Australian Government
Australian Institute of Health and Welfare

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INJURY RESEARCH AND STATISTICS SERIES
Number 61

# Hospitalisations due to falls by older people, Australia

## 2007–08

Australian Institute of Health and Welfare
Canberra
Cat. no. INJCAT 137

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This publication is part of the Australian Institute of Health and Welfare's Injury research and statistics series. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 1444-3791
ISBN 978-1-74249-303-9

**Suggested citation**
AIHW: Bradley C 2012. Hospitalisations due to falls by older people, Australia 2007–08. Injury research and statistics series no. 61. Cat. no. INJCAT 137. Canberra: AIHW.



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Published by the Australian Institute of Health and Welfare

**Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.**

# Contents

# Abbreviations

| | |
|---|---|
| ABS | Australian Bureau of Statistics |
| AIHW | Australian Institute of Health and Welfare |
| AR-DRG | Australian Refined Diagnosis Related Group |
| ASGC | Australian Standard Geographical Classification |
| DoHA | Australian Government Department of Health and Ageing |
| ICISS | ICD-based injury severity score |
| NHMD | National Hospital Morbidity Database |
| NISU | National Injury Surveillance Unit |

# Symbols

| | |
|---|---|
| n.e.c | not elsewhere classified |
| n.p. | not publishable because of small numbers, confidentiality or other concerns about the quality of the data |
| CI | confidence interval |
| SD | standard deviation |
| SE | standard error |

# Summary

The report focuses on hospitalised falls occurring in the financial year 2007–08 and includes estimates of the cost to the hospital system due to serious falls.

## Falls in 2007–08

The estimated number of hospitalised injury cases due to falls in people aged 65 and over was 74,400 in 2007–08, nearly 3,000 more cases than identified in 2006–07. However, the age-standardised rate of fall injury cases for older people (2,516 per 100,000 population) was about the same as in 2006–07 (2,503 per 100,000).

As in the previous reports in this series, females accounted for most of the hospitalised fall injury cases and rates of fall cases were higher for females than for males in all age groups.

About one-third of fall injury cases had injuries to the hip and thigh, and most of those injuries were hip fractures. Head injuries accounted for about one in five cases and were more common for males than females.

## Circumstances of falls

As in previous years, a fall on the same level due to slipping, tripping and stumbling was the most common cause of a hospitalised fall.

The home was the most common place of occurrence for serious falls in 2007–08, followed by aged care facilities. Together, these places accounted for 70% of hospitalised falls. As in 2006–07, older people who lived in aged care facilities had a rate of falls five times as high as that for people of the same age who lived in the community and fell in their home.

## Hospital care

Hospital care related to falls included both the first episode of hospital care for a fall injury case (i.e. care for an acute injury), inter-hospital transfers ($n$ = 9,076) and further episodes of care that can be described as 'follow-up care'. Nearly 25,000 episodes of follow-up care were identified for people aged 65 and older in 2007–08.

A further 40,700 hospital separations in 2007–08 contained coding indicative of a fall (either both an injury additional diagnosis and a fall external cause or the diagnosis R29.6 (tendency to fall, not elsewhere classified) within the record.

Episodes of hospital care directly attributable to an injurious fall used 1.2 million patient days in 2007–08 and the average total length of stay per fall injury case was estimated to be 16.0 days.

Acute episodes of hospital care directly attributable to fall injuries in 2007–08 were estimated to have cost more than $648 million. This estimate is nearly $50 million higher than that estimated for 2006–07.

Acute care for injuries to the hip and thigh was estimated to have cost more than $323 million in 2007–08, half of the total cost to the hospital system due to fall injury in this year.

# 1 Introduction

This report is the fourth in a series of reports on hospitalisations due to falls by people aged 65 and older in Australia. Previous reports examined hospitalised falls in the financial years 2003–04 (Bradley and Harrison 2007), 2005–06 (Bradley and Pointer 2008) and 2006–07 (Bradley 2012). The present report analyses fall-related hospital separations data from the National Hospital Morbidity Database (NHMD) for the financial year 2007–08.

Falls are common among older people and often result in fractures or other serious injuries (see Gillespie et al. 2009; Lord et al. 2001; Tinetti et al. 1988). They may have substantial impacts on the older person's health and well-being and may result in loss of independence and in admission to residential care (see Chang et al. 2004; Clemson et al. 2008; Rubenstein 2006). The Australian Institute of Health and Welfare (AIHW) has estimated that between 21% and 23% of Australians aged 65 and older who separated from hospital due to an injurious fall in 2001–02 (and who left hospital alive) went to residential aged care immediately on leaving hospital. Of these, about 20% were new admissions into permanent care and about 10% were admissions into respite (that is, short-term) residential care (Karmel et al. 2008).

In Australia, an estimated one in three older people living at home experiences a fall annually (for example, Dolinis et al. 1997; Lord et al. 1993; Morris et al. 2004) and about three in four hospitalised injuries involving older Australians are due to falls (e.g. Bradley and Harrison 2008). Rates of falls increase with age, and additional risk factors for falls and fall-related injury include gender, medication use and predisposing medical conditions including Parkinson's disease, osteoporosis, incontinence and vision problems (e.g. Chiarelli et al. 2009; Cumming 1998; Lord 2006; Lord et al. 2001; Wood et al. 2002). Social and socioeconomic factors can also affect the risk of falls for older people (Dolinis et al. 1997; Gill et al. 2005; West et al. 2004). Further, being a hospital-admitted patient, whether due to either an injurious fall sustained previously or an unrelated condition, also increases an older person's risk of falling (e.g. Batchelor et al. 2009; Fischer et al. 2005; Foss et al. 2005; Shuto et al. 2010). Importantly, having had one fall is a risk factor for future falls (e.g. Pluijm et al. 2006), and developing a fear of falling, which may result in reduced activity levels, can also increase falls risk (Rubenstein 2006).

A substantial proportion of injurious falls involving older people result in hospitalisation (e.g. Lord et al. 1993; Sattin et al. 1990; Tinetti et al. 1988) and the cost to the health system of serious fall-related injuries is considerable (e.g. Hall and Hendrie 2003; Tiedemann et al. 2008). Our 2006–07 falls report estimated the total cost of fall-related acute episodes of hospital care for older people at $600.3 million (Bradley 2012). Further, estimates of the costs associated with injurious falls which include 'lifetime' costs (that is, indirect costs such as the cost of lost production due to incapacitation or premature death or costs borne by the family or community) exceed $1 billion per year (Moller 1998; see also Potter-Forbes and Aisbett 2003).

## This report

This report examines all NHMD records for people aged 65 and older that included both an injury diagnosis (S00–T75 or T79) and an external cause code signifying an unintentional fall (W00–W19) for the financial year 2007–08. These codes could appear anywhere within the

record (that is, analysis was not restricted to records that had a principal diagnosis indicating that the injury was the primary reason for the episode of hospital care).

Two major aspects of hospitalised fall-related injury are discussed:

1. the annual incidence of new cases and
2. the burden to the hospital system (that is, the additional admitted patient episodes of fall-related care, the patient days attributed to these separations and the estimated cost of this care).

The structure of this report is similar to that for previous years. Chapter Two presents the estimated annual incidence of fall events resulting in injury and hospitalisation in 2007–08 for people aged 65 and older while Chapter Three describes the characteristics of these fall injury cases, including the mechanism and circumstances (place of occurrence, activity) of the event.

Chapter Four discusses the burden to the hospital system due to fall-related episodes of admitted patient care. The section briefly describes a set of separations omitted from Chapters Two and Three—the hospital records that meet our definition of an incident case, but have been generated through an admitted patient's being transferred from one hospital to another ('inward transfers'). Including these separations in incidence estimates would result in the multiple counting of some injurious fall events.

Chapter Four also presents estimates of additional hospital episodes involving fall-related injuries for people aged 65 and older in 2007–08, principally admitted patient care that can be characterised as either 'fall-related follow-up care' and 'other fall-related' hospital separations. Analysis of another type of fall-related hospital record is also included in Chapter Four; separations containing the diagnosis R29.6, which describes a "tendency to fall because of old age or other unclear health problems" (NCCH 2006). The nature of these separations and their relationship to injurious falls are not fully understood and will not be until sufficient (that is, national or near to it) person-linked data become available for analysis. Nevertheless, it seems appropriate to include these separations as a component of the fall-related burden to the Australian hospital system.

Continuing our assessment of the burden to the hospital system due to falls by older Australians, Chapter Five presents a short analysis of the length of stay for fall-related episodes of care while Chapter Six provides an estimate of the cost to the hospital system for fall-related care. The estimation approach is the same as that presented in the 2006–07 report (Bradley 2012), with only acute episodes of care considered. This method allows a more accurate assessment of cost than was able to be provided for the 2003–04 data year (Bradley and Harrison 2007).

Unlike previous reports, the present report does not contain an analysis of health interventions in the data-set. Readers are directed to the three previous reports in the series (Bradley 2012; Bradley and Harrison 2007; Bradley and Pointer 2008) for analyses of this type of data. Similarly, the present report does not present an analysis of trends over time for fall-related hospitalisations for Australians aged 65 and older; however, this information will be included in the next report in this series, relating to the 2008–09 data year.

Confidence Intervals are provided in some figures to show non-sampling variation, which is largest where case counts are small. Further information is provided in Data Issues.

# 2 Fall injury incidence

This chapter presents the estimated annual incidence of fall events resulting in injury and hospitalisation in 2007–08 for people aged 65 and older.

During 2007–08, nearly 2.9 million hospital separations in Australia involved people aged 65 and older (AIHW 2009a). Of these, 108,618 (3.8%) had a principal diagnosis in the range S00–T75 or T79, denoting community injury (that is, excluding injuries sustained in the context of surgical and medical care, such as complications or sequelae). More than three-quarters of these injury separations (76.9%, *n* = 83,490) also had a first external cause code in the range W00–W19, denoting an unintentional fall (Table 2.1).

The number of new cases of fall-related injury resulting in hospitalisation is difficult to estimate accurately due to certain limitations of data available at a national level. The incidence of injury events resulting in hospitalisation can, however, be estimated from the NHMD by excluding any separation meeting the specified selection criteria that also has a mode of admission denoting 'transfer from another acute hospital' (see Appendix A). This method accounts for transfers between hospitals but not re-admissions, if these are also recorded as injury cases due to a fall.

Calculated in this way, the estimated number of hospitalised injury cases due to falls in people aged 65 and over in 2007–08 was 74,414—a rise of 2,668 (3.7%) since the previous year (see Bradley 2012). As in 2006–07, these 74,414 fall injury cases represent 2.6% of all hospital separations for the population aged 65 and older in 2007–08 (Table 2.1).

**Table 2.1: Key indicators for hospital separations of people aged 65+, Australia 2007–08**

| Key indicators | Males | Females | Persons[(b)] |
|---|---|---|---|
| All hospital separations 2007–08, aged 65+[(a)] | 1,481,198 | 1,380,683 | 2,861,895 |
| Principal diagnosis S00–T75 or T79 | 37,542 | 71,076 | 108,618 |
| Principal diagnosis S00–T75 or T79 and external cause W00–W19 | 25,187 | 58,303 | 83,490 |
| | | | |
| Estimated fall injury cases | 22,459 | 51,955 | 74,414 |
| As percentage of all hospital separations aged 65+ | 1.5% | 3.8% | 2.6% |
| As percentage of all S00–T75 or T79 injuries aged 65+ | 59.8% | 73.1% | 68.5% |
| | | | |
| Mean length of stay for fall injury cases: days (SD) | 7.3 (10.0) | 7.7 (14.3) | 7.6 (13.1) |
| Total patient days, fall injury cases | 164,186 | 399,176 | 563,362 |
| As percentage of all hospital patient days aged 65+ | 2.9% | 6.1% | 4.6% |

(a) Data source: *Australian hospital statistics 2007–08* (AIHW 2009a).

(b) Persons totals include separations for which sex was not reported.

The age-standardised rate of fall injury cases for people aged 65 and older in 2007–08 was 2,516 per 100,000 population, a slightly higher figure than that estimated for 2006–07 (Bradley 2012).

# Age and sex

Females aged 65 and older sustained a greater number of hospitalised fall injuries than males, constituting 69.8% of the cases in 2007–08 ($n$ = 51,955). The age-standardised rate of hospitalised falls for older females was also higher than that for older males; the rate of fall cases for females aged 65 and older was 2,964 per 100,000 population, while the rate of fall cases for males 65 and older was 1,894 per 100,000 population. This represents a male: female (M:F) rate ratio of 0.6 hospitalised falls for males for every 1.0 female case.

Further, the females aged 65 and older who were hospitalised due to an injurious fall were significantly older than the males similarly hospitalised (Mann Whitney U test, $p < 0.001$). The mean age of females hospitalised due to an injurious fall was 82.4 (± 7.9 SD) while the mean age of males was 80.3 (± 8.0 SD). (All persons: 81.7 ± 8.0 SD).

Age-specific rates of fall injury cases increase markedly with age. In 2007–08, the highest rate observed for hospitalised cases was for persons aged 95 and older; 12,437 cases per 100,000 population. This is a somewhat lower rate for this age group than observed in 2006–07 (12,824 per 100,000, see Bradley 2012). Figure 2.1 presents the age-specific rates of fall injury cases for males and females aged 65 and older. The rate of fall injury cases was greater for females than males in all age groups (as indicated by the 95% confidence intervals). This difference was greatest for people aged 75–79, for whom the M:F rate ratio was 0.59 to 1.00 (that is, hospitalised falls involving males occurred at just over half the rate of falls involving females). For people aged 95 and older, however, this difference was the least, with an M:F ratio of 0.80 to 1.00.

Figure 2.1 demonstrates that the rate of serious falls was substantially higher for persons aged 75 and older for both sexes. While convention maintains that fall injury indicators include all people aged 65 and older, following Pointer et al. (2003) we also present age-standardised rates of fall injury cases specifically for the population aged 75 and over. In this older aged population, the rate of fall injury cases was almost double that for the population aged 65 and over—4,269 per 100,000 persons.

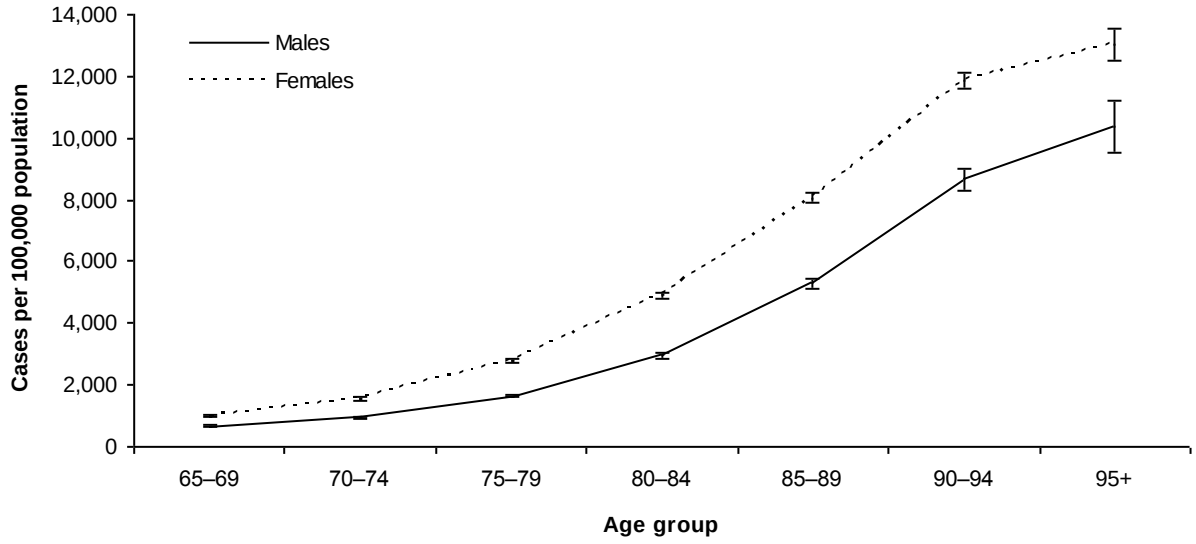



**Figure 2.1: Age-specific rates of fall injury cases (± 95% CI); males and females aged 65+, Australia 2007–08**

# Injury type

As in previous years, the largest proportion of fall injury cases for both males and females resulted in injuries to the hip and thigh (Table 2.2). Fractures of the neck of the femur (also called hip fractures; cases with a principal diagnosis of S72.0–S72.2) accounted for most injuries to the hip and thigh. A higher proportion of cases involving females resulted in injuries to the hip and thigh, and fractures of the neck of the femur, than for males. The proportion of persons with a principal diagnosis of an injury to the hip and thigh in 2007–08 was slightly lower than that in previous years (30.0%, compared with 30.3% in 2006–07; 31.1% in 2005–06; and, 33.5% in 2003–04). This is commensurate with a declining trend for rates of hip fracture observed since 1999–00 (Bradley 2012; see also Cassell and Clapperton 2008).

Injuries to the head were the second most common principal diagnosis for both males and females, constituting 18.6% of all fall cases. Again, this is a rise in proportion compared with that for previous years and is consistent with a significant increasing trend in rates for fall-related head injury cases since 1999–00 (approximately 7% increase annually, see Bradley 2012). Unlike hip fractures due to falls, however, the proportion of males who suffered head injuries was much higher (24.6%) than for females (15.9%).

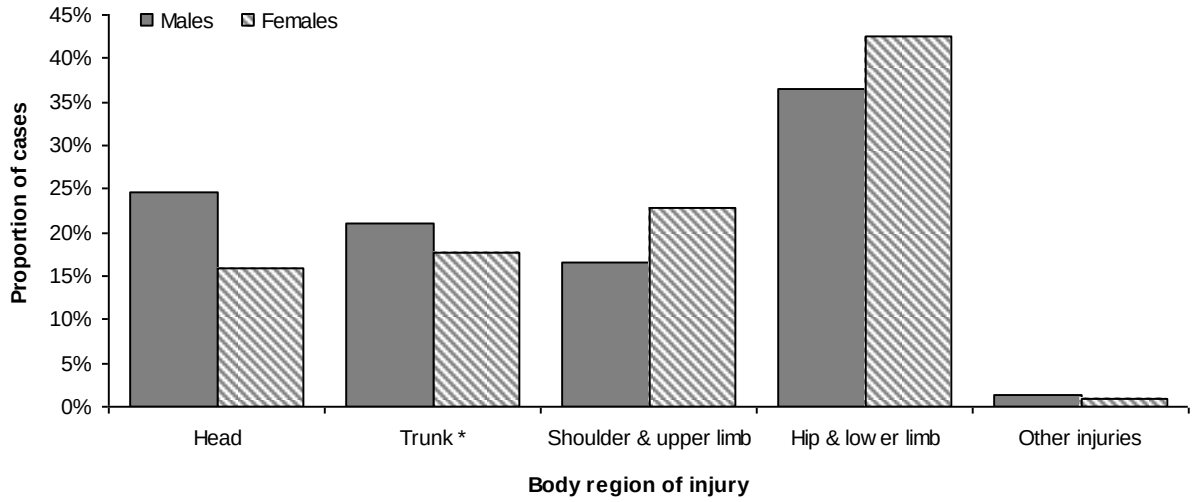
**Table 2.2: Principal diagnosis injury types for fall injury cases; males, females and persons aged 65+, Australia 2007–08**

| Principal diagnosis | Males | Females | Persons |
|---|---|---|---|
| Injuries to the head | 5,528 (24.6%) | 8,280 (15.9%) | 13,808 (18.6%) |
| Injuries to the neck | 407 (1.8%) | 520 (1.0%) | 927 (1.2%) |
| Injuries to the thorax | 2,049 (9.1%) | 2,631 (5.1%) | 4,680 (6.3%) |
| Injuries to the abdomen, lower back, lumbar spine and pelvis | 2,250 (10.0%) | 6,079 (11.7%) | 8,329 (11.2%) |
| Injuries to the shoulder and upper arm | 1,886 (8.4%) | 5,263 (10.1%) | 7,149 (9.6%) |
| Injuries to the elbow and forearm | 1,262 (5.6%) | 5,818 (11.2%) | 7,080 (9.5%) |
| Injuries to the wrist and hand | 576 (2.6%) | 809 (1.6%) | 1,385 (1.9%) |
| Fractured neck of femur | 4,530 (20.2%) | 12,338 (23.7%) | 16,868 (22.7%) |
| Other hip and thigh injuries | 1,591 (7.1%) | 3,836 (7.4%) | 5,427 (7.3%) |
| *Total injuries to the hip and thigh* | *6,121 (27.3%)* | *16,174 (31.1%)* | *22,295 (30.0%)* |
| Injuries to the knee and lower leg | 1,803 (8.0%) | 5,123 (9.9%) | 6,926 (9.3%) |
| Injuries to the ankle and foot | 256 (1.1%) | 754 (1.5%) | 1,010 (1.4%) |
| Injuries involving multiple body regions | 26 (0.1%) | 35 (0.1%) | 61 (0.1%) |
| Injuries to unspecified parts of trunk, limb or body region | 186 (0.8%) | 319 (0.6%) | 505 (0.7%) |
| Burns | n.p. (0.0%) | n.p. (0.0%) | n.p. (0.0%) |
| Poisoning by drugs, medicaments and biological substances | n.p. (0.0%) | n.p. (0.0%) | n.p. (0.0%) |
| Toxic effects of non-medicinal substances | n.p. (0.0%) | n.p. (0.0%) | n.p. (0.0%) |
| Other and unspecified effects of external causes | 11 (0.0%) | 21 (0.0%) | 32 (0.0%) |
| Certain early complications of trauma | 93 (0.4%) | 125 (0.2%) | 218 (0.3%) |
| **Total** | **22,459 (100.0%** | **51,955 (100.0%)** | **74,414 (100%)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

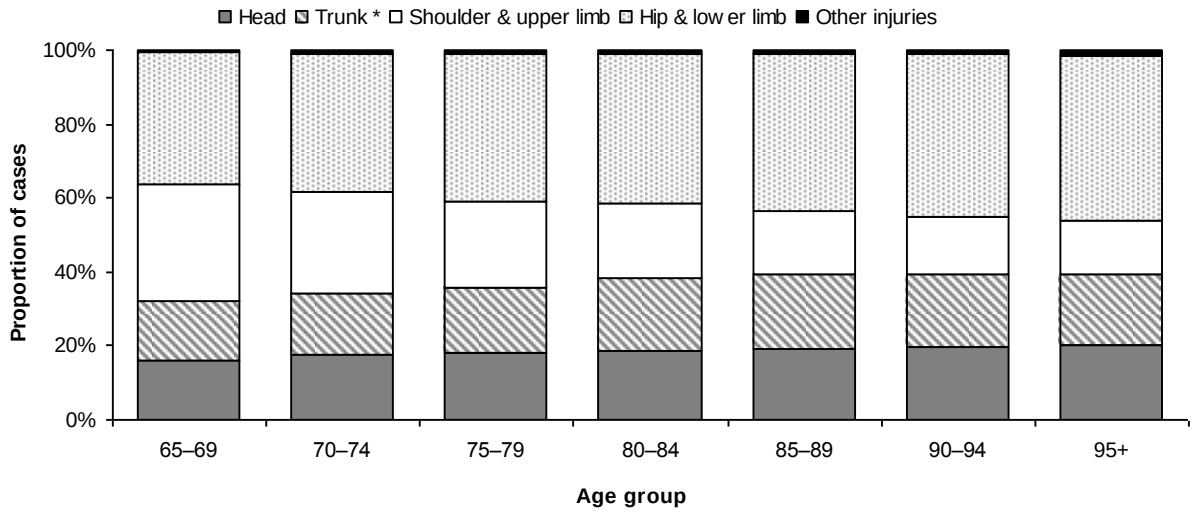
Presenting a similar picture to that observed in previous reports, Figure 2.2 highlights the differences in the types of injury sustained by males and females aged 65 and older in 2007–08. Males sustained proportionately more injuries to the head and trunk regions while females sustained proportionately more injuries to the shoulder and upper limbs and to the hip and lower limbs.

Figure 2.3 describes the body region injured for falls injury cases for all people aged 65 and older in 2007–08, for five-year age groups. Of most interest, the proportion of injuries to the shoulder and upper limbs declined with increasing age while the proportion of injuries to the hip and lower limbs, and head injuries, increased.




* Trunk includes neck, thorax, abdomen, lower back, lumbar spine and pelvis.

**Figure 2.2: Major body region injured according to the principal diagnosis for fall injury cases; males and females aged 65+, Australia 2007–08**




* Trunk includes neck, thorax, abdomen, lower back, lumbar spine and pelvis.

**Figure 2.3: Major body region injured according to the principal diagnosis by age; fall injury cases involving people aged 65+, Australia 2007–08**

## Fractures

Two-thirds (62.2%, *n* = 46,279) of people aged 65 and older who were hospitalised due to an injurious fall in 2007–08 sustained at least one fracture; this is a slight decrease from the proportion observed in previous years. The number of fractures present in the multiple diagnosis fields of the case separations in 2007–08 ranged from 0 (37.8%, *n* = 28,135) to 15 (*n* = 1). Most people hospitalised due to a fall injury sustained a single fracture (54.6%, *n* = 40,615), and a higher proportion of females sustained fractures than males (66.0% and 53.5%, respectively).

Fall cases with a principal diagnosis denoting injuries to the elbow and forearm and injuries to the hip and thigh had the largest proportion of fractures present in the record; 83.3% (*n* = 5,900) and 82.8% (*n* = 18,458), respectively (see Table 2.3). Injuries to the hip and thigh accounted for the greatest proportion of all fracture-related fall injury cases, about two in every five such injuries (39.9%). The vast majority of these hip and thigh cases (91.4%) had a principal diagnosis of fractured neck of femur.

Fracture-related fall injury cases that had a principal diagnosis of fractured neck of femur (*n* = 16,868) occurred at an age-standardised rate of 561 per 100,000 population in 2007–08. As indicated earlier, this is a slightly lower rate than that observed in previous years. Females aged 65 and older in 2007–08 had a higher rate of fall-related fractured neck of femur (678 cases per 100,000) than males (392 per 100,000). Age-specific rates of fall-related fractured neck of femur injuries were highest for people aged 95 and older; 3,379 per 100,000, compared with 97 per 100,000 for people aged 65–69.

While the rate of hospitalised fall injury cases involving fractures increased with age, fracture cases represented a decreasing proportion of all fall injury cases as age increased (Figure 2.4). However, Figure 2.4 also shows that the rate of hip fractures increased as a proportion of all fall-related fracture cases. The age-related decrease in fall injury cases involving fractures can be seen to be largely driven by decreases in the proportion of fracture-related falls injuries involving females, as the proportion of cases involving fractures remained fairly consistent for males (Figure 2.5).

**Table 2.3: Principal diagnosis injury type for fall injury cases involving fractures; males, females and persons 65+, Australia 2007–08**

| Principal diagnosis | Males | Females | Persons | Per cent of case type |
|---|---|---|---|---|
| Injuries to the head | 810 (6.7%) | 1,218 (3.6%) | 2,028 (4.4%) | 14.7% |
| Injuries to the neck | 269 (2.2%) | 303 (0.9%) | 572 (1.2%) | 61.7% |
| Injuries to the thorax | 1,553 (12.9%) | 1,939 (5.7%) | 3,492 (7.5%) | 74.6% |
| Injuries to the abdomen, lower back, lumbar spine and pelvis | 1,363 (11.4%) | 4,471 (13.0%) | 5,834 (12.6%) | 70.0% |
| Injuries to the shoulder and upper arm | 1,119 (9.3%) | 3,893 (11.4%) | 5,012 (10.8%) | 70.1% |
| Injuries to the elbow and forearm | 703 (5.9%) | 5,197 (15.2%) | 5,900 (12.7%) | 83.3% |
| Injuries to the wrist and hand | 210 (1.7%) | 419 (1.2%) | 629 (1.4%) | 45.4% |
| Fractured neck of femur | 4,530 (37.7%) | 12,338 (36.0%) | 16,868 (36.4%) | 100.0% |
| Other hip and thigh injuries | 366 (3.0%) | 1,224 (3.6%) | 1,590 (3.4%) | 29.3% |
| *Total injuries to the hip and thigh* | *4,896 (40.8%)* | *13,562 (39.6%)* | *18,458 (39.9%)* | *82.8%* |
| Injuries to the knee and lower leg | 924 (7.7%) | 2,901 (8.5%) | 3,825 (8.3%) | 55.2% |
| Injuries to the ankle and foot | 141 (1.2%) | 349 (1.0%) | 490 (1.1%) | 48.5% |
| Other diagnoses | 19 (0.2%) | 20 (0.1%) | 39 (0.1%) | 4.8% |
| **Total** | **12,007 (100.0%)** | **34,272 (100.0%)** | **46,279 (100.0%)** | **62.2%** |

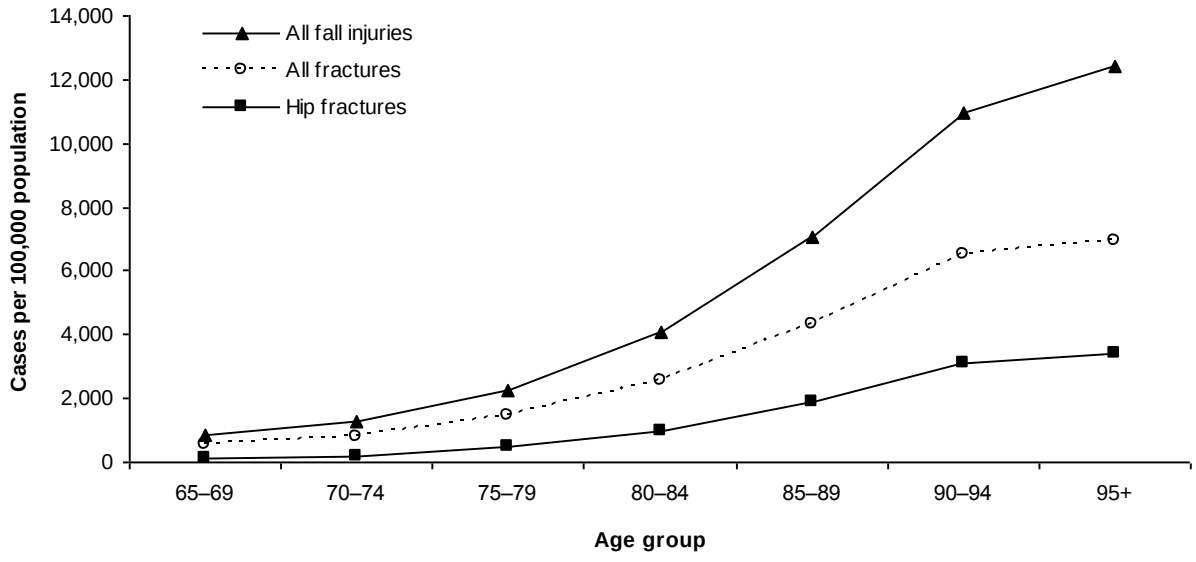



**Figure 2.4: Age-specific rates of fall injury cases; hip fractures, all fractures and all fall injuries. Persons aged 65+, Australia 2007–08**

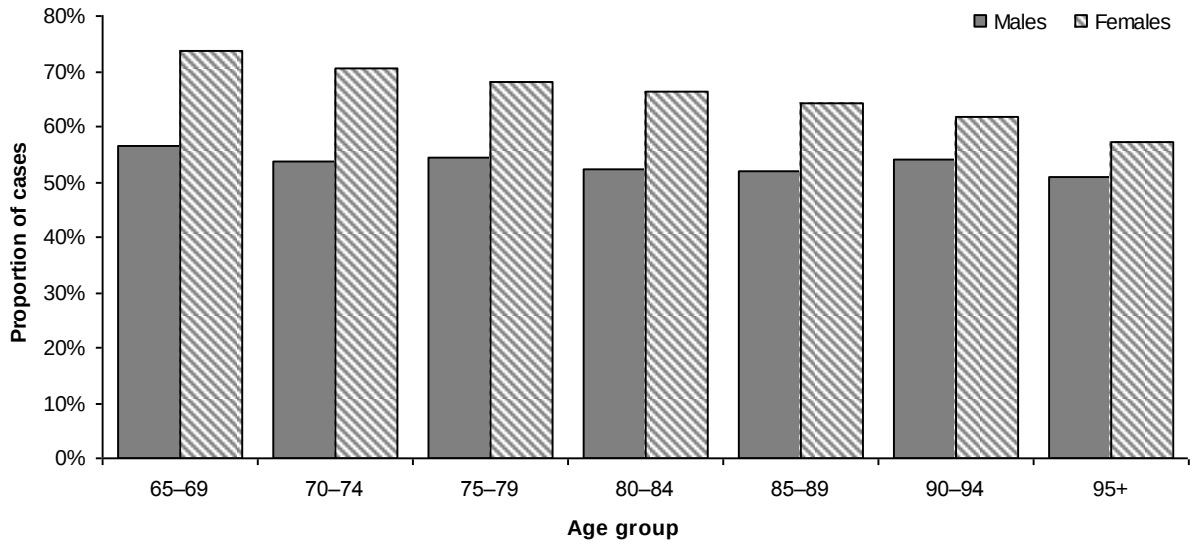



**Figure 2.5: Fall injury cases involving fractures as a proportion of the total number of hospitalised cases; males and females aged 65+, Australia 2007–08**

# Severity

An ICD-based injury severity score (ICISS) of less than 0.941 is considered to represent a high threat to life (see Henley and Harrison 2009; Stephenson et al. 2003). On the basis of the injury diagnoses contained in the records, not just fracture diagnoses, the average ICISS score (multiplicative method) for all fall injury cases was 0.939 (± 0.077 SD). This is the same level of severity as observed for fall cases in 2006–07.

# Geographical distribution

## State or territory of usual residence

Age-standardised rates of hospitalised fall injury cases for people aged 65 and older in 2007–08 varied according to the jurisdiction of the person's usual residence (Figure 2.6). Older residents of Queensland, Western Australia, South Australia and Tasmania all had rates of hospitalised fall injuries that were lower than that for Australia as a whole. Conversely, older residents of New South Wales and Victoria had rates of hospitalised fall injuries higher than that for all Australia. This is a similar pattern to that observed in previous years (see Bradley 2012; Bradley and Harrison 2007).

Rates of hospitalised fall injuries involving females aged 65 and older in 2007–08 were higher than those for males in all jurisdictions. The highest age-standardised rate for females was observed for Victorians (3,231 per 100,000 population) and the lowest for Tasmanians (2,253 per 100,000). For males, the highest rate observed was for New South Wales (2,031 per 100,000) and, as for females, the lowest for Tasmania (1,391 per 100,000).

Age-standardised rates of hip fracture (principal diagnoses S72.0–S72.2) varied to a lesser degree by jurisdiction of residence than all fall injury cases (Figure 2.7). For most jurisdictions, 95% confidence intervals for the rates crossed, or approached, the national rate, suggesting that there is not a substantial difference between these rates of hospitalised hip fracture. The exceptions to this were hip fracture rates for Queensland (higher than the national rate) and Western Australia (lower than the national rate). The pattern of rates of hip fracture across the jurisdictions does not closely reflect that for all hospitalised falls (that is, Figure 2.6).

Similar to all fall cases, rates of hospitalised hip fractures for females aged 65 and older in 2007–08 were higher than those for males in all jurisdictions except the Northern Territory (largely due to small case numbers).

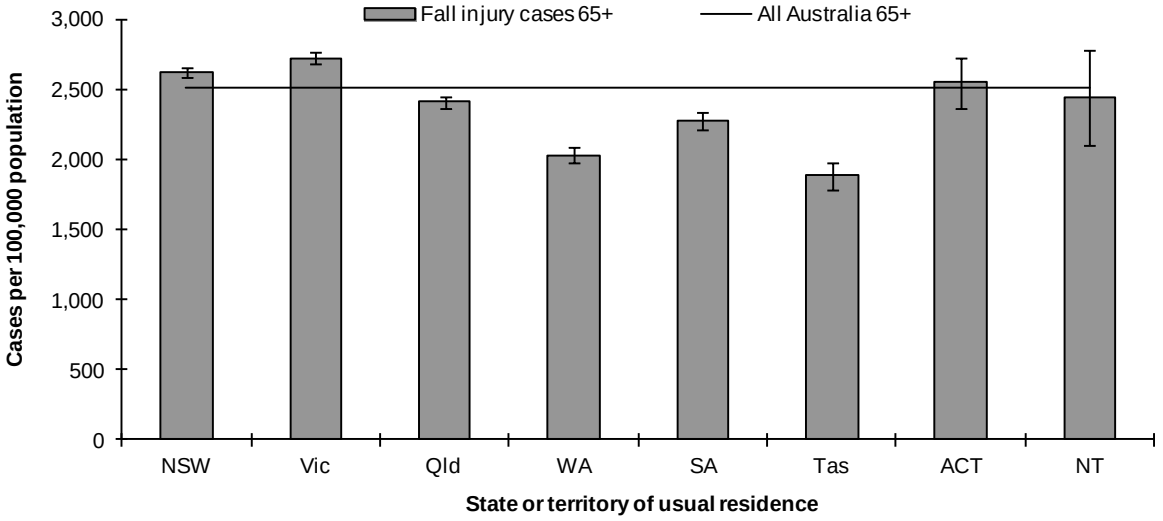



**Figure 2.6: Age-standardised rates of fall injury cases (± 95% CI) by state or territory of usual residence; persons aged 65+, 2007–08**

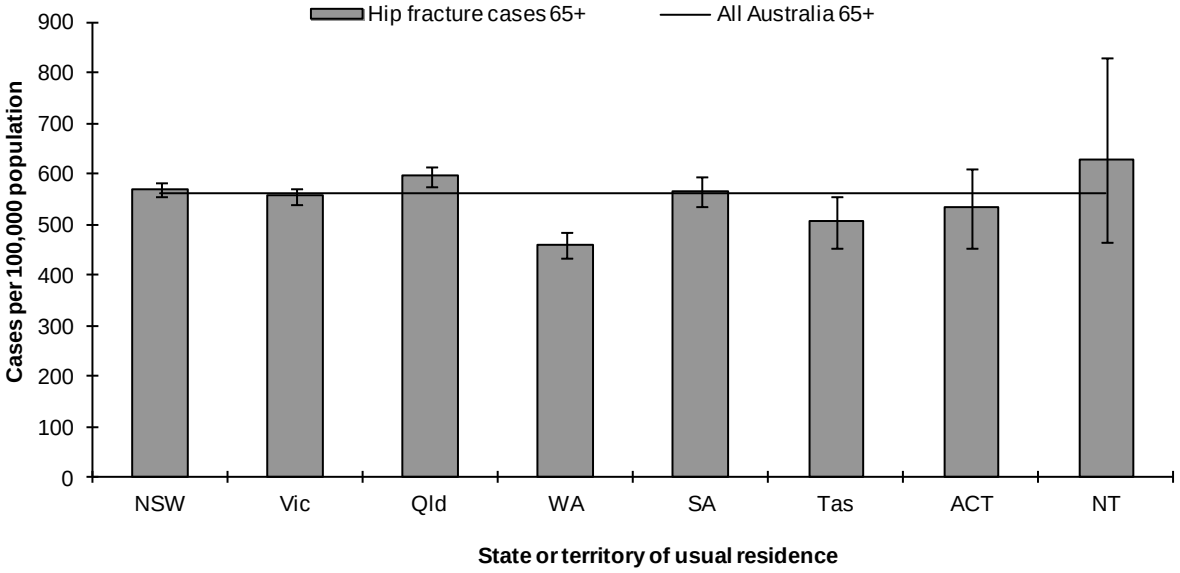



**Figure 2.7: Age-standardised rates of hip fracture cases (± 95% CI) by state or territory of usual residence; persons aged 65+, 2007–08**

## Remoteness of usual residence

Age-standardised rates of hospitalised falls involving people aged 65 and older in 2007–08 were calculated according to the Australian Standard Geographical Classification of the remoteness of the place of usual residence (see ABS 2008b). These data are available from the Australian Bureau of Statistics (ABS) only for the year ending 30 June (see ABS 2008b). Accordingly, values for 31 December were calculated using the mean of the population estimates for 2007 and 2008.

Rates were quite similar for all remoteness zones (Figure 2.8). This is a somewhat different picture than that observed in previous years: the rate of hospitalised fall injuries for people aged 65 and older living in *Very remote* regions in 2007–08 was similar to the rates of falls in all other regions. In previous years, the rate of hospitalised falls for people living in *Very remote* regions was lower than those in other regions, particularly at older ages (see Bradley 2012; Bradley and Harrison 2007).

Table 2.4 replicates a table describing 2003–04 data that was presented in Bradley and Harrison (2007). From the rates and rate-ratios presented here, it appears that rates of falls involving residents of *Very remote* areas are becoming more like those for residents of *Major cities* (and thus the rest of the Australian population), for both sexes and most age groups.

The underlying drivers of these rates are unknown, and are of interest as overall injury rates (for falls and other causes) are usually much higher for residents of the more remote regions of Australia (see Bradley and Harrison 2008). We have previously proposed that the lower rates of hospitalised fall injuries for older residents of *Very remote* areas may be due to a number of factors, including; the influence of proximity to health services (for example, maybe only the most serious fall injuries are admitted to hospital if the person lives some distance from health services), a 'survivor effect' (for example, it is possible that only the most healthy, robust individuals stay living in *Very remote* regions in older age) and a 'non-survivor effect' (whereby serious falls in older people in *Very remote* locations may result in the person's death before they can reach hospital). The observation of more

comparable hospitalised falls rates for residents of *Very remote* areas in 2007–08, then, may be related to changes in such factors. For example, improved health service provision in *Very remote* areas may result in cases being more readily admitted to hospital, increasing the frequency of admission for less serious fall injuries as well as for the very serious ones (which may have proved fatal if not for rapid transport to appropriate medical attention). Similarly, increasing policy emphasis on enabling older people to 'age in place' may be allowing the more frail older population of *Very remote* areas to access the services required to remain in their homes and negate the need to move to less remote areas (that is, ameliorating the 'survivor effect' proposed above).

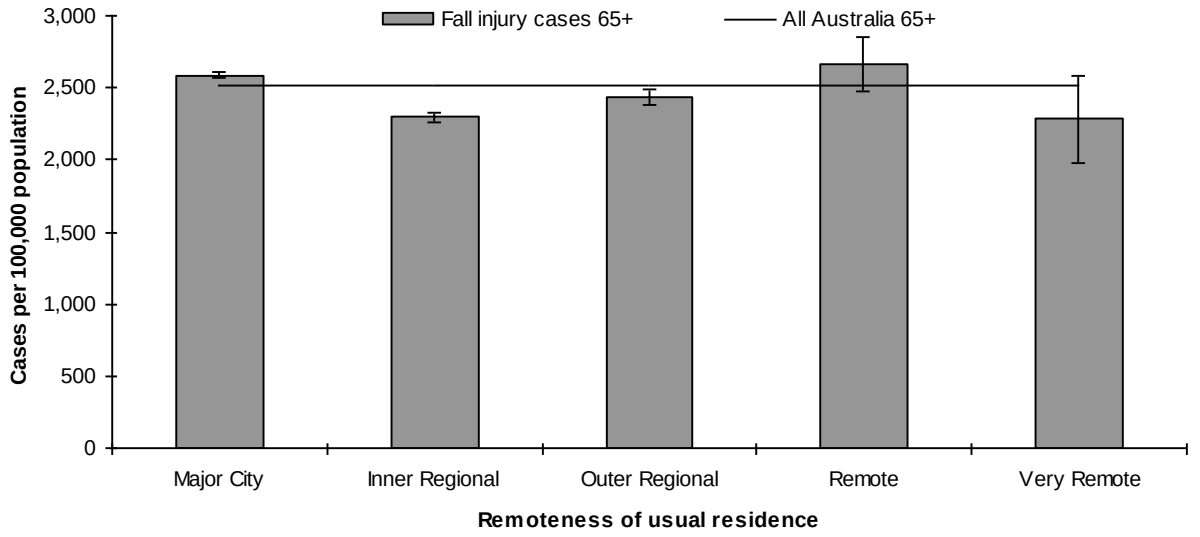



**Figure 2.8: Age-standardised rates of fall injury cases (± 95% CI) by remoteness of usual residence, persons aged 65+ 2007–08**

**Table 2.4: Age-specific rates of hospitalised fall cases (per 100,000 population) for males and females aged 65+ living in *Major cities* versus *Very remote* regions of Australia 2007–08**

| | Males | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Major cities*** | ***Very remote*** | **Ratio 07–08** | **Ratio 03–04** | ***Major cities*** | ***Very remote*** | **Ratio 07–08** | **Ratio 03–04** |
| 65–69 | 691 | 990 | 0.7 | 1.2 | 976 | 1,465 | 0.7 | 0.8 |
| 70–74 | 979 | 1,320 | 0.7 | 0.7 | 1,561 | 1,897 | 0.8 | 1.6 |
| 75–79 | 1,721 | 1,383 | 1.2 | 1.5 | 2,834 | 2,933 | 1.0 | 1.2 |
| 80–84 | 3,066 | 2,642 | 1.2 | 2.0 | 5,013 | 5,534 | 0.9 | 1.7 |
| 85+ | 6,496 | 3,738 | 1.7 | 2.2 | 9,748 | 5,573 | 1.7 | 2.5 |
| **Age-standardised rate 65+** | **1,940** | **1,683** | **1.2** | **1.5** | **3,028** | **2,890** | **1.0** | **1.6** |

Changes in the patterns of hip fracture due to falls in older people are also observed for 2007–08 hospitals data (Figure 2.9). Unlike the previous year, when rates of hip fracture cases were highest for residents of *Outer regional* areas and lowest for residents of *Very remote* areas, rates of hip fracture in 2007–08 were highest for residents of *Very remote* regions (613 per 100,000 population).

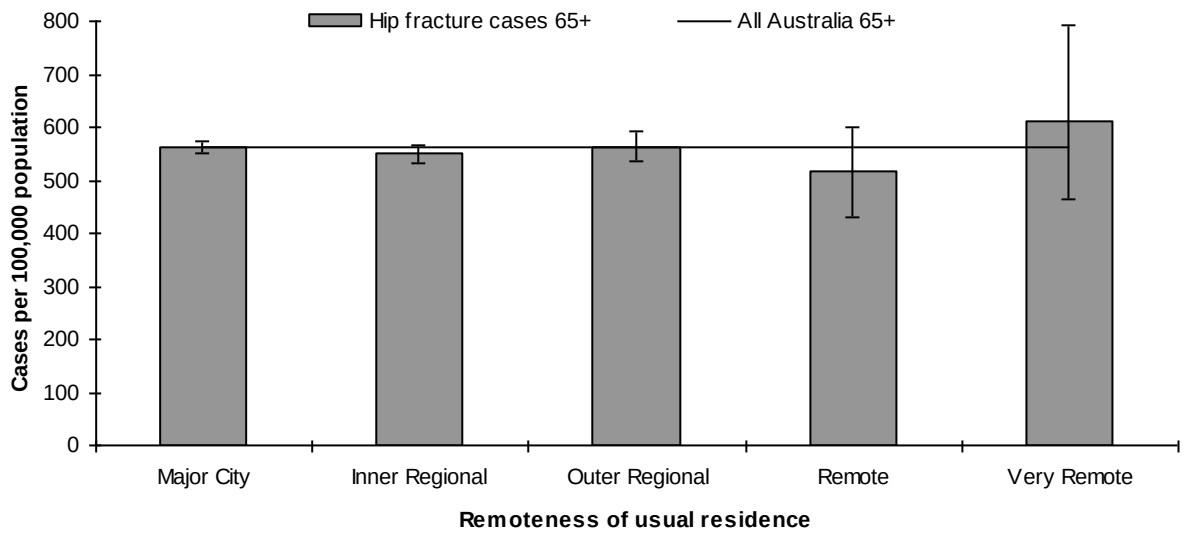



**Figure 2.9: Age-standardised rates of hip fracture cases (± 95% CI) by remoteness of usual residence, persons aged 65+ 2007–08**

# 3 Circumstances of fall injury cases

This chapter describes the circumstances of occurrence of the hospitalised fall injury cases for people aged 65 and older in 2007–08 (those included in Chapter Two).

The 2007–08 data-year was the second to be coded to the fifth edition of the ICD-10-AM (NCCH 2006). In this edition, a number of fourth-character external cause codes were introduced in order to better describe some fall events. These events included falls involving pedestrian conveyances; falls involving beds, chairs and other furniture; and 'other fall on same level'. The revision of these external cause codes gives a far greater level of detail as to the mechanism of older people's injurious falls.

As in previous years, most of hospitalised fall injury cases for people aged 65 and older in 2007–08 were recorded as falls on the same level from slipping, tripping and stumbling (33.0%, see Table 3.1). Slips, trips and stumbles were proportionately more common for females than for males and, for both sexes, most of these types of fall (62.4%) were explicitly attributed to tripping. Similarly, unspecified falls (accounting for 28.3% of cases) and 'other fall on same level' (20.3%) remained the second- and third-most common types of injurious fall resulting in the hospitalisation of people aged 65 and over in 2007–08.

Most 'other fall on same level' were coded to the other or unspecified categories within W18 (90.1% of the 15,122 cases coded to W18) and only small proportions of cases were coded as falls due to bumping against objects (4.4% of cases coded to W18), from or off toilets (4.3%) and in or into bathtubs or showers (not resulting in drowning, 1.3%). Likewise, cases coded to the other newly expanded external cause categories of the fifth edition of the ICD-10-AM were generally assigned to the relevant other and/or unspecified categories of the code (for example, W07.9 rather than, say, W07.3).

Similarly, and as in 2006–07, the expanded fourth-character coding for W02 (falls involving pedestrian conveyances) suggests that falls by older people of this type generally involve 'other and unspecified' pedestrian conveyances, likely to be mobility scooters. Nine in ten (91.4%, $n$ = 235) of the fall cases involving people aged 65 and older coded to W02 in 2007–08 were attributed to 'other and unspecified' pedestrian conveyances.

**Table 3.1: Causes of hospitalised fall injury cases: first external cause code for males, females and persons aged 65+, Australia 2007–08**

| External cause | Males | Females | Persons |
|---|---|---|---|
| Fall on same level involving ice and snow (W00) | n.p. (0.0%) | n.p. (0.0%) | 7 (0.0%) |
| Fall on same level from slipping (W01.0) | 1,781 (7.9%) | 4,737 (9.1%) | 6,518 (8.8%) |
| Fall on same level from tripping (W01.1) | 3,980 (17.7%) | 11,344 (21.8%) | 15,324 (20.6%) |
| Fall on same level from stumbling (W01.2) | 814 (3.6%) | 1,894 (3.6%) | 2,708 (3.6%) |
| *Total fall on same level from slipping, tripping and stumbling (W01)** | *6,575 (29.3%)* | *17,975 (34.6%)* | *24,550 (33.0%)* |
| Fall involving other and unspecified pedestrian conveyance (W02.9) | 119 (0.5%) | 116 (0.2%) | 235 (0.3%) |
| *Total fall involving pedestrian conveyances (W02)** | *133 (0.6%)* | *124 (0.2%)* | *257 (0.3%)* |
| Other fall on same level due to collision with another person (W03) | 53 (0.2%) | 181 (0.3%) | 234 (0.3%) |
| Fall while being carried or supported by other persons (W04) | n.p. (0.0%) | n.p. (0.0%) | 16 (0.0%) |
| Fall involving wheelchair (W05) | 187 (0.8%) | 311 (0.6%) | 498 (0.7%) |
| Fall involving special purpose bed (W06.1) | 103 (0.5%) | 240 (0.5%) | 343 (0.5%) |
| Fall involving conventional bed (W06.6) | 192 (0.9%) | 452 (0.9%) | 644 (0.9%) |
| Fall involving other specified bed (W06.8) | 15 (0.1%) | 33 (0.1%) | 48 (0.1%) |
| Fall involving unspecified bed (W06.9) | 634 (2.8%) | 1,563 (3.0%) | 2,197 (3.0%) |
| *Total fall involving bed (W06)** | *948 (4.2%)* | *2,293 (4.4%)* | *3,241 (4.4%)* |
| Fall involving stool (W07.3) | 61 (0.3%) | 125 (0.2%) | 186 (0.2%) |
| Fall involving bath chair (W07.5) | 11 (0.0%) | 48 (0.1%) | 59 (0.1%) |
| Fall involving commode chair (W07.6) | 13 (0.1%) | 98 (0.2%) | 111 (0.1%) |
| Fall involving other specified chair (W07.8) | 169 (0.8%) | 386 (0.7%) | 555 (0.7%) |
| Fall involving unspecified chair (W07.9) | 393 (1.7%) | 880 (1.7%) | 1,273 (1.7%) |
| *Total fall involving chair (W07)** | *662 (2.9%)* | *1,608 (3.1%)* | *2,270 (3.1%)* |
| Fall involving table (W08.2) | 31 (0.1%) | 47 (0.1%) | 78 (0.1%) |
| *Total fall involving other furniture (W08)** | *56 (0.2%)* | *105 (0.2%)* | *161 (0.2%)* |
| Fall involving playground equipment (W09) | n.p. (0.0%) | n.p. (0.0%) | 7 (0.0%) |
| Fall on and from stairs and steps (W10) | 1,413 (6.3%) | 3,045 (5.9%) | 4,458 (6.0%) |
| Fall on and from ladder (W11) | 1,005 (4.5%) | 278 (0.5%) | 1,283 (1.7%) |
| Fall on and from scaffolding (W12) | 30 (0.1%) | 0 (0.0%) | 30 (0.0%) |
| Fall from or through balcony or verandah (W13.0) | 32 (0.1%) | 31 (0.1%) | 63 (0.1%) |
| Fall out of or through window (W13.1) | 13 (0.1%) | 7 (0.0%) | 20 (0.0%) |
| Fall from roof (W13.3) | 82 (0.4%) | 6 (0.0%) | 88 (0.1%) |
| Fall through roof (W13.4) | 33 (0.1%) | 0 (0.0%) | 33 (0.0%) |
| Fall from, out of or through other specified building or structure (W13.8) | 71 (0.3%) | 45 (0.1%) | 116 (0.2%) |
| *Total fall from, out of or through building or structure (W13)** | *246 (1.1%)* | *105 (0.2%)* | *351 (0.5%)* |

*(continued)*

**Table 3.1 (continued): Causes of hospitalised fall injury cases: first external cause code for males, females and persons aged 65+, Australia 2007–08**

| External cause* | Males | Females | Persons |
|---|---|---|---|
| Fall from tree (W14) | n.p. (0.2%) | n.p. (0.0%) | 48 (0.1%) |
| Fall from cliff (W15) | 32 (0.1%) | 26 (0.1%) | 58 (0.1%) |
| Diving or jumping into water causing injury other than drowning (W16) | n.p. (0.0%) | n.p. (0.0%) | 10 (0.0%) |
| Other fall from one level to another (W17) | 363 (1.6%) | 425 (0.8%) | 788 (1.1%) |
| Fall from bumping against object (W18.0) | 209 (0.9%) | 450 (0.9%) | 659 (0.9%) |
| Fall from or off toilet (W18.1) | 131 (0.6%) | 515 (1.0%) | 646 (0.9%) |
| Fall in or into bathtub or shower (W18.2) | 78 (0.3%) | 115 (0.2%) | 193 (0.3%) |
| Other specified fall on same level (W18.8) | 1,070 (4.8%) | 2,398 (4.6%) | 3,468 (4.7%) |
| Unspecified fall on same level (W18.9) | 3,026 (13.5%) | 7,130 (13.7%) | 10,156 (13.6%) |
| *Total other fall on same level (W18)** | *4,514 (20.1%)* | *10,608 (20.4%)* | *15,122 (20.3%)* |
| Unspecified fall (W19) | 6,185 (27.5%) | 14,840 (28.6%) | 21,025 (28.3%) |
| **Total** | **22,459 (100.0%)** | **51,955(100.0%)** | **74,414 (100.0%)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

* Some totals include cases from categories omitted from the table due to small counts.

# Place of occurrence

As in previous years, half of all hospitalised fall injury cases involving people aged 65 and older in 2007–08 occurred in the home, including the driveway to the home (49.1%, see Table 3.2). Aged care facilities were the reported place of occurrence for a further 22.1% of hospitalised fall injury cases, with a greater proportion of cases involving females occurring here (24.0%) than for males (17.9%). These proportions are roughly similar to those recently reported for hospitalised osteoporotic hip fractures in Australia (AIHW 2010).

Place of occurrence was not specified in 16.4% of records for fall injury cases in 2007–08.

**Table 3.2: Place of occurrence for fall injury cases; males, females and persons aged 65+, Australia 2007–08**

| Place of occurrence | Males | Females | Persons |
|---|---|---|---|
| Driveway to home | 233 (1.0%) | 376 (0.7%) | 609 (0.8%) |
| Other and unspecified place in home | 10,793 (48.1%) | 25,143 (48.4%) | 35,936 (48.3%) |
| *Total home* | *11,026 (49.1%)* | *25,519 (49.1%)* | *36,545 (49.1%)* |
| Aged care facilities | 4,017 (17.9%) | 12,451 (24.0%) | 16,468 (22.1%) |
| Other and unspecified residential institutions | 82 (0.4%) | 165 (0.3%) | 247 (0.3%) |
| *Total residential institution* | *4,099 (18.3%)* | *12,616 (24.3%)* | *16,715 (22.5%)* |
| School | 5 (0.0%) | 27 (0.1%) | 32 (0.0%) |
| Health service area | 422 (1.9%) | 835 (1.6%) | 1,257 (1.7%) |
| Other specified institution and public administrative area | 103 (0.5%) | 282 (0.5%) | 385 (0.5%) |
| *Total specified institution and public administrative area* | *530 (2.4%)* | *1,144 (2.2%)* | *1,674 (2.2%)* |
| Sporting grounds (outdoor) | 88 (0.4%) | 102 (0.2%) | 190 (0.3%) |
| Sporting hall (indoor) | 12 (0.1%) | 31 (0.1%) | 43 (0.1%) |
| Other and unspecified sports and athletics areas | 52 (0.2%) | 63 (0.1%) | 115 (0.2%) |
| *Total sports and athletics areas* | *152 (0.7%)* | *196 (0.4%)* | *348 (0.5%)* |
| Roadway | 313 (1.4%) | 526 (1.0%) | 839 (1.1%) |
| Footpath | 780 (3.5%) | 1,469 (2.8%) | 2,249 (3.0%) |
| Other and unspecified public highway, street or road | 43 (0.2%) | 77 (0.1%) | 120 (0.2%) |
| *Total public highway, street or road* | *1,136 (5.1%)* | *2,072 (4.0%)* | *3,208 (4.3%)* |
| Shop and store | 379 (1.7%) | 998 (1.9%) | 1,377 (1.9%) |
| Cafe, hotel and restaurant | 271 (1.2%) | 371 (0.7%) | 642 (0.9%) |
| Other and unspecified trade and service area | 129 (0.6%) | 201 (0.4%) | 330 (0.4%) |
| *Total trade and service area* | *779 (3.5%)* | *1,570 (3.0%)* | *2,349 (3.2%)* |
| Industrial and construction area | 41 (0.2%) | 11 (0.0%) | 52 (0.1%) |
| Farm | 65 (0.3%) | 32 (0.1%) | 97 (0.1%) |
| Areas of water (e.g. streams, lakes, sea) | 27 (0.1%) | 29 (0.1%) | 56 (0.1%) |
| Beach | 53 (0.2%) | 71 (0.1%) | 124 (0.2%) |
| Forest | 22 (0.1%) | 34 (0.1%) | 56 (0.1%) |
| Other specified countryside | 19 (0.1%) | 19 (0.0%) | 38 (0.1%) |
| Car park | 79 (0.4%) | 171 (0.3%) | 250 (0.3%) |
| Other specified place of occurrence | 229 (1.0%) | 439 (0.8%) | 668 (0.9%) |
| *Total other specified place of occurrence* | *429 (1.9%)* | *763 (1.5%)* | *1,192 (1.6%)* |
| Unspecified place of occurrence | 4,200 (18.7%) | 8,021 (15.4%) | 12,221 (16.4%) |
| **Total*** | **22,459 (100.0%)** | **51,955 (100.0%)** | **74,414 (100.0%)** |

* Totals include 13 cases for which place of occurrence was not reported.

## Aged care facilities

Nearly one-quarter of injurious falls involving a person aged 65 or older that resulted in hospitalisation in 2007–08 were reported to have occurred in an aged care facility (*n* = 16,468, Table 3.2).

The 2003–04 falls report detailed the method by which the population of people aged 65 and older resident in aged care facilities is used to estimate the rate of falls in aged care facilities (Bradley and Harrison 2007, p. 15). This report similarly uses estimates of the resident population in aged care facilities. However, two years of population data (30 June 2007 and 30 June 2008) have been averaged to derive a 31 December 2007 estimate that is better suited for comparison with other rates presented for the financial year. These data were obtained from the relevant *Residential aged care in Australia* reports (AIHW 2008, 2009b; see also Appendix A).

As in previous years, the age-standardised rate of falls in aged care facilities involving people aged 65 and older who were resident in such facilities in 2007–08 was five times as high as the rate of falls in the home involving people aged 65 and older who were resident in the community. The rate of fall injury cases in aged care facilities for persons aged 65 and older living in residential facilities was 7,867 per 100,000 population, while the age-standardised rate of falls in the home for older persons living in the community was 1,434 per 100,000. Further, the age-standardised rates of falls by residents of aged care facilities were somewhat higher than those estimated for 2006–07, increasing by 4.1% for males (to 7,084 per 100,000) and by 2.2% for females (to 8,443 per 100,000). This is in keeping with trends observed for the 1999–2007 period (Bradley 2012).

The age-specific rates of fall injury cases that occurred in the home or in aged care facilities in 2007–08 are presented in Figure 3.1. As in 2006–07, the rate of hospitalised falls for the oldest males resident in aged care facilities was higher than the equivalent rate for females. The highest age-specific fall injury rates observed for residents of aged care facilities were 13,733 per 100,000 population for males aged 95 and older (compared with 6,413 per 100,000 for males of that age who were resident in the community and falling in the home) and 13,289 per 100,000 for females aged 90–94 (compared with 8,018 per 100,000 for females of that age who were resident in the community and falling in the home). While the actual number of fall injury cases for people aged 90 and older may be considered to be relatively small (*n* < 13,000 in 2007–08), given the predicted rise in the proportion of the population of this age (see ABS 2008c) we consider it important to report specific information for this group.

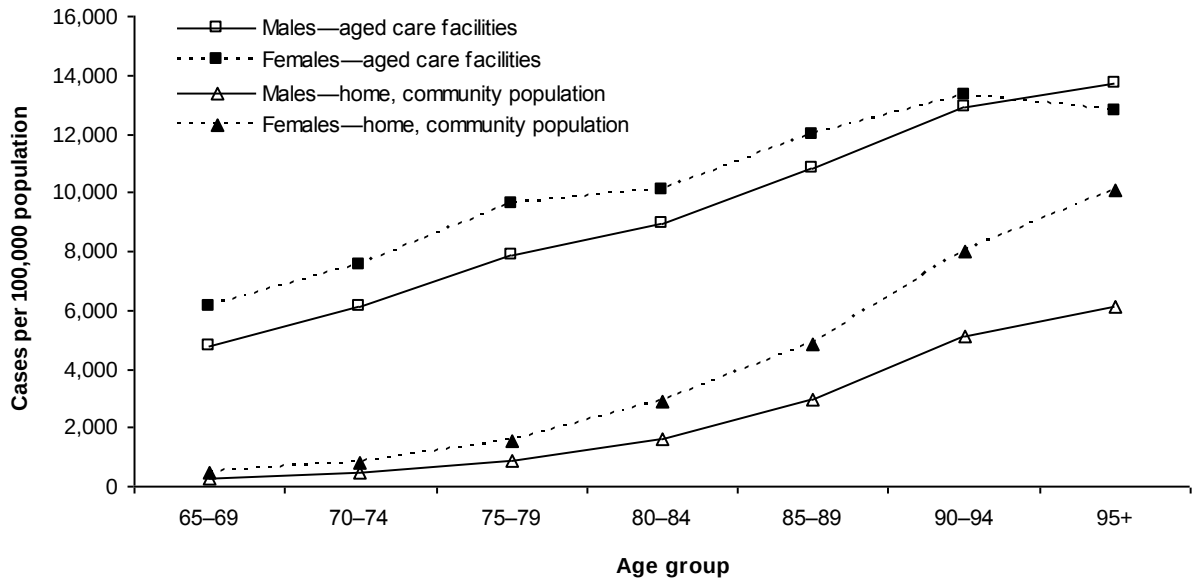



**Figure 3.1: Age-specific rates of falls in the home and in aged care facilities calculated using the estimated population of people resident in the general community and residential care: males and females 65+, Australia 2007–08**

# Activity when fall occurred

About two-thirds of the hospitalised fall injury cases for people aged 65 and older in 2007–08 were assigned a U73.9 activity code—'unspecified activity' (68.0%, see Table 3.3).

Of the 23,800 (32.0%) fall injury cases with a specified activity code, the most common activity engaged in at the time of the injurious fall was 'resting, sleeping, eating or engaging in other vital activities' (42.7% of cases with a specified activity, *n* = 10,161). The reported activity for a further 8,401 cases (35.3% of cases with a specified activity) was 'other specified activity'. These proportions are similar to those observed in previous years (see Bradley 2012; Bradley and Harrison 2007; Bradley and Pointer 2008) and little difference between males and females was noted for the reported activity engaged in at the time of the injurious fall.

Not surprisingly, rates of fall injuries coded as having been sustained while engaged in the presumably more vigorous types of listed activities (e.g. while engaged in sports, while working for income) decreased as age increased. Correspondingly, the rate of falls while resting, sleeping, eating or engaging in other vital activities increased markedly with age; from 69 per 100,000 population for those aged 65–69 to 2,383 per 100,000 for those aged 95 or older. Rates of fall cases coded to 'unspecified activity' also markedly increased with age; from 545 per 100,000 population for those aged 65–69 to 8,506 per 100,000 for those aged 95 or older.

Unlike coding for sport-related or income-producing work activities, there is no sub-categorisation of the activity codes most commonly recorded for hospitalised fall cases involving people aged 65 and older (NCCH 2006). Accordingly, as in previous years specific(and useful) information about the types of activity during which injurious falls by older people were sustained in 2007–08 was available for less than two per cent of cases.

**Table 3.3: Reported activity for fall injury cases; males, females and persons aged 65+, Australia 2007–08**

| Activity | Males | Females | Persons | Per cent specified |
|---|---|---|---|---|
| While engaged in sports | 236 (1.1%) | 377 (0.7%) | 613 (0.8%) | 2.6% |
| While engaged in leisure | 155 (0.7%) | 371 (0.7%) | 526 (0.7%) | 2.2% |
| While working for income | 141 (0.6%) | 74 (0.1%) | 215 (0.3%) | 0.9% |
| While engaged in other types of work | 1,348 (6.0%) | 2,536 (4.9%) | 3,884 (5.2%) | 16.3% |
| While resting, sleeping, eating or engaging in other vital activities | 2,812 (12.5%) | 7,349 (14.1%) | 10,161 (13.7%) | 42.7% |
| Other specified activity | 2,617 (11.7%) | 5,784 (11.1%) | 8,401 (11.3%) | 35.3% |
| *Total specified* | *7,309 (32.5%)* | *16,491 (31.7%)* | *23,800 (32.0%)* | *100.0%* |
| Unspecified activity | 15,139 (67.4%) | 35,434 (68.2%) | 50,573 (68.0%) | |
| **Total*** | **22,459 (100.0%)** | **51,955 (100.0%)** | **74,414 (100.0%)** | |

* Totals include 41 cases for which activity was not reported.

# 4 The burden of injury due to falls

Chapters Two and Three focused on the estimated number of new cases of hospitalised fall-related injury that occurred in the year to 30 June 2008. This chapter focuses on the nature and extent of hospital care provided in that period because of a fall-related injury. This includes analysis of the fall injury records omitted from the estimation of cases (having a mode of admission of transfer from another acute hospital) as well as records that describe episodes of admitted patient fall-related follow-up care, other separations including both an injury diagnosis and a fall external cause ('other fall-related' separations), and separations containing the R29.6 code describing a 'tendency to fall'. Additional measures of the burden to the hospital system due to fall-related care, the patient days for fall-related episodes and estimates of the cost to the hospital system due to falls, are presented in subsequent chapters.

## Fall injury inward transfers

To reduce multiple counting of fall cases in our de-identified data-set, a number of records were omitted from the analyses presented in the previous chapters. These records had a principal diagnosis in the range S00–T75 or T79 and a first external cause code in the range W00–W19 (that is, the same as fall injury cases), but also had a mode of admission denoting a transfer from another acute hospital. These records should not be regarded as representing additional fall cases as they are likely to have already generated a (previous) separation record describing the injury event.

A total of 9,076 fall injury inward transfer separations were identified in the 2007–08 data. As in previous years, inward transfer separations represented 0.3% of the total number of hospitalisations for people aged 65 and older in this period. These separations occurred at an age-standardised rate of 306 per 100,000 population and, as for fall injury cases, inward transfers occurred at a higher rate for females (360 per 100,000) than for males (231 per 100,000). Females accounted for 69.9% ($n$ = 6,348) of all fall injury inward transfer separations.

Like fall injury cases, inward transfers most commonly had an injury to the hip and thigh as the principal diagnosis. Injuries to the hip and thigh made up a greater proportion of transfer separations however; 41.1% of inward transfers compared with 30.0% of fall cases. Most of this increase was due to hip fractures rather than other types of injury to the hip and thigh (34.4% of transfer separations versus 22.7% of fall cases). Head injuries were proportionately less common for inward transfers than for fall cases; 11.4% compared with 18.6%, respectively.

The external causes reported for inward transfer separations were similar to those for fall injury cases in that falls due to tripping, slipping and stumbling, 'other specified' falls and unspecified falls were the three most common mechanisms of falls. However, proportionately fewer inward transfers were attributed to falls due to tripping, slipping and stumbling (27.4% versus 33.0%) or 'other specified' falls (17.1% versus 20.3%) than for fall cases. Conversely, 'unspecified fall' was a far more common external cause ascribed to inward transfer separations than to fall injury cases (38.9% versus 28.3%, respectively), suggesting that a level of specificity regarding the case is lost as the patient moves through the hospital system.

# Fall-related follow-up care separations

As in previous reports, the current work presents analysis of a number of fall-related hospital separations we term 'fall-related follow-up care' separations. Work by the National Injury Surveillance Unit (NISU) using Western Australian person-linked data has shown that a large proportion of injury cases were associated with subsequent separations coded with a principal diagnosis from Chapter XXI of the ICD-10-AM (see Bradley and Harrison 2007; also Kreisfeld and Newson 2006). Such records are numerous and must be considered in a valid estimation of the burden of hospitalised fall injury. Since people admitted for follow-up care related to a fall injury have usually been previously admitted for acute care for the injury (the fall injury cases described in the previous sections of this report), these separations represent an additional part of the burden due to fall injury rather than additional cases.

'Fall-related follow-up care' separations have a principal diagnosis code from Chapter XXI of the ICD-10-AM (*Factors influencing health status and contact with health services*), specifically:

- Z47—other orthopaedic follow-up care
- Z48—other surgical follow-up care
- Z50—care involving use of rehabilitation procedures and
- Z75.1—person awaiting admission to adequate facility elsewhere.

They also have both an injury (S00–T75 or T79) and a falls external cause code (W00–W19) elsewhere in the record (see also Appendix A).

Note that these fall-related follow-up care separations have not been identified on the basis of a 'rehabilitation' type of episode of care. (Rehabilitation/follow-up care is implied by the principal diagnosis, irrespective of the recorded type of episode of care.) It is also possible that these separations describe an injurious fall in hospital while receiving care for another condition rather than post-fall care. More may be known about this when condition onset flag data become available for analysis (AIHW 2009a).

Nearly 25,000 fall-related follow-up care separations were identified for people aged 65 and older in 2007–08 ($n$ = 24,429). Nevertheless, this represents a decrease in the number of these types of separation since 2006–07 (8.9%, or $n$ = 2,399, fewer separations). These 24,429 fall-related follow-up care separations represent 0.9% of all hospital separations for the older population in 2007–08. As in previous years, nearly three-quarters involved women (71.3%, $n$ = 17,422).

The mean age of the person hospitalised in a fall-related follow-up care separation was 82.3 years (± 7.3 SD), the same as that in 2006–07 and slightly older than the average for fall injury cases. The mean ages for males and females hospitalised in a follow-up care separation were also the same as those in the previous year; 81.0 years (± 7.3 SD) and 82.8 years (± 7.2 SD), respectively.

The age-standardised rate of fall-related follow-up care separations for all people aged 65 and older in 2007–08 was 822 separations per 100,000 population, lower than the rate observed in 2006–07 (933 per 100,000, see Bradley 2012). As in 2006–07, however, the age-standardised rate for females (985 per 100,000) was much higher than for males (593 per 100,000). Again, these rates were lower than in 2006–07, with a larger decrease for females (12.3%).

Rates of fall-related follow-up care separations in 2007–08 increased considerably with age for both males and females until very old age, when rates levelled off somewhat (Figure 4.1). As for fall injury cases, age-specific rates of fall-related follow-up care separations were higher for females than for males in every age group. For the group aged 95 and older, however, this difference was not substantial. This is a similar pattern to that observed in previous years.

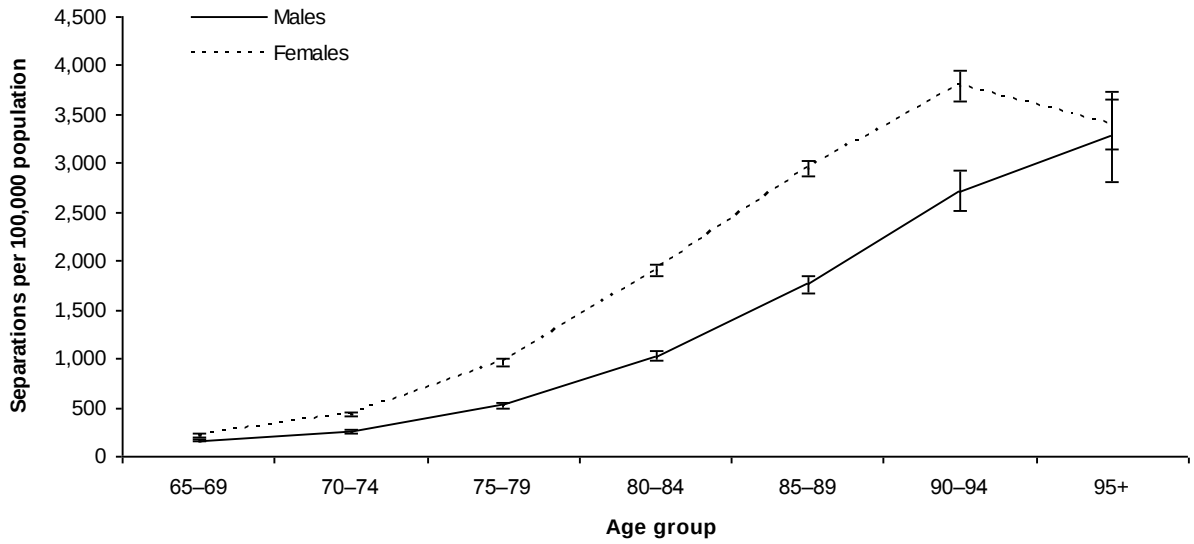



**Figure 4.1: Age-specific rates of fall-related follow-up care separations (± 95% CI); males and females aged 65+, Australia 2007–08**

## Diagnoses for fall-related follow-up care

More than three-quarters (85.7%, *n* = 20,926) of fall-related follow-up care separations had a principal diagnosis of Z50 (care involving use of rehabilitation procedures). This represents 9.1% fewer such separations (*n* = 2,089 less) than observed in 2006–07. While Z50 accounts for the majority of separations in every age group (Figure 4.2), there were increasing proportions of follow-up care separations with Z75.1 (person awaiting admission to adequate facility elsewhere) as the principal diagnosis for the older age groups.

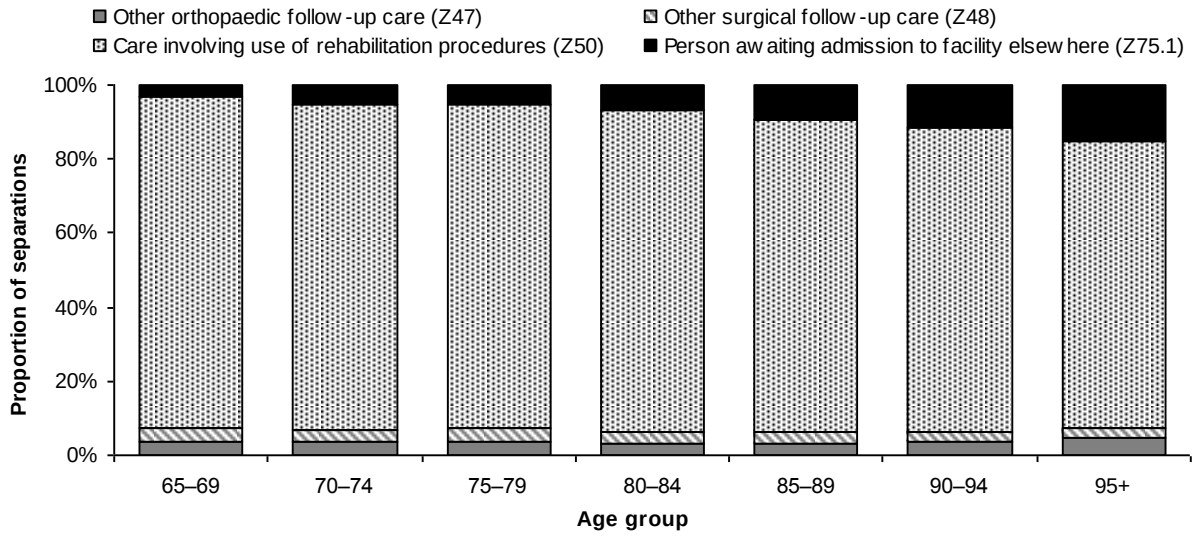



**Figure 4.2: Principal diagnosis group for fall-related follow-up care separations by age, persons aged 65+, Australia 2007–08**

Table 4.1 describes the specific principal diagnoses for fall-related follow-up care separations for people aged 65 and older in 2007–08. Most of these separations (78.9%, *n* = 19,286) had a principal diagnosis of Z50.9 (care involving use of rehabilitation procedures, unspecified). This was 1,740 (8.3%) fewer Z50.9 separations than in 2006–07. The next most common principal diagnosis for fall-related follow-up care separations was Z75.11 (person awaiting admission to residential aged care service). These 1,767 records accounted for 7.2% of fall-related follow-up care separations in 2007–08 and, as observed in previous years (e.g. Bradley 2012; Bradley and Pointer 2008), separations of this type were proportionately more common for males (9.1%) than for females (6.5%).

**Table 4.1: Principal diagnosis for fall-related follow-up care separations; males, females and persons aged 65+, Australia 2007–08**

| Principal diagnosis | Males | Females | Persons |
|---|---|---|---|
| Follow-up care involving removal of fracture plate and other internal fixation device (Z47.0) | 0 (0.0%) | 6 (0.0%) | 6 (0.0%) |
| Other specified orthopaedic follow-up care (Z47.8) | 50 (0.7%) | 190 (1.1%) | 240 (1.0%) |
| Orthopaedic follow-up care, unspecified (Z47.9) | 142 (2.0%) | 454 (2.6%) | 596 (2.4%) |
| *Total other orthopaedic follow-up care (Z47)* | *192 (2.7%)* | *650 (3.7%)* | *842 (3.4%)* |
| Attention to surgical dressings and sutures (Z48.0) | n.p. (0.0%) | n.p. (0.1%) | 18 (0.1%) |
| Other specified surgical follow-up care (Z48.8) | 215 (3.1%) | 521 (3.0%) | 736 (3.0%) |
| Surgical follow-up care, unspecified (Z48.9) | 5 (0.1%) | 7 (0.0%) | 12 (0.0%) |
| *Total other surgical follow-up care (Z48)* | *223 (3.2%)* | *543 (3.1%)* | *766 (3.1%)* |
| Cardiac rehabilitation (Z50.0) | n.p. (0.1%) | n.p. (0.0%) | 9 (0.0%) |
| Other physical therapy (Z50.1) | 302 (4.3%) | 729 (4.2%) | 1,031 (4.2%) |
| Occupational therapy and vocational rehabilitation, not elsewhere classified (Z50.7) | 9 (0.1%) | 14 (0.1%) | 23 (0.1%) |
| Care involving use of other rehabilitation procedures (Z50.8) | 168 (2.4%) | 409 (2.3%) | 577 (2.4%) |
| Care involving use of rehabilitation procedure, unspecified (Z50.9) | 5,434 (77.6%) | 13,852 (79.5%) | 19,286 (78.9%) |
| *Total care involving use of rehabilitation procedures (Z50)* | *5,917 (84.4%)* | *15,009 (86.1%)* | *20,926 (85.7%)* |
| Person awaiting admission to acute hospital (Z75.10) | 7 (0.1%) | 11 (0.1%) | 18 (0.1%) |
| Person awaiting admission to residential aged care service (Z75.11) | 639 (9.1%) | 1,128 (6.5%) | 1,767 (7.2%) |
| Person awaiting admission to rehabilitation facility/unit (Z75.13) | 11 (0.2%) | 32 (0.2%) | 43 (0.2%) |
| Person awaiting admission to other health care facility (Z75.18) | 16 (0.2%) | 36 (0.2%) | 52 (0.2%) |
| Person awaiting admission to adequate facility elsewhere, unspecified (Z75.19) | n.p. (0.0%) | n.p. (0.1%) | 15 (0.1%) |
| *Total person awaiting admission to adequate facility elsewhere (Z75.1)* | *675 (9.6%)* | *1,220 (7.0%)* | *1,895 (7.8%)* |
| **Total** | **7,007 (100.0%)** | **17,422 (100.0%)** | **24,429 (100.0%)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

The first-listed injury diagnosis (S00–T75, T79) in fall-related follow-up care separation records was also identified for further analysis (Table 4.2). As for fall injury cases, the most common injury category was an injury to the hip or thigh (46.8%, *n* = 11,423) and most of these injuries were hip fractures (40.3% of all fall-related follow-up care separations). As observed for fall injury inward transfers, injuries to the hip and thigh (and hip fractures, more specifically) accounted for a greater proportion of follow-up care separations than they did fall injury cases.

Head injuries, which were the second most common principal diagnosis for both fall cases and inward transfers, were proportionately less common for fall-related follow-up care separations (7.5% of follow-up separations versus 18.6% of fall cases and 11.4% of inward transfers). Conversely, abdominal injuries were more common among fall-related follow-up care separations, accounting for about one in seven such records (13.9%, *n* = 3,397).

**Table 4.2: First-listed injury diagnosis for fall-related follow-up care separations; males, females and persons aged 65+, Australia 2007–08**

| Injury diagnosis | Males | Females | Persons |
|---|---|---|---|
| Injuries to the head | 868 (12.4%) | 971 (5.6%) | 1,839 (7.5%) |
| Injuries to the neck | 155 (2.2%) | 156 (0.9%) | 311 (1.3%) |
| Injuries to the thorax | 350 (5.0%) | 649 (3.7%) | 999 (4.1%) |
| Injuries to the abdomen, lower back, lumbar spine and pelvis | 804 (11.5%) | 2,593 (14.9%) | 3,397 (13.9%) |
| Injuries to the shoulder and upper arm | 497 (7.1%) | 1,607 (9.2%) | 2,104 (8.6%) |
| Injuries to the elbow and forearm | 303 (4.3%) | 937 (5.4%) | 1,240 (5.1%) |
| Injuries to the wrist and hand | 112 (1.6%) | 222 (1.3%) | 334 (1.4%) |
| Fractured neck of femur | 2,711 (38.7%) | 7,142 (41.0%) | 9,853 (40.3%) |
| Other hip and thigh injuries | 436 (6.2%) | 1,134 (6.5%) | 1,570 (6.4%) |
| *Total injuries to the hip and thigh* | *3,147 (44.9%)* | *8,276 (47.5%)* | *11,423 (46.8%)* |
| Injuries to the knee and lower leg | 539 (7.7%) | 1,639 (9.4%) | 2,178 (8.9%) |
| Injuries to the ankle and foot | 108 (1.5%) | 212 (1.2%) | 320 (1.3%) |
| Injuries involving multiple body regions | 7 (0.1%) | 8 (0.0%) | 15 (0.1%) |
| Injuries to unspecified parts of trunk, limb or body region | 51 (0.7%) | 93 (0.5%) | 144 (0.6%) |
| Effects of foreign body entering through natural orifice | n.p. (0.1%) | n.p. (0.0%) | 7 (0.0%) |
| Burns | n.p. (0.1%) | n.p. (0.0%) | 8 (0.0%) |
| Poisoning by drugs, medicaments and biological substances | 13 (0.2%) | 7 (0.0%) | 20 (0.1%) |
| Toxic effects of non-medicinal substances | 0 (0.0%) | n.p. (0.0%) | n.p. (0.0%) |
| Other and unspecified effects of external causes | n.p. (0.0%) | n.p. (0.0%) | n.p. (0.0%) |
| Certain early complications of trauma | 42 (0.6%) | 42 (0.2%) | 84 (0.3%) |
| **Total** | **7,007 (100.0%)** | **17,422 (100.0%)** | **24,429 (100.0%)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

## External cause for fall-related follow-up care

As for fall injury cases and inward transfers, the most common fall external causes attributed to fall-related follow-up care separations were slips, trips and stumbles, 'other fall on same level' and unspecified falls (Table 4.3). Similar to fall injury transfer separations, however, the most common external cause for fall-related follow-up care separations was 'unspecified fall' (W19, 40.2% of separations). As noted previously, these observations suggest that some detail regarding the circumstances of an injurious fall is lost from records after the original hospitalisation for the injury event. This compounds the difficulty of accurately attributing the burden of disease due to particular types of fall.

**Table 4.3: First-listed fall external cause for fall-related follow-up care separations; males, females and persons aged 65+, Australia 2007–08**

| External cause | Males | Females | Persons |
|---|---|---|---|
| Fall on same level from slipping (W01.0) | 494 (7.1%) | 1,373 (7.9%) | 1,867 (7.6%) |
| Fall on same level from tripping (W01.1) | 949 (13.5%) | 3,082 (17.7%) | 4,031 (16.5%) |
| Fall on same level from stumbling (W01.2) | 223 (3.2%) | 625 (3.6%) | 848 (3.5%) |
| *Total fall on same level from slipping, tripping and stumbling (W01)* | *1,666 (23.8%)* | *5,080 (29.2%)* | *6,746 (27.6%)* |
| Fall involving pedestrian conveyances (W02) | 51 (0.7%) | 38 (0.2%) | 89 (0.4%) |
| Other fall on same level due to collision with, or pushing by, another person (W03) | 13 (0.2%) | 38 (0.2%) | 51 (0.2%) |
| Fall involving wheelchair (W05) | 76 (1.1%) | 68 (0.4%) | 144 (0.6%) |
| Fall involving bed (W06) | 374 (5.3%) | 600 (3.4%) | 974 (4.0%) |
| Fall involving chair (W07) | 180 (2.6%) | 484 (2.8%) | 664 (2.7%) |
| Fall involving other furniture (W08) | 7 (0.1%) | 22 (0.1%) | 29 (0.1%) |
| Fall on and from stairs and steps (W10) | 316 (4.5%) | 875 (5.0%) | 1,191 (4.9%) |
| Fall on and from ladder (W11) | 237 (3.4%) | 82 (0.5%) | 319 (1.3%) |
| Fall on and from scaffolding (W12) | 26 (0.4%) | 0 (0.0%) | 26 (0.1%) |
| Fall from, out of or through building or structure (W13) | 90 (1.3%) | 28 (0.2%) | 118 (0.5%) |
| Other fall from one level to another (W17) | 47 (0.7%) | 87 (0.5%) | 134 (0.5%) |
| Other fall on same level (W18) | 1,163 (16.6%) | 2,922 (16.8%) | 4,085 (16.7%) |
| Unspecified fall (W19) | 2,741 (39.1%) | 7,085 (40.7%) | 9,826 (40.2%) |
| Other falls* | 20 (0.3%) | 13 (0.1%) | 33 (0.1%) |
| **Total** | **7,007 (100.0%)** | **17,422 (100.0%)** | **24,429 (100.0%)** |

* Other falls includes categories too small to publish, e.g. fall while being carried or supported by other persons (W04).

# 'Other fall-related' separations

In previous reports, a fourth class of fall-related separations was identified for people aged 65 and older, additional to those types already discussed above (e.g. Bradley and Harrison 2007). These 'other fall-related' separations did not meet the criteria specified for fall injury cases, fall injury inward transfers or fall-related follow-up care separations, but did contain both a relevant injury code (S00–T75 or T79) and external cause code (W00–W19) within the record.

The exact nature of these 'other fall-related' separations is not known. Some possible circumstances for such cases include chance (that is, a person admitted for a non-injury condition happened to have an injury condition), co-morbid injury (for example, a person admitted due to a neoplasm had a pathological fracture), complication of care (for example, a person in hospital for treatment of a non-injury condition slipped and fell), and injury during the onset of another condition (for example, a person fell and was injured during an acute myocardial infarction). When comprehensive national condition onset data (items flagging whether the condition was present on admission to hospital or not) become available for analysis, we may be better able to understand these fall-related injuries (see AIHW 2009a). Although it continues to be difficult to assess the degree to which these separations impact

on the total burden of hospitalised fall-related injury, we present a brief examination of 'other fall-related' separations for 2007–08 here.

An additional 22,666 episodes of hospital care involving people aged 65 and older were identified as 'other fall-related' separations in 2007–08. These separations represent 0.8% of the total number of hospital separations for people aged 65 and older in this year. This is similar to the observations made in previous years (see Bradley 2012). Females accounted for 54.7% (*n* = 12,399) of 'other fall-related' separations, a lower proportion than observed for the classes of fall injury separations considered thus far.

The age-standardised rate of 'other fall-related' separations was 770 per 100,000 population in 2007–08, and age-specific rates were higher for older age groups as for the other separation types presented in this report (Figure 4.3). However, and as in previous years but unlike the fall injury classes analysed to this point, the age-specific rates for males were higher than those for females in every age group. The age-standardised rate of 'other fall-related' separations for males aged 65 and older was 861 per 100,000 while the equivalent rate for females was 709 per 100,000. The rate-ratio was 1.2 'other fall-related' separations for males for every 1.0 'other fall-related' separation for females.

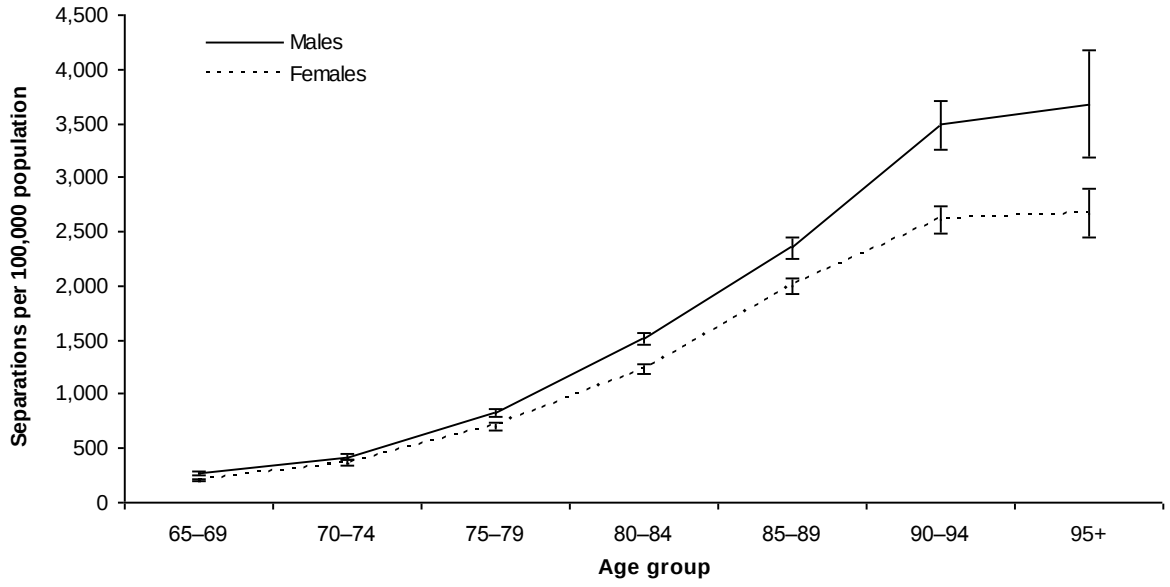



**Figure 4.3: Age-specific rates of 'other fall-related' separations (± 95% CI); males and females aged 65+, Australia 2007–08**

Most 'other fall-related' separations did not have an injury code of any type as the principal diagnosis (96.2% of 'other fall-related' separations, see Table 4.4). One in five 'other fall-related' separations (21.0%) had a principal diagnosis from Chapter IX of the ICD-10-AM (*Diseases of the circulatory system*). A further 15.6% of 'other fall-related' separations had a principal diagnosis from Chapter XVIII (*Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified*). As in 2006–07, the two most common principal diagnoses for 'other fall-related' separations in this *Symptoms, signs* group were R55 (syncope and collapse, 47.1% of these separations) and R29.6 (tendency to fall, not elsewhere classified, 14.7%).

R29.6 is not supposed to be applied in cases of known trauma (NCCH 2006). Separations containing the R29.6 code are discussed further in the following section.

Of the 3.8% 'other fall-related' separations that did have an injury code as the principal diagnosis, two in five (39.2% *n* = 335) were 'complications of surgical and medical care'. For these, the two most common diagnoses were T81.41 (wound infection following a procedure, 18.2%) and T84.0 (mechanical complication of internal joint prosthesis, 14.0%).

**Table 4.4: ICD-10-AM chapter of principal diagnosis for 'other fall-related' separations; males, females and persons aged 65+, Australia 2007–08**

| ICD-10-AM chapter | Males | Females | Persons |
|---|---|---|---|
| Certain infectious and parasitic diseases | 241 (2.3%) | 287 (2.3%) | 528 (2.3%) |
| Neoplasms | 928 (9.0%) | 687 (5.5%) | 1,615 (7.1%) |
| Diseases of the blood, blood-forming organs, etc. | 136 (1.3%) | 181 (1.5%) | 317 (1.4%) |
| Endocrine, nutritional and metabolic diseases | 443 (4.3%) | 531 (4.3%) | 974 (4.3%) |
| Mental and behavioural disorders | 616 (6.0%) | 744 (6.0%) | 1,360 (6.0%) |
| Diseases of the nervous system | 519 (5.1%) | 498 (4.0%) | 1,017 (4.5%) |
| Diseases of the eye and adnexa | 13 (0.1%) | 20 (0.2%) | 33 (0.1%) |
| Diseases of the ear and mastoid process | 25 (0.2%) | 61 (0.5%) | 86 (0.4%) |
| Diseases of the circulatory system | 2,229 (21.7%) | 2,531 (20.4%) | 4,760 (21.0%) |
| Diseases of the respiratory system | 1,178 (11.5%) | 1,007 (8.1%) | 2,185 (9.6%) |
| Diseases of the digestive system | 504 (4.9%) | 654 (5.3%) | 1,158 (5.1%) |
| Diseases of the skin and subcutaneous tissue | 283 (2.8%) | 380 (3.1%) | 663 (2.9%) |
| Diseases of the musculoskeletal system and connective tissue | 478 (4.7%) | 815 (6.6%) | 1,293 (5.7%) |
| Diseases of the genitourinary system | 436 (4.2%) | 865 (7.0%) | 1,301 (5.7%) |
| Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified | 1,556 (15.2%) | 1,982 (16.0%) | 3,538 (15.6%) |
| Injury, poisoning and certain other consequences of external causes | 349 (3.4%) | 505 (4.1%) | 854 (3.8%) |
| Factors influencing health status | 332 (3.2%) | 651 (5.3%) | 983 (4.3%) |
| **Total*** | **10,267 (100.0%)** | **12,399 (100.0%)** | **22,666 (100.0%)** |

* Totals include one separation from a chapter with a case count too small to publish.

# 'Tendency to fall' separations

The fifth edition of the ICD-10-AM includes the diagnosis code R29.6 (tendency to fall, not elsewhere classified). R29.6 replaces the R29.81 (other and unspecified symptoms and signs involving the nervous and musculoskeletal systems—falls) code used in previous editions of the ICD-10-AM. The R29.6 diagnosis is appropriate for situations where the patient has the "tendency to fall because of old age or other unclear health problems" but not for falls due to accidents, difficulty in walking, dizziness and giddiness, syncope and collapse or falls that cause injury. That is, R29.6 should not be used in cases of known trauma associated with a fall or with a known medical condition which is found to be the cause of the fall (NCCH 2006).

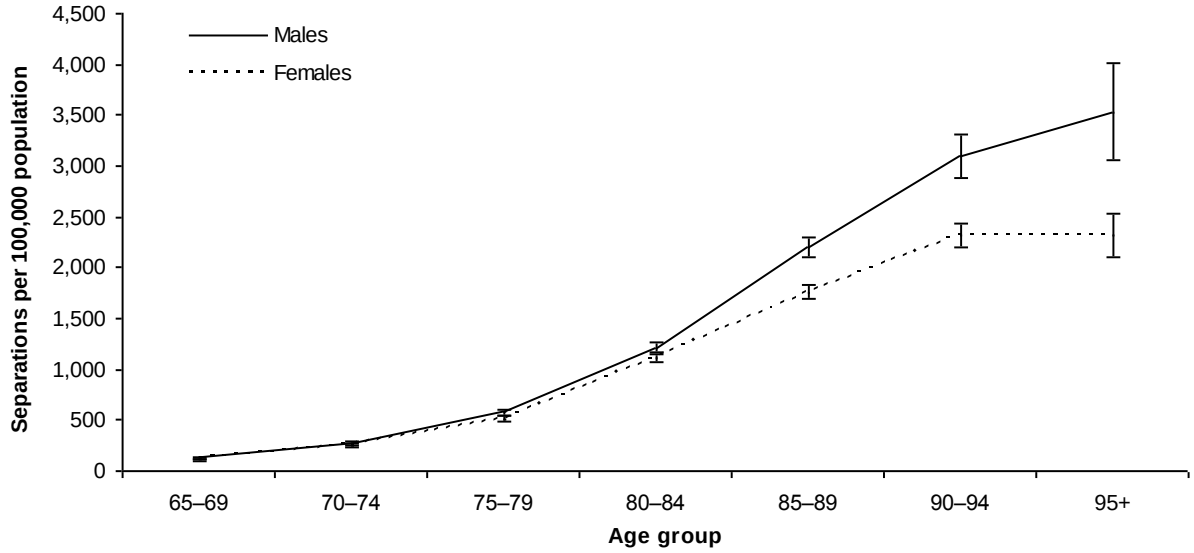
A total of 22,856 hospital separations for people aged 65 and older in 2007–08 included the diagnosis code R29.6. A relatively small number of the fall injury separations already discussed in this report included at least one R29.6 diagnosis (Table 4.5). Omitting these separations (as they have already been considered in previous sections) left 18,010 separations containing an R29.6 diagnosis in the analysis. Some of the separations, contrary to the coding instructions outlined above, also contained either (but not both) a community injury diagnosis (S00–T75 or T79, *n* = 496) or an external cause signifying a fall (W00–W19, *n* = 531).

**Table 4.5: Records containing a diagnosis of 'tendency to fall' (R29.6) by separation type; males, females and persons aged 65+, Australia 2007–08**

| Separation type | Males | Females | Persons | Per cent of type |
|---|---|---|---|---|
| 'Tendency to fall' diagnosis in record (but not injury diagnosis and fall external cause) | 7,908 | 10,102 | 18,010 | 100.0% |
| Fall injury case | 678 | 1,308 | 1,986 | 2.7% |
| Fall injury inward transfer | 78 | 169 | 247 | 2.7% |
| Fall-related follow-up care | 358 | 741 | 1,099 | 4.5% |
| Other fall-related separation (any injury diagnosis with fall external cause) | 687 | 827 | 1,514 | 6.7% |
| **Total** | **9,709** | **13,147** | **22,856** | |

Of the 18,010 'tendency to fall' separations for people aged 65 and older in 2007–08, the majority (56.1%, *n* = 10,102) involved females. This is a lower proportion for females than that noted for most other types of fall-related separations in this report. Further, the age-standardised rate of R29.6 separations was higher for males (672 per 100,000 population) than for females (565 per 100,000. Persons overall; 605 per 100,000). These observations may be related to the injury-risk; older females with a 'tendency to fall' may be more likely to be injured than older males, and thus appear in our data-set as a fall injury case (or other fall-related separation) rather than in this set of records.

Age-specific rates of 'tendency to fall' separations for males were higher than those for females for most age groups, particularly for the oldest old (Figure 4.4).




* Includes only those 'tendency to fall' separations not already classified as fall injury cases, inward transfers, follow-up care or 'other fall-related separations'

**Figure 4.4: Age-specific rates of 'tendency to fall' separations* (± 95% CI); males and females aged 65+, Australia 2007–08**

A little under one-third of 'tendency to fall' separations (30.2%) had a principal diagnosis from Chapter XXI of the ICD-10-AM (*Factors influencing health status and contact with health* services, see Table 4.6). This is the same chapter from which 'fall-related follow-up care separations' were drawn, if they had a principal diagnosis of Z47, Z48, Z50 or Z75.1 plus both an additional diagnosis of injury (S00–T75 or T79) and an external cause signifying a fall (W00–W19). These Chapter XXI separations, then, lacked either an injury or a falls code (or both). Similar to fall-related follow-up care separations, however, most of this group had Z50.9 (care involving use of rehabilitation procedure, unspecified) as the principal diagnosis (69.6%, *n* = 3,780). Z75.11 (person awaiting admission to residential aged care service) was also a frequent principal diagnosis for this group (15.0%, *n* = 816).

Principal diagnoses from Chapter XVIII (*Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified*) of the ICD-10-AM were also common for 'tendency to fall' separations, accounting for a further quarter of these records (24.7%). Of these 4,432 records, most (71.2%, *n* = 3,167) had R29.6 as the principal diagnosis.

**Table 4.6: ICD-10-AM chapter of principal diagnosis for 'tendency to fall' separations*; males, females and persons aged 65+, Australia 2007–08**

| ICD-10-AM chapter | Males | Females | Persons |
|---|---|---|---|
| Certain infectious and parasitic diseases | 112 (1.4%) | 112 (1.1%) | 224 (1.2%) |
| Neoplasms | 396 (5.0%) | 226 (2.2%) | 622 (3.5%) |
| Diseases of the blood, blood-forming organs, etc. | 66 (0.8%) | 54 (0.5%) | 120 (0.7%) |
| Endocrine, nutritional and metabolic diseases | 172 (2.2%) | 261 (2.6%) | 433 (2.4%) |
| Mental and behavioural disorders | 368 (4.7%) | 477 (4.7%) | 845 (4.7%) |
| Diseases of the nervous system | 357 (4.5%) | 308 (3.0%) | 665 (3.7%) |
| Diseases of the ear and mastoid process | 8 (0.1%) | 27 (0.3%) | 35 (0.2%) |
| Diseases of the circulatory system | 694 (8.8%) | 835 (8.3%) | 1,529 (8.5%) |
| Diseases of the respiratory system | 526 (6.7%) | 453 (4.5%) | 979 (5.4%) |
| Diseases of the digestive system | 191 (2.4%) | 229 (2.3%) | 420 (2.3%) |
| Diseases of the skin and subcutaneous tissue | 114 (1.4%) | 151 (1.5%) | 265 (1.5%) |
| Diseases of the musculoskeletal system and connective tissue | 284 (3.6%) | 571 (5.7%) | 855 (4.7%) |
| Diseases of the genitourinary system | 300 (3.8%) | 622 (6.2%) | 922 (5.1%) |
| Symptoms, signs, abnormalities not elsewhere classified | 1,909 (24.1%) | 2,538 (25.1%) | 4,447 (24.7%) |
| Injury, poisoning and consequences of external causes | 95 (1.2%) | 110 (1.1%) | 205 (1.1%) |
| Factors influencing health status | 2,313 (29.2%) | 3,120 (30.9%) | 5,433 (30.2%) |
| **Total**** | **7,908 (100.0%)** | **10,102 (100.0%)** | **18,010 (100.0%)** |

* Includes only 'tendency to fall' separations not already classified as fall injury cases, inward transfers, follow-up care or 'other fall-related separations'.

** Totals include 11 separations from chapters with case-counts too small to publish.

# 5 Length of stay

This chapter provides information on the average and total admitted patient care days due to fall-related hospital care.

## Fall injury case separations

The 74,414 fall injury case separations for people aged 65 and older in 2007–08 accounted for 563,362 patient days in this period. This represents 4.6% of all patient days for hospitalisations for this age group. The number of patient days for fall injury case separations in 2007–08 increased by 23,389 days (4.3%) since 2006–07.

The length of stay per fall injury case separation ranged from one day (34.2% $n$ = 25,465) to more than 500 days ($n$ = 2). The two case separations with extremely long lengths of stay were episodes of care lasting 1.4 and 6.5 years. While previous reports in this series (e.g. Bradley and Harrison 2007) have omitted such lengthy stays from some analyses, they have been left in here as examination of the full unit records suggests they are not erroneous records. In all, less than 0.05% of fall injury case separations had a length of stay of 100 days or more ($n$ = 35). The mean length of stay for all fall injury case separations was 7.6 days (± 13.1 SD), with the mean length of stay for males (7.3 days ± 10.0 SD) similar to that for females (7.6 days ± 14.3 SD). As observed in previous reports, the mean length of stay for fall injury case separations increased with age for both males and females, although it was slightly shorter for those aged 95 and older (Figure 5.1).

Fall injury case separations with a principal diagnosis of an injury to the hip and thigh accounted for the greatest proportion of patient days in 2007–08 (39.5%). Injuries to the abdomen, lower back, lumbar spine and pelvis accounted for a further 14.6% of patient days and injuries to the head another 10.8%. Unsurprisingly, the three most common causes of fall injury cases (falls due to tripping, slipping and stumbling, 'other fall on same level' and unspecified falls) accounted for the vast majority of the patient days for case separations in 2007–08 (83.1% combined).

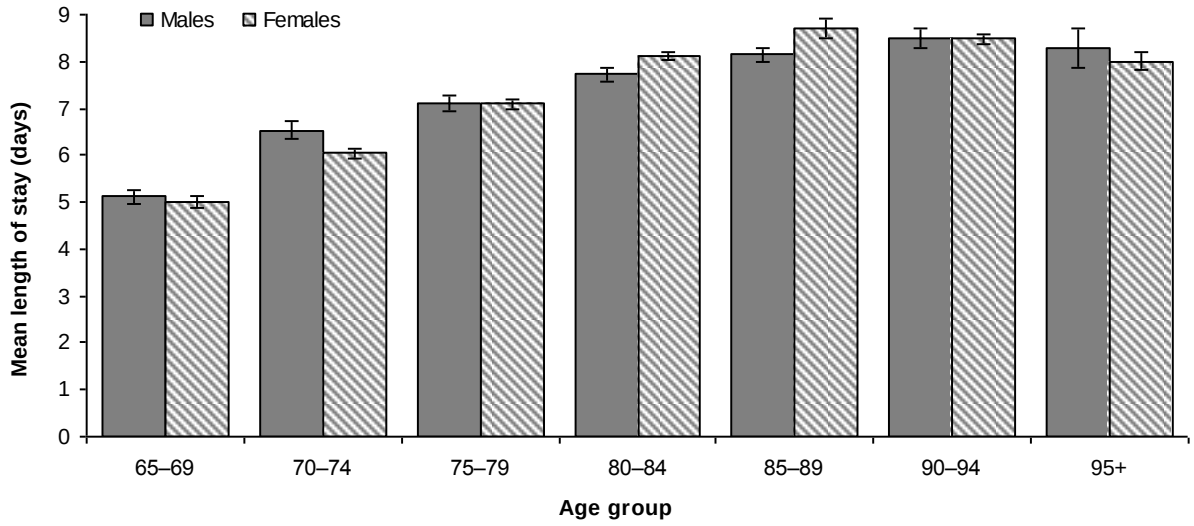



**Figure 5.1: Mean length of stay (days ± SE) for fall injury case separations; males and females aged 65+, Australia 2007–08**

# Fall injury inward transfer separations

Fall injury inward transfer separations for people aged 65 and older (*n* = 9,096) accounted for 123,939 patient days in 2007–08. This represents 1.0% of all patient days for hospitalisations for this age group. The number of patient days for inward transfer separations in 2007–08 increased by 4,646 days (3.9%) since 2006–07, a much smaller proportional increase than that observed between 2005–06 and 2006–07 (see Bradley 2012).

The proportion of fall injury inward transfer separations having only a one day stay was much smaller than that for fall injury case separations (8.0% versus 34.2%, respectively). Similarly, a greater proportion of inward transfer separations had a length of stay of 100 days or more compared with case separations (0.2% versus 0.05%, respectively). Accordingly, the mean length of stay for fall injury inward transfer separations (13.7 days ± 14.6 SD) was substantially longer than that for fall injury case separations.

The mean length of stay for fall injury inward transfers involving males was 13.6 days (± 14.7 SD) while the mean length of stay for females was 13.7 days (± 14.5 SD). Lengths of stay were generally longer for the older age groups (Figure 5.2).

As for fall injury case separations, inward transfers with a principal diagnosis of an injury to the hip and thigh accounted for the greatest proportion of patient days in 2007–08 (42.6%). As noted previously, these hip and thigh injuries were proportionately more common and, in this case, burdensome for inward transfers compared with fall injury case separations. While injuries to the abdomen, lower back, lumbar spine and pelvis (accounting for 13.2% of inward transfer patient days) and injuries to the head (9.3%) were, similarly, the second- and third-most common source of patient days for fall injury inward transfers, these proportions are smaller than those for fall injury case separations.

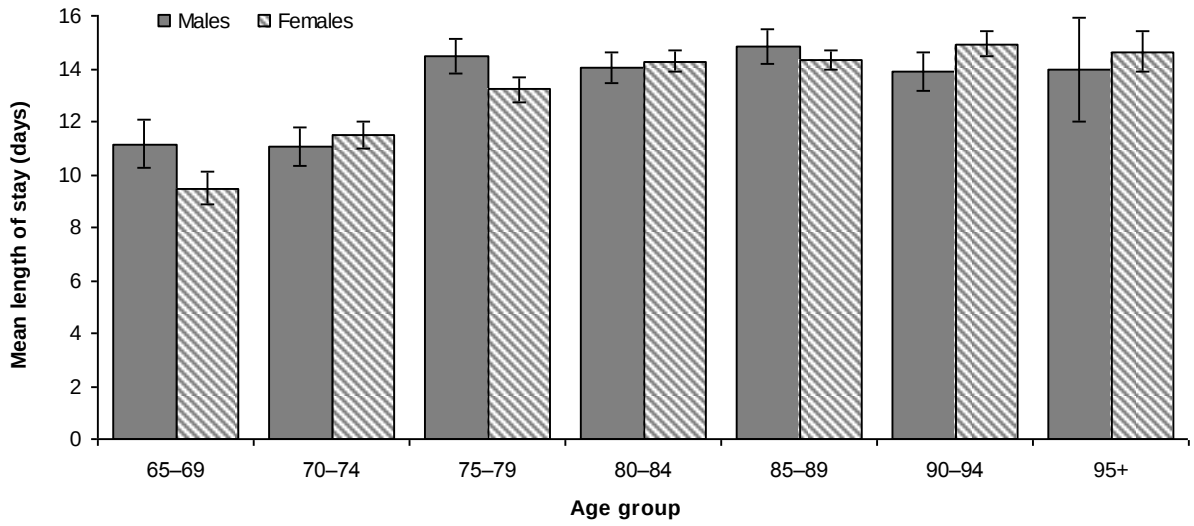



**Figure 5.2: Mean length of stay (days ± SE) for fall injury inward transfer separations; males and females aged 65+, Australia 2007–08**

# Fall-related follow-up care separations

The 24,429 fall-related follow-up care separations for people aged 65 and older in 2007–08 accounted for 503,404 patient days—7,467 (1.5%) fewer patient days than in 2006–07. Despite this decrease, these half-million patient days for fall-related follow-up care were almost as numerous as those for case separations (*n* = 74,414 separations, 563,362 patient days). The patient days used by fall-related follow-up care separations in 2007–08 represent 4.1% of all patient days for hospitalisations for people aged 65 and older in this period.

The proportion of fall-related follow-up care separations having a length of stay of one day was much smaller than that for fall injury case separations (11.6 % versus 34.2%, respectively). Also, a larger proportion of follow-up care separations had a length of stay of 100 days or more compared with case and transfer separations (0.9%).

Overall, the mean length of stay for fall-related follow-up care separations was 20.6 days (± 31.2 SD). This is substantially longer than the means for both fall injury case separations and fall injury inward transfers. The mean length of stay for follow-up care separations for males (21.5 days ± 28.1 SD) was about the same as that for females (20.3 days ± 32.3 SD). Mean lengths of stay for fall-related follow-up care separations were generally longer for the older age groups (Figure 5.3).

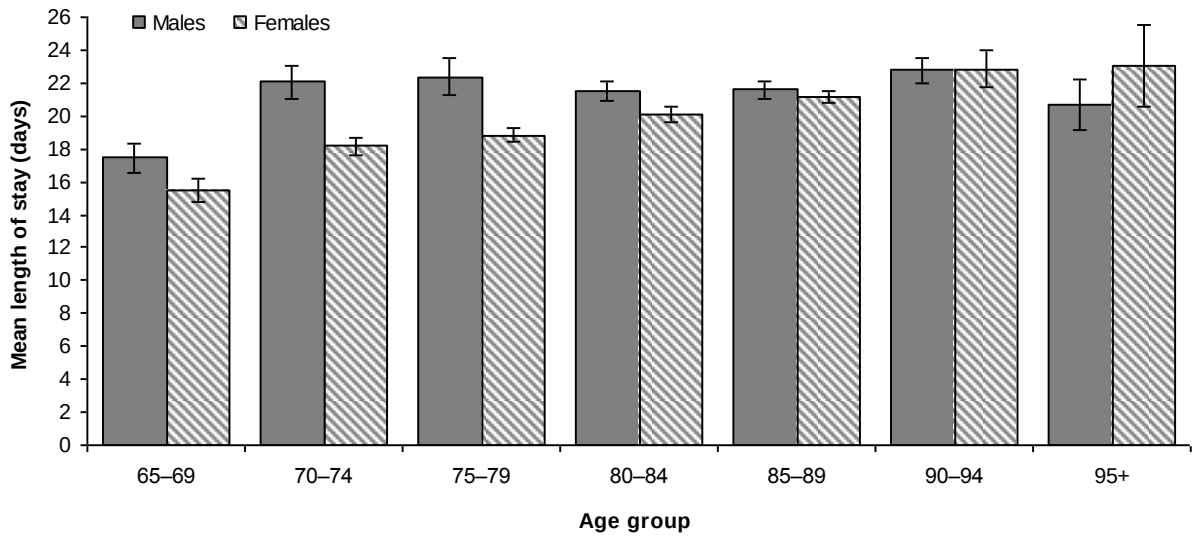



**Figure 5.3: Mean length of stay (days ± SE) for fall-related follow-up care separations; males and females aged 65+, Australia 2007–08**

Not surprisingly, the most common type of fall-related follow-up care separation—those with a principal diagnosis of Z50 (care involving use of rehabilitation procedures, *n* = 20,926)—accounted for most patient days (82.2%, *n* = 413,605). However, separations with a principal diagnosis of Z75.1 (person awaiting admission to adequate facility elsewhere, *n* = 1,895) accounted for a greater number of patient days (12.3%) than expected from separation counts (7.8% of follow-up care separations).

As observed in previous reports, mean lengths of stay for fall-related follow-up care separations differed between the four principal diagnosis groups (Figure 5.4). Separations with principal diagnoses of 'other orthopaedic follow-up care', 'other surgical follow-up care' or 'care involving use of rehabilitation procedures' had similar mean lengths of stay (16.4–19.8 days) while separations with a principal diagnosis describing 'person awaiting admission to adequate facility elsewhere' had a much longer mean length of stay (32.7 days ± 90.8 SD). It is noteworthy that of the eleven fall-related follow-up care separations with extremely long lengths of stay (≥ 365 days), eight had a principal diagnosis of Z75.11 (person awaiting admission to residential aged care service). Removing these eleven lengthy stays from the analysis reduced the mean length of stay for 'person awaiting admission to adequate facility elsewhere' separations to 27.7 days (± 39.2 SD); however, this is still markedly higher than those for other types of fall-related follow-up care.

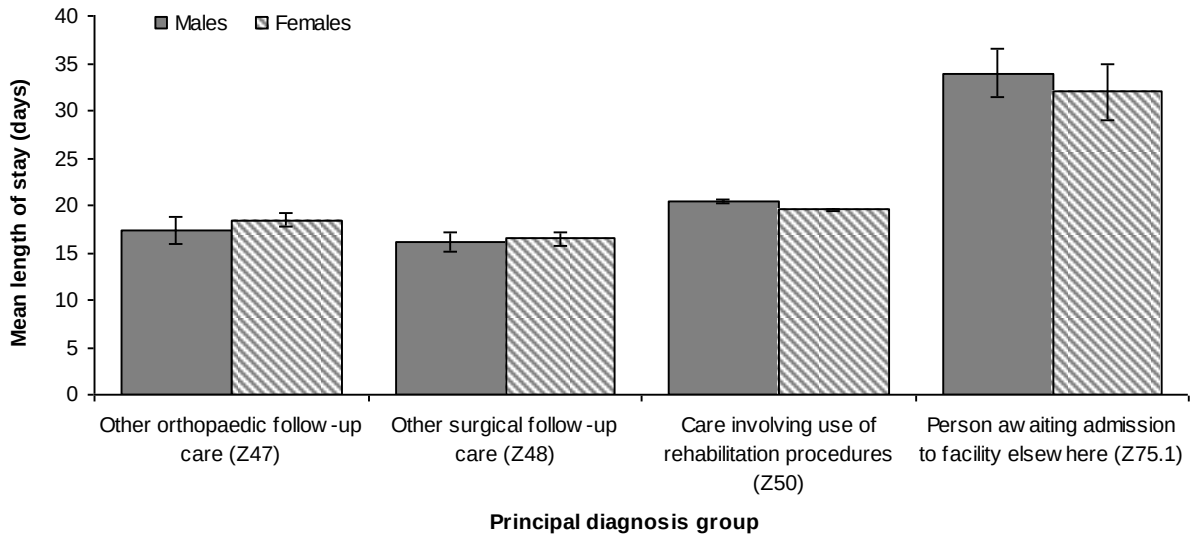



**Figure 5.4: Mean length of stay (days ± SE) for fall-related follow-up care principal diagnosis groups; males and females aged 65+, Australia 2007–08**

# 'Other fall-related' and 'tendency to fall' separations

A further 614,741 patient days in 2007–08 were attributed to 'other fall-related' separations (*n* = 22,666, 352,119 patient days) and separations including the diagnosis R29.6 (tendency to fall; *n* = 18,010, 262,622 patient days).

The mean length of stay for 'other fall-related' separations was 15.5 days (± 34.9 SD). This is substantially longer than the means for both fall injury case separations and fall injury inward transfers but lower than that for fall-related follow-up care separations, particularly those with principal diagnoses describing 'person awaiting admission to adequate facility elsewhere'. The mean length of stay for 'other fall-related' separations involving males (16.0 days ± 39.1 SD) was slightly longer than the mean length of stay for females (15.1 days ± 31.0 SD), and mean lengths of stay for 'other fall-related' separations were relatively consistent for all age groups. Separations with principal diagnoses describing diseases of the circulatory system (Chapter IX of the ICD-10-AM) accounted for the largest proportion of patient days used by this 'other fall-related' group (18.3%).

The mean length of stay for R29.6 (tendency to fall) separations was 14.6 days (± 31.2 SD). This is substantially longer than the means for both fall injury case separations and fall injury inward transfers but shorter than that for fall-related follow-up care separations. Mean lengths of stay were similar for males and females (14.8 days ± 43.9 SD and 14.4 days ± 38.0 SD, respectively). Further, mean lengths of stay for fall-related follow-up care separations varied inconsistently with age, with the shortest mean observed for people aged 85–89 (13.7 days ± 21.5 SD) and the longest for people aged 95 and over (17.0 days ± 52.3 SD).

# All fall-related hospitalisations

The total number of patient days for hospital care *directly* attributable to injurious falls (that is, fall injury case, inward transfer and fall-related follow-up care separations) by people aged 65 and older in 2007–08 was 1,190,705 (Table 5.1). This figure represents 9.7% of all patient days for this population in this period and some 20,568 more patient days than used in 2006–07 (1.8% increase, a smaller increase than noted between 2005–06 and 2006–07).

The additional 614,741 patient days attributable to 'other fall-related' and 'tendency to fall' separations brings the total number of patient days for fall-related separations for people aged 65 and older in 2007–08 to more than 1.8 million. However, as neither the relationship between the injurious fall and the principal reason for hospitalisation for the 'other fall-related' category nor the use of the 'tendency to fall' code are fully understood, the patient days for such separations have been omitted from the following analyses.

**Table 5.1: Patient days for selected fall-related hospitalisations, males, females and persons aged 65+, Australia 2007–08**

| Fall injury separation type | Males | Females | Persons |
|---|---|---|---|
| Fall injury case separations | 164,186 | 399,176 | 563,362 |
| Fall injury inward transfer separations | 37,105 | 86,834 | 123,939 |
| Fall-related follow-up care separations | 150,431 | 352,973 | 503,404 |
| **Total** | **351,722** | **838,983** | **1,190,705** |

The 107,919 hospital separations directly attributable to injurious falls (that is, fall injury case, inward transfer and fall-related follow-up care separations) involving people aged 65 and older in 2007–08 accounted for 6.1% of all patient days for males of this age and a considerable 12.8% of patient days for females. These proportions are similar to those observed for 2006–07 (see Bradley 2012). The M:F difference is not unexpected given the far higher rate of fall injury cases for older females.

As observed in previous reports, the patient days for fall-related separations in 2007–08 as a proportion of all patient days for any cause increased with age for both males and females (Figure 5.5). For persons aged 85 and older, fall-related separations accounted for nearly one-fifth of the total number of patient days for this population (17.1%).

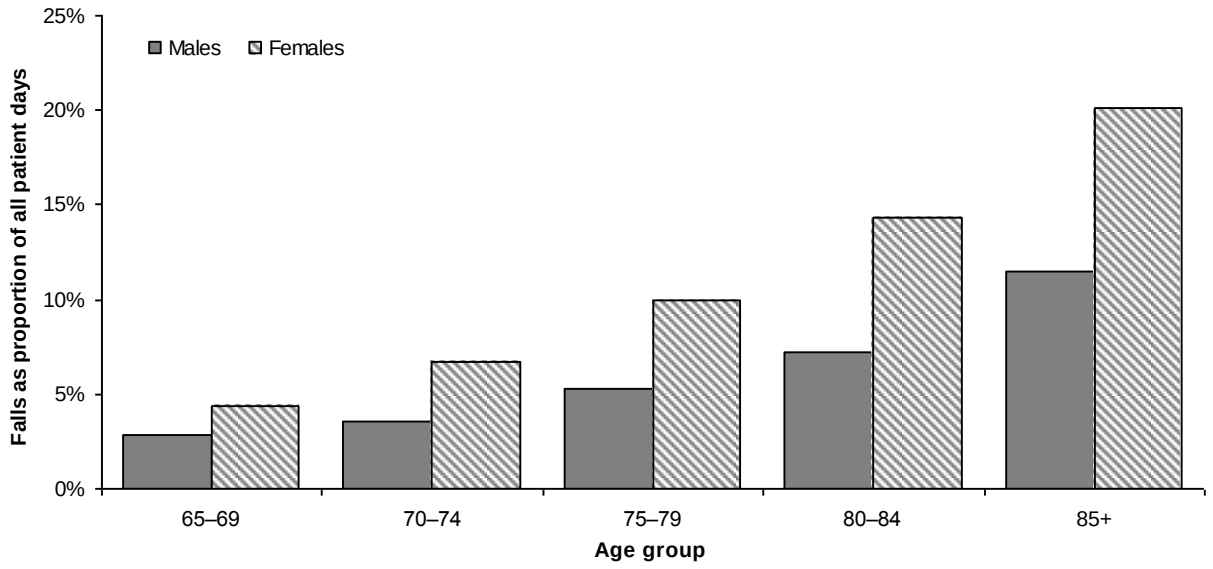



**Figure 5.5: Total patient days for fall-related hospitalisations as a proportion of all patient days for the population aged 65+, males and females, Australia 2007–08**

# Total mean length of stay

The length of stay analysis presented above separately considers the three groups of hospital separations directly attributable to falls. The fall injury inward transfers and fall-related follow-up care episodes discussed in Chapter Four are typically preceded by an initial episode for acute care (the cases of Chapters Two and Three). Hence, a valid estimate of the average total duration of hospital care (mean total length of stay) for admitted incidents of fall-related injury should include the patient days for all phases of care. On this basis, the estimated total mean length of stay for fall injury cases in 2007–08 ($n$ = 74,417) was 16.0 days. This estimate is similar to that reported for falls hospitalised in the previous year (Bradley 2012).

# 6 Estimated costs

This chapter presents estimated costs for fall-related hospital care, based on the Australian Refined Diagnosis Related Groups reported for the separations.

## Methods

The Australian Refined Diagnosis Related Groups (AR-DRGs) classification system categorises admitted patient episodes of care into groups with similar conditions and similar expected usage of hospital resources. This categorisation is based on information contained in the separation record such as the diagnoses, procedures and demographic characteristics of the patient (AIHW 2009a). Costs for episodes of care (separations) can be estimated by applying cost weights to the AR-DRGs reported for each separation. Cost weights are defined by the Department of Health and Ageing (DoHA) as 'a measure of the relative cost of a DRG'. Usually, the average cost across all DRGs is chosen as the reference value, and given a weight of 1 (DoHA 2009b).

Estimates in this report were calculated by applying 2007–08 cost weights based on AR-DRG Version 5.1 to fall-related acute episodes of hospital care in both the public and private sectors, using separate public and private sector cost weights (DoHA 2009a). These separate cost weights account for the differences in the range of services provided in the different types of hospital and the likelihood that some cost items (for example, those covered under the Medical Benefits Schedule) are not included in the private sector hospital costs (see DoHA 2009b). A similar method was used by Potter-Forbes and Aisbett (2003) to estimate the direct hospital cost component in their study of the cost (and burden) of injury in New South Wales.

As in previous reports (Bradley 2012; Bradley and Harrison 2007), only acute episodes of care have been included in the cost analyses presented here. AR-DRG cost weights are appropriate only for acute episodes of care. Estimates of costs for admitted patient rehabilitation care were not provided for the 2007–08 financial year (DoHA 2009b).

The method used to estimate the cost of fall-related hospitalisations in our *Hospitalisations due to falls by older people* series is different from that employed by some Australian fall-injury researchers. The so-called 'bottom-up' approach has been used to estimate the cost of falls by older people in Western Australia and New South Wales (Hall and Hendrie 2003; Hendrie et al. 2003; Tiedemann et al. 2008). These prospective studies monitored the costs incurred by older people due to falls (e.g. hospital care, other medical treatment, pharmacy, rehabilitation, nursing and informal care costs). An average cost-per-fall and total cost to the health system values were then estimated from these data. As the New South Wales study included falls that did not result in hospital admission, the cost-per-fall was lower than that reported by other Australian studies (Tiedemann et al. 2008).

Another approach to costing fall injuries is the so-called 'top-down' method, which estimates the cost of fall-related injury as a proportion of the total (known) national health-care expenditure. This approach has been used by Moller (2003) to forecast a three-fold increase in the total health cost attributed to injurious falls, to $1.4 billion annually, by 2051.

Yet another approach to estimate the impact of injuries due to falls is the 'Global Burden of Disease' method. Studies of this type measure the burden of falls injuries in terms of 'disability-adjusted life years', a measure that accounts for the years of life lost (prematurely)

due to fatal conditions and the years of life lived with disability for non-fatal conditions. Largely due to the older age of the population most at risk of serious falls, fall injuries often rank as less burdensome than suicide and self-inflicted injuries and injuries due to road traffic crashes when measured in this way. Even so, Begg et al. (2007) reported that fall injuries accounted for 1% of the total burden of disease and injury in Australia in the calendar year 2003.

Some burden of disease studies add a cost component to their measurement, applying an estimated dollar-cost per disability-adjusted life year of burden (e.g. Moller 1998; Potter-Forbes and Aisbett 2003). Using this method, the resulting high cost for fall-related injuries frequently sees falls being ranked as more burdensome than other types of injury, including self-inflicted injuries and those due to road traffic crashes.

Unlike some of the studies described above, it was beyond the scope of the current work to consider the wider health system costs (for example, the costs associated with general practitioner, emergency department or outpatient treatment) or the indirect costs (for example, premature death, lost productivity, informal nursing care, pain and suffering) related to fall-related injury. It must also be remembered that we have had to omit some fall-related episodes of care from our estimate (that is, non-acute care) and, accordingly, definitely underestimate the cost of hospital care due to fall-related injury.

# The cost of hospital care for falls by older people

A total of 83,344 fall-related hospital separations for people aged 65 and older in 2007–08 were considered in the current cost estimate (Table 6.1). These *acute* care fall injury cases, fall injury inward transfers and fall-related follow-up care separations represent 77.2% of all such fall-related separations, but only 56.1% of all of the fall-related separations considered in this report (that is, including 'other fall-related' and 'tendency to fall' separations, and both acute and non-acute episodes of care).

Most of the separations included in this cost estimate were from public hospitals (82.7%, $n$ = 68,899), with the remainder from private hospitals. As observed in previous reports (Bradley 2012; Bradley and Harrison 2007), the majority of the fall-related follow-up care separations in 2007–08 were omitted from the analysis due to their being coded as rehabilitation and other types of non-acute care (Table 6.1).

**Table 6.1: Type of episode of care by type of institution for fall-related hospitalisations: persons aged 65+, Australia 2007–08**

| Type of episode of care | | Public sector | Private sector | Total |
|---|---|---|---|---|
| Fall injury cases | Acute care | 61,911 (98.5%) | 11,571 (99.8%) | 73,482 (98.7%) |
| | Other types of care* | 912 (1.5%) | 20 (0.2%) | 932 (1.3%) |
| Fall injury inward transfer separations | Acute care | 5,499 (83.3%) | 2,463 (99.4%) | 7,962 (87.7%) |
| | Other types of care* | 1,100 (16.7%) | 14 (0.6%) | 1,114 (12.3%) |
| Fall-related follow-up care separations | Acute care | 1,489 (8.4%) | 411 (6.1%) | 1,900 (7.8%) |
| | Other types of care* | 16,213 (91.6%) | 6,316 (93.9%) | 22,529 (92.2%) |
| **Total** | **Acute care** | **68,899 (79.1%)** | **14,445 (69.5%)** | **83,344 (77.2%)** |
| | **Other types of care*** | **18,225 (20.9%)** | **6,350 (30.5%)** | **24,575 (22.8%)** |

* Other types of care may include rehabilitation, palliative care, geriatric evaluation and management, psychogeriatric care, maintenance care and other and unknown types of care.

The total estimated direct cost to the hospital system for the 83,344 acute fall-related hospitalisations involving people aged 65 and older in 2007–08 was $648.2 million (Table 6.2). This estimate is 8.0% ($47.9 million) higher than that reported for 2006–07 (Bradley 2012). Fall-related acute episodes of care in public hospitals contributed $548.9 million (84.7%) to the total estimate, while equivalent care in the private sector contributed the remaining $99.3 million.

**Table 6.2: Estimated cost to the hospital system for fall-related acute episodes of care ($ million); males, females and persons aged 65+, Australia 2007–08**

| Hospital sector | | Fall injury cases | Fall injury inward transfers | Fall-related follow-up care* | Total |
|---|---|---|---|---|---|
| Males | Public sector | 143.8 | 22.9 | 3.1 | 169.7 |
| | Private sector | 21.1 | 5.2 | 0.4 | 26.6 |
| | Total | 164.9 | 28.1 | 3.4 | 196.4 |
| Females | Public sector | 329.3 | 41.1 | 8.7 | 379.1 |
| | Private sector | 58.4 | 13.2 | 1.0 | 72.6 |
| | Total | 387.8 | 54.3 | 9.7 | 451.8 |
| Persons | Public sector | 473.1 | 64.0 | 11.8 | 548.9 |
| | Private sector | 79.5 | 18.4 | 1.3 | 99.3 |
| **Total** | | **552.6** | **82.4** | **13.1** | **648.2** |

* Excludes the majority of fall-related follow-up care separations as most (92%) do not have an assigned case-type of 'acute care'.

Injuries to the hip and thigh (chiefly hip fractures) predominated among fall-related hospital separations, and accounted for about one-third of all case, transfer and follow-up records combined. These separations, however, contributed $323.8 million to the cost of fall-related hospital care in 2007–08—half of the total estimate for fall-related acute care for this period (Table 6.3). Head injuries ($73.7 million, 11.4%) and injuries to the abdomen ($61.0 million, 9.4%) were the second- and third-most expensive type of injury for fall-related separations, respectively. Together, these three injury types accounted for $458.5 million (70.7%) of the estimated cost to the hospital system due to fall-related acute care for people aged 65 and older in 2007–08.

**Table 6.3: Estimated cost to the hospital system for fall-related acute episodes of care, by principal diagnosis; people aged 65+, Australia 2007–08**

| Principal diagnosis | Fall injury cases ($ m) | Fall injury inward transfers ($ m) | Fall-related follow-up care ($ m)* | Total ($ m) | Per cent total cost |
|---|---|---|---|---|---|
| Injuries to the head | $62.6 | $10.5 | $0.6 | $73.7 | 11.4% |
| Injuries to the neck | $6.4 | $2.5 | $0.1 | $9.0 | 1.4% |
| Injuries to the thorax | $27.9 | $3.4 | $0.2 | $31.6 | 4.9% |
| Injuries to the abdomen, lower back, lumbar spine and pelvis | $54.0 | $6.4 | $0.6 | $61.0 | 9.4% |
| Injuries to the shoulder and upper arm | $43.4 | $5.2 | $0.8 | $49.4 | 7.6% |
| Injuries to the elbow and forearm | $33.1 | $3.1 | $0.7 | $36.9 | 5.7% |
| Injuries to the wrist and hand | $4.8 | $0.5 | $0.1 | $5.4 | 0.8% |
| Injuries to the hip and thigh | $270.3 | $44.6 | $8.8 | $323.8 | 50.0% |
| Injuries to the knee and lower leg | $41.9 | $5.5 | $1.0 | $48.4 | 7.5% |
| Injuries to the ankle and foot | $ 4.2 | $0.4 | $0.1 | $4.6 | 0.7% |
| Other injuries | $4.0 | $0.3 | $0.1 | $4.3 | 0.7% |
| **Total** | **$552.6** | **$82.4** | **$13.1** | **$648.2** | **100.0%** |

* Excludes the majority of fall-related follow-up care separations as most (92%) do not have an assigned case-type of 'acute care'.

Three types of fall mechanism predominated among fall-related hospital separations; slipping, tripping and stumbling, 'other fall on same level' and unspecified falls. Together, these external causes accounted for 82.4% of all fall-related case, transfer and follow-up separations for people aged 65 and older in 2007–08. The estimated cost to the hospital system for acute care due to slips, trips and stumbles in 2007–08 was $210.8 million, or 32.5% of the total cost of fall-related hospital care (Table 6.4). The estimated cost to the hospital system for care due to 'other fall on same level' was $130.6 million (20.2%) while that for unspecified falls was $190.2 million (29.3% of the total cost). Together, these three types of fall accounted for $531.6 million (82.0%) of the estimated cost to the hospital system due to fall-related acute care for people aged 65 and older in 2007–08.

**Table 6.4: Estimated cost to the hospital system for fall-related hospitalisations, by external cause; people aged 65+, Australia 2007–08**

| External cause | Fall injury cases ($ m) | Fall injury inward transfers ($ m) | Fall-related follow-up care ($ m)* | Total ($ m) | Per cent total cost |
|---|---|---|---|---|---|
| Fall on same level from slipping (W01.0) | $51.7 | $6.3 | $1.1 | $59.0 | 9.1% |
| Fall on same level from tripping (W01.1) | $112.5 | $13.3 | $2.0 | $127.8 | 19.7% |
| Fall on same level from stumbling (W01.2) | $20.6 | $3.0 | $0.3 | $23.9 | 3.7% |
| *Total fall on same level from slipping, tripping and stumbling (W01)* | *$184.7* | *$22.6* | *$3.4* | *$210.8* | *32.5%* |
| Fall involving wheelchair (W05) | $3.6 | $0.6 | $0.0 | $4.2 | 0.6% |
| Fall involving bed (W06) | $24.1 | $3.3 | $0.4 | $27.9 | 4.3% |
| Fall involving chair (W07) | $17.7 | $2.3 | $0.3 | $20.3 | 3.1% |
| Fall involving playground equipment (W09) | $0.1 | $3.8 | $0.0 | $3.8 | 0.6% |
| Fall on and from stairs and steps (W10) | $32.2 | $0.0 | $0.6 | $32.8 | 5.1% |
| Fall on and from ladder (W11) | $9.6 | $1.7 | $0.1 | $11.4 | 1.8% |
| Other fall from one level to another (W17) | $5.1 | $0.8 | $0.1 | $6.1 | 0.9% |
| Other fall on same level (W18) | $113.3 | $15.2 | $2.2 | $130.6 | 20.2% |
| Unspecified fall (W19) | $153.7 | $30.7 | $5.8 | $190.2 | 29.3% |
| Other falls | $8.5 | $1.4 | $0.0 | $10.1 | 1.6% |
| **Total** | **$552.6** | **$82.4** | **$13.1** | **$648.2** | **100.0%** |

* Excludes the majority of fall-related follow-up care separations as most (92%) do not have an assigned case-type of 'acute care'.

## The cost of additional fall-related separations

As explained above, estimating the true cost of hospitalised falls using AR-DRG cost weights is complicated by the inappropriateness of this measure for non-acute care. It is also difficult to estimate the costs associated with the additional groups of fall-related separations discussed in this report; 'other fall-related' separations and 'tendency to fall' separations. The assignment of AR-DRGs, and the higher-order Major Diagnostic Categories (MDCs), is heavily based on the principal diagnosis for the episode of care (see AIHW 2009a). Accordingly, the AR-DRG cost weights appropriate for the 'other fall-related' and 'tendency to fall' separations considered here better describe the cost of the treatment of the principal diagnosis (for example, cardiac surgery and convalescence for records with principal diagnoses from Chapter IX of the ICD-10-AM, *Diseases of the circulatory system*; or surgery/treatment for neoplasms for records with principal diagnoses from Chapter II, *Neoplasms*) than the costs incurred by the additional fall injury. It is likely, then, that including the cost of these episodes of care overestimates the cost to the hospital system due to falls. Nevertheless, at least some of the cost for these episodes of care is due to fall-related conditions; otherwise, the injury diagnosis and fall external cause code, or R29.6 diagnosis, would not feature in the hospital record. Accordingly, a brief examination of the estimated cost associated with 'other fall-related' and 'tendency to fall' separations in 2007–08 is presented here.

Nearly all (91.1%, *n* = 20,648) of the 22,666 records identified as being 'other fall-related' separations in 2007–08 were episodes of acute care and were included in this cost estimate. The total estimated cost to the hospital system for this care in 2007–08 was $166.5 million. Most of this cost (82.3%, $137.0 million) was incurred in the public sector. Reflecting the diversity of principal diagnoses for these 'other fall-related' separations, costs were fairly evenly spread across the range of ICD-10-AM chapters.

A smaller proportion of 'tendency to fall' separations was coded as acute episodes of care (65.5%) than seen for 'other fall-related' separations. The total estimated cost to the hospital system for these 11,798 episodes of care in 2007–08 was $77.3 million and most of this cost (84.6%, $65.4 million) was incurred in the public sector. The most expensive group of 'tendency to fall' separations were those with principal diagnoses describing symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (29.8%, $23.0 million).

Together, the estimated cost of 'other fall-related' and 'tendency to fall' acute care separations added an unknown proportion of an estimated $243.8 million to the cost to the hospital system due to fall-related conditions.

### The mean cost per hospitalised fall

The mean cost of hospital care per fall injury case can be estimated in a similar way to that for the mean length of stay per case presented in the previous chapter; the total cost for all fall-related hospitalisations divided by the estimated number of cases involving people aged 65 and older in 2007–08 (*n* = 74,414). We have included only the costs for those separations most directly related to injurious falls; fall injury cases, inward transfers and fall-related follow-up care separations ($648.2 million, see Table 6.2). This results in an estimated mean cost to the hospital system of $8,710 per fall injury case. The mean cost for cases involving males was slightly higher ($8,744) than that for females ($8,696). It must be remembered, though, that these values are certain to underestimate the actual cost of hospital care per serious fall given the exclusion of non-acute episodes of care from the calculation.

## Costs by AR-DRG groupings

Tables 6.5 to 6.7 list the ten most costly AR-DRGs for acute-care fall injury case separations, inward transfer separations and fall-related follow-up care separations for people aged 65 and older in 2007–08. Separations from both public hospitals and the private sector are combined for these tables. Some of these AR-DRGs rank highly for cost because, while the number of separations with the particular AR-DRG was relatively low, the care provided was relatively expensive (for example, I03C *hip replacement without catastrophic/severe complications or co-morbidities*; there were only 1,653 acute fall injury cases with this AG-DRG, but at an average cost per separation of $16,748). Others rank highly for cost due to the volume of separations with a particular, although relatively inexpensive, AR-DRG (for example, I75B *injury to the shoulder, arm, elbow, knee, leg or ankle, age greater than 64 years, without complications or co-morbidities*; having an average cost of $3,374, but nearly 4,500 fall injury case separations had this AR-DRG in 2007–08). Again, note that the relatively small cost estimate for fall-related follow-up care reflects the fact that available cost weights were not appropriate to apply to non-acute episodes of care.

The most expensive AR-DRGs for fall injury case and inward transfer separations in 2007–08 were very similar to those identified in previous years (Bradley 2012; Bradley and Harrison 2007); hip, femur and pelvis procedures predominated and injuries with associated complications or co-morbidities were common. Similarly, the most expensive AR-DRGs for inward transfer separations also included A06Z *tracheostomy or ventilation, greater than 95 hours* and B78A *intracranial injury with catastrophic/severe complications or co-morbidities*, indicative of the more severe nature of transferred cases (Table 6.6).

Due to the small proportion of fall-related follow-up care separations that were for acute care in 2007–08, the data presented in Table 6.7 should be viewed as an indication only of the types of AR-DRG such separations have, rather than as an accurate presentation of costs. As expected, 'aftercare' and rehabilitation-related AR-DRGs were most common. As in previous years, two AR-DRGs—I73A *aftercare of musculoskeletal implants/prostheses, age greater than 59, with catastrophic/severe complications or co-morbidities* and Z63A *other aftercare with catastrophic/severe complications or co-morbidities*—accounted for more than half of the acute-care follow-up care separations ($n$ = 1,123, 59.1%) and three-quarters of the costs (73.6%) considered in this analysis.

The costs for the higher-order MDCs contributing to the 2007–08 estimates are described in Appendix Tables A2 to A4.

Given that the relationship between the reported fall injury, or tendency to fall, and the principal reason for the episode of care is not particularly well understood for 'other fall-related' and 'tendency to fall' separations, common and/or costly AR-DRGs (or MDCs) were not analysed.

**Table 6.5: The ten most costly AR-DRGs for acute-care fall injury case separations; persons aged 65+ years, Australia 2007–08**

| AR-DRG v5.1 | Description | Count | Cost ($ m) |
|---|---|---|---|
| I08A | Other hip and femur procedure with catastrophic/severe complications or co-morbidities | 5,210 | $97.1 |
| I03B | Hip replacement with catastrophic/severe complications or co-morbidities or Hip revision without catastrophic/severe complications or co-morbidities | 3,004 | $62.6 |
| I08B | Other hip and femur procedure without catastrophic/severe complications or co-morbidities | 3,303 | $36.0 |
| X60A | Injuries, age greater than 64 years, with complications or co-morbidities | 6,505 | $31.5 |
| I03C | Hip replacement without catastrophic/severe complications or co-morbidities | 1,653 | $27.7 |
| I75A | Injury to the shoulder, arm, elbow, knee, leg or ankle, age greater than 64 years, with complications or co-morbidities | 3,361 | $26.0 |
| I77A | Fracture of pelvis with catastrophic/severe complications or co-morbidities | 1,743 | $20.2 |
| J65A | Trauma to the skin, subcutaneous tissue and breast, age greater than 69 years | 4,852 | $17.3 |
| I19Z | Other elbow or forearm procedures | 2,422 | $15.2 |
| I75B | Injury to the shoulder, arm, elbow, knee, leg or ankle, age greater than 64 years, without complications or co-morbidities | 4,459 | $15.0 |

**Table 6.6: The ten most costly AR-DRGs for acute-care fall injury inward transfer separations; persons aged 65+, Australia 2007–08**

| AR-DRG v5.1 | Description | Count | Cost ($ m) |
|---|---|---|---|
| I08A | Other hip and femur procedure with catastrophic/severe complications or co-morbidities | 802 | $14.7 |
| I03B | Hip replacement with catastrophic/severe complications or co-morbidities or Hip revision without catastrophic/severe complications or co-morbidities | 518 | $10.7 |
| I08B | Other hip and femur procedure without catastrophic/severe complications or co- morbidities | 612 | $6.6 |
| I03C | Hip replacement without catastrophic/severe complications or co-morbidities | 308 | $5.2 |
| A06Z | Tracheostomy or ventilation, greater than 95 hours | 47 | $4.3 |
| I75A | Injury to the shoulder, arm, elbow, knee, leg or ankle, age greater than 64 years, with complications or co-morbidities | 449 | $3.3 |
| I77A | Fracture of pelvis with catastrophic/severe complications or co-morbidities | 234 | $2.5 |
| I13B | Humerus, tibia, fibula and ankle procedures, age greater than 59 years, without catastrophic/severe complications or co-morbidities | 239 | $2.2 |
| I78A | Fracture of the neck of femur with catastrophic/severe complications or co-morbidities | 288 | $2.1 |
| B78A | Intracranial injury with catastrophic/severe complications or co-morbidities | 172 | $2.1 |

**Table 6.7: The ten most costly AR-DRGs for acute-care fall-related follow-up care separations; persons aged 65+, Australia 2007–08**

| AR-DRG v5.1 | Description | Count | Cost |
|---|---|---|---|
| I73A | Aftercare of musculoskeletal implants/prostheses, age greater than 59, with catastrophic/severe complications or co-morbidities | 578 | $5.8 |
| Z63A | Other aftercare with catastrophic/severe complications or co-morbidities | 545 | $3.8 |
| Z60A | Rehabilitation with catastrophic/severe complications or co-morbidities | 161 | $1.4 |
| I73B | Aftercare of musculoskeletal implants/prostheses, age greater than 59, without catastrophic/severe complications or co-morbidities | 170 | $0.7 |
| Z64A | Other factors influencing health status | 95 | $0.4 |
| Z63B | Other aftercare without catastrophic/severe complications or co-morbidities | 149 | $0.4 |
| Z60B | Rehabilitation without catastrophic/severe complications or co-morbidities | 21 | $0.2 |
| Z60C | Rehabilitation, same-day admission | 136 | $0.1 |
| A06Z | Tracheostomy or ventilation, greater than 95 hours | n.p. | $0.1 |
| Z01A | OR procedures with diagnoses of other contacts with health services with catastrophic/severe complications or co-morbidities | 14 | $0.1 |

*As described above, acute-care episodes of care contribute less than 8% of all fall-related follow-up care separations.

n.p. Small cell counts have been suppressed to prevent patient identification.

# 7 Discussion

Falls are common among older people and often result in fractures or other serious injuries (Gillespie et al. 2009; Lord et al. 2001; Sattin 1992; Tinetti et al. 1988). About three-quarters of all hospitalised injuries involving older Australians are due to falls (Bradley and Harrison 2008). This report confirms that the rate of hospitalised falls for people aged 65 and older remains high and that hospitalisations for injuries due to falls and other fall-related conditions continue to constitute a substantial proportion of Australia's burden of disease and health expenditure.

In total, 107,919 separations were identified as being directly related to injurious falls by people aged 65 and older in 2007–08 (including case separations, inward transfers and follow-up care separations). This represents 3.8% of all hospital separations for any cause for this population. Further, these fall-related hospitalisations accounted for 1.2 million patient days in 2007–08, representing 9.7% of all hospital patient days for the population aged 65 and older.

An additional 22,666 hospital separations for people aged 65 and older were identified as having something to do with injurious falls (termed 'other fall-related separations' in this report) and a further 18,010 separations in 2007–08 included a diagnosis describing a 'tendency to fall, not elsewhere classified' (R29.6). Separations of these types contributed 0.6 million additional patient days (5.0%) to the burden to the hospital system for people aged 65 and older.

## Fall injuries and circumstances

The estimated number of fall injury cases for people aged 65 and over that resulted in hospitalisation in 2007–08 was 74,414. The age-standardised rate of fall injury cases was 2,516 per 100,000 population, marginally higher than in 2006–07 (2,503 per 100,000) but representing nearly 3,000 additional serious falls. As in previous years, and reflective of the general population aged 65 and older, females made up a higher proportion of fall-related hospitalisations in 2007–08. Age-specific rates of hospitalised fall injury cases suggest that older females continue to have a higher risk of serious falls than older males.

While injuries to the hip and thigh were the most common type of injury sustained in a serious fall case for both males and females, a high proportion of hospitalised falls resulted in head injuries. Head injuries accounted for a slightly larger proportion of fall injury cases in 2007–08 than in 2006–07 (18.6% versus 18.0%, respectively) and a similar increase in head injuries was observed for fall injury inward transfers (11.4% in 2007–08 versus 10.8% in 2006–07). Of note, head injuries are proportionately more common for older males than for older females and this may affect the design of any intervention specifically developed to reduce these injuries.

As in previous years, the most common type of fall for fall injury cases in 2007–08 was a 'fall on the same level due to slipping, tripping and stumbling' (W01). This was the most common cause of a fall-related injury for both males and females. Correspondingly, the second most common cause of fall injury case was an 'unspecified fall' (W19) and the third most common, an 'other fall on same level' (W18). Similarly, W01, W18 and W19 were also the most commonly listed external causes for other types of fall-related hospitalisation.

Nearly two-thirds of the 24,550 cases coded as slips, trips and stumbles in 2007–08 were attributed to trips. This may have relevance for falls prevention interventions.

The financial year 2007–08 was the second year that hospital data were coded to the fifth edition of the ICD-10-AM. In this edition, extended subcategory coding for fall external causes was available to describe falls involving beds, chairs and other furniture (NCCH 2006). New subcategory coding was also provided for W18 (other fall on same level), a very commonly used code but one that has previously been difficult to interpret. Nevertheless, and as observed for 2006–07 data, most fall cases of these types were coded to the relevant 'other' and/or 'unspecified' sub-categories so, unfortunately, little has been gained from introducing the new coding as far as our understanding of the circumstances of older people's injurious falls.

As in previous years, seven out of ten fall injury cases were recorded as having occurred in the home or in aged care facilities, and place was recorded as 'unspecified' for a further 16% of fall cases. Rates of fall injury cases in aged care facilities in 2007–08 remained markedly higher than the corresponding rates of fall injury cases in the home for people resident in the general community. Similar findings for residents of aged care facilities in a region of New South Wales have been described by Gibson et al. (2008).

A high proportion of fall injury cases were again coded to 'unspecified activity' in 2007–08; about seven in ten cases were coded this way. The next most common activity code was 'while resting, sleeping, eating or engaging in other vital activities'. As discussed in previous reports (e.g. Bradley 2012; Bradley and Pointer 2008), prevention programs would greatly benefit from more detailed information on the activity in which older fallers were engaged when they were injured so these programs can better target their resources. It is suggested that future revisions of the ICD-10-AM activity codes explicitly address activities such as housework, DIY, gardening and volunteer work, and tackle the rather nebulous 'vital activities', in fourth- or fifth-character subcategories. In particular, and given the recent introduction of condition onset coding (see AIHW 2009a), a category describing 'while being taken care of' or 'while receiving hospital treatment' (or similar) would be a timely addition to the activity codes of the ICD-10-AM.

# The burden of fall-related injury

The additional types of separation identified in this report as being fall-related (that is, fall injury inward transfers, fall-related follow-up care, 'other fall-related' and 'tendency to fall' separations) significantly increased the already substantial burden of hospitalised fall injury cases among people aged 65 and older in 2007–08. Fall-related follow-up care separations contributed almost as many patient days as those for initial episodes of hospital care due to fall injury (cases); 0.50 million days compared with 0.56 million days, respectively. Consideration of this fall-related follow-up care brought the total number of hospital patient days directly related to fall injuries by people aged 65 and older in 2007–08 to nearly 1.2 million. Inclusion of the patient days for 'other fall-related' and R26.9 (tendency to fall, not elsewhere classified) separations increased this figure by a further 0.6 million days.

Defined by a set of four principal diagnoses from Chapter XXI of the ICD-10-AM (*Factors influencing health status and contact with health services*) plus the presence of both an injury diagnosis and a fall external cause code, 24,429 fall-related follow-up care separations for people aged 65 and older were identified in 2007–08 data. As in previous years, the principal diagnosis Z50.9 (care involving use of rehabilitation procedure, unspecified) was found to be a particularly common type of follow-up care separation; 79% of fall-related follow-up care

separations had this principal diagnosis. A further 8% of fall-related follow-up care separations had a principal diagnosis indicating that the person was awaiting admission to an adequate facility elsewhere (Z75.1). Most of these specified that the person was waiting for admission to a residential aged care service. It is thought that separations of this type are additional to the 21–23% of older people who are admitted to residential aged care directly following a hospitalised fall injury (as estimated by the AIHW for 2001–02, see Karmel et al. 2008).

Another class of fall-related separation that added to the burden to the hospital system due to falls were those we term 'other fall-related' separations. These separations do not meet the criteria specified for fall injury cases, inward transfers or fall-related follow-up care separations, but do contain both a relevant injury code (S00–T75 or T79) and external cause code (W00–W19) within the record. The exact relationship between the fall injury and the principal reason (principal diagnosis) for these 'other fall-related' separations is not known. The recent introduction of national condition onset data (items flagging whether the condition was present on admission to hospital or not, see AIHW 2009a) is likely to play a vital role in developing our understanding of these injuries.

'Other fall-related' separations contributed a further 22,666 episodes of hospital care and 0.3 million patient days for people aged 65 and older in 2007–08. About one in five 'other fall-related' separations (21%) had a principal diagnosis describing diseases of the circulatory system. A further 16% had a principal diagnosis describing 'symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified', about half of these had R55 (syncope and collapse) as the specific principal diagnosis. Of note, unlike fall injury cases, inward transfers and fall-related follow-up care separations, both the age-standardised and age-specific rates of 'other fall-related' separations were higher for older males than for older females.

The final group of fall-related hospital separations considered in this report are those defined by the presence of the diagnosis code R29.6 (tendency to fall, not elsewhere classified). This diagnosis should be used in situations where the patient has the tendency to fall because of old age "or other unclear health problems" but not for injurious falls or a tendency to fall due to known conditions. Nevertheless, a relatively small number of separations that contained a 'tendency to fall' diagnosis in 2007–08 also contained both an injury and a fall external cause code and were considered elsewhere in the report (that is, as fall injury cases, transfers, follow-up care or 'other fall-related' separations). A further 18,010 separations in 2007–08 were identified as containing only the 'tendency to fall' diagnosis code of interest and 0.3 million patient days were attributed to these episodes of care. Interestingly, as for 'other fall-related' separations, but unlike fall injury cases, inward transfers and fall-related follow-up care separations, the age-standardised rate of 'tendency to fall' separations (and the age-specific rate for most age groups) was higher for older males than for older females.

# The cost of fall-related hospital care

This report also estimated the burden of serious falls in terms of the cost to the hospital system due to fall-related episodes of care. The estimated total cost to the hospital system for acute care directly attributable to fall-related hospital care involving people aged 65 and older in 2007–08 was $648.2 million, an increase of approximately $48 million (8%) on the previous year. Together, acute care for injuries to the hip and thigh, head injuries and injuries to the abdomen accounted for 71% of this cost.

Acute 'other fall-related' and 'tendency to fall' separations—episodes of care where the relationship between the injurious fall or the tendency to fall and the principal reason for the admission is less clear—added a further $166.5 million and $77.3 million to the estimate, respectively.

These cost estimates certainly undervalue the true cost of injurious falls and fall-related hospital care due to the omission of non-acute episodes of care from the cost analysis. However, even with the exclusion of some known fall-related episodes of hospital care (that is, non-acute care), our conservative estimate that falls cost the hospital system substantially more than $0.5 billion in 2007–08 is a much higher figure than the $384.9 million projection for the year 2011 of Moller (2003). Moreover, our estimate also exceeds Moller's $603.9 million *total* cost projection for 2011, which includes consideration of the cost of residential care, non-hospital medical treatment, allied health and pharmaceuticals. Some of the mismatch between our estimates and those of Moller (2003) is attributable to increases in the rate of hospitalised falls since his baseline year. While Moller's projections estimated that there would be 47,100 falls admitted to hospital in 2011, we observed nearly double that in 2007–08 (74,414 fall cases plus 9,076 inward transfer separations). Given that the rate of hospitalised falls is thought to be increasing by a magnitude of about 1.7% per year (Bradley 2012), it is highly desirable that Moller's analysis (2003) be revised in order to better guide hospital and residential aged care planning in Australia.

We also estimated the mean cost of hospitalisation per fall injury case for 2007–08 (accounting for case, transfer and follow-up care separations) at $8,710 per case. Again, this is a higher figure than that produced by some recent Australian analyses. Tiedemann et al. (2008) reported a cost estimate of $1,600 per fall using data from a prospective study, but this figure included falls that did not require (expensive) admitted patient care. Potter-Forbes and Aisbett (2003), however, estimated an average cost of $5,688 (cited in Tiedemann et al. 2008) for falls of a severity more comparable to those discussed in the present report, although this estimate does not appear to assess the burden of hospital care due to fall-related follow-up care. Cost estimates from work conducted in Western Australia are much more like that reported here, with an estimated average cost per hospitalised fall of about $6,500–$6,800 (see Hall and Hendrie 2003; Hendrie et al. 2003). Importantly, the inclusion criteria for these two studies were very similar (for hospitalised cases) to those applied in the current work. That our estimate is slightly higher than those of these authors is likely to be a result of (a) the observed increase in rates of fall-related follow-up care separations in recent years and (b) inflation over time.

# Appendix A: Data issues

## Data sources

Hospital separations data were provided by the AIHW (see AIHW 2009a). Less than 1% of injury and poisoning separations are thought to be missing from the data reported, representing minimal risk of sampling error.

Estimated resident population data by age, sex and place of usual residence were also obtained from the AIHW, similar to that published as the *Australian demographic statistics* series (ABS 2008a). Population estimates of residents of aged care facilities were obtained from the AIHW report series *Residential aged care in Australia* (e.g. AIHW 2008, 2009b). The number of people aged 65 and older resident in the community was estimated by subtracting the number of residents of aged care facilities from the general population data.

## ICD-10-AM

This report is based on hospital separations data coded according to the fifth edition of the Australian clinical modification of ICD-10, the ICD-10-AM (NCCH 2006).

## Selection criteria

### Fall cases and inward transfer separations

Fall cases were defined as all NHMD unit records with a date of separation between 1 July 2007 and 30 June 2008 that met the following specifications:

- The patient was aged 65 or older
- The principal diagnosis was in the range S00–T75 or T79
- The left-most external cause code was in the range W00–W19 *falls* and,
- The mode of admission was not a transfer from another acute hospital.

Diagnoses S00–T75 or T79 have been used to specify 'community injury' (that is, injuries that occur outside the hospital setting) in recent NISU reports (e.g. Bradley and Harrison 2008). Selection has been based on principal diagnosis because this refers to the condition chiefly accounting for the episode in hospital. The left-most (first-listed) external cause code was chosen as a selection criterion as this is considered to be most likely to be related to the principal diagnosis (Table 8.1).

Inward transfers from other acute hospitals were omitted from incidence estimates as this reduces multiple counting of cases that generate more than one separation record. The NHMD unit records are de-identified and do not contain information relating to a separation's place in a sequence of hospital episodes. As such, a sequence of separations in which an individual is admitted to hospital and then transferred to another hospital results in two (un-linked) unit records. Further, re admissions relating to the same case are not flagged, again generating multiple entries in the database. As such, the number of hospital separations meeting our definition of injury overestimates the number of injury cases that led to hospitalisation.

Separations with a principal diagnosis S00–T75 or T79, a first reported external cause code W00–W19 and a mode of admission indicating a transfer from another acute hospital, omitted from injury incidence enumeration, were analysed separately as 'falls injury inward transfers'.

## Follow-up care separations

Analysis of person-linked data suggests that many separations following an episode of care for an injury, particularly for older people with falls injuries, are coded with a principal diagnosis from Chapter XXI of the ICD-10-AM (*Factors influencing health status and contact with health services*). More specifically, most such cases are coded as Z50—care involving use of rehabilitation procedures. These cases contribute to a non-negligible proportion of the burden of injury due to falls by older people.

In this report, follow-up care separations due to falls were defined as NHMD unit records with a date of separation between 1 July 2007 and 30 June 2008 that met the following specifications:

- The patient was aged 65 or older
- The principal diagnosis was either:
    - Z47 (other orthopaedic follow-up care')
    - Z48 (other surgical follow-up care')
    - Z50 (care involving use of rehabilitation procedures')
    - Z75.1 (person awaiting admission to adequate facility elsewhere')
- Any diagnosis variable contained a code in the range S00–T75 or T79 and,
- Any external cause code variable contained a code in the range W00–W19.

The diagnoses specified above accounted for over 81% of the total number of separations for people aged 65 and over in 2007–08 with a principal diagnosis from Chapter XXI of the ICD-10-AM and a falls external cause code within the record.

## 'Other fall-related' separations

Another group of fall-related separations was specified that includes all separation records containing a diagnosis code for injury (S00–T75 or T79) and an external cause code for an unintentional fall (W00–W19) and that are not included in any of the groups above. This group includes NHMD unit records with a date of separation between 1 July 2007 and 30 June 2008 where:

- The patient was aged 65 or older
- Any diagnosis variable contained a code in the range S00–T75 or T79
- Any external cause code variable contained a code in the range W00–W19
- The separation was not classed as a fall injury incident case or inward transfer and,
- The separation was not classed as a fall-related follow-up care separation.

Most of these 'other fall-related' separations had a principal diagnosis for a non-injury condition. This category also included separations with a principal diagnosis in the range S00–T75 or T79 that had a fall code W00–W19 but not as the first reported external cause and injury separations that had a principal diagnosis from Chapter XXI (*Factors influencing health status and contact with health services*) other than those designated as fall-related follow-up

care separations. Some of these additional cases had first external cause codes denoting complications of medical and surgical care.

### 'Tendency to fall' separations

The fifth edition of the ICD-10-AM includes the diagnosis code R29.6 (tendency to fall, not elsewhere classified). R29.6 replaces the R29.81 'other and unspecified symptoms and signs involving the nervous and musculoskeletal systems—falls' code used in previous editions of the ICD-10-AM (see NCCH 2004). The entry in the coding manual for R29.6 reads "tendency to fall because of old age or other unclear health problems" (NCCH 2006, Tabular List p. 382), and falls due to accidents, difficulty in walking, dizziness and giddiness, syncope and collapse or causing injury are explicitly excluded. Further, the ICD-10-AM coding standards regarding both the R29.6 and R29.81 codes (that is, across editions) specify that these codes should not be applied in cases of known injury or when a medical condition is found to be the cause of the recurrent falls.

In this report, 'tendency to fall' separations were analysed separately from other fall-related episodes of hospital care and were defined as NHMD unit records with a date of separation between 1 July 2007 and 30 June 2008 that met the following specifications:

- The patient was aged 65 or older
- Any diagnosis variable contained an R29.6 code
- The separation was not classed as a fall injury incident case or inward transfer
- The separation was not classed as a fall-related follow-up care separation and,
- The separation was not classed as an 'other fall-related' separation.

All case selection criteria used in this report are summarised in Table A1.

## Calculation of rates

Age-specific rates were calculated for age groups (five-year bands up to age 90–94, and a group for ages 95 and older) using national and jurisdictional population estimates as at 31 December 2007 (the mid-point of the financial year). These data were obtained from the AIHW and are similar to that presented in the *Australian demographic statistics* series (ABS 2008a).

Population estimates according to Australian Standard Geographical Classification of remoteness (see ABS 2008b) are available from the ABS only for the year ending 30 June. Values for 31 December were calculated using the mean of the population estimates for 2007 and 2008.

As outlined in Chapter Three, rates of falls occurring in the home and in aged care facilities were calculated using denominator data reflecting the estimated place of residence for the population. Population estimates of residents of aged care facilities were obtained from the AIHW report series *Residential aged care in Australia* (AIHW 2008, 2009b). The number of people aged 65 and older resident in the community were then estimated by subtracting the number of residents of aged care facilities from the general population.

The age distribution of the population aged 65 and older differs between jurisdictions, remoteness zones and genders, and is changing over time. In this report most rates for the whole age range 65 and older have been standardised using the direct method to facilitate valid comparisons. The Australian population at 30 June 2001 has been used as the standard.

## Quantifying variability in the counts presented in this report

The data presented in this report are subject to two types of statistical error, non-random and random. (A third type of statistical error, sampling error, does not apply here because none of the data sources used involved probability sampling.)

Non-random error: Some amount of non-random error is to be expected in administrative data collections such as the hospital inpatient data on which this report relies. For example, non-random error could occur if the approach to assigning cause codes to cases were to differ systematically between jurisdictions or over time. Systems are in place to encourage uniform data collection and coding and scrutiny of data during analysis includes checking for patterns that might reflect non-random error. Nevertheless, some non-random error is likely to remain. Identified or suspected non-random errors large enough to materially affect findings are mentioned in reports.

Random error: The values presented in the report are subject to random error, or variation. Variation is relatively large when the case count is small (especially if less than about 10) and small enough to be unimportant in most circumstances when the case count is larger (i.e. more than a few tens of cases).

Some of the topics for which results are reported compare groups that vary widely in case count, largely due to differences in population size (e.g. the population of NSW is more than 30 times as large as the NT population and the Major City zone population is nearly 90 times as large as that of the Very Remote zone). In this situation, year-to-year changes in counts or rates for the smaller-population groups may be subject to large random variation. There is potential to misinterpret such fluctuations as meaningful rises or falls in occurrence.

In this situation, and similar ones, guidance is provided to readers concerning how much variation of values can be expected due to random variation of small counts. Confidence Intervals (CIs) are calculated for this purpose.

## Confidence intervals

The AIHW is presently undertaking a review to assess the provision of confidence intervals and statistical tests when data arise from sources that provide information on all subjects, rather than from a sample survey. This review will include analysis of the methods used to calculate confidence intervals, as well as the appropriateness of reporting confidence intervals and undertaking statistical testing for such data. This review aims to ensure that statistical methods used in AIHW reports remain robust and appropriately inform understanding and decision making. As a consequence, the type of information reported in future editions of this publication may change.

# Costs

This report has applied estimated cost weights based on AR-DRG Version 5.1 to both public sector and private sector fall-related acute episodes of hospital care. These cost weights are appropriately applied only to acute episodes of care (see DoHA 2009b), so non-acute separations have been omitted from the analysis accordingly.

## Small case counts

Cell counts in tables that are five cases or fewer have been suppressed to protect patient confidentiality. In instances where only one cell in a row or column has a count of five or fewer, another cell in the same row or column has also been suppressed to prevent back-calculation. The abbreviation 'n.p.' has been used in these tables to denote these suppressions. For these tables, the totals include the suppressed information.

## Errors, inconsistencies and uncertainties

This report uses data collected from state and territory hospitals. After coding and collection from the states and territories, the data are further processed by the AIHW and the NISU. The geographical spread of the data and the large number of people involved in its processing increase the risk of inconsistencies across time and place in the data. Variations in reporting and coding continue to exist across jurisdictions, although National Minimum Data Sets have been in place for some considerable amount of time.

As outlined above, incidence is not equivalent to number of hospital separations. Methods to extract actual cases of incidence produce estimates only.

**Table A1: Case selection criteria for fall-related separations for people aged 65+, Australia 2007–08**

| Separation type | Males | Females | Persons |
|---|---|---|---|
| **Fall injury cases:** | | | |
| – Principal diagnosis is S00–T75 or T79, | | | |
| – First external cause is W00–W19, and | | | |
| – Mode of admission is not a transfer from another acute hospital. | 22,459 | 51,955 | 74,414 |
| **Fall injury inward transfer separations:** | | | |
| – Principal diagnosis is S00–T75 or T79, | | | |
| – First external cause is W00–W19, and | | | |
| – Mode of admission is a transfer from another acute hospital. | 2,728 | 6,348 | 9,076 |
| **Fall-related follow-up care separations:** | | | |
| – Principal diagnosis is Z47, Z48, Z50 or Z75.1, and | | | |
| – Any external cause is W00–W19. | 7,007 | 17,422 | 24,429 |
| **'Other fall-related' separations:** | | | |
| – Any diagnosis is S00–T75 or T79, | | | |
| – Any external cause is W00–W19, | | | |
| – Is not an incident case or inward transfer, and | | | |
| – Is not a follow-up care separation. | 10,267 | 12,399 | 22,666 |
| **'Tendency to fall' separations:** | | | |
| – Any diagnosis R29.6, | | | |
| – Is not an incident case or inward transfer, | | | |
| – Is not a follow-up care separation, and | | | |
| – Is not an 'other fall-related' separation. | 7,908 | 10,102 | 18,010 |
| **Total number of fall-related separations in 2007–08** | **50,369** | **98,226** | **148,595** |

# Appendix B: Additional tables

**Table A2: Major Diagnostic Category cost estimates for (acute care) fall injury cases; males, females and persons aged 65+, Australia 2007–08**

| Major Diagnostic Category | AR-DRG v5.0 | Males (*n*) | Females (*n*) | Persons (*n*) |
|---|---|---|---|---|
| Major procedures where the principal diagnosis may be associated with any MDC | A01Z–A41Z | $8,425,240 (92) | $4,441,466 (49) | $12,866,706 (141) |
| Diseases and disorders of the nervous system | B01Z–B81B | $13,530,630 (1,986) | $13,858,746 (2,407) | $27,389,376 (4,393) |
| Diseases and disorders of the eye | C01Z–C63B | $859,611 (413) | $1,347,886 (648) | $2,207,497 (1,061) |
| Diseases and disorders of the ear, nose, mouth and throat | D01Z–D67Z | $1,082,199 (469) | $1,664,954 (709) | $2,747,153 (1,178) |
| Diseases and disorders of the respiratory system | E01A–E75C | $8,199,623 (1,335) | $8,316,452 (1,370) | $16,516,075 (2,705) |
| Diseases and disorders of the digestive system | G01A–G70B | $68,440 (7) | $47,891 (6) | $116,331 (13) |
| Diseases and disorders of the hepatobiliary system and pancreas | H01A–H64B | $16,557 (n.p.) | $29,803 (n.p.) | $46,360 (8) |
| Diseases and disorders of the musculoskeletal system and connective tissue | I01Z–I78C | $102,617,279 (10,738) | $302,467,131 (32,905) | $405,084,410 (43,643) |
| Diseases and disorders of the skin, subcutaneous tissue and breast | J01Z–J67B | $5,855,614 (1,687) | $12,702,514 (3,553) | $18,558,128 (5,240) |
| Diseases and disorders of the kidney and urinary tract | L01A–L67C | $133,558 (26) | $135,742 (15) | $269,300 (41) |
| Diseases and disorders of the male reproductive system | M01Z–M64Z | $6,153 (n.p.) | 0 | $6,153 (n.p.) |
| Diseases and disorders of the female reproductive system | N01Z–N62B | 0 | $6,212 (n.p.) | $6,212 (n.p.) |
| Diseases and disorders of the blood and blood forming organs and immunological disorders | Q01Z–Q62B | $150,979 (18) | $127,118 (12) | $278,097 (30) |
| Infectious and parasitic diseases | S60Z–T64B | $99,425 (11) | $160,944 (16) | $260,369 (27) |
| Injuries, poisoning and toxic effects of drugs | W01Z–X64B | $23,013,349 (5,360) | $41,572,003 (9,506) | $64,585,352 (14,866) |
| Burns | Y01Z–Y62B | $7,016 (n.p.) | $1,113 (n.p.) | $8,129 (n.p.) |
| Error DRGs | 901Z–963Z | $800,785 (60) | $882,348 (68) | $1,683,133 (128) |
| **Total** | | **$164,866,458 (22,210)** | **387,762,323 (51,272)** | **$552,628,781 (73,482)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

**Table A3: Major Diagnostic Category cost estimates for (acute care) fall injury inward transfers; males, females and persons aged 65+, Australia 2007–08**

| Major Diagnostic Category | AR-DRG v5.0 | Males (*n*) | Females (*n*) | Persons (*n*) |
|---|---|---|---|---|
| Major procedures where the principal diagnosis may be associated with any MDC | A01Z–A41Z | $2,760,224 (30) | $1,552,666 (17) | $4,312,890 (47) |
| Diseases and disorders of the nervous system | B01Z–B81B | $3,928,769 (323) | $2,871,901 (295) | $6,800,670 (618) |
| Diseases and disorders of the eye | C01Z–C63B | $36,959 (12) | $83,962 (27) | $120,921 (39) |
| Diseases and disorders of the ear, nose, mouth and throat | D01Z–D67Z | $94,492 (29) | $104,632 (34) | $199,124 (63) |
| Diseases and disorders of the respiratory system | E01A–E75C | $824,142 (124) | $815,137 (143) | $1,639,279 (267) |
| Diseases and disorders of the hepatobiliary system and pancreas | H01A–H64B | $8,677 (n.p.) | 0 | $8,677 (n.p.) |
| Diseases and disorders of the musculoskeletal system and connective tissue | I01Z–I78C | $17,954,093 (1,552) | $45,071,694 (4,365) | $63,025,787 (5,917) |
| Diseases and disorders of the skin, subcutaneous tissue and breast | J01Z–J67B | $307,056 (90) | $597,251 (155) | $904,307 (245) |
| Diseases and disorders of the kidney and urinary tract | L01A–L67C | $34,701 (n.p.) | $12,867 (n.p.) | $47,568 (8) |
| Diseases and disorders of the male reproductive system | M01Z–M64Z | $1,662 (n.p.) | 0 | $1,662 (n.p.) |
| Diseases and disorders of the female reproductive system | N01Z–N62B | | $2,967 (n.p.) | $2,967 (n.p.) |
| Diseases and disorders of the blood and blood forming organs and immunological disorders | Q01Z–Q62B | $12,411 (n.p.) | 0 | $12,411 (n.p.) |
| Infectious and parasitic diseases | S60Z–T64B | 0 | $22,029 (n.p.) | $22,029 (n.p.) |
| Injuries, poisoning and toxic effects of drugs | W01Z–X64B | $1,937,979 (247) | $3,081,287 (482) | $5,019,266 (729) |
| Error DRGs | 901Z–963Z | $189,235 (14) | $89,068 (6) | $278,303 (20) |
| **Total** | | **$28,090,400 (2,434)** | **$54,305,461 (5,528)** | **$82,395,861 (7,962)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

**Table A4: Major Diagnostic Category cost estimates for (acute care) fall-related follow-up care separations; males, females and persons aged 65 + years, Australia 2007–08**

| Major Diagnostic Category | AR-DRG v5.0 | Males (*n*) | Females (*n*) | Persons (*n*) |
|---|---|---|---|---|
| Major procedures where the principal diagnosis may be associated with any MDC | A01Z–A41Z | 0 | $84,278 (n.p.) | $84,278 (n.p.) |
| Diseases and disorders of the nervous system | B01Z–B81B | 0 | $35,720 (n.p.) | $35,720 (n.p.) |
| Diseases and disorders of the musculoskeletal system and connective tissue | I01Z–I78C | $1,527,819 (166) | $5,052,957 (590) | $6,580,776 (756) |
| Factors influencing health status and other contacts with health services | Z01A–Z65Z | $1,863,437 (316) | $4,534,109 (824) | $6,397,546 (1,140) |
| Error DRGs | 901Z–963Z | $28,196 (n.p.) | 0 | $28,196 (n.p.) |
| **Total** | | **$3,419,452 (483)** | **$9,707,064 (1,417)** | **$13,126,516 (1,900)** |

n.p. Small cell counts have been suppressed to prevent patient identification.

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