

A B S T R A C T

Falls are a major health problem for persons aged 65 years and over. This study examined differences in patterns of fall-related injuries and deaths between age groups, sexes, and among Health Regions of BC. For those under the age of 65 years, fall-related injuries are highest among males, whereas for those 65 and over, falls among females exceed those among males by 2:1. For persons aged 65 and over, 84% of hospital days for unintentional injuries involve falls, with transportation and "other" unintentional injuries contributing 16%. While older women are hospitalized more often for fall-related injuries, more older men die from fall-related injuries. Hospitalization rates due to injuries from falls are highest in the Northern Regions of BC. Policy implications of the findings are discussed.

A B R É G É

Les chutes constituent un problème de santé important chez les personnes de 65 ans et plus. L'étude examine les différences dans les types de blessures et de décès à la suite d'une chute par groupes d'âge, par sexes et par régions sanitaires de la Colombie-Britannique. Chez les personnes de moins de 65 ans, le pourcentage des blessures à la suite d'une chute est le plus élevé chez les hommes alors que parmi les personnes de 65 ans et plus, les chutes chez les femmes sont le double de celles des hommes. Pour les personnes âgées de 65 ans et plus, 84 % des journées d'hospitalisation pour une blessure involontaire sont associées à des chutes, les « autres » blessures involontaires et celles associées aux déplacements constituant les 16 % qui restent. Alors que les femmes âgées sont plus souvent hospitalisées pour des blessures liées à une chute, un plus grand nombre d'hommes âgés décèdent des suites de blessures liées à une chute. Le taux d'hospitalisation à la suite d'une chute est le plus élevé dans les régions du nord de la Colombie-Britannique. On discute également les conséquences de ces résultats sur la politique.

Mortality and Morbidity Related to Injuries from Falls in British Columbia

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Falling is an important health problem among older people. Approximately 30% of community-dwelling Canadians aged 65 years and older experience at least one fall each year and about 25% of those who fall suffer moderate to severe injuries.^{1,2} For long-term care residents the annual rate of having one or more falls is 50%, with at least 5% resulting in fractures and 10% in other serious injuries.³ These injury rates represent considerable costs in terms of human suffering and health care expenses.

The estimated cost to Canadians in 1994 for fall-related injuries among persons 65 years and older was \$2.8 billion.⁴ This figure includes direct costs of institutional expenditures and professional services, and indirect costs of lost productivity due to premature mortality and disability. It does not include additional expenses such as the cost of medications for fall-related injuries, negligence claims or the work of nonprofessional caregivers.

Most studies show the etiology of a fall to be a complex combination of factors that reflect physical, cognitive, behavioural and social conditions operating alone, or in conjunction with, environmental hazards.^{1,5} There is evidence to suggest that some falls can be prevented through strategies such as the amelioration of underlying medical conditions, education on risks and prevention, exercise, and the removal of

environmental hazards.⁶⁻⁸ However, more studies and better data collection systems are needed in order to determine the nature and scope of the problem and the effectiveness of different strategies.

This paper reports on a descriptive study of morbidity and mortality patterns related to falls over a five-year period in BC. The purpose is to compare ages, sex, and regional differences among fallers, and to examine what proportion of all hospitalizations are those due to falls. Comparisons are also drawn between falls and other causes of "Unintentional" injury. A fall is defined according to the International Classification of Diseases – Ninth Revision (ICD-9 Codes) as an unexpected event wherein a person fell to the ground from an upper level or from the same level, including falls up stairs and falls onto a piece of furniture.⁹ The nature of the fall is reported by ICD-9 sub-codes known as E-codes (E880-E888); these exclude falls from burning buildings, into fire, into water or machinery, onto pointed or sharp objects or from transport vehicles.⁹

The data are based on hospital separations from the Information and Analysis Branch of the Ministry of Health, and mortality rates from the BC Vital Statistics Agency. The data are averaged over five-year periods between 1991/92-1995/96 (hospital separations) and 1991-1995 (deaths). Hospital separation rates are reported per 1,000 of the population and death rates per 100,000. Hospitalizations are based on the number of separations, not individuals, i.e., each hospital separation is counted as a separate event even if the same individual is admitted more than once with the same diagnosis. BC Health Region data are based on the postal code of the person hospitalized.

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RESULTS

Hospitalizations due to falls for all ages

Fall-related injuries are a problem for males and females of all ages in BC, but are particularly severe for those aged 65 and over for both cases and rates. Table I compares the average annual number of cases and cases per 1,000 of the population, between 1991/92 and 1995/96, by age and sex. For both cases and rates, hospitalizations due to falls for males exceeded those of females in the 0 to 24, and 25 to 64 age groups. However, for those 65 and over, this trend reversed, with cases and rates for females almost twice those of males.

For all ages, fall-related injuries are the major contributor to hospital days due to unintentional causes of injury; they accounted for an average of 189,861 hospital days each year between 1991/92 and 1995/96. This is 60% of all hospital days involving unintentional injury, with transportation and other unintentional causes of injury accounting for approximately 20% each.

The annual expenditure for hospital stays involving fall-related injuries for all ages is estimated at \$134 million based on an average of \$705 per day.^{10,11} This is considerably higher than the combined contribution to costs for hospital days that involved transportation (approximately \$45 million) and other unintentional causes (approximately \$44 million) (Table II). These costs are for acute care inpatient services only, and do not include costs for nursing care after discharge, physician services or therapies needed as a result of fall-related injuries.

Differences exist between younger and older persons with respect to the distribution of hospital days involving different unintentional causes of injury. For persons under the age of 65 years, the number of hospital days are fairly evenly distributed between those that involved falls, transportation and other unintentional injuries (Table II). However, for persons aged 65 and over, the vast majority of hospital days (84%) are attributed to those that involved fall-related injuries with transportation and other unintentional injuries contributing 16% of all hospital days due to unintentional injuries for this age group (Figure 1).

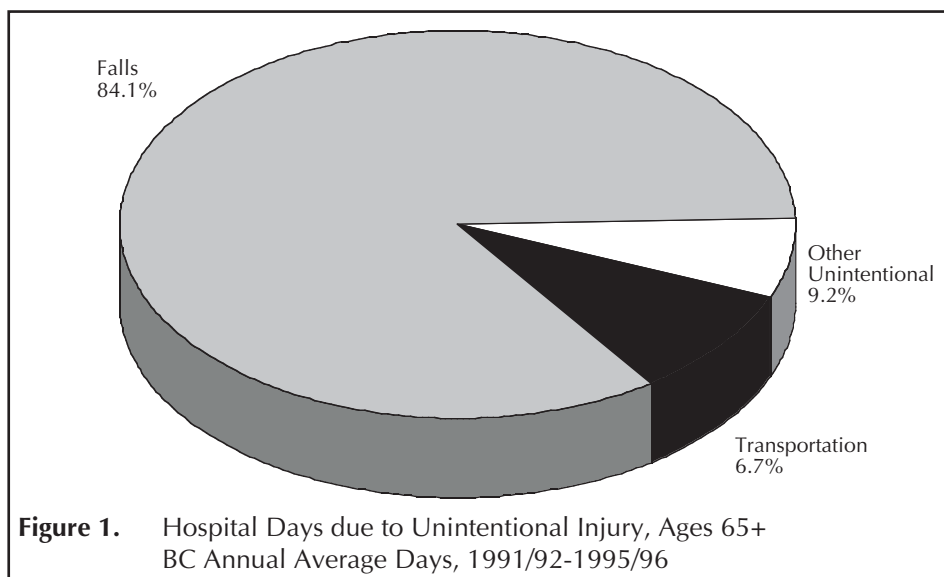


Figure 1. Hospital Days due to Unintentional Injury, Ages 65+ BC Annual Average Days, 1991/92-1995/96

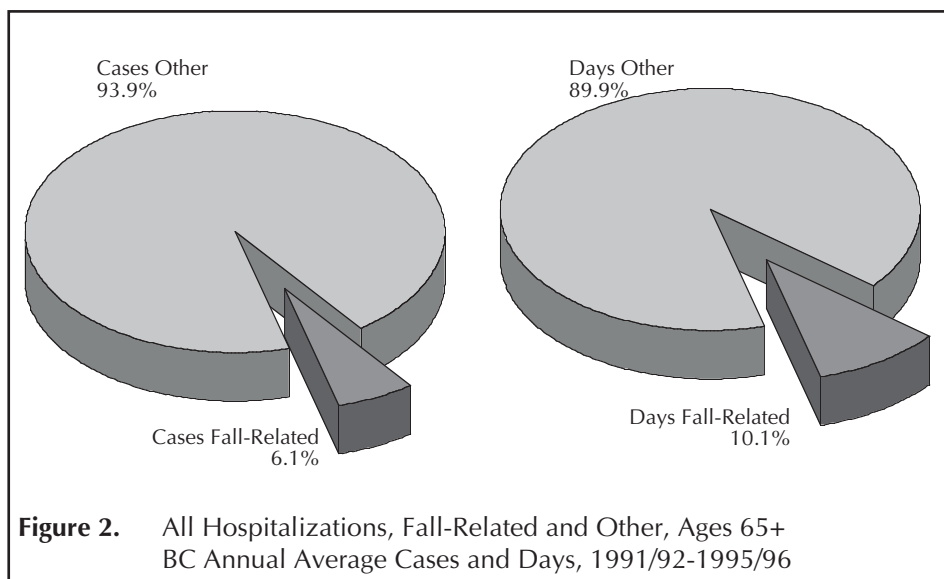


Figure 2. All Hospitalizations, Fall-Related and Other, Ages 65+ BC Annual Average Cases and Days, 1991/92-1995/96

	0-24 years	25-64 years	65+ years
Males – Cases	2119	2934	2467
Females – Cases	1167	2245	5969
Males – Cases/1,000	3.5	3.01	12.54
Females – Cases/1,000	2	2.35	23.31

Hospitalizations and deaths due to falls among persons aged 65 years and older

For persons aged 65 and over, fall-related injuries were involved in approximately 8,437 cases, or 6.1% of all hospitalizations on average from 1991/92 to 1995/96 (Figure 2). This increased to 10.1% for all hospital days, an average of approximately 146,245 days each year, reflecting the

longer stays when treatment for fall-related injuries were involved compared to all reasons for being hospitalized. The average length of hospital stay when fall-related injuries are involved was 17 days, compared with 9 days when injuries from falls were not involved. The term “Days Fall-Related” refers to all days when a fall-related injury was the primary diagnosis that describes the

TABLE II
Hospital Days and Estimated Hospital Costs* When Unintentional Injuries are Involved
BC Average Annual Costs, 1991/92-1995/96

	< 65 years			> 65 years			All Ages		
	Days	Cost	%	Days	Cost	%	Days	Cost	%
Falls	43,616	31m	31	146,245	103m	84	189,861	134m	60
Transportation	51,995	37m	36	11,606	8m	7	63,601	45m	20
Other Unintentional	46,992	33m	33	15,962	11m	9	62,954	44m	20
Total	142,603	101	100	173,813	122	100	316,416	223	100

* Estimates based on \$705 per day.
 m = million

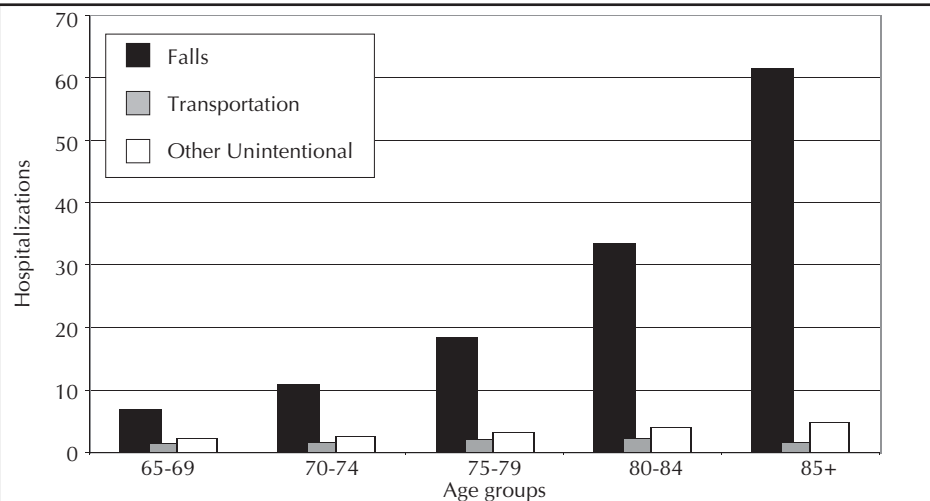


Figure 3. Hospitalizations due to Unintentional Causes of Injury, Ages 65+ BC Annual Average Cases per 1,000 Population, 1991/92-1995/96

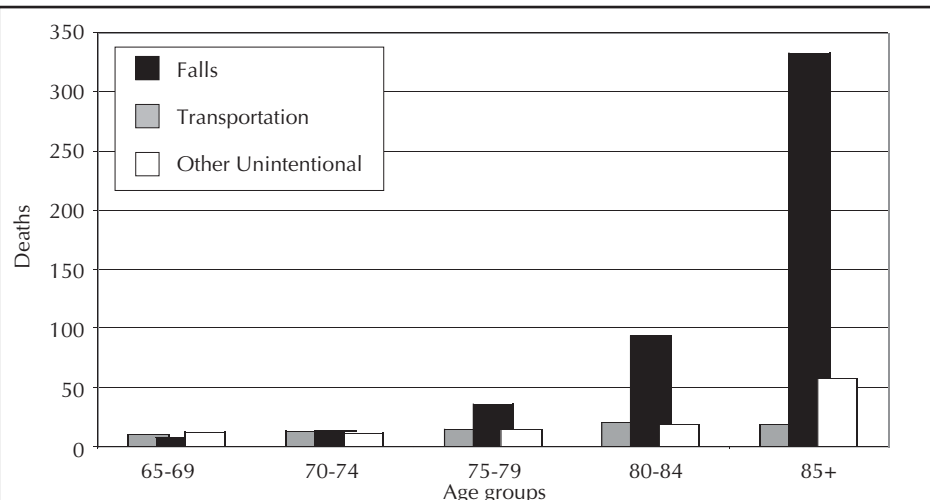


Figure 4. Deaths due to Unintentional Causes of Injury, Ages 65+ BC Annual Average per 100,000 Population, 1991-1995

most significant condition which contributes to length of stay in hospital.¹²

The average number of total hospital days increased with age, and not surprisingly, the relative proportion of days related to falls is greatest for the very old (Table

III). Whereas only 5% of the total hospital days were related to falls among those 65 to 69, the figure increased to 19% among those aged 85 and older.

Major differences exist between the sexes by age groups 65 and over for fall-related

and total hospitalizations. Male rates exceed female rates for total hospitalizations, whereas female rates exceed male rates for fall-related hospitalizations (Table IV).

Falls are the largest contributor to hospitalization rates for unintentional causes of injury for all age groups aged 65 and over and these rates increase sharply with advancing age (Figure 3). Other unintentional causes of injury, while only a small proportion of the total, also increase with age. The largest contributors to other unintentional causes of injury for those aged 65 and over are poisoning at 18%, and overexertion at 14%. Injuries related to transportation are the smallest contributors to hospitalization rates for those aged 65 years and older and this contribution decreases further for ages 85 and over.

The most common cause of a fall reported by persons aged 65 and over who were hospitalized for injuries due to a fall was “on the same level from slipping, tripping or stumbling” (42%) – as categorized in the ICD-9 E-code system (Table V).^{9,p.1058} The next largest category reported is “other and unspecified fall” (31%), which includes falls of an unknown nature. For ages 65 and over, females exceed males for all categories of leading causes of falls, with the exception of falls from ladders.

While older women are hospitalized more often than men due to fall-related injuries, more men die from fall-related injuries. Women, per 1,000 of the population, exceed men for hospitalizations due to falls in all age groups over 65 years, particularly among the older ages (Table VI). However, for death rates due to falls the opposite is the case, with men exceeding women for age groups 65 and over, with the margin decreasing as age increases.

When compared to all other unintentional causes of injury, falls are the leading cause of death for those aged 65 and over. Age group comparisons per 100,000 of the population between deaths due to injury from transportation, falls, and other unintentional causes show little difference for ages 65 to 74 (Figure 4). After the age of 75, death rates due to falls exceed the other categories, with falls accounting for 81% of deaths due to unintentional injury for ages 85 and over.

Regional variations for hospitalization rates due to unintentional injuries for persons aged 65 years and over show falls as the leading cause of injury in all 20 Health Regions compared to all other causes, including transportation (Table VI). The highest rates are found in the Northern and Interior regions and lowest in the Lower Mainland and Southern Vancouver Island. The rate of hospitalizations due to fall injuries for women is nearly twice that for men in most areas.

DISCUSSION

This report demonstrates that falls are the leading cause of injury and injury-related death among BC's older population. This problem is not unique to BC. For all of Canada in 1995/96, 61% of hospital days for injury were for persons aged 65 and over, and falls accounted for 84% of all injury admissions for this age group.¹² Costs related to injuries for all ages was determined in 1993 to be the third largest contributor to the burden of illness in Canada, accounting for 14.3 billion dollars – only illness due to cardiovascular or musculoskeletal conditions ranked higher¹³ – yet, injury-related research ranks last in terms of the proportion of funds allocated by the government.¹³

In BC, falls are clearly a necessary priority for future injury prevention services and research. A better understanding of the factors contributing to the difference between the sexes may assist in tailoring prevention strategies to gender-specific health or lifestyle differences. Regional differences may provide valuable clues for use in fall prevention strategies specific to each region. It is interesting to note that the regions with the highest fall-related injury

TABLE III
All Hospital Days, Fall-Related and Other, Ages 65+
BC Annual Average Days per 1,000 Population, 1991/92-1995/96

	65-69 yrs	70-74 yrs	75-79 yrs	80-84 yrs	85+ yrs
Fall-Related Days/1,000	80.15	157.66	314.84	627.89	1244.6
Falls-Related as % of Total	5%	6%	9%	13%	19%
Other Days/1,000	1666.37	2322.44	3256.48	4258.38	5160.84

TABLE IV
All Hospital Cases, Fall-Related and Total, Ages 65+, by Sex
BC Average Annual Rate per 1,000 Population 1991/92-1995/96

Age (years)	Total Cases		Fall-Related Cases	
	Males	Females	Males	Females
65-69	243.6	184.4	5.8	8.0
70-74	318.4	238.3	8.3	13.0
75-79	401.4	310.3	12.5	22.8
80-84	491.6	379.9	23.3	40.2
85+	568.3	429.4	45.2	69.7
65+	346.0	276.9	12.5	23.3

TABLE V
Hospitalizations due to Falls by External Cause (E-codes), Ages 65+, by Sex
BC Average Annual Cases per 1,000 Population, 1991/92-1995/96

	Females	Males
Same Level Slip/Trip[E885]	11.1132	4.8362
Other/Unspecified[E888]	7.6223	4.2505
Another Level[E884]	2.3609	1.5233
Chair or Bed[E884.2]	1.9587	1.1684
Stairs[E880]	1.5135	0.8847
Ladder[E881]	0.1148	0.5978

TABLE VI
Hospitalizations and Deaths due to Falls, Ages 65+, by Sex
BC Average Annual Rates

Age (years)	Hospitalizations/per 1,000		Deaths/per 100,000	
	Males	Females	Males	Females
65-69	5.76	8.04	10.90	5.10
70-74	8.28	13.00	18.50	10.30
75-79	12.54	22.77	40.90	32.70
80-84	23.33	40.22	106.40	84.40
85+	45.24	69.67	338.90	330.20

rates also tend to have the lowest income and education levels, and the highest rates of unemployment.¹⁴ It can also be speculated that environmental contributors exist, as many of these same regions have the harshest weather conditions and are the least developed.

Data used for this study are limited by the non-specific nature of hospital records, as demonstrated by lack of specificity in the ICD-9 sub-coding. For instance, in BC the second most frequent reason recorded for hospitalizations due to an injury from a fall is classified under the imprecise code of "E888 Other or unspecified fall".^{9,p.1030} This problem may be reduced with the

revisions to the ICD-10, scheduled for implementation in Canada in 2000.^{15,16} Another limitation is the inability to identify repeat admissions for the same injury in the current system for recording hospital separations. Studies show that this could account for a significant portion. A New Zealand study found that 16.1% of all injury admissions were readmission and a US study found injury readmission to be as high as 20%.¹⁷

Data collection systems also lack information on injuries from emergency departments, physician's offices and clinics. Studies show that for every injury-related death, there are approximately 330 visits to

TABLE VII
Hospitalizations due to Unintentional Cause of Injury,
Ages 65+, by Sex, and by Region*
BC Annual Age-Standardized† Rate per 1,000 Population, 1991/92-1995/96

Region	Falls		Other Unintentional		Total
	Females	Males	Females	Males	
North West	44.02	20.19	10.05	14.89	35.08
Northern Interior	31.45	22.41	6.97	12.04	34.45
Peace Liard	28.99	18.17	7.88	12.74	30.91
Cariboo	35.81	15.86	9.08	12.35	28.21
East Kootenay	31.69	16.41	6.64	10.04	26.45
West Kootenay	31.57	16.97	8.28	8.59	25.56
Coast Garibaldi	37.02	17.51	7.53	7.62	25.13
Thompson	28.45	16.06	6.78	7.36	23.42
Up.Island/Central Coast	27.46	14.71	4.85	6.87	21.58
North Okanagan	26.78	12.64	6.02	6.88	19.52
Simon Fraser	25.20	14.03	5.11	4.78	18.81
S.Okanag/Similkameen	23.48	12.22	4.79	5.85	18.07
Burnaby	22.62	13.08	3.27	3.92	17.00
Fraser Valley	22.15	11.12	5.08	5.77	16.89
S. Fraser Valley	22.99	11.78	3.90	4.66	16.44
Central Vancouver Isl.	23.16	11.11	3.97	5.26	16.37
Vancouver	19.05	10.89	3.72	4.26	15.15
Capital	20.70	11.14	3.54	3.84	14.98
North Shore	19.70	10.33	3.26	3.38	13.71
Richmond	19.94	9.41	3.26	4.16	13.57

* Health Region boundaries as they existed in 1991/92-1995/96

† Indirect age-standardization used to adjust for differing age mixes between regions

emergency departments and mortality statistics constitute less than 0.01% of all injuries receiving medical attention.^{18,19}

The Canadian population is aging and more seniors are becoming independently mobile with the assistance of barrier-free building designs and technological advances in mobility aids.²⁰ With these changes, a larger proportion of our aging population will be at risk of injury from a fall than ever before. These demographic shifts emphasize the need for widespread and cost-effective strategies to promote safety. In order to apply such strategies, information related to the risk and occurrence of falls should be collected in a manner that promotes evidence-based practice. Priority should be given to improving existing data collection and data storage systems to enhance their ability to complement current injury prevention strategies.

Preventing falls and related injuries is important to the health and independence of all Canadian seniors. Knowledge of the scope and magnitude of this problem is needed by policy makers who are charged

with the difficult task of allocating resources for the future health care needs of older persons.

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