians age 65 and over died as a direct result of a fall. On an age-standardized basis, there was a statistically significant increase in the rate of deaths due to falls from 1997-1999 to 2000-2002 and the rate of deaths due to falls increased with age in both time periods. The rate of deaths due to falls was higher for women than for men. Where the location of the fall was known, the majority of falls resulting in deaths among Canadians age 65 and over occurred in the person's home.

The increasing number of fall-related deaths among those age 65 and over reflects the growing proportion of this age group in Canada. However, the fact that the *rate* of fall-related deaths has shown a statistically significant increase points to a growing problem that warrants further investigation. While the interpretation of the data is complicated by the possible impact of the conversion from ICD 9 to ICD 10 coding, nonetheless, the increase in the number and rate of deaths due to falls among seniors may be due in part to an increase in adverse health conditions associated with increasing age. These conditions can contribute to an increased risk of sustaining a severe injury and a decrease in the ability to recover from an injury. Conditions such as dementia, diabetes and the effects of a stroke are all known to increase the risk of falling and being injured (Oleske et al., 1995; Lamb et al., 2003).

Females showed a higher rate of deaths due to falls than males and a statistically significant increase in the rate of deaths over time. This is not the case for males – although their death rate is also increasing over time, the increase is not statistically significant. These differences may be due to the greater prevalence of osteoporosis among women, which puts them at greater risk of sustaining a serious fracture from a fall (Osteoporosis Society of Canada, 1996).

The majority of fall-related injuries that result in death among seniors occur in the home. However, it is important to consider the amount of time that persons at greatest risk of falling spend inside compared to outside their homes. Even though seniors tend to spend more time inside their homes, 29% of falls causing death are occurring outside the home, pointing to a need to focus falls prevention efforts in these settings as well as in the home. Falls within the home and outside of the home are shown to occur most often from one level to another. This is consistent with findings in the National Trauma Registry study of severe injuries, showing that the majority of these injuries occurred on stairs and steps (Canadian Institute of Health Information, 2003).

Falls occurring in residential care settings likely reflect the frailer populations in these settings, including those who would be more prone to injury and have multiple co-morbid health conditions that may limit their ability to recover from a serious injury. The use of medications associated with an increased risk of falling may also contribute to the higher rates of serious injury among the elderly in institutional settings (Neutel et al., 1996).

Together, these findings point to the need to pay more attention to the prevention of falls among the very old, females and those who are more susceptible to injury due to the effects of compounding health problems. It is not likely that age or gender per se increases the likelihood of death due to a fall-related injury, but rather, the underlying health conditions associated with old age and female gender. Attention should also be given to environmental contributors to severe fall-related injuries, particularly to the design and maintenance of stairs and steps, both within and outside of the home.

Limitations

Deaths reported in this study are limited only to those for which a fall was the underlying or direct cause of death and may reflect an underestimation of the magnitude of the problem of deaths due to falls. Deaths for which a fall was an indirect cause (contributing, associated, or antecedent causes to the underlying cause of death) were not included. An indirect death from a fall occurs when the fall itself is not deadly, but the injuries that are sustained may undermine the individual's health so much that other diseases and illnesses prove fatal. Pneumonia and infections are often the direct cause of death where a fall is the indirect cause (Scott, Peck and Kendall, 2004).

The findings reported here are also affected by the recoding of 'Accidental falls' as a cause of death group with the implementation of ICD 10. Included in the ICD 9 group of codes for accidental falls is ICD 9 code E887, 'Fracture, cause unspecified.' However, this cause of death is not included in the ICD-10 group of codes for falls but rather in ICD 10 code 'X59, Exposure to unspecified factor.' Therefore, E887 was not included in the analysis for this report and may further limit the true picture of deaths from falls for this population.

In addition, limitations of this study may include those that are inherent in the collection of vital statistics data. Errors could occur during certification of death or during the classification (coding) done by a medical coder.

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