Hospitalisation due to falls in older people, Australia, 2003–04

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Executive summary

Falls are common among older people and often result in fractures or other serious injuries. This report examines Australian hospital data pertaining to fall injuries in people aged 65 years and older in 2003–04.

Four subsets of fall-related hospitalisations are examined:

- Fall injury incident cases,
- Inward transfer separations for fall injuries;
- Fall-related follow-up care separations; and,
- 'Other fall-related' separations.

The number of fall injury incidents (events) for people aged 65 years and older which led to hospitalisation in 2003–04 was estimated to be 60,497. The age-standardised rate of fall injury incidents in people aged 65 years and older was 2,295.3 per 100,000 population.

Age-specific rates of fall injury incidents increased exponentially from the age of 75 years and peaked in the 90–94 years age group at 9,653.7 fall injury incidents per 100,000 population. Females aged 65 years and older constituted a larger proportion of fall injury incidents than males (72.3%). Females also had a much higher age-standardised rate of falls (2,751.5 per 100,000) than males (1,623.8 per 100,000).

For both males and females, the most frequent type of injury sustained in a fall injury incident was an injury to the hip and thigh (33.5% of fall injury incidents, n=20,292). Injuries to the elbow and forearm and head injuries were also common types of injuries resulting from a fall injury incident. Females sustained a higher proportion of injuries to the elbow and forearm (12.2%) than males (5.5%), while males sustained a higher proportion of head injuries (21.2%) than females (12.7%). Two thirds (66.7%, n=40,357) of all hospitalised fall injury incidents for people aged 65 years and older in 2003–04 resulted in at least one fracture diagnosis.

The most common type of fall event was a fall on the same level due to slipping, tripping or stumbling (W01—34.3% of fall injury incidents, n=20,737). The next most common types of fall event were 'unspecified falls' (W19—28.5%) and 'other falls on the same level' (W18—18.9%). These types of falls were also the most common types of falls recorded in fall injury inward transfers, fall-related follow-up care separations and 'other fall-related' separations. The types of fall events affecting males and females were very similar, but males were observed to suffer far more falls on or from ladders (4.8%, n=800) than females (0.5%, n=238). Seven out of every ten fall injury incidents occurred in the home or in an aged care facility (n=42,362) and for six of every ten fall injury incidents, the activity being undertaken at the time of the falls event was unspecified.

The most common type of procedures listed in fall injury incident records were 'non-invasive, cognitive and other interventions, not elsewhere classified' procedures, which include health assessments, diagnostic tests, counselling, therapeutic interventions, anaesthesia and allied health interventions such as physiotherapy. Seven in ten procedures conducted due to fall injury incidents were procedures such as these (67.9% of listed procedures, n=111,078). Procedures involving the musculoskeletal system (15.8%, n=25,803) and imaging services (9.9%, n=16,196) were also common.

The mean length of stay for fall injury incidents was 8.1 days (± 11.2 SD) and the mean length of stay increased with age for both males and females. The total number of hospital bed-days occupied due to fall injury incidents in people aged 65 years and older in 2003–04 was 487,401 bed-days. This represents 4.2% of all hospitalised bed-days for this age group, in this year.

A further 7,274 separations in 2003–04 were identified as fall injury inward transfers. As for fall injury incidents, injuries to the hip and thigh predominated, however the proportion of injuries to the hip and thigh was much larger for fall injury inward transfer separations (49.0%, n=3,567). Also, like fall injury incidents, most fall injury inward transfer separations were due to unspecified falls (W19, 38.1%) and falls on the same level due to slips, trips and stumbles (W01, 28.5%). It is of note that unspecified falls accounted for a higher proportion of fall injury inward transfer separations than for fall injury incidents. Mean length of stay was longer for fall injury inward transfers than for fall injury incidents and contributed 97,267 hospital bed-days in 2003–04.

Falls in older people resulted in 15,825 fall-related follow-up care separations in 2003–04. Seven out of ten fall-related follow-up care separations had a principal diagnosis of Z50.9—care involving use of rehabilitation procedure, unspecified (n=11,370). As for fall injury incidents (and inward transfers), the most common type of injury recorded in fall-related follow-up care separations was an injury to the hip and thigh, and specifically, S72—fracture of femur (50.1%, n=7,925). The most common fall external cause codes listed in fall-related follow-up care separations were unspecified falls, falls on the same level due to slipping, tripping and stumbling, and other specified falls on the same level. Again, this is similar to fall injury incidents but, as for inward transfers, unspecified falls (W19) predominate.

Fall-related follow-up care separations added to the substantial burden of hospitalised fall-related injury. Fall-related follow-up care separations had a longer mean length of stay (21.5 days ± 30.7 SD) than fall injury incidents and 340,946 bed-days were occupied in 2003–04 due to fall-related follow-up care separations.

A further 18,048 separations for people aged 65 years and older were identified as being fall-related in the 2003–04 hospitals data. These 'other fall-related' separations did not fit the criteria specified for fall injury incidents, fall injury inward transfers or fall-related follow-up care separations, but contained both an injury (S00–T75 or T79) and a falls code (W00–W19) somewhere within the record. Interestingly, the rate of these 'other fall-related' separations was higher for males (749.6 per 100,000) than for females (644.6 per 100,000), quite unlike all other types of fall-related separation. Further, this group of fall-related separations differed from the three types of falls separations described above in that head injuries were the most common first-listed injury (in the range S00–T75 or T79) in the records (32.1%, n=5,791) while injuries to the hip and thigh were relatively infrequent (12.8%, n=2,313). As expected, the principal diagnoses for 'other fall-related' separations varied widely, and were commonly for diseases of the circulatory system (20.9%, n=3,765), 'symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified' (R00–R99, 14.7%, n=2,662) and diseases of the respiratory system (9.7%, n=1,748).

The mean length of stay for all 'other fall-related' separations for persons aged 65+ years was 17.8 days (± 69.2 SD). This was considerably longer than the mean length of stay for injury incidents but shorter than the mean length of stay for fall-related follow-up care separations. Long lengths of stay (in excess of 1,000 days in some cases) for some separations coded with a principal diagnosis of Z75.3 (unavailability and inaccessibility of health-care facilities) contributed to this. The total number of bed-days occupied by 'other fall-related' separations in people aged 65 years and older in 2003–04 was 320,600 days.

The total number of fall-related hospitalisations for people aged 65 years and older in 2003–04 was 101,644, which represents 4.3% of all hospital separations for any cause for this population. The total burden of fall-related hospitalisations for people aged 65 years and older in 2003–04 was disproportionately higher, with 1,246,214 bed-days representing 10.9% of all hospital bed-days for this population in this year. Dividing this number of bed-days by the estimated incidence of 60,497 cases for 2003–04 results in an estimated average total number of hospital bed-days per incident case of 20.6 days. However, as the role of falls injury for 'other fall-related' separations is not entirely clear, a more appropriate estimate of the estimated average total number of hospital bed-days per incident case, including only the bed-days attributable to fall incidents, inward transfers and fall-related follow-up care, is 15.3 days. While lower, this is significantly longer than the estimate for incident cases only and better describes the burden on hospitals due to serious falls.

The cost of hospitalised fall injury and other fall-related separations in older people for the financial year 2003–04 was estimated by applying Australian Refined Diagnosis Related Groups (AR-DRG) v5.0 cost weights to records coded as acute episodes of care. For this year, private hospital cost weights were not published, so public hospital cost weights were also applied to private admissions to approximate expenditure. The total cost of fall-related acute episodes of care was estimated to be $566.0 million. As costs could not be estimated for separations coded as rehabilitation, and other non-acute episodes of care, in addition to the lack of accurate costs for private admissions, this cost estimate is thought to underestimate the total cost of fall-related hospitalisations for people aged 65 years and older. Further, this estimate does not include the cost of post-hospital care and other indirect costs incurred by falls. However, based on these estimates, it is likely that the annual 'lifetime' cost of falls in older people exceeds the $1 billion cost suggested by Moller (1998).

1 Introduction

Falls are common among older people and often result in fractures or other serious injuries. In Australia, approximately one in three older persons living at home experience a fall annually (Lord et al. 1993; Dolinis et al. 1997; Morris et al. 2004) and approximately 4% of people 75 years and older in 2004–05 reported having suffered an injury as a result of a 'low fall' in the four weeks prior to survey (ABS 2006). A substantial proportion of falls in community-dwelling older people result in hospitalisation (Sattin et al. 1990; Hall & Hendrie 2003; Hendrie et al. 2004) and serious falls in older people substantially increase the risk of admission to residential care (Tinetti & Williams 1997). Further, based on a conventional method of case identification, more than 1,300 deaths in people aged 65 years and older are attributed to falls in a calendar year (Kreisfeld et al. 2004). Use of additional causes of death information suggests that the number of deaths involving falls in older people may actually be twice this (Kreisfeld & Harrison forthcoming).

Risk factors for falls and fall-related injury include increasing age, gender, medication use and predisposing medical conditions including Parkinson's disease, osteoporosis and vision problems (Fildes et al. 1994; Lord et al. 2001; Wood et al. 2002; Mwanri & Fuller 2003; Lewis et al. 2004; Morris et al. 2004). Social, and socio-economic, factors can also affect the risk of falls in the elderly (Dolinis et al. 1997; West et al. 2004; Gill et al. 2005; Lechevallier-Michel et al. 2005). Importantly, having had one fall is a risk factor for future falls (Pluijm et al. 2006).

The cost to the heath system of serious fall-related injuries is considerable. The direct cost to the health system (including hospitalisation, doctor visits, medications and institutional care) for falls in older people in Australia was estimated to be $406.4 million for the financial year 1993–94 (Mathers & Penm 1999). More recent calculations estimated this cost to be $498.2 million in 2001 (Moller 2003). Estimates of the costs associated with falls which include 'lifetime' costs, that is indirect and/or informal costs (e.g. lost production due to incapacitation or premature death and costs borne by the family or community), exceed $1 billion per year (Moller 1998).

Further, as in other developed nations, the ageing of the Australian population has enlarged the population at high risk of fall-related injury and population projections imply substantial increase in years to come. In 2001, 12.4% of the Australian population was aged 65 years and older and population projections suggest that by 2051, this group will account for over 24% of the total population (Moller 2003). Hospitalised fall-related injury of older persons is predicted to increase almost threefold in the next fifty years, requiring over three quarters of a million additional bed days per year and an estimated 3,320 nursing home places in 2051 (Moller 2003). Accordingly, public health policy will need to continue to include falls in the elderly as an injury prevention priority (Pointer et al. 2003).

This report examines fall-related hospitalisations in 2003–04 for Australians aged 65 years and older. Using National Hospital Morbidity Database (NHMD) records of separations ending during 2003–04, this analysis includes all separations for people aged 65 years and older which included both an injury diagnosis (S00–T75 or T79) and an external cause code signifying an unintentional fall (W00–W19). These codes could appear anywhere within the record (i.e. analysis was not restricted to records which had a principal diagnosis indicating that the injury was the primary reason for the episode of hospital care).

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

1. the annual incidence of new cases;
2. the burden to the hospital system, including acute care, follow-up care, and other types of care; and
3. the estimated cost of fall injury to the hospital system.

Chapter 2 presents the estimated annual incidence of fall events resulting in injury and hospitalisation in 2003–04 for people aged 65 years and older. Chapter 3 describes the characteristics of these injury incidents, including the mechanism and circumstances (place of occurrence, activity) of the fall event. Chapter 4 provides a brief description of a set of separations omitted from Chapters 2 and 3; separations which meet the definition of incident case, but have been transferred from another hospital. Including these separations in incidence estimates would result in the multiple counting of some injurious fall events.

Chapter 5 presents and describes estimates of the nature and extent of hospital inpatient care provided in Australia in the year to June 30, 2004 due to fall-related injuries in people aged 65 years and older. Separations in these analyses include episodes of fall-related follow-up care and 'other fall-related' separations for which the primary reason for the episode of hospital care was not an injurious fall, but injury and unintentional fall codes featured in the record. The burden to the hospital system of fall-related injuries, in terms of bed-days, is also discussed in Chapter 5, and estimates of the direct cost to the hospital system due to fall-related injury are also presented.

2 Incidence

During 2003–04, over 2.3 million hospital separations in Australia were generated by people aged 65 years and older (AIHW 2005a). Of these, 89,707 (3.8%) had a principal diagnosis in the range S00–T75 or T79, denoting community injury (i.e. excluding injuries sustained in the context of surgical and medical care, such as complications or sequelae). Three quarters of these injury separations (75.5%) also had a first external cause code in the range W00–W19, denoting an unintentional fall.

The number of new cases of fall-related injury resulting in hospitalisation is difficult to estimate, due to certain limitations of data available at a national level. The incidence of injury events resulting in hospitalisation can be estimated from NHMD data by excluding any separation meeting the specified selection criteria which also has a mode of admission denoting 'transfer from another acute hospital' (see Data Issues section). Calculated in this way, the estimated number of injury events due to falls in people aged 65 years and over in 2003–04 was 60,497. The method used to obtain this estimate accounts for transfers between hospitals, and for 'statistical' transfers within hospitals, but not readmissions, if these are also recorded as injury cases due to a fall. These 60,497 fall injury incidents represent 2.5% of all hospital separations for the population aged 65 years and older in 2003–04.

Table 1: Key indicators for hospital separations of people aged 65+ years, 2003–04

	Males	Females	Persons
All hospital separations 2003–04, aged 65+ years [a, b]	1,203,275	1,176,230	2,379,516
Principal diagnosis S00–T75 or T79	29,123	60,584	89,707
Principal diagnosis S00–T75 or T79 and external cause W00–W19	18,810	48,961	67,771
Estimated falls incident cases	16,779	43,718	60,497
As percentage of all hospital separations aged 65+ years	1.4%	3.7%	2.5%
As percentage of all S00–T75 or T79 injuries aged 65+ years	57.6%	72.2%	67.4%
Mean length of stay for fall injury incident cases: days (SD)	7.9 (11.3)	8.1 (11.2)	8.1 (11.2)
Total bed-days, fall injury incident cases	133,233	354,168	487,401
As percentage of all hospital patient days aged 65+ years	2.6%	5.7%	4.2%

(a) Data source: *Australian hospital statistics 2003–04* (AIHW 2005a).

(b) Persons total includes 11 separations for which sex was unreported.

The age-standardised rate of fall injury incidents in people aged 65 years and older was 2,295.3 per 100,000 population. The age-specific rate of fall injury incidents peaked in the 90–94 years age group at 9,653.7 fall injury incidents per 100,000 population. Females aged 65+ years sustained a greater number of injurious falls than males aged 65+ years, constituting 72.3% of the cases. The age-standardised rate of falls in older females was also higher than that of older males. The rate of falls incidents for females 65+ years was 2,751.5 per 100,000, while the rate of falls incidents for males 65+ years was 1,623.8 per 100,000 population. This represents a M:F ratio of 0.6 hospitalised falls in males for every 1.0 cases in females.

Age and sex

Males accounted for only 27.7% of hospitalised fall injury incidents for people aged 65 years and older. This is due to the smaller proportion of males than females in the older population, combined with the lower age-specific rates for hospitalisations due to falls for males than females. Males aged 65 years and older who sustained falls were significantly younger than females who sustained falls (Mann Whitney U test, $p<0.001$). The mean age of males hospitalised due to fall injury incidents was 80.0 years (± 7.8 SD) while the mean age of females was 82.0 years (± 7.7 SD).

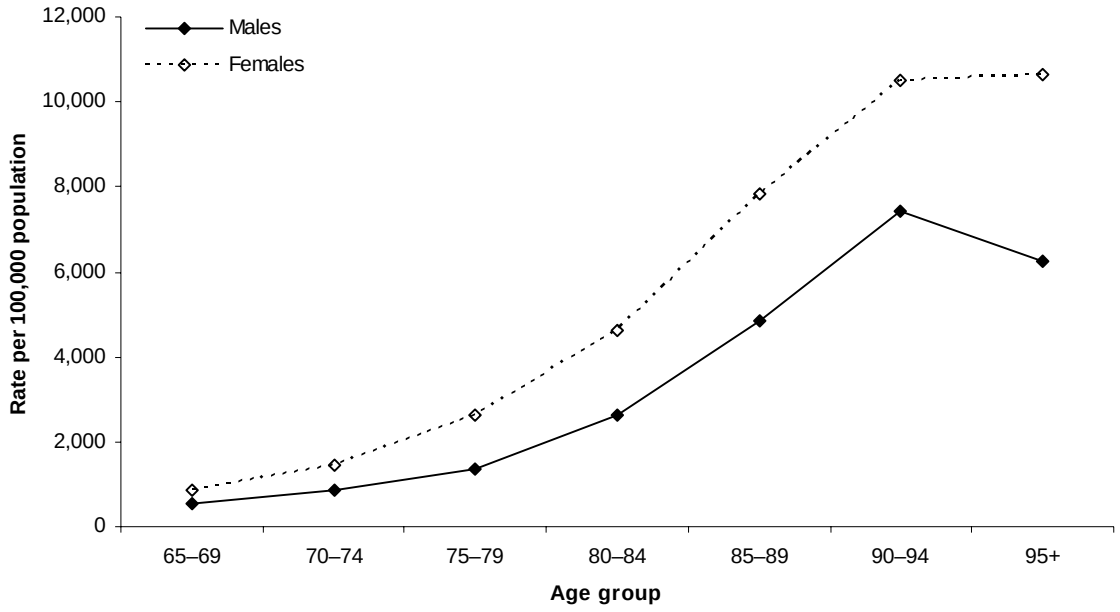


Figure 1: Age-specific rates of injury incidents due to falls in males and females aged 65 years and older, 2003–04

Figure 1 describes the age-specific rate of injury incidents due to falls in males and females aged 65+ years. The rate of fall injury incidents was greater for females than males in all age-groups. The M:F ratio at different age groups ranged from 0.5 falls for males for every 1.0 falls for females at ages 75–79 years to 0.7 falls for males for every 1.0 falls for females at ages 90–94 years.

The rates of injury incidents due to falls increased substantially after the age of 75 years for both sexes. Identified as an important target population for injury prevention (Pointer et al. 2003; NPHP 2004), the age-standardised rate of falls in people aged 75 years and older was 3,926.1 per 100,000 population. The age-standardised rate of falls in males 75+ years was 2,745.4 per 100,000 while the rate of falls in females 75+ years was 4,653.9 per 100,000.

The rate of fall injury events for men peaked in the 90–94 years age group and the decline in the falls rate at ages 95+ years suggests that increased frailty and decreased mobility in the very old affects falls risk for men. Although the rate of falls incidents for women 95+ years is marginally higher than for those aged 90–94 years, the rate is seen to stabilise (rather than decline) in the very old.

Injury type

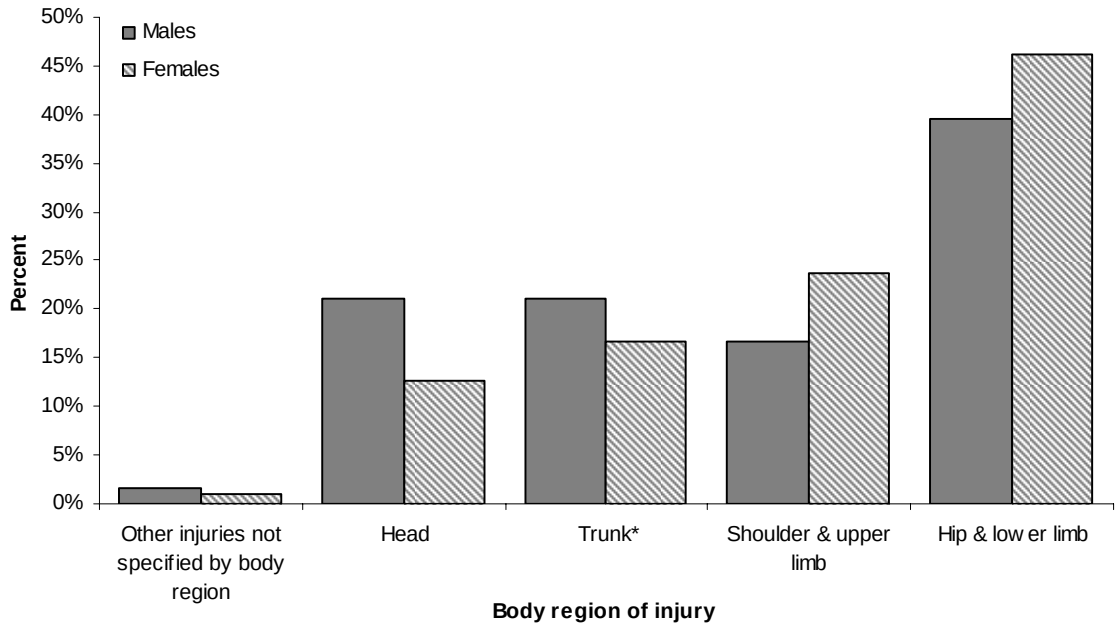
The largest proportion of injury incidents due to falls for both males and females resulted in injuries to the hip and thigh (persons: 33.5%, n=20,292). As can be seen in Table 2, injuries to the head were the second most common principal diagnosis for both males and females, constituting 15.0% of all incident cases. However, the proportion of males who suffered head injuries was much higher (21.2%) than for females (12.7%). Males also sustained a greater proportion of injuries to the thorax (9.9%). Females sustained a higher proportion (12.2%) of injuries to the elbow and forearm than males. Injuries to the abdomen, lower back, lumbar spine and pelvis and injuries to the knee and lower leg were common principal diagnoses for both males and females.

Table 2: Principal diagnosis injury types for fall injury incident cases, males, females and persons 65+ years, 2003–04

ICD-10-AM 3rd edition principal diagnosis	Males	Females	Persons
Injuries to the head	3,553 (21%)	5,539 (13%)	9,092 (15%)
Injuries to the neck	245 (1%)	326 (1%)	571 (1%)
Injuries to the thorax	1,659 (10%)	2,183 (5%)	3,842 (6%)
Injuries to the abdomen, lower back, lumbar spine & pelvis	1,617 (10%)	4,753 (11%)	6,370 (11%)
Injuries to the shoulder & upper arm	1,497 (9%)	4,374 (10%)	5,871 (10%)
Injuries to the elbow & forearm	923 (6%)	5,318 (12%)	6,241 (10%)
Injuries to the wrist & hand	385 (2%)	644 (1%)	1,029 (2%)
Injuries to the hip & thigh	5,203 (31%)	15,089 (35%)	20,292 (34%)
Injuries to the knee & lower leg	1,247 (7%)	4,536 (10%)	5,783 (10%)
Injuries to the ankle & foot	195 (1%)	554 (1%)	749 (1%)
Injuries involving multiple body regions	27 (0%)	37 (0%)	64 (0%)
Injuries to unspecified parts of trunk, limb or body region	154 (1%)	255 (1%)	406 (1%)
Burns	* (0%)	* (0%)	* (0%)
Poisoning by drugs, medications & biological substances	* (0%)	* (0%)	* (0%)
Other and unspecified effects of external causes	10 (0%)	20 (0%)	30 (0%)
Certain early complications of trauma	61 (0%)	87 (0%)	148 (0%)
Total	**16,779**	**43,718**	**60,497**

* Small case numbers have been suppressed to prevent patient identification.

Figure 2 highlights the differences in the types of injuries sustained by males and females. Males aged 65+ years experienced higher proportions of injuries to the head and trunk regions while females aged 65+ years experienced higher proportions of injuries to the shoulder and upper limbs and the hip and lower limbs.



* Trunk includes the neck, thorax, abdomen, lower back, lumbar spine & pelvis

Figure 2: Major body region injured according to the principal diagnosis of fall injury incident cases, males and females 65+ years, 2003–04

Fractures

The scope of this report is hospitalised injury due to falls and the burden to hospitals due to fall-related injury. The aims of most fall prevention programs, however, are to reduce the *impact* of falls by improving balance and physiological strength and reducing the risk of osteoporotic fractures. While the presence of diagnoses codes indicative of osteopathy (e.g. M80–M94) are not considered in this report, the incidence of fracture injuries due to falls has been analysed.

Two thirds (n=40,357, 66.7%) of people aged 65 years and older hospitalised due to a fall injury incident sustained at least one fracture. The number of fractures present in the multiple diagnosis fields of the separations ranged from 0 (n=20,140, 33.3%) to 10 (n=1). Most people only sustained a single fracture (n=35,603, 58.9%).

A higher proportion of females hospitalised due to a fall injury event sustained fractures (70.0%) than males (58.2%). The proportion of males who sustained one or more fractures in a fall injury incident remained similar at all ages. For females, however, the proportion of cases with fractures declined slightly with increasing age (Figure 3). Nonetheless, the rate of fall incidents involving one or more fracture diagnoses increased markedly with age for both sexes (Figure 4). Due to the high proportion of fractures present in fall injury cases at all ages, the rates of fracture incidence showed a similar pattern to that for fall injury itself. However, unlike fall injury overall, the rate of fall-related fractures in females 95+ years was slightly lower than the rate at ages 90–94 years.

Cases with a principal diagnosis denoting injuries to the elbow and forearm had the largest proportion of fractures present among the diagnoses (n=5,501, 88.1%). Females admitted with elbow and forearm injury due to a fall were more likely than males to have sustained a fracture (92.0% of females having one or more fracture diagnoses

versus 66.1% of males). Similarly, a high proportion of cases with a principal diagnosis denoting injuries to the hip and thigh reported one or more fractures (85.1%, n=17,268). Of these, most cases (92.0%) had a principal diagnosis denoting fractures of the upper femur (S72.0, S72.1 or S72.2).

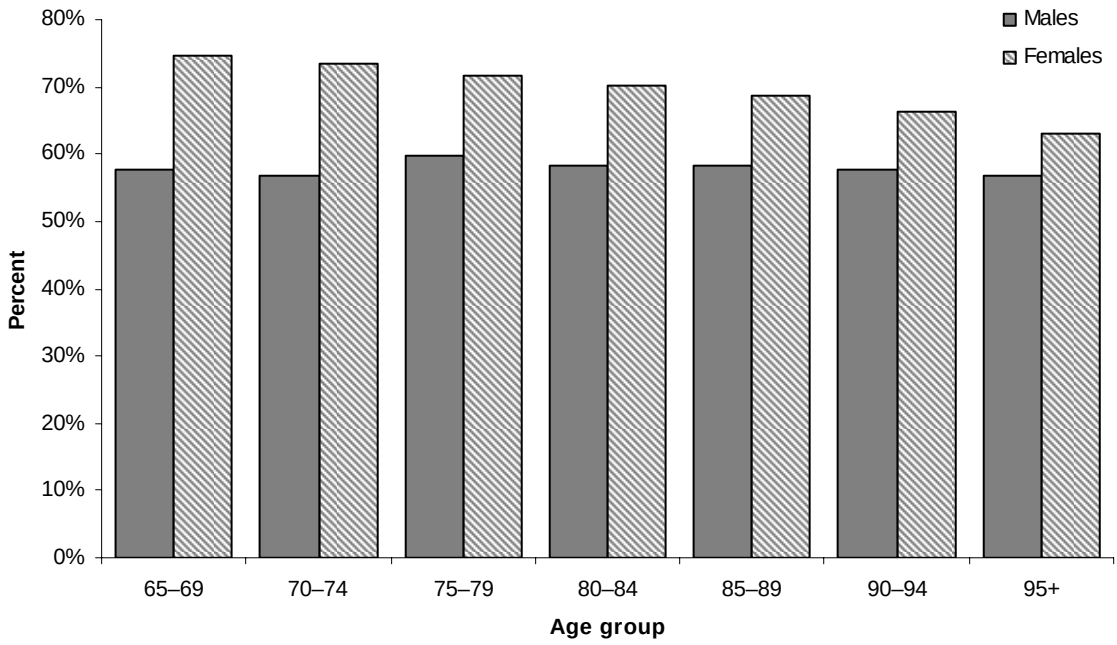


Figure 3: The proportion of hospitalised fall injury incidents incurring one or more fracture diagnoses, males and females 65+ years, 2003–04

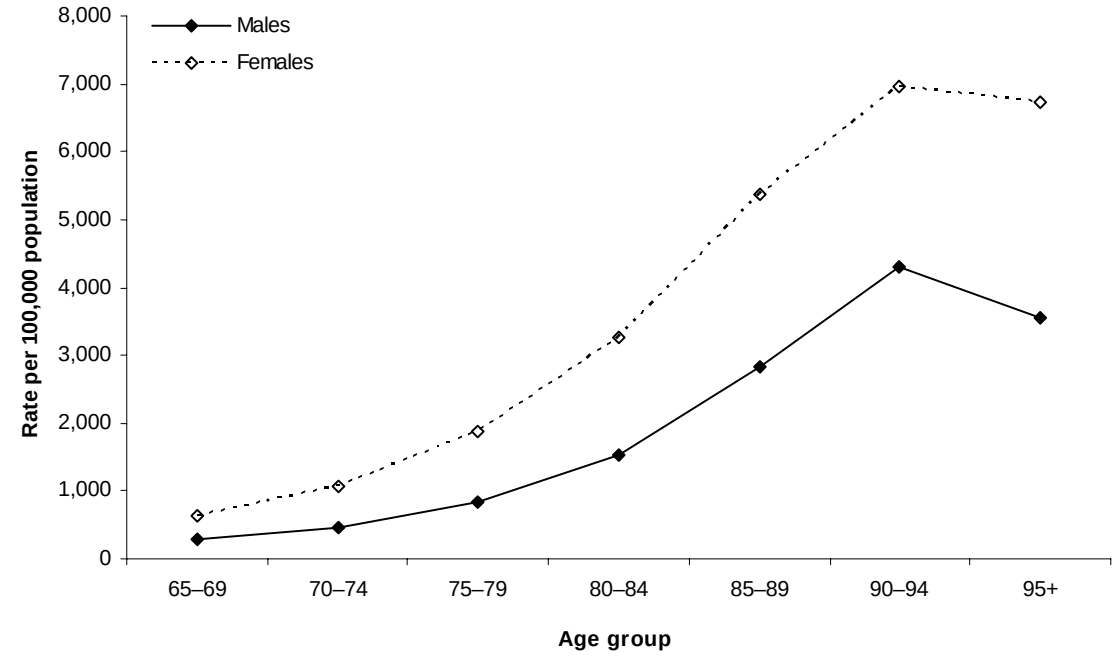


Figure 4: Age-specific rates of one or more fracture diagnoses in fall injury cases, males and females 65+years, 2003–04

Geographical distribution

The rate of hospitalised fall injury incidents for people aged 65 years and older in 2003–04 varied by state (Figure 5). As described above, the Australian rate of fall injury incidents in people aged 65+ years was 2,295.3 per 100,000 population. The estimated incidence rate of hospitalised falls in older people in Victoria was higher than the national rate (2,523.5 per 100,000) and the rate of falls in people 65+ years in New South Wales and the Northern Territory were quite similar to the national rate (New South Wales: 2,302.4 per 100,000. Northern Territory: 2,229.9 per 100,000). The recorded rates of hospitalised fall-related injury in older people in all other states and territories were lower than the national rate.

These results were largely driven by the state-based rates of falls in older women (Table 3). As described above, the Australian rate of fall injury incidents in females aged 65+ years was 2,751.5 per 100,000 population females aged 65+ years in Victoria and the Northern Territory had higher rates of hospitalised falls incidents than the Australian age-standardised rate (Victoria: 3,049.6 per 100,000. Northern Territory: 2,896.6 per 100,000). In all other states, the rates of hospitalised fall injuries in females aged 65+ years were lower than the national rate. The estimated rate of hospitalised falls in females aged 65+ years in Tasmania was much lower than the rate for all females 65+ years (2,147.0 per 100,000, n=911).

For males aged 65 years and older, rates of hospitalised falls incidents were higher than the national rate in Victoria, similar to the national rate in New South Wales and Queensland and lower than the national rate in the remaining states and territories (Table 3).

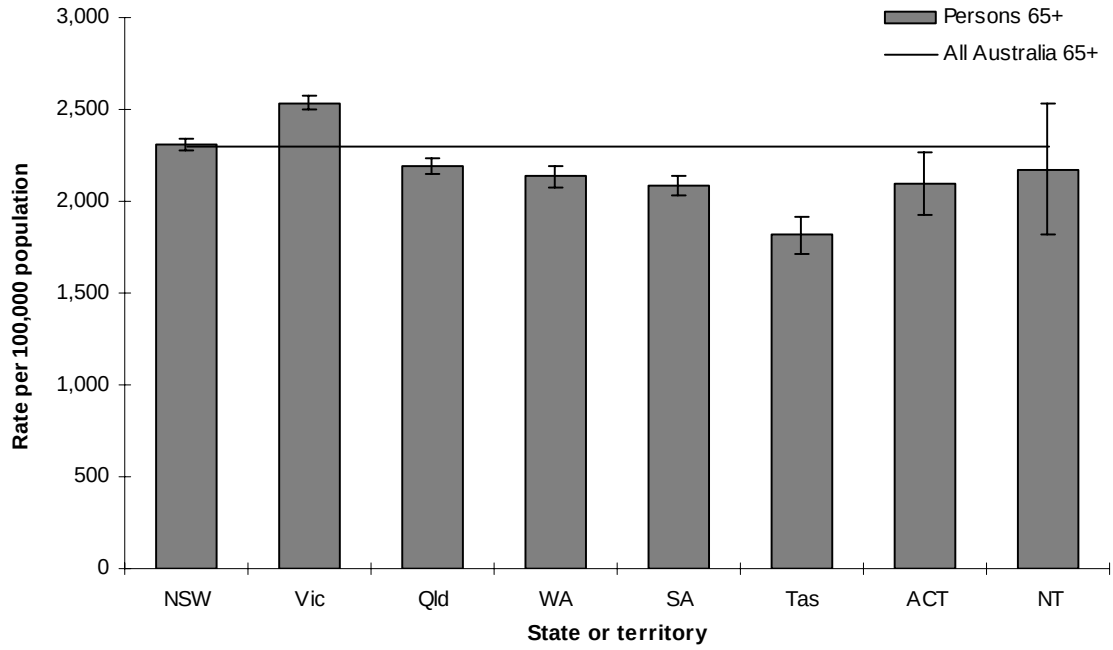


Figure 5: Age-standardised rates of hospitalised fall-related injury in all people 65+ years by state of usual residence (± 95% CI), Australia, 2003–04

Table 3: Age-standardised rates of hospitalised fall injury incidents by state of usual residence, males, females and persons aged 65+ years (difference from all-Australia rate), 2003–04

	Males	Females	Persons
Australia	*1,623.8*	*2,751.5*	*2,295.3*
NSW	1,663.2 (+39.4)	2,728.6 (-22.8)	2,302.4 (+7.1)
Vic	1,745.9 (+122.1)	3,049.6 (+298.1)	2,523.5 (+228.2)
Qld	1,620.1 (-3.7)	2,591.3 (-160.2)	2,187.8 (-107.5)
WA	1,400.4 (-223.3)	2,618.0 (-133.5)	2,124.2 (-171.1)
SA	1,431.9 (-191.9)	2,503.5 (-248.0)	2,077.8 (-217.5)
Tas	1,314.0 (-309.8)	2,147.0 (-604.5)	1,817.0 (-478.3)
ACT	1,423.7 (-200.1)	2,578.0 (-173.5)	2,094.2 (-201.1)
NT	1,384.7 (-239.0)	2,896.6 (+145.1)	2,229.9 (-65.4)

Rates of hospitalised falls in people aged 65 years and older were also calculated according to the Australian Standard Geographical Classification of the remoteness of the place of usual residence. Rates were very similar for all remoteness zones except for people, especially females, whose recorded place of residence is classified as Very remote (Figure 6). Rates of hospitalised falls were substantially lower for this group. This finding was associated with particularly low rates of hospitalised falls incidence for persons aged 80+ years living in Very remote areas (Figure 7). The lack of a strong association between remoteness and hospitalised fall injury is noteworthy because a positive association has been found for other types of injury cases (Berry & Harrison 2006).

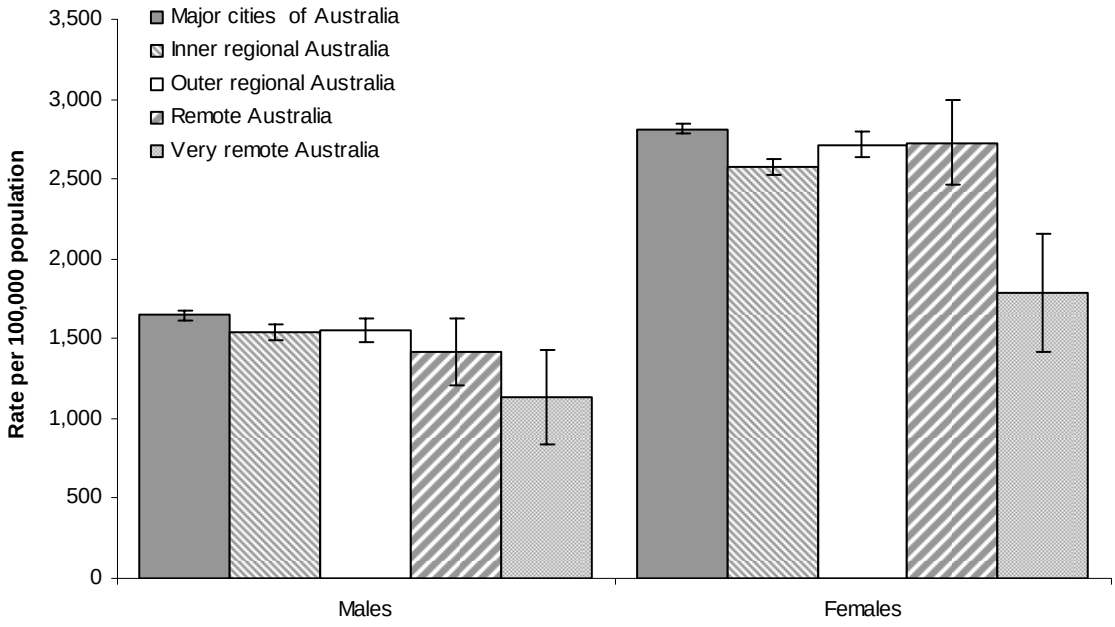
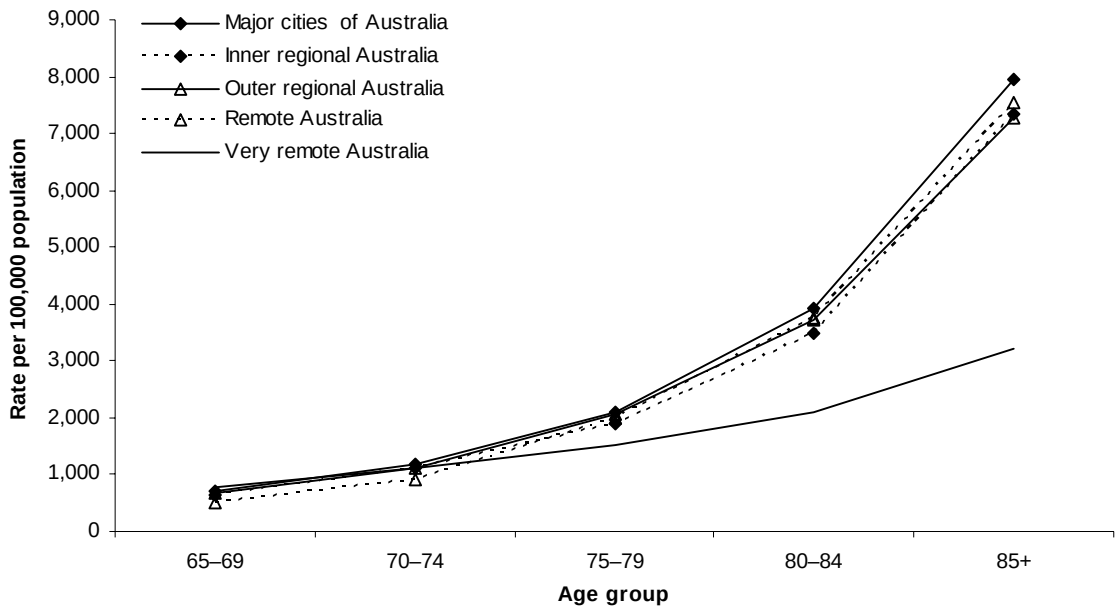


Figure 6: Age-standardised rate of hospitalised falls incidents by the remoteness of usual residence (± 95% CI), males and females 65+ years, Australia, 2003–04



Note: Age groups to 85+ years only due to population data constraints.

Figure 7: Age-specific rate of hospitalised falls incidents by the remoteness of usual residence, persons 65+ years, Australia, 2003–04

Similar patterns were observed for both male and female age-specific rates (Table 4). The ratio of rates of hospitalised falls in males aged 65–69 years was 1.2 incidents in Major cities for every 1.0 incidents in Very remote areas. For males aged 85+ years, this ratio was 2.2 hospitalised falls in Major cities for every 1.0 incident in Very remote areas. Similarly, the ratio of rates of hospitalised falls in females aged 65–69 years was 0.8 incidents in Major cities for every 1.0 incident in Very remote areas while for females aged 85+, this ratio was 2.4 hospitalised falls in Major cities for every 1.0 incidents in Very remote areas.

Table 4: Age-specific rates of hospitalised falls incidents for males and females aged 65 years and older living in Major cities versus Very remote areas of Australia, 2003–04

	Males			Females		
	Major cities of Australia	Very remote Australia	Rate Ratio	Major cities of Australia	Very remote Australia	Rate Ratio
65–69	545.1	457.9	1.2	869.7	1,151.0	0.8
70–74	846.7	1,279.6	0.7	1,468.6	894.5	1.6
75–79	1,375.7	924.6	1.5	2,651.0	2,150.4	1.2
80–84	2,709.3	1,381.6	2.0	4,733.2	2,734.0	1.7
85+	5,651.7	2,586.3	2.2	8,985.8	3,666.2	2.5

Note: Age groups to 85+ years only due to population data constraints.

The reason or reasons for the sharp difference between the Very remote zone and all other zones are not clear. Possible explanations include the increased likelihood that falls with less severe consequences will result in admission if the injured person lives near a hospital than if they live in a remote place, or a 'survivor effect', whereby ill or frail older people may move to less remote areas, leaving only the healthiest, most robust older residents in the Very remote population. Alternatively, a 'non-survivor effect' could be an influence here, whereby serious falls in older people in Very remote locations may result in the person's death before they can reach hospital. A fourth potential explanation is misclassification of place of residence (e.g. some older people recorded in population data as living in Very remote areas might actually live in less remote places).

3 Circumstances of fall injury incident cases

This chapter provides a description of the circumstances of occurrence of the hospitalised incident cases due to falls in people aged 65 years and older in 2003–04 (those included in Chapter 2).

Table 5: Causes of hospitalised falls: first external cause code for males, females and persons aged 65+ years, Australia, 2003–04

	Males	Females	Persons
Fall on same level involving ice & snow (W00)	* (0%)	* (0%)	6 (0%)
Fall on same level from slipping, tripping & stumbling (W01)	5,017 (30%)	15,720 (36%)	20,737 (34%)
Fall involving ice-skates, skis, roller-skates or skateboard (W02)	20 (0%)	11 (0%)	31 (0%)
Other fall on same level due to collision with, or pushing by, another person (W03)	57 (0%)	172 (0%)	229 (0%)
Fall while being carried or supported by other persons (W04)	* (0%)	* (0%)	18 (0%)
Fall involving wheelchair (W05)	137 (1%)	242 (1%)	379 (1%)
Fall involving bed (W06)	753 (4%)	1,959 (4%)	2,712 (4%)
Fall involving chair (W07)	522 (3%)	1,332 (3%)	1,854 (3%)
Fall involving other furniture (W08)	81 (0%)	130 (0%)	211 (0%)
Fall involving playground equipment (W09)	* (0%)	* (0%)	6 (0%)
Fall on & from stairs & steps (W10)	997 (6%)	2,469 (6%)	3,466 (6%)
Fall on & from ladder (W11)	800 (5%)	238 (1%)	1,038 (2%)
Fall on & from scaffolding (W12)	26 (0%)	0 (0%)	26 (0%)
Fall from, out of or through building or structure (W13)	213 (1%)	87 (0%)	300 (0%)
Fall from tree (W14)	* (0%)	* (0%)	45 (0%)
Fall from cliff (W15)	15 (0%)	10 (0%)	25 (0%)
Diving or jumping into water causing injury other than drowning or submersion (W16)	7 (0%)	8 (0%)	15 (0%)
Other fall from one level to another (W17)	324 (2%)	398 (1%)	722 (1%)
Other fall on same level (W18)	3,001 (18%)	8,436 (19%)	11,437 (19%)
Unspecified fall (W19)	4,758 (28%)	12,482 (29%)	17,240 (28%)
Total falls incidents	**16,779**	**43,718**	**60,497**

* Small case numbers have been suppressed to prevent patient identification.

Described in Table 5, the majority of hospitalised fall injury incidents for people aged 65 years and older were recorded as falls on the same level from slipping, tripping and stumbling (W01, 34.3%, n=20,737). This was the highest-ranking fall type for both males and females. Females, however, sustained a higher proportion of hospitalised slips, trips and stumbles than males (36.0% versus 29.9% respectively). The third edition of the ICD-10-AM allows falls from slipping, tripping and stumbling to be differentiated through the use of a fourth-character code. Falls on the same level due to tripping were most common, representing 60.7% of all W01 injury incidents (n=12,585). Accordingly, the age-standardised rate of falls on the same level due to tripping

(479.1 per 100,000 population,) was higher than either the rate of falls due to slipping (216.6 per 100,000) or the rate of falls due to stumbling (93.5 per 1000,000).

The second most common external cause associated with a fall injury incident for both males and females aged 65+ years was W19—an unspecified fall. Similarly, the third most common type of fall for both males and females was W18—'other fall on same level'. On the whole, little difference was noted in the types of fall sustained by men and women aged 65 years and older except that males sustained a higher proportion of falls from ladders than females (4.8% versus 0.5%, respectively).

Age-specific rates for the three most common unintentional fall external cause codes (W01, W19 and W18) showed the same exponential increase after the age of 75 years as noted for all fall injury incidents (described previously). However, the rate of falls on or from stairs and steps (the fourth most common falls external cause code for fall injury incidents overall) declined with age after 85–89 years, while the rate of falls involving beds, the fifth most common falls code, increased less sharply at older ages (Figure 8).

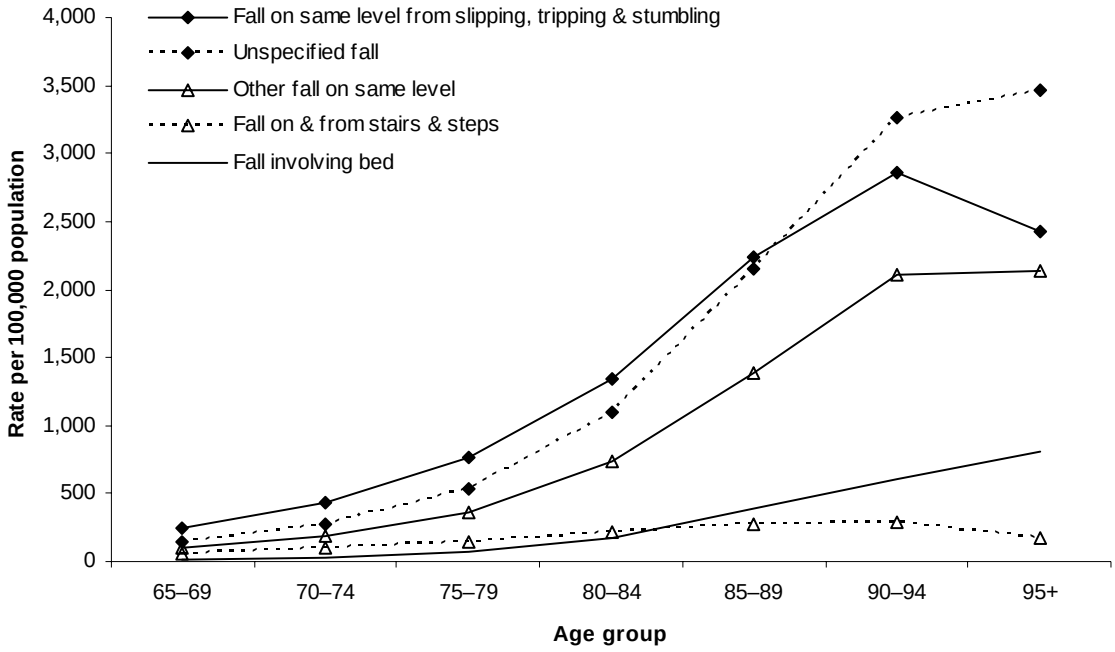


Figure 8: Age-specific rates of falls incidents for the five most common external cause codes, persons 65+ years, Australia, 2003–04

A particularly interesting type of fall injury is that of falls on or from ladders (W11). The age-standardised rate of falls from ladders was 4.1 times higher for males than for females (69.0 per 100,000 vs. 16.9 per 100,000 respectively). Further, as can be seen in Figure 9, the age-specific rates for males and females describe very different patterns—unlike those for most other falls types where observed differences are generally differences in magnitude rather than trend. The age-specific rate of falls from ladders for females is low for all groups and decreases slightly with age. The age-specific rate for males, however, is quite high (relative to females) and displays a distinct peak in the 65–79 year groups.

There is no fourth-character coding applicable to W11 so it is not possible to know which of these falls are from low heights or from the top of very tall ladders. Males, however, sustained a higher proportion of injuries to the head and the trunk (15.0% and 37.4%, respectively) than females (10.1% and 18.1%, respectively), suggesting falls from a greater height. Most falls on or from ladders were sustained in or around the home (62.7%, n=651).

These data support previous studies which suggest that differences in rates for this type of injury may be exposure-related in that males may undertake riskier home maintenance tasks than females (Driscoll et al. 2003), that less protective equipment is utilised in the home than is common in occupational situations (Kent & Pearce 2006), and that the attitudes of, and/or a lack of awareness in, older men, in particular, may lead to them undertaking tasks beyond their abilities, contributing to a higher falls risk (Mwanri & Fuller 2003).

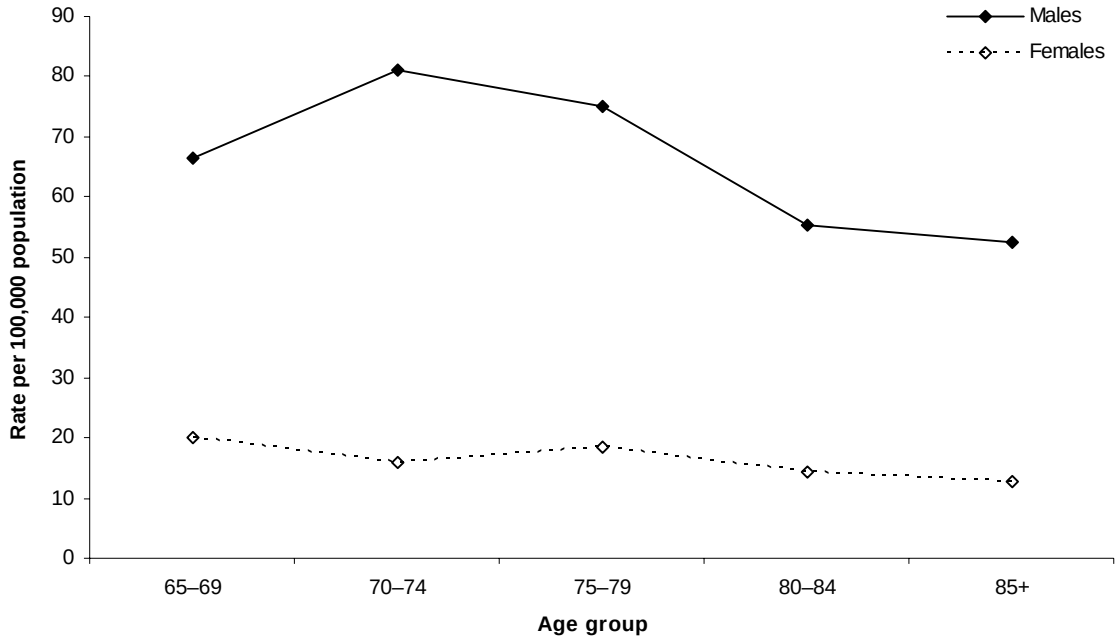


Figure 9: Age-specific rates of falls incidents for falls on or from ladders, males and females 65+ years, Australia, 2003–04

Place of occurrence

Half of all fall injury incidents for people aged 65 years and older occurred in the home, including the driveway to the home (n=29,892, 49.4%). Another large proportion of fall injury incidents occurred in aged care facilities, more so for women than for men (22.2% vs. 16.4% respectively, Table 6). That is, seven out of every ten fall injury incidents occurred either in the home or in aged care facilities.

The proportion of the population resident in aged care facilities is quite high at older ages (44.9% of people aged 95 and older, as calculated from AIHW 2005b). As such, it is misleading to calculate rates of falls in particular locations (aged care facilities, home) using all-Australia population estimates as the denominator. Estimates of the Australian population aged 65 years and older in 2003–04 who were residents of aged care facilities were obtained from the AIHW report *Residential aged care in Australia 2003–04: a statistical overview* (2005b). These data were point-in-time estimates for 30 June 2004. However, comparison with the number of occupied place-days for 2003–04 (53.1 million or 145,504 person-years) suggests that the population estimate for 30 June 2004 accurately reflects the size of the population aged 65 years and older in residential care throughout the year 2003–04, over-estimating this population by only 1.5%. As such, rates of falls in aged care facilities have been calculated using these population estimates as the denominator. Similarly, the number of people aged 65 years and older resident in the community (i.e. home) was estimated by subtracting the number of residents of aged care facilities from the general population and rates presented for falls occurring in the home use this population estimate as the denominator.

This method produces rates specific to the two main settings in which older people live. The reliability of these rates depends on the underlying assignment of cases and population by place. Note that this method includes in the numerator for aged care facilities *all* fall injury incidents at ages 65 years and older in this setting. While the great majority of these will be residents of these facilities, this will in all probability include some incidents involving visitors.

The age-standardised rate of fall injury incidents which occurred in the home for persons aged 65 years and older living at home was 1,319.6 per 100,000 population while the age-standardised rate of falls in aged care facilities for persons aged 65 years and older living in residential facilities was much higher; 6,404.3 per 100,000 population. This is not surprising given that it is expected that the part of the population requiring residential care would be more frail than people living in the general community and as such, would have a higher risk of injurious falls.

The age-specific rate of fall injury incidents which occurred in the home or in aged care facilities are presented in Figure 10. The rates of falls in the two populations were similar in that the rates increased with age and the rates for females are higher than those for males in all age groups. Notable differences in the rates for the two populations include the observation that for all age groups, rates of fall incidents in aged care facilities are higher than rates of falls at home. Also, the trends with increasing age are different for people living in the community and residents of aged care facilities; an exponential increase in the rate of falls was observed for people living in the community while a more linear trend was observed for falls in aged care facilities. An explanation for this observation may be that a person aged 65–69 years requiring aged care accommodation is likely to be more frail than a person aged 65–69 years resident in the community, and the difference between a person aged 65–69 years requiring aged care accommodation and a person aged 95 years or older in this setting may be less marked than for people of these ages resident in the

community. Nonetheless, even accounting for general frailty in the aged care population, rates of fall injury incidents are still seen to increase with age.

Despite appearances, the male:female ratios for rates of falls are similar for each age group for both falls in the home and falls in aged care facilities. The age-standardised rate ratio for falls in the home is 0.5 fall incidents for males for every 1.0 fall incidents in females (range: 0.5–0.6) while the age-standardised rate ratio for falls in aged care facilities is 0.8 fall incidents for males for every 1.0 fall incidents in females (range: 0.7–0.9). The higher rate ratios for males in aged care facilities suggests that males have a higher risk of falls in this setting than males living in the community, relative to the respective rates of falls by females.

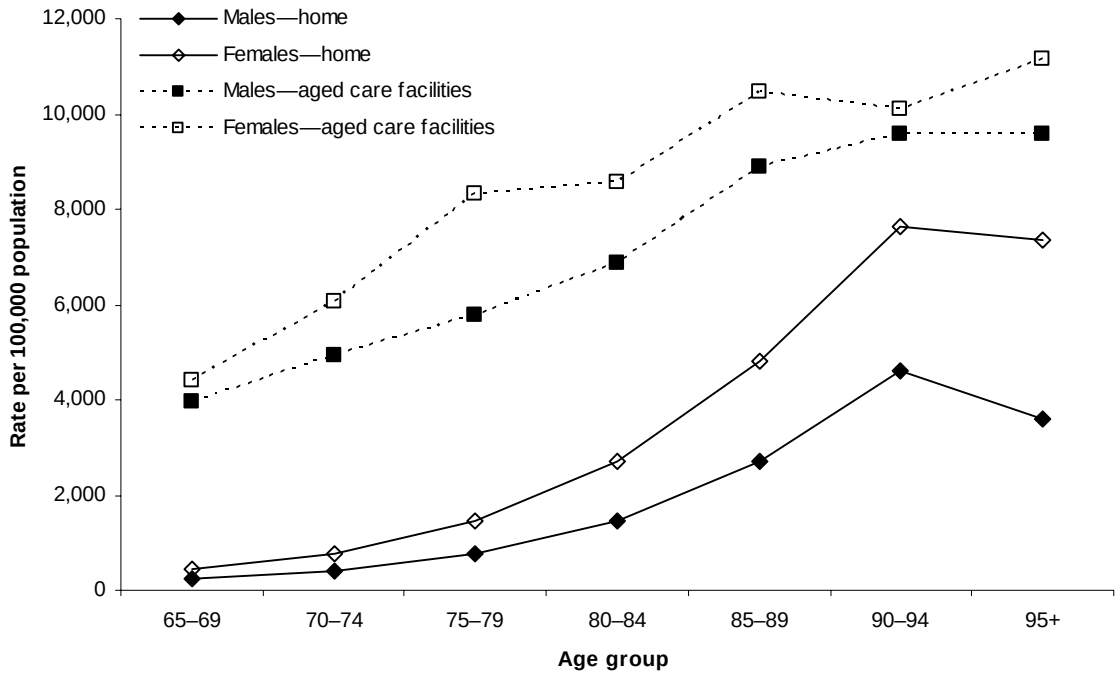


Figure 10: Rates of falls in the home and in aged care facilities calculated using the estimated population of people resident in the general community and residential care, males and females 65+ years, 2003–04

The home, followed by aged care facilities, were the most common places of occurrence for fall injury incidents overall, and for many particular types of falls (Table 6). Falls in homes and in aged care facilities accounted for 94.4% of falls while being carried or supported by other persons, 92.5% of falls involving beds, 81.0% of falls involving chairs and 78.7% of falls involving other types of furniture. Most falls on or from ladders, highlighted in the previous section, occurred in the home, including the driveway to the home (62.7% of such incidents). The home was also recorded as the place of occurrence for high portions of falls from trees (62.2%).

Table 6: Place of occurrence for fall injury incidents, males, females and persons aged 65+ years, Australia, 2003–04

		Males	Females	Persons
Home	Driveway to home	164 (1%)	273 (1%)	437 (1%)
	Other & unspecified place in home	8,216 (49%)	21,239 (49%)	29,455 (49%)
Residential institution	Aged care facilities	2,744 (16%)	9,726 (22%)	12,470 (21%)
	Other specified residential institution	44 (0%)	140 (0%)	184 (0%)
	Unspecified residential institution	8 (0%)	63 (0%)	71 (0%)
School, other institution & public administration area	School	6 (0%)	17 (0%)	23 (0%)
	Health Service area	419 (2%)	1,010 (2%)	1,429 (2%)
	Other specified institution & public administrative area	125 (1%)	308 (1%)	433 (1%)
Sports & athletics area	Sporting grounds (outdoor)	51 (0%)	108 (0%)	159 (0%)
	Sporting hall (indoor)	10 (0%)	21 (0%)	31 (0%)
	Other & unspecified sports & athletic areas	36 (0%)	41 (0%)	77 (0%)
Street & highway	Roadway	226 (1%)	407 (1%)	633 (1%)
	Footpath (sidewalk)	563 (3%)	1,345 (3%)	1,908 (3%)
	Other specified public highway, street or road	23 (0%)	52 (0%)	75 (0%)
	Unspecified public highway, street or road	10 (0%)	37 (0%)	47 (0%)
Trade & service area	Shop & store	208 (1%)	863 (2%)	1,071 (2%)
	Commercial garage	16 (0%)	11 (0%)	27 (0%)
	Office building	7 (0%)	7 (0%)	14 (0%)
	Cafe, hotel & restaurant	218 (1%)	311 (1%)	529 (1%)
	Other specified trade & service area	74 (0%)	143 (0%)	217 (0%)
	Unspecified trade & service area	11 (0%)	20 (0%)	31 (0%)
Industrial & construction area	Construction area	19 (0%)	24 (0%)	43 (0%)
	Other & unspecified industrial & construction area	14 (0%)	5 (0%)	19 (0%)
Farm	Farm	40 (0%)	28 (0%)	68 (0%)
Other specified place	Stream of water	13 (0%)	10 (0%)	23 (0%)
	Large area of water	7 (0%)	6 (0%)	13 (0%)
	Beach	30 (0%)	56 (0%)	86 (0%)
	Forest	12 (0%)	26 (0%)	38 (0%)
	Other specified countryside	17 (0%)	29 (0%)	46 (0%)
	Car park (parking lot)	38 (0%)	117 (0%)	155 (0%)
	Other specified place	179 (1%)	391 (1%)	570 (1%)
Unspecified place of occurrence		3,220 (19%)	6,860 (16%)	10,080 (17%)
Place not reported		11 (0%)	24 (0%)	35 (0%)
Total		**16,779**	**43,718**	**60,497**

Note: Places of occurrence with counts of less than 5 have been incorporated into the relevant category's 'other specified' subcategory.

Activity

The third edition of the ICD-10-AM has 24 three-character level activity codes which include a further 252 sub-categories which describe the activity being undertaken when injured in more detail (NCCH 2002). Most of these refer to sporting and similar activities. The majority of fall injury incidents for people aged 65+ years were designated a U73.9 activity code: 'unspecified activity' (61.9%, n=37,435 see Table 7). The age-standardised rate of 'unspecified activity' fall injury incidents in people aged 65 years and over was 1,419.8 per 100,000.

Table 7: Activity engaged in when injured—main categories—fall injury incidents for males, females and persons aged 65+ years, Australia, 2003–04

	Males	Females	Persons
While engaged in sports	170 (1%)	323 (1%)	493 (1%)
While engaged in leisure	179 (1%)	386 (1%)	565 (1%)
While working for income	99 (1%)	73 (0%)	172 (0%)
While engaged in other types of work	1,082 (6%)	2,151 (5%)	3,233 (5%)
While resting, sleeping, eating or engaging in other vital activities	2,223 (13%)	6,395 (15%)	8,618 (14%)
Other specified activity	2,756 (16%)	7,118 (16%)	9,874 (16%)
Unspecified activity	10,241 (61%)	27,194 (62%)	37,435 (62%)
Activity not reported/not applicable	29 (0%)	78 (0%)	107 (0%)
Total	**16,779**	**43,718**	**60,497**

Not surprisingly, given the category's significant contribution to the total number of cases, the age-specific rates for falls sustained during unspecified activities showed the same age-related increase as for all incidents (previously described in Figure 1). Similarly, falls occurring while the person was sleeping, eating or undertaking other vital activities (14.2% of incidents) and falls sustained during 'other specified activities' (16.3% of incidents) showed a marked increase in rate with age (Figure 11). Falls incidents occurring while engaged in 'other' (non-income producing) types of work and during sports and leisure activities showed some increase in age, but of a lesser magnitude than the activities previously discussed. Further, the rate of fall incidents while engaged in 'other' types of work and during sports and leisure activities decreased for people aged 95 years and older (Figure 11).

Less than 1% of all fall injury incidents in people aged 65+ years were sustained during sporting activities (0.8%, n=493). Table 8 describes the most common types of sporting activities associated with fall injury incidents for people aged 65+. Sample sizes were too small to present such rankings according to age. Over half of falls incidents attributed to sports activities (53.3%, n=263) were sustained while walking, playing tennis, bowling or playing golf. Interestingly, despite the large number of specific sporting categories, 9.3% (n=46) of sports-related falls incidents were coded as 'other specified sport and exercise activities' (U70.8).

The rate of fall injuries sustained while working for income was low overall, as one would expect in this population. Falls while working for income accounted for only 0.3% of the total number of fall injury incidents in people aged 65 years and older in 2003–04 (n=172). Working for income was one of the few activity classes where the age standardised rate of falls was higher for males (8.5 per 100,000) than for females

(5.1 per 100,000). Of the specified work-types, males sustained a higher proportion of falls while working in agriculture, forestry and fishing industries (18.2%, n=18) and females sustained a higher proportion of falls while working in health service industries (15.1%, n=11).

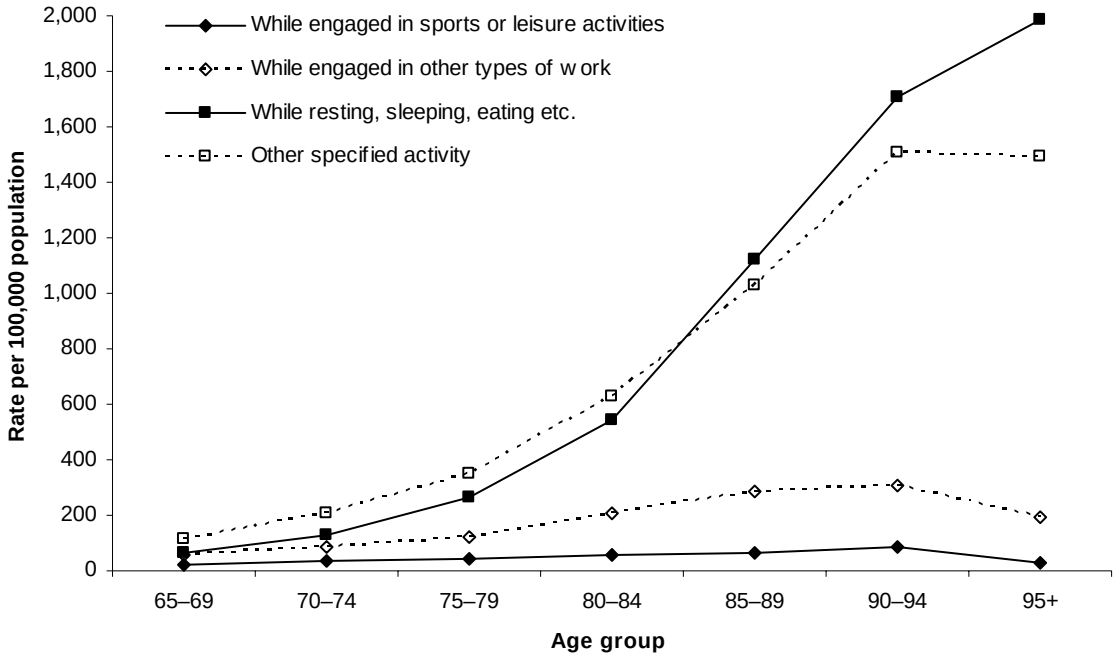


Figure 11: Activity engaged in during a fall injury incident: age-specific rates for persons aged 65+ years, Australia, 2003–04

Table 8: The ten most common sports-related activities associated with fall injury incidents in people aged 65+ years, Australia, 2003–04

Rank	Males (n=169)	Females (n=323)	Persons (n=492)
1	Bowling (17%)	Walking (21%)	Walking (17%)
2	Tennis (11%)	Tennis (17%)	Tennis (15%)
3	Walking (9%)	Bowling (12%)	Bowling (14%)
4	Other specified sport & exercise activity (9%)	Dancing (9%)	Other specified sport & exercise activity (9%)
5	Fishing (7%)	Other specified sport & exercise activity (9%)	Golf (8%)
6	Skiing (6%)	Golf (8%)	Dancing (7%)
7	Golf (6%)	Table tennis (3%)	Fishing (3%)
8	Jogging & running (4%)	Swimming (2%)	Skiing (2%)
9	Swimming (3%)	Badminton (2%)	Table tennis (2%)
10	Dancing (3%)	Hiking (2%)	Swimming (2%)

Procedures involved in incident cases

National Hospital Morbidity Database separation records contain information regarding the medical procedures involved in a hospitalisation. The National Health Data Dictionary defines a procedure as 'a clinical intervention that: is surgical in nature, and/or carries a procedural risk, and/or carries an anaesthetic risk, and/or requires specialised training, and/or requires special facilities or equipment only available in an acute care setting' (AIHW 2003, page 63). Multiple procedures can be listed in the hospital separation. The third edition of the ICD-10-AM groups the very large number of procedures into 1,424 aggregate 'blocks', according to the Australian Classification of Health Interventions (NCCH 2002). These block numbers are included in NHMD separation records, for each listed procedure.

The total number of procedures listed in fall injury incident separations for people aged 65 years and older was 163,471. The number of procedures per fall injury incident separation ranged from 0 (n=14,207, 23.5%) to 32 (n=1). Half of all fall injury incidents had 2 or fewer procedures or blocks listed in the separation (54.2%, n=32,786) and the mean number of procedures or blocks per fall injury incident was 2.7 (± 2.6 SD). The number of procedures or blocks per separation did not differ significantly by sex (t-test, p = 0.98). The number of procedures or blocks per separation did significantly differ by age (ANOVA*, p<0.001) however differences were not large (Figure 12).

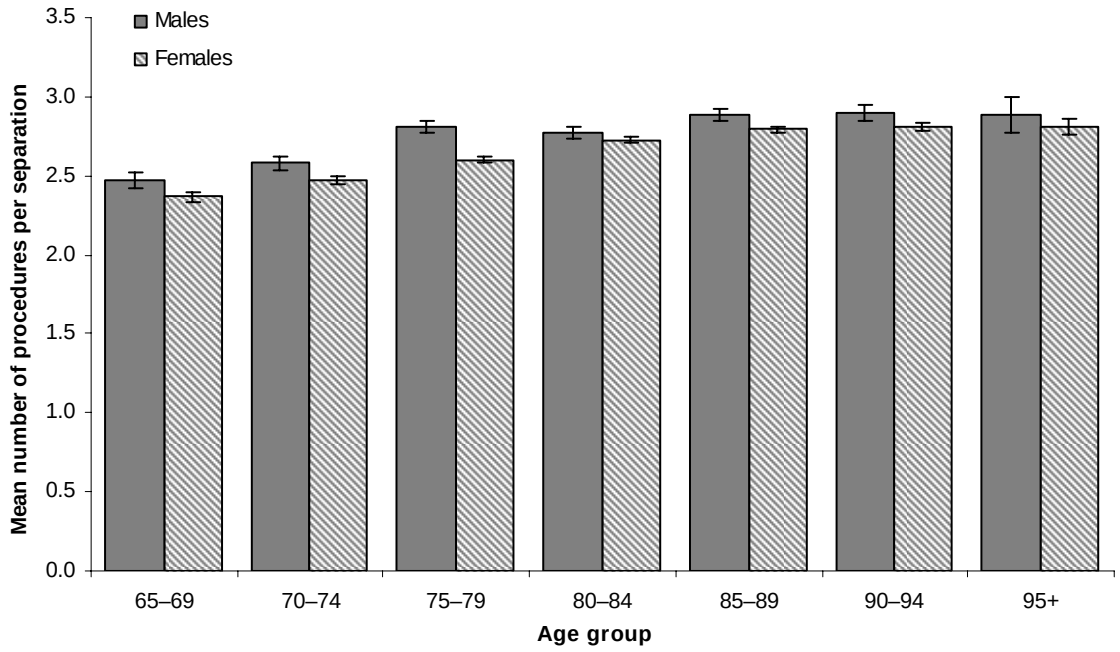


Figure 12: Mean number of procedures/blocks (± SE) per separation by age group, males and females 65+ years, Australia, 2003–04

* The one-way analysis of variance model (ANOVA) examines the association between a single nominal predictor variable (e.g. age groups) and a continuous outcome variable (e.g. number of procedures per separation).

The most common procedure types listed in fall injury incident cases for both men and women were 'non-invasive, cognitive and other interventions, not elsewhere classified' (67.9% of all procedures), procedures on the musculoskeletal system (15.8%) and imaging services (9.9%—see Table 9).

Table 9: Total number of procedures listed in fall injury incident separations for people aged 65+ years, Australia, 2003–04

	Males	Females	Persons
Procedures on Nervous System	352 (1%)	446 (0%)	798 (0%)
Procedures on Endocrine System	* (0%)	* (0%)	* (0%)
Procedures on Eye and Adnexa	62 (0%)	82 (0%)	144 (0%)
Procedures on Ear & Mastoid process	37 (0%)	23 (0%)	60 (0%)
Procedures on Nose, Mouth & Pharynx	86 (0%)	154 (0%)	240 (0%)
Dental Services	11 (0%)	19 (0%)	30 (0%)
Procedures on Respiratory System	762 (2%)	545 (0%)	1,307 (1%)
Procedures on Cardiovascular System	486 (1%)	634 (1%)	1,120 (1%)
Procedures on Blood & Blood-Forming Organs	16 (0%)	26 (0%)	42 (0%)
Procedures on Digestive System	317 (1%)	491 (0%)	808 (0%)
Procedures on Urinary System	404 (1%)	466 (0%)	870 (1%)
Procedures on Male Genital Organs	25 (0%)	NA	25 (0%)
Gynaecological Procedures	0 (0%)	11 (0%)	11 (0%)
Procedures on Musculoskeletal System	5,851 (13%)	19,952 (17%)	25,803 (16%)
Dermatological and Plastic Procedures	1,737 (4%)	3,138 (3%)	4,875 (3%)
Procedures on Breast	* (0%)	* (0%)	* (0%)
Chemotherapeutic and Radiation Oncology Procedures	23 (0%)	21 (0%)	44 (0%)
Non-invasive, Cognitive and Other Interventions, nec	29,492 (65%)	81,586 (69%)	111,078 (68%)
Imaging Services	5,687 (13%)	10,509 (9%)	16,196 (10%)
Total	**45,348**	**118,123**	**163,471**

* Small case numbers have been suppressed to prevent patient identification.

Note: Counts of procedures in this table exceed case numbers as there was a mean of 2.7 procedures listed per fall injury incident.

'Non-invasive, cognitive and other interventions' procedures include health assessments, diagnostic tests, counselling, therapeutic interventions, anaesthesia and allied health interventions such as physiotherapy. Fall injury incident separations coded with at least one 'non-invasive, cognitive and other interventions' procedure had up to 16 such procedures listed in the record. The mean number of 'non-invasive, cognitive and other interventions' procedures listed in these separations was 2.7 (± 1.6 SD). For cases having at least one such procedure, males had significantly more 'non-invasive, cognitive and other interventions' procedures listed per separation than females (2.8 ± 1.7 SD versus 2.7 ± 1.6 SD respectively, t-test $p<0.001$). Further, the mean number of 'non-invasive, cognitive and other interventions' procedures per separation increased significantly with age (ANOVA $p<0.001$, see Figure 13).

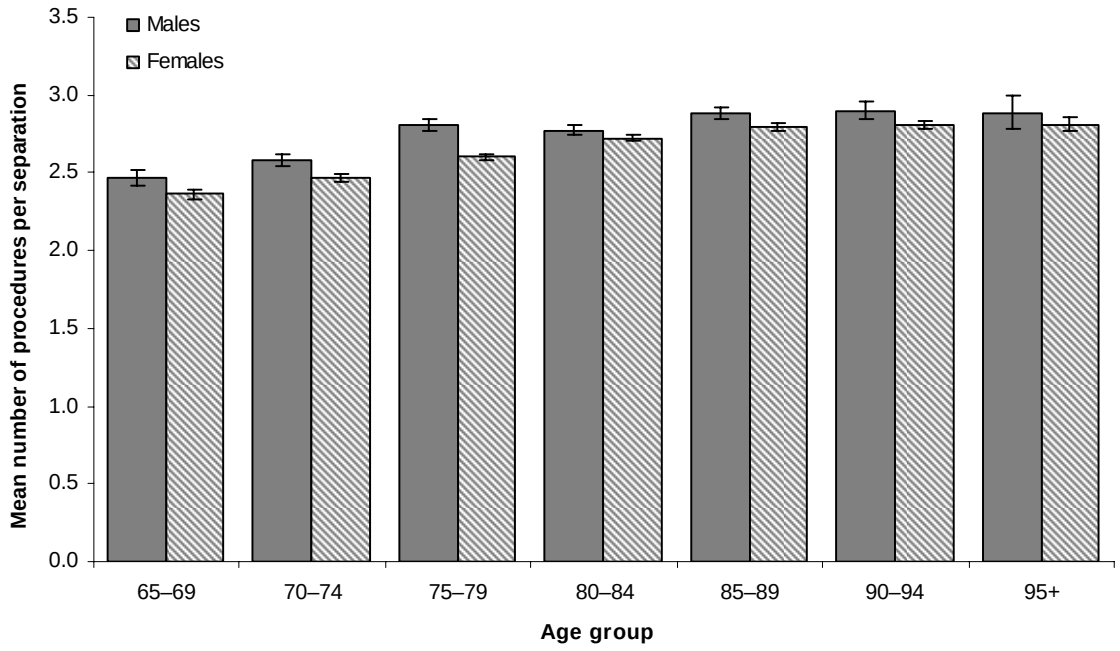


Figure 13: Mean number of 'non-invasive, cognitive and other interventions' procedures per fall injury incident separation (± SE), given at least one such procedure reported, males and females 65+ years, Australia, 2003–04

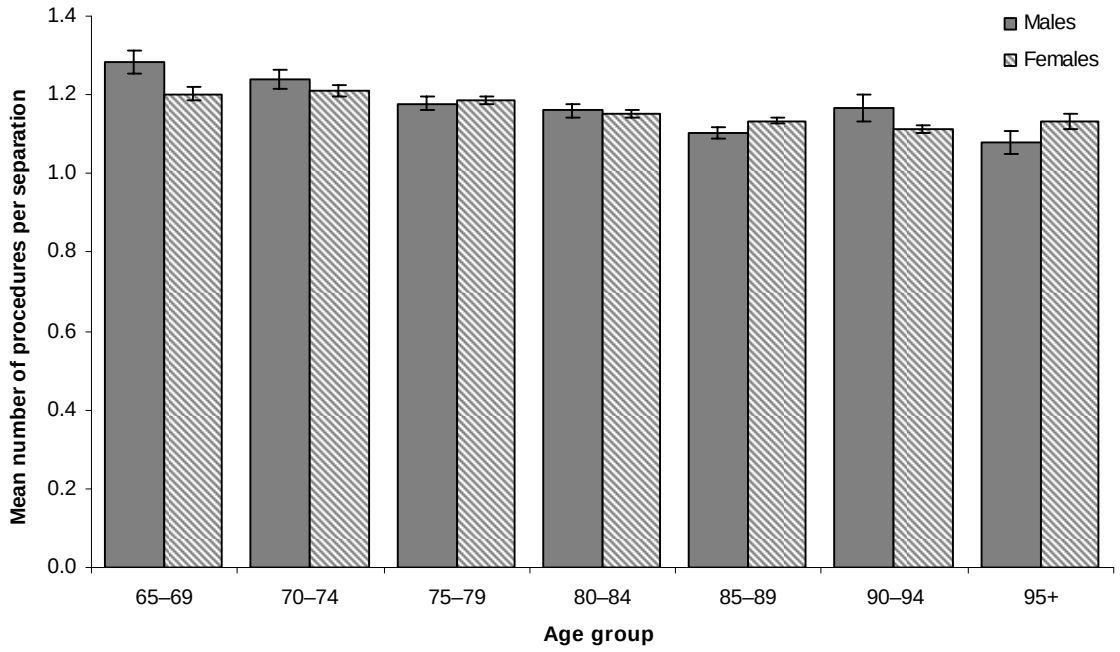


Figure 14: Mean number of musculoskeletal procedures per fall injury incident separation (± SE), given at least one such procedure reported, males and females 65+ years, Australia, 2003–04

Fall injury incident separations coded with at least one musculoskeletal procedure (e.g. immobilisation, reduction of fractures, arthroplasty) had up to 10 such procedures listed in the record. The mean number of musculoskeletal procedures listed in these separations was 1.2 (± 0.5 SD). The mean number of musculoskeletal procedures did not differ significantly according to sex (t-test, p=0.05) however the mean number of musculoskeletal procedures per separation significantly decreased with age (ANOVA p<0.001, see Figure 14).

Procedures classed as 'imaging services' include ultrasounds, computerised tomography and magnetic resonance imaging. Similar to 'non-invasive, cognitive and other interventions', separations for males having at least one imaging services procedure included significantly more imaging procedures per separation than females (1.4 ± 0.7 SD versus 1.3 ± 0.6 SD respectively, t-test p<0.001). However, as for musculoskeletal procedures, the mean number of imaging procedures per separation decreased with age (ANOVA p<0.001).

Seven specific procedure types accounted for half of the 163,302 procedures performed during admissions due to fall injury incidents (50.4%, n=82,347). These were: allied health intervention, physiotherapy (20.4%), allied health intervention, occupational therapy (9.2%), allied health intervention, social work (6.4%), computerised tomography of the brain (4.0%), transfusion of packed cells (3.6%), internal fixation of fracture of trochanteric or subcapital femur (3.6%) and allied health intervention, dietetics (3.2%). These seven categories were the highest ranking for both males and females, although the order differed slightly (see Table A1). Consistent with having a higher proportion of head injuries, a higher proportion of procedures for males were computerised tomography of the brain (5.3% for males versus 3.5% for females). Similarly, females underwent a higher proportion of procedures for a closed reduction of a fracture of the distal radius than males (1.8% for females versus 0.4% for males), consistent with sustaining a higher proportion of injuries to the elbow and forearm.

The rates of fall injury incident separations including codes for any of the three most common procedures (allied health interventions; physiotherapy, occupational therapy, and social work) all increased with age (Figure 15). The increase with age in the rate of separations listing physiotherapy procedures was particularly high, reaching a peak of 5,576.8 separations per 100,000 population in the 90–94 years age group. These allied health intervention procedures were associated with a wide range of injury types, most commonly injuries to the hip and thigh (n=14,527, 41.5% of separations coded with at least one of these procedures). Given the large proportion of injuries to the hip and thigh for fall injury incidents overall, age-specific rates were also calculated for the procedure block 1489—arthroplasty of hip (procedures 49319-00, 49318-00, 49315-00, 49312-00, and 47522-00). As expected, the rate of separations containing these codes increased with age, to a peak of 776.2 separations per 100,000 population in the 90–94 years age group.

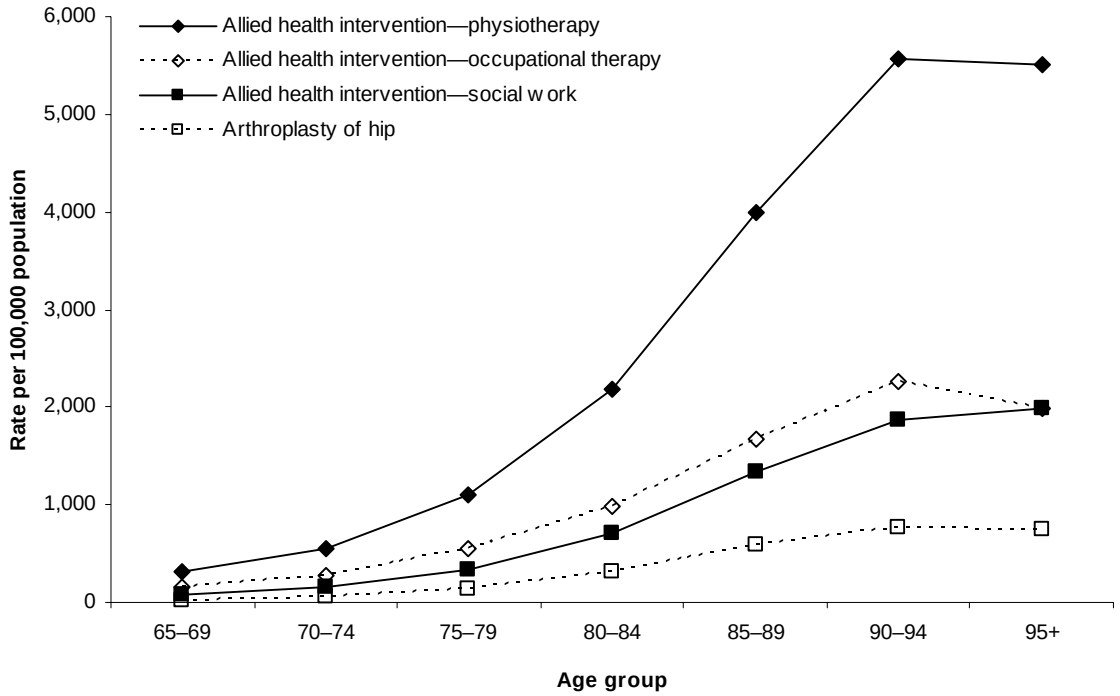


Figure 15: Age specific rates per 100,000 population for four common procedure types, persons 65+ years, Australia, 2003–04

4 Fall injury inward transfers

This chapter provides a brief description of the set of hospitalisation records which were omitted from the previous two chapters in order to reduce multiple counting of incident cases of hospitalised fall-related injury due to transfers between hospitals.

7,274 separations had a principal diagnosis in the range S00–T75 or T79 and a first external cause code in the range W00–W19 (i.e. similar to falls incident cases), but also had a mode of admission denoting a transfer from another acute hospital. These separations are likely to have already generated a separation describing the injury event. Fall injury inward transfer separations represented 0.3% of the total number of hospitalisations for people aged 65 years and older in 2003–04.

As for fall injury incidents, injuries to the hip and thigh predominated, however the proportion of injuries to the hip and thigh was much larger for fall injury inward transfer separations than for fall injury incidents (49.0%, n=3,567, see Table 10, below, and Table 2, previously). Further, the proportion of fall injury transfer separations which had a principal diagnosis of injuries to the head (8.4%, n=612) was considerably lower than the proportion of such diagnoses for fall injury incidents. The mean age of fall injury inward transfer separations (81.6 years ± 7.6 SD) was slightly older than the mean age for fall injury incidents (81.4 years ± 7.8 SD), but not significantly so (Mann Whitney U, p=0.6).

The age-standardised rate of fall injury inward transfer separations for persons aged 65 years and older was 275.8 separations per 100,000 population. As for fall injury incidents, the rate for females (328.8 per 100,000) was substantially higher than for males (197.0 per 100,000). Age-specific rates by sex for fall injury transfer separations showed a similar trend to that observed for fall injury incident cases (Figure 16).

Table 10: Principal diagnosis groups for fall injury transfer separations, males, females and persons aged 65+ years, Australia, 2003–04

ICD-10-AM 3rd edition principal diagnosis	Males	Females	Persons
Injuries to the head	256 (13%)	356 (7%)	612 (8%)
Injuries to the neck	70 (3%)	78 (1%)	148 (2%)
Injuries to the thorax	151 (7%)	153 (3%)	304 (4%)
Injuries to the abdomen, lower back, lumbar spine & pelvis	175 (9%)	530 (10%)	705 (10%)
Injuries to the shoulder & upper arm	140 (7%)	464 (9%)	604 (8%)
Injuries to the elbow & forearm	80 (4%)	418 (8%)	498 (7%)
Injuries to the wrist & hand	31 (2%)	39 (1%)	70 (1%)
Injuries to the hip & thigh	942 (46%)	2,625 (50%)	3,567 (49%)
Injuries to the knee & lower leg	153 (8%)	508 (10%)	661 (9%)
Injuries to the ankle & foot	15 (1%)	39 (1%)	54 (1%)
Injuries involving multiple body regions	* (0%)	* (0%)	* (0%)
Injuries to unspecified parts of trunk, limb or body region	9 (0%)	20 (0%)	29 (0%)
Other and unspecified effects of external causes	* (0%)	* (0%)	* (0%)
Certain early complications of trauma	6 (0%)	8 (0%)	14 (0%)
Total	**2,031**	**5,243**	**7,274**

* Small case numbers have been suppressed to prevent patient identification.

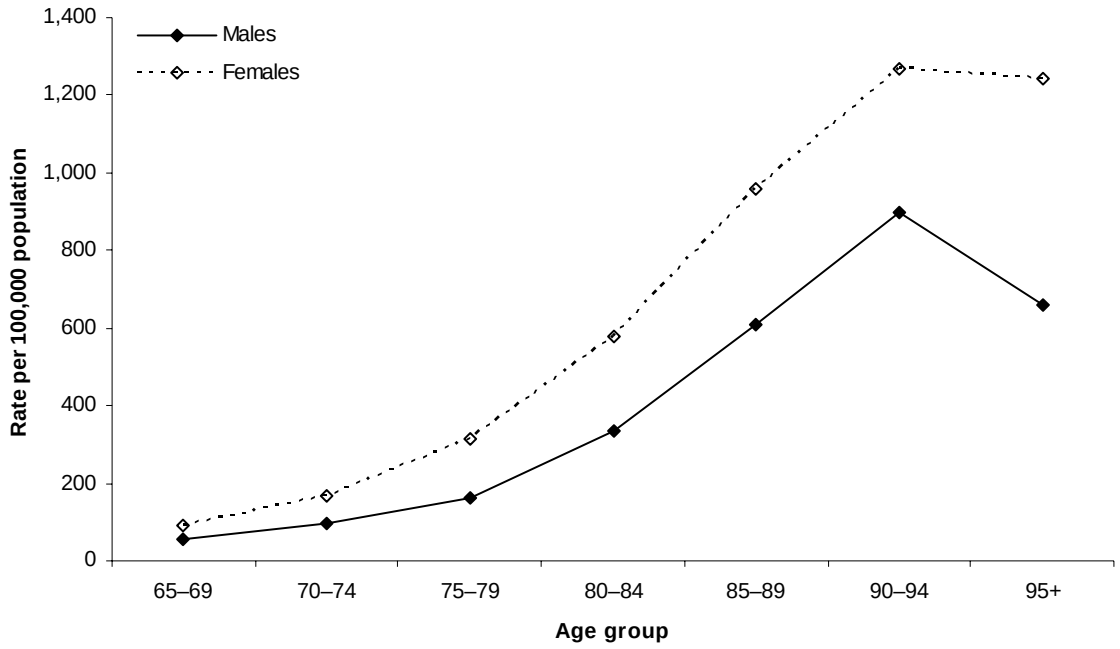


Figure 16: Age-specific rates for fall injury transfer separations, males and females aged 65+ years, Australia, 2003–04

Similar to fall injury incidents, most fall injury transfer separations were due to unspecified falls (W19, 38.1%), falls on the same level due to slips, trips and stumbles (W01, 28.5%) and other falls on the same level (W18, 17.6%). As for fall injury incidents, falls on the same level due to tripping were most common, representing 60.0% of all W01 injury incidents (n=1,244). It is interesting to note that unspecified falls accounted for a higher proportion of fall injury inward transfer separations than for fall injury incidents.

Table 11: Falls types for fall injury transfer separations, males, females and persons aged 65+ years, Australia, 2003–04

	Males	Females	Persons
Fall on same level from slipping, tripping & stumbling	492 (24%)	1,581 (30%)	2,073 (28%)
Fall involving ice-skates, skis, roller-skates or skateboards	* (0%)	* (0%)	* (0%)
Other fall on same level due to collision with, or pushing by, another person	6 (0%)	11 (0%)	17 (0%)
Fall while being carried or supported by other persons	* (0%)	* (0%)	*(0%)
Fall involving wheelchair	15 (1%)	17 (0%)	32 (0%)
Fall involving bed	77 (4%)	199 (4%)	276 (4%)
Fall involving chair	54 (3%)	144 (3%)	198 (3%)
Fall involving other furniture	9 (0%)	10 (0%)	19 (0%)
Fall involving playground equipment	* (0%)	* (0%)	* (0%)
Fall on & from stairs & steps	93 (5%)	243 (5%)	336 (5%)
Fall on & from ladder	86 (4%)	32 (1%)	118 (2%)
Fall on & from scaffolding	6 (0%)	0 (0%)	6 (0%)
Fall from, out of or through building or structure	31 (2%)	10 (0%)	41 (1%)
Fall from tree	* (0%)	* (0%)	5 (0%)
Fall from cliff	* (0%)	* (0%)	* (0%)
Diving or jumping into water causing injury other than drowning or submersion	* (0%)	* (0%)	5 (0%)
Other fall from one level to another	48 (2%)	37 (1%)	85 (1%)
Other fall on same level	370 (18%)	913 (17%)	1,283 (18%)
Unspecified fall	731 (36%)	2,038 (39%)	2,769 (38%)
Total	**2,031**	**5,243**	**7,274**

* Small case numbers have been suppressed to prevent patient identification.

5 The burden of injury due to falls

Chapters 2 and 3 focus on the estimated number of new cases of hospitalised fall-related injury that occurred in the year to 30 June 2004. This chapter focuses on the nature and extent of hospital care provided in that period because of a fall-related injury.

Fall-related follow-up care

Recent work by the National Injury Surveillance Unit using person-linked data has revealed that a large proportion of injury incidents are associated with subsequent separations coded with a principal diagnosis from Chapter XXI of the ICD-10-AM, factors influencing health status and contact with health services (Kreisfeld & Newson 2006; Bradley & Harrison forthcoming). This pattern is frequently observed for hip fracture injuries in particular.

Commonly, a person admitted to hospital due to a hip fracture has an initial episode of care resembling that defined in this report as an incident case (a principal diagnosis in the range S00–T75 or T79 and a leftmost external cause code for an unintentional fall, W00–W19), followed by another episode for rehabilitation or other follow-up care. The principal diagnosis of the subsequent episode is often a code for the type of follow-up care provided and the injury for which the follow-up care is required is usually recorded as an additional diagnosis. The most common principal diagnosis codes for these cases are;

- 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.

Such cases are numerous and must be considered in a valid estimation of the burden of 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 (like the injury incident separations described in previous sections of this report) these separations represent an additional part of the burden due to fall injury rather than additional cases.

This report has identified fall-related follow-up care separations on the basis of having a principal diagnosis of one of the four types listed above as well as an injury (S00–T75 or T79) and a falls external cause code (W00–W19) anywhere in the record (see also 'Selection criteria'). 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 explicit in the principal diagnosis, irrespective of the recorded type of episode of care). However, 89.2% of the records selected are recorded as being 'rehabilitation' type of episodes (Table 16).

Nearly 16,000 fall-related follow-up care separations were identified for people aged 65 years and older in 2003–04 (n=15,825). These separations represent 0.7% of the total number of hospital separations for people aged 65 years and older in 2003–04. Three-quarters of these were for women (74.2%, n=11,747). The mean age of the person for a fall-related follow-up care separation was 82.4 years (± 7.1 SD), which was significantly older than the age of persons hospitalised for a fall injury incident (81.4 years ± 7.8 SD Mann Whitney U, p<0.001). Females hospitalised for a fall-related follow-up care separation had a mean age of 82.8 years (± 7.0 SD) and, as for fall injury incidents, were significantly older than males (mean 81.0 years ± 7.2 SD Mann Whitney U, p<0.001).

The age-standardised rate of fall-related follow-up care separations for all people aged 65 years and older was 598.5 separations per 100,000 population. The age-standardised rate for females (727.9 per 100,000) was much higher than for males (400.4 per 100,000). Age-specific rates of fall-related follow-up care separations increased considerably for both males and females until very old age, when rates decreased somewhat (Figure 17).

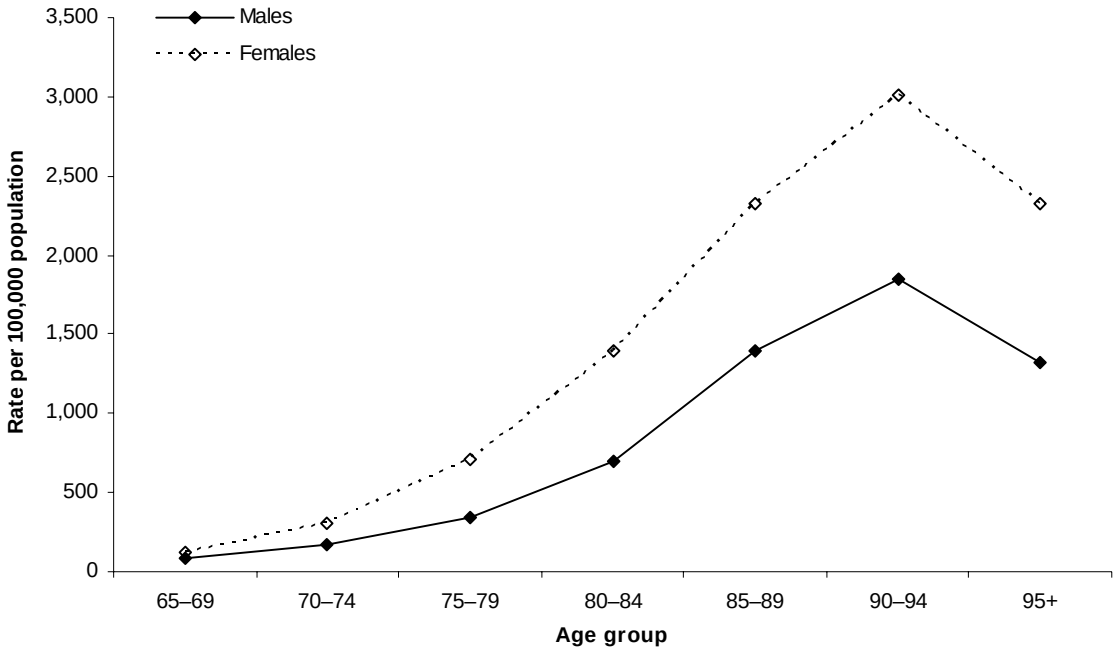


Figure 17: Age-specific rates of fall-related follow-up care separations, males and females aged 65+ years, Australia, 2003–04

Diagnosis types

More than three quarters (79.4%, n=12,565) of fall-related follow-up care separations had a principal diagnosis of Z50 (care involving use of rehabilitation procedures). In particular, most fall-related follow-up care separations (71.8%, n=11,370) had a principal diagnosis of Z50.9—care involving use of rehabilitation procedure, unspecified (Table 12).

Another common principal diagnosis for fall-related follow-up care separations indicated that the person was awaiting admission to another care facility (Z75.1x: 11.1%, n=1,754). Of these, the majority (89.9%, n=1,576) were coded as Z75.11—person awaiting admission to residential aged care service. A higher proportion of fall-related follow-up care separations for men (12.1%) had this principal diagnosis than separations for women (9.2%). While some separations coded with a principal diagnosis of Z75.11 were as young as 65 years, the mean age for these cases was higher than for all fall-related follow-up care separations—84.4 years ± 6.8 SD

Table 12: Principal diagnosis for fall-related follow-up care separations, males, females and persons aged 65+ years, Australia, 2003–04

ICD-10-AM 3rd edition principal diagnosis		Males	Females	Persons
Z47.0	Follow-up care involving removal of fracture plate & other internal fixation device	* (0%)	* (0%)	20 (0%)
Z47.8	Other specified orthopaedic follow-up care	50 (1%)	235 (2%)	285 (2%)
Z47.9	Orthopaedic follow-up care, unspecified	53 (1%)	190 (2%)	243 (2%)
Z48.0	Attention to surgical dressings & sutures	5 (0%)	10 (0%)	15 (0%)
Z48.8	Other specified surgical follow-up care	226 (6%)	700 (6%)	926 (6%)
Z48.9	Surgical follow-up care, unspecified	5 (0%)	12 (0%)	17 (0%)
Z50.0	Cardiac rehabilitation	* (0%)	* (0%)	5 (0%)
Z50.1	Other physical therapy	95 (2%)	523 (4%)	618 (4%)
Z50.4	Psychotherapy, not elsewhere classified	* (0%)	* (0%)	* (0%)
Z50.7	Occupational therapy & vocational rehabilitation, nec	* (0%)	* (0%)	12 (0%)
Z50.8	Care involving use of other rehabilitation procedures	123 (3%)	434 (4%)	557 (4%)
Z50.9	Care involving use of rehabilitation procedure, unspecified	2,969 (73%)	8,401 (72%)	11,370 (72%)
Z75.10	Person awaiting admission to acute hospital	* (0%)	* (0%)	9 (0%)
Z75.11	Person awaiting admission to residential aged care service	493 (12%)	1,083 (9%)	1,576 (10%)
Z75.12	Person awaiting admission to psychiatric facility/unit	* (0%)	* (0%)	* (0%)
Z75.13	Person awaiting admission to rehabilitation facility/unit	25 (1%)	72 (1%)	97 (1%)
Z75.14	Person awaiting admission to palliative care facility/unit	* (0%)	* (0%)	* (0%)
Z75.18	Person awaiting admission to other health care facility	12 (0%)	36 (0%)	48 (0%)
Z75.19	Person awaiting admission to adequate facility elsewhere, unspecified	7 (0%)	14 (0%)	21 (0%)
Total		**4,078**	**11,747**	**15,825**

* Small case numbers have been suppressed to prevent patient identification.

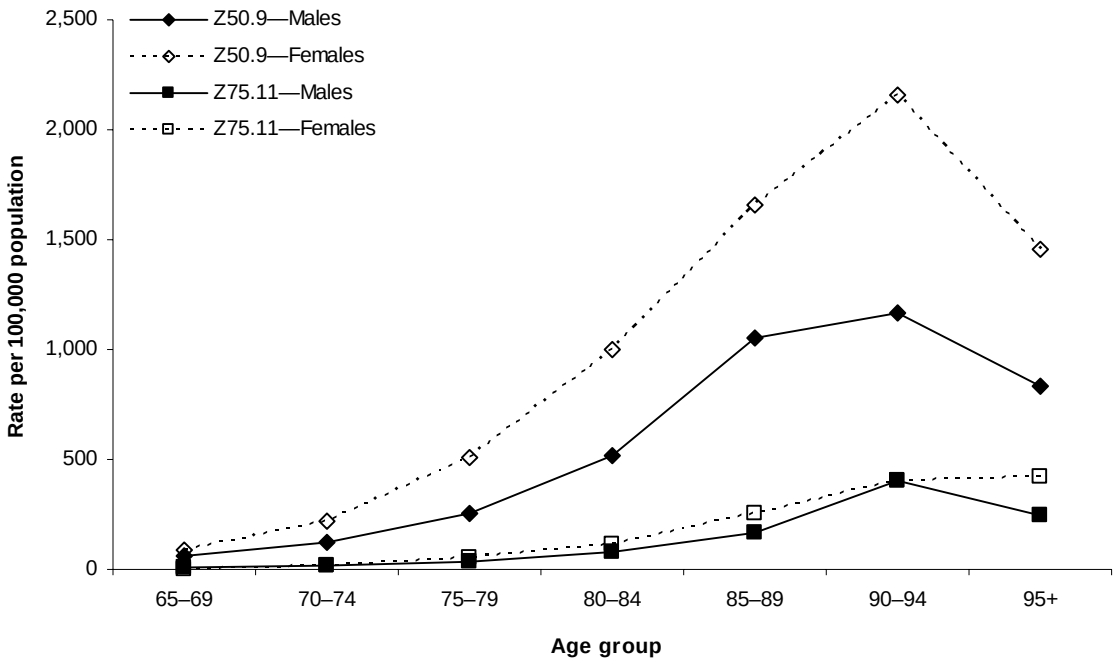


Figure 18: Age-specific rates for the two most common principal diagnoses for fall-related follow-up care separations, males and females aged 65+ years, Australia, 2003–04

The age-standardised rate of fall-related follow-up care separations with a principal diagnosis of Z50.9 (care involving use of rehabilitation procedure, unspecified) for all people aged 65 years and older was 430.3 separations per 100,000 population. The age-standardised rate for females (521.6 per 100,000) was much higher than for males (290.1 per 100,000). As for all fall-related follow-up care separations, the age-specific rates of separations with a principal diagnosis of Z50.9 increased considerably for both males and females until very old age, when rates decreased slightly (Figure 18). The age-standardised rate for the second most common principal diagnosis for fall-related follow-up care separations (Z75.11—person awaiting admission to residential aged care service) was 59.1 per 100,000 population. While the age- and sex-specific rates showed a similar trend to that previously described, the rates for females awaiting admission to residential aged care service continued to increase in the 95+ years age group.

The first-listed injury diagnosis recorded in these fall-related follow-up care separations was identified for further analysis. As for fall injury incidents, the most common injury category was an injury to the hip or thigh (52.0%, n=8,231). Nearly all of these injuries to the hip and thigh (96.3%, n=7,925) had a first-listed injury code of S72—fracture of femur. Fractures of the femur (S72) was the leading injury type for both males (46.7%, n=1,906) and females (51.2%, n=6,019) for all fall-related follow-up care separations. The next most frequent injury types were S32—fracture of lumbar spine and pelvis (10.1%, n=1,598) and S42—fracture of shoulder and upper arm (6.9%, n=1,085). Head injuries (S00–S09), while the second-most common injury category for fall injury incidents, were the fifth most common injury category for fall-related follow-up care separations (6.2%, n=988). As for fall injury incidents, however, injuries to the head constituted a higher proportion of fall-related follow-up care separations for males (10.7%, n=437) than for females (4.7%, n=551).

External cause

By definition, all fall-related follow-up care separations contained a W00–W19 code within the record and for a large proportion of fall-related follow-up care separations (97.6%, n=15,443) this was the leftmost (first-listed) external cause code in the record. A further 1.8% (n=286) fall-related follow-up care separations had a leftmost external cause code signifying complications of surgical and medical care (codes in the range Y40–Y84). The remaining separations (n=96, 0.6%) had leftmost external cause codes variously denoting transportation injuries, burns and scalds, other unintentional injuries, assault injuries, injuries of undetermined intent and nosocomial conditions.

The leftmost unintentional fall external cause code (W00–W19) was identified and analysed for all fall-related follow-up care separations (i.e. the principal external cause in most cases). As for fall injury incident cases, fall-related follow-up care separations were commonly caused by 'unspecified falls' (W19, 39.2%, n=6,210), falls on the same level from slipping, tripping and stumbling (W01, 28.9%, n=4,567) and other falls on the same level (W18, 18.1%, 2,860). Interestingly, the ranking of these common fall types is different for fall-related follow-up care separations than for incident cases, with W19 (unspecified) falls being more frequent in rehabilitation separations than W01 falls. Unspecified falls were the most common fall type for both males and females (Table 13).

Table 13: Causes of fall-related follow-up care separations: first listed W00–W19 external cause for males, females and persons aged 65+ years, Australia, 2003–04

Fall type	Males	Females	Persons
Fall on same level involving ice & snow (W00)	* (0%)	* (0%)	* (0%)
Fall on same level from slipping, tripping & stumbling (W01)	1,064 (26%)	3,503 (30%)	4,567 (29%)
Other fall on same level due to collision with, or pushing by, another person (W03)	9 (0%)	23 (0%)	32 (0%)
Fall while being carried or supported by other persons (W04)	* (0%)	* (0%)	* (0%)
Fall involving wheelchair (W05)	44 (1%)	34 (0%)	78 (0%)
Fall involving bed (W06)	206 (5%)	462 (4%)	668 (4%)
Fall involving chair (W07)	113 (3%)	287 (2%)	400 (3%)
Fall involving other furniture (W08)	15 (0%)	27 (0%)	42 (0%)
Fall on & from stairs & steps (W10)	188 (5%)	465 (4%)	653 (4%)
Fall on & from ladder (W11)	89 (2%)	44 (0%)	133 (1%)
Fall on & from scaffolding (W12)	* (0%)	0 (0%)	* (0%)
Fall from, out of or through building or structure (W13)	27 (1%)	10 (0%)	37 (0%)
Fall from tree (W14)	* (0%)	0 (0%)	* (0%)
Fall from cliff (W15)	* (0%)	* (0%)	10 (0%)
Diving or jumping into water causing injury other than drowning or submersion (W16)	* (0%)	* (0%)	6 (0%)
Other fall from one level to another (W17)	50 (1%)	70 (1%)	120 (1%)
Other fall on same level (W18)	756 (19%)	2,104 (18%)	2,860 (18%)
Unspecified fall (W19)	1,501 (37%)	4,709 (40%)	6,210 (39%)
Total fall-related follow-up care separations	**4,078**	**11,747**	**15,825**

* Small case numbers have been suppressed to prevent patient identification.

The age-standardised rate of fall-related follow-up care separations for unspecified falls for persons aged 65 years and older was 234.4 separations per 100,000 population. Age-specific rates increased to a peak in the 90–94 years age group (Figure 19). Other common types of fall-related follow-up care separations showed a similar trend, except for falls involving stairs and steps, where the peak of 77.3 separations per 100,000 population occurred in the 85–90 years age group. Age-specific rates for males and females for the three most common fall types (unspecified falls, slips, trips and stumbles, and other falls on the same level) showed the same pattern as for persons aged 65+ years overall.

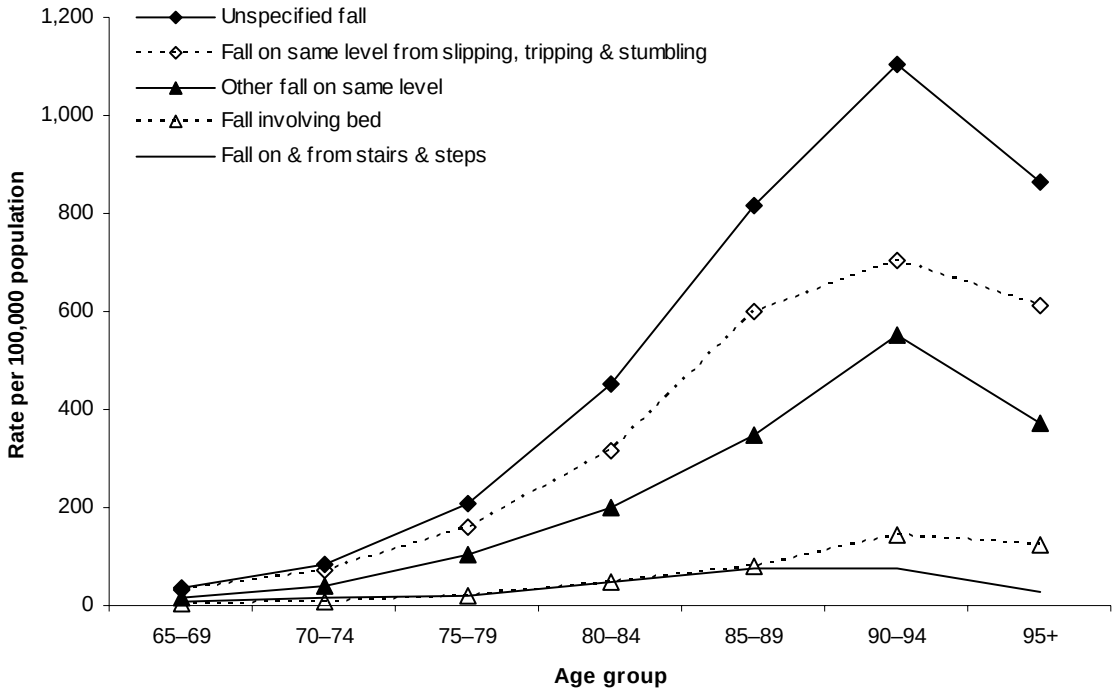


Figure 19: Age-specific rates of fall-related follow-up care separations for the five most-common fall types, persons aged 65+ years, Australia, 2003–04

Procedures

The number of procedures listed in fall-related follow-up care separations ranged from 0 (5.5%, n=870) to 30 (n=1) procedures per record. The total number of procedures listed in all fall-related follow-up care separations was 46,876. The mean number of procedures per separation was 3.0 (± 2.1 SD). Males had a significantly higher mean number of procedures per separation than females (3.1 ± 2.2 SD versus 2.9 ± 2.0 SD, respectively. Mann Whitney U, $p<0.001$). The most common procedures listed for both male and female fall-related follow-up care separations were 'non-invasive, cognitive and other interventions, not elsewhere classified' (94.4% of procedures, n=44,234) and imaging services (3.4%, n=1,609). Unlike fall injury incidents relatively few codes in fall-related follow-up care separations were for procedures on the musculoskeletal system (0.4%, n=168).

Three specific codes accounted for two-thirds (67.1%, n=31,503) of all procedures performed during fall-related follow-up care separations. These were; allied health intervention, physiotherapy (29.6%), allied health intervention, occupational therapy (22.9%), allied health interventions, social work (14.6%). The ten most-common procedure types were the same for both males and females and together accounted for more than 84% of all fall-related follow-up care procedures (Table 14). With the exception of hydrotherapy and podiatry, these procedures were among those most frequently identified in fall injury incident separations (previously described).

Table 14: Ten most common procedures for fall-related follow-up care separations, males, females and persons aged 65+ years, Australia, 2003–04

	Males	Females	Persons
Allied health intervention, physiotherapy	3,561 (28%)	10,328 (30%)	13,889 (30%)
Allied health intervention, occupational therapy	2,727 (22%)	8,027 (23%)	10,754 (23%)
Allied health intervention, social work	1,811 (14%)	5,049 (15%)	6,860 (15%)
Allied health intervention, dietetics	917 (7%)	2,430 (7%)	3,347 (7%)
Allied health intervention, speech pathology	724 (6%)	1,112 (3%)	1,836 (4%)
Allied health intervention, podiatry	190 (2%)	556 (2%)	746 (2%)
Computerised tomography of brain	205 (2%)	372 (1%)	577 (1%)
Allied health intervention, pharmacy	142 (1%)	390 (1%)	532 (1%)
Hydrotherapy	166 (1%)	347 (1%)	513 (1%)
Allied health intervention, other	121 (1%)	379 (1%)	500 (1%)
Subtotal	*10,564 (84%)*	*28,990 (85%)*	*39,554 (84%)*
Total procedures	**12,595**	**34,281**	**46,876**

‘Other fall-related’ separations

A further 18,048 separations for people aged 65 years and older were identified as being related to falls in addition to those already discussed. These ‘other fall-related’ separations did not meet the criteria specified for fall injury incidents, 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. These separations represent 0.8% of the total number of hospital separations for people 65 years and older in 2003–04.

The age-standardised rate of ‘other fall-related’ separations was 685.5 per 100,000 population and age-specific rates of ‘other fall-related’ separations showed a similar increasing trend to that observed previously (Figure 20). However, unlike the fall-related separations 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 years and older was 749.6 per 100,000 while the rate for females was 644.6 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. This is compared to 0.6 fall injury incidents for males for every 1.0 fall injury incidents for females.

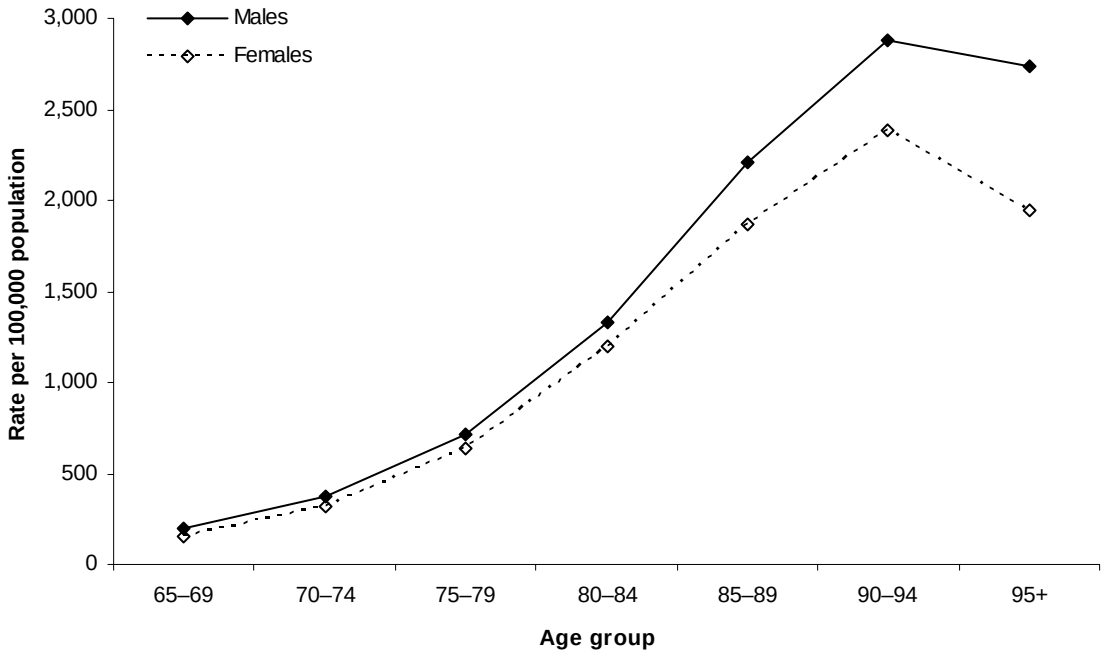


Figure 20: Age-specific rates for ‘other fall-related’ separations, males and females aged 65+ years, Australia, 2003–04

The majority of ‘other fall-related’ separations did not have an injury code of any type as the principal diagnosis (95.4% of ‘other fall-related’ separations, n=17,209). A large proportion of ‘other fall-related’ separations (20.9%, n=3,765) had a principal diagnosis from Chapter IX of the ICD-10-AM—diseases of the circulatory system. Other common diagnosis types were from Chapter XVIII—symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (14.7%, n=2,662) and Chapter X—diseases of the respiratory system (9.7%, n=1,748, see Table 15).

Table 15: Principal diagnosis types for 'other fall-related' separations, males, females and persons aged 65+ years, Australia, 2003–04

ICD-10-AM 3rd edition principal diagnosis	Males	Females	Persons
Certain infectious & parasitic diseases	149 (2%)	167 (2%)	316 (2%)
Neoplasms	753 (10%)	569 (6%)	1,322 (7%)
Diseases of the blood, blood-forming organs, etc	89 (1%)	149 (1%)	238 (1%)
Endocrine, nutritional & metabolic diseases	306 (4%)	417 (4%)	723 (4%)
Mental & behavioural disorders	536 (7%)	694 (7%)	1,230 (7%)
Diseases of the nervous system	480 (6%)	492 (5%)	972 (5%)
Diseases of the eye & adnexa	17 (0%)	24 (0%)	41 (0%)
Diseases of the ear & mastoid process	19 (0%)	41 (0%)	60 (0%)
Diseases of the circulatory system	1,619 (21%)	2,146 (21%)	3,765 (21%)
Diseases of the respiratory system	946 (12%)	802 (8%)	1,748 (10%)
Diseases of the digestive system	346 (4%)	433 (4%)	779 (4%)
Diseases of the skin & subcutaneous tissue	198 (3%)	331 (3%)	529 (3%)
Diseases of the musculoskeletal system & connective tissue	329 (4%)	664 (6%)	993 (6%)
Diseases of the genitourinary system	323 (4%)	609 (6%)	932 (5%)
Symptoms, signs, abnormalities nec	1,085 (14%)	1,577 (15%)	2,662 (15%)
Injury, poisoning & consequences of external causes	342 (4%)	497 (5%)	839 (5%)
Factors influencing health status	248 (3%)	648 (6%)	896 (5%)
Total †	**7,786**	**10,262**	**18,048**

† Totals include 3 separations from categories too small to publish.

A small proportion of 'other fall-related' separations (4.6%, n=839) had a principal diagnosis denoting injury. Of these, 63.2% (530) had a principal diagnosis on the 'community injury' range (S00–T75 or T79). By definition, none of these injury separations had a leftmost external cause indicating a fall (W00–W19, otherwise the separation would have been classed as either an injury incident or a falls inward transfer as already discussed). However, all of these separations had a W00–W19 external cause code elsewhere in the record. The most common case type for these separations was an injury to the hip or thigh due to complications of medical and surgical care (27.5% of 'other' S00–T75 or T79 separations, n=146).

Most of the remaining 'other fall-related' separations with an injury principal diagnosis were complications of surgical and medical care (T80–T88; 34.9%, n=293). Of these, most (92.2%, n=270) had a leftmost external cause code also indicating complications of medical and surgical care. The most common such external cause code was Y83.1—complications of a surgical operation the implant of an artificial internal device (49.1%, n=144). Again, by definition all of these separations had both a diagnosis code in the range S00–T75 or T79 and a W00–W19 external cause code somewhere in the record. The relationship between these complications of surgical and medical care fall-related separations (both principal diagnosis and leftmost external cause) and increasing age was linear for both males and females (Figure 21).

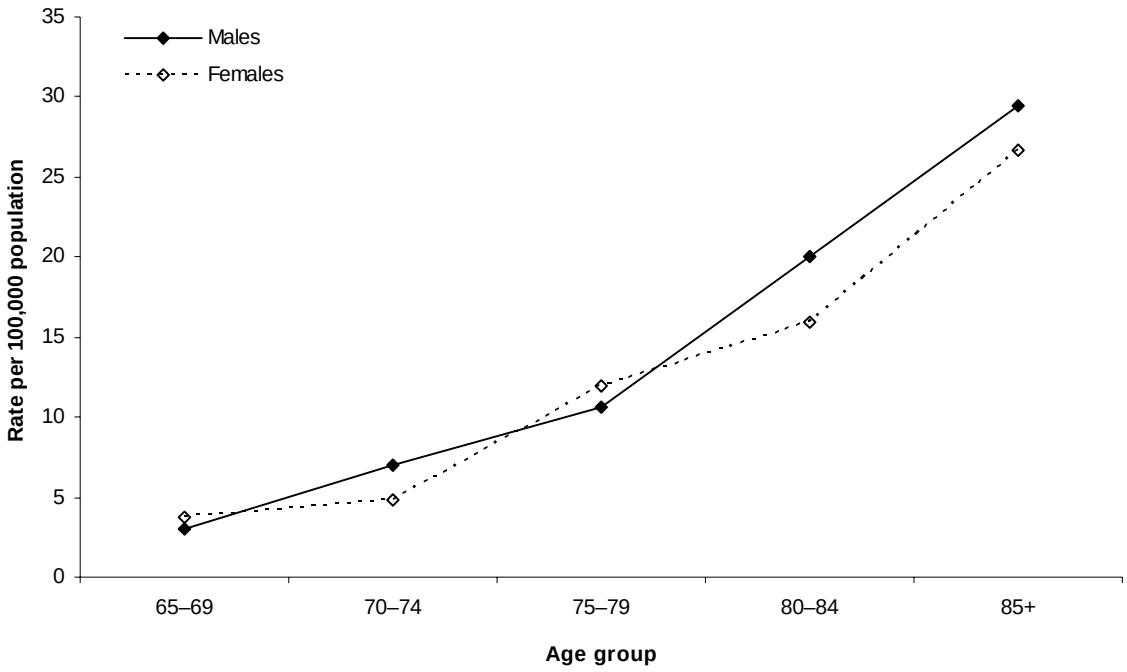


Figure 21: Age-specific rates for 'other fall-related' complications, males and females aged 65+ years, Australia, 2003–04

Injury characteristics of 'other fall-related' separations

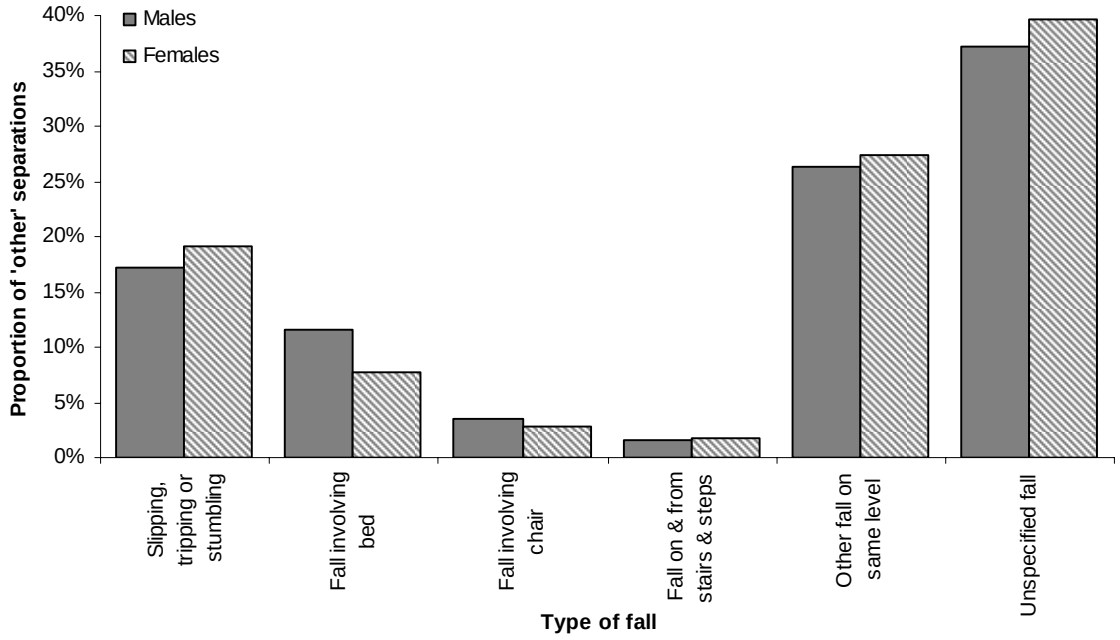
The first-listed injury diagnoses (S00–T75 or T79) for all 'other fall-related' separations were quite different to those of fall injury incidents, inward transfers and fall-related follow-up care separations. The most common injury codes, for both males and females, were open wounds of the head (S01, 14.5%, n=2,608) and superficial injuries to the head (S00, 10.4%, n=1,874). Head injury of all types (S00–S09) constituted 32.1% of the first-listed injury diagnoses for all 'other fall-related' separations (n=5,791). In contrast, S72 (fractures of the femur), the predominant injury type for fall injury incidents, fall-related follow-up care separations and fall injury inward transfers, was the first-listed injury type for only 8.4% of 'other fall-related' separations (n=1,523). However, as noted in previous analyses, there is a close relationship between Chapter XXI principal diagnoses and S72 additional diagnoses. For separations with a Chapter XXI principal diagnosis*, a third of records (32.9%, n=295) had S72 as the first-listed injury code.

The majority of 'other fall-related' hospital separations had a leftmost external cause code in the range W00–W19 (86.8%, n=15,674). A further 10.0% (n=1,808) of the separations had a leftmost external cause code denoting complications of surgical and medical care (Y40–Y84, these include some of the 'other fall-related' injury separations discussed above). By definition, all of the 'other fall-related' separations had a W00–W19 code within the record and the leftmost falls code (i.e. the principal external cause in most cases) was identified for further analysis. Similar to the previous analyses, the most common falls type for 'other fall-related' separations was

* *Note:* excludes Z47, Z48, Z50 and Z75.1 codes as these are defined as falls-related follow-up care separations and are discussed in the first section of Chapter 5.

unspecified falls (W19, 38.6%, n=6,972). Again, falls on the same level due to slips, trips and stumbles (W01) and other falls on the same level (W18) were frequent, but unlike previous analyses, slips, trips and stumbles accounted for a lower proportion of cases than other falls on the same level (see Figure 22).

Place and activity codes were also analysed for the 'other fall-related' separations. A large proportion of separations (32.6%, n=5,875) had a leftmost place code denoting the home. Unlike previous analyses, however, the most common place code for 'other fall-related' separations was Health Service Area (39.7%, n=7,163). Concomitantly, aged care facilities were a relatively infrequent place of occurrence for 'other fall-related' separations (8.6%, n=1,551). The most common first-listed activity in 'other fall-related' separations was 'unspecified activity' (57.8%, n=10,425) and a larger proportion of 'other fall-related' separations had an activity code of while resting, sleeping or engaging in other vital activities (22.4%, n=4,036) than was observed for fall injury incidents.



* Categories accounting for less than 1% of the total for all persons 65+ years have been omitted.

Figure 22: Proportions* of the first-listed fall for 'other fall-related' separations, males and females aged 65+ years, Australia, 2003–04

These 'other fall-related' separations are difficult to interpret on the basis of information available in the NHMD. The principal diagnosis (i.e. the main reason for the hospital episode) was generally not an injury or follow-up care diagnosis, but an injury, due to a fall, was also included among the additional diagnoses. Some possible circumstances for such cases are: chance (i.e. a person admitted for a non-injury condition happened to have an injury condition); co-morbid injury (e.g. a person admitted due to a neoplasm had a pathological fracture); complication of care (e.g. a person in hospital for treatment of a non-injury condition slipped and fell); and, injury during the onset of another condition (e.g. a person fell and was injured during an acute myocardial infarction). Additional information would be required in order to fully understand the role of fall injury in these cases. However, this group of records should not be ignored when estimating the burden of hospitalised fall-related injury.

Length of stay

Fall injury incident separations for people aged 65 years and older accounted for 487,401 bed-days in 2003–04. This represents 4.2% of all bed-days for hospitalisations for this age group. The length of stay per fall injury incident ranged from 1 day (32.4% n=19,605) to more than 600 days (n=1). The mean length of stay for fall injury incident cases was 8.1 days (± 11.2 SD). The mean length of stay for males (7.9 days ± 11.3 SD) did not differ significantly from that of females (8.1 days ± 11.2 SD t-test, p=0.12). The mean length of stay did significantly differ by age, however (ANOVA, p<0.001). Mean length of stay increased with age for both males and females (Figure 23). However, in the 95+ years age group the mean length of stay for females (and persons overall) decreased slightly while the length of stay for males continued to increase.

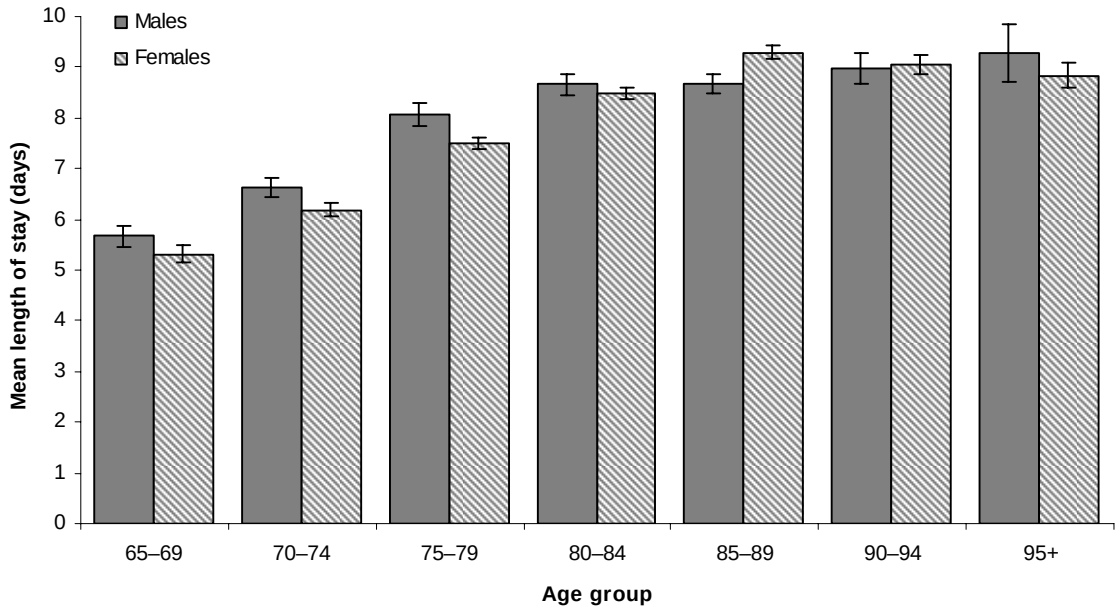
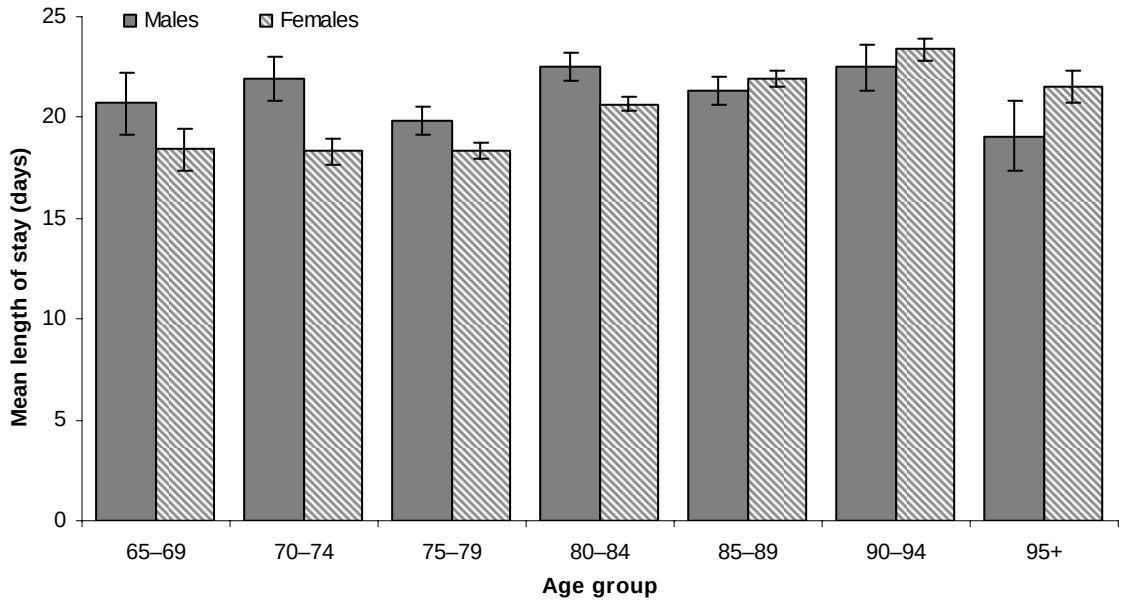


Figure 23: Mean length of stay (days ± SE) for fall injury incident cases, males and females aged 65+ years, Australia, 2003–04

Fall injury inward transfers had a longer mean length of stay than fall injury incidents (13.4 days ± 15.5 SD), probably due to higher injury severity in transferred cases. The mean length of stay for males was 13.0 days (± 15.7 SD) while the mean length of stay for females was 13.5 days (± 15.4 SD). As for fall injury incidents, the mean length of stay increased until ages 90–94 years and then decreased slightly in the 95+ years age group. This pattern was similar for both males and females. In total, falls inward transfer separations in people aged 65 years and older contributed 97,267 hospital bed-days in 2003–04, which was 0.8% of all bed-days occupied by this population in this year.

Fall-related follow-up care separations for people aged 65 years and older accounted for 340,946 bed-days in 2003–04. This represents 3.0% of all bed-days for hospitalisations for this age group. The length of stay per separation ranged from 1 day (10.9% n=1,725) to more than 1,400 days (n=1). The mean length of stay for fall-related

follow-up care separations was much longer than for fall injury incident cases or inward transfers (21.5 days ± 30.7 SD). Twenty-one separations had a length of stay exceeding 250 days. Fifteen of these separations were for females and ages ranged from 71–93 years. These very long stay outliers did not unduly influence the mean length of stay for fall-related follow-up care separations however; calculations based on lengths of stay of less than 250 days only reduced the mean to 20.9 days (± 20.7 SD). Even with the 21 long-stay outliers removed from the sample, mean lengths of stay did not differ significantly according to sex (t-test, p=0.06). Although mean length of stay did differ significantly by age (ANOVA, p<0.001), there was not a clear relationship between the two variables (Figure 24).



Note: 21 separations with a length of stay exceeding 250 days have been omitted from the figure.

Figure 24: Mean length of stay (days ± SE) for fall-related follow-up care separations, males and females aged 65+ years, Australia, 2003–04

As shown in Figure 25, there was an obvious association between mean lengths of stay and principal diagnosis type. Z75.1 diagnoses (person awaiting admission to adequate facility elsewhere) had much longer lengths of stay than other types of diagnoses for fall-related follow-up care separations, for both males and females.

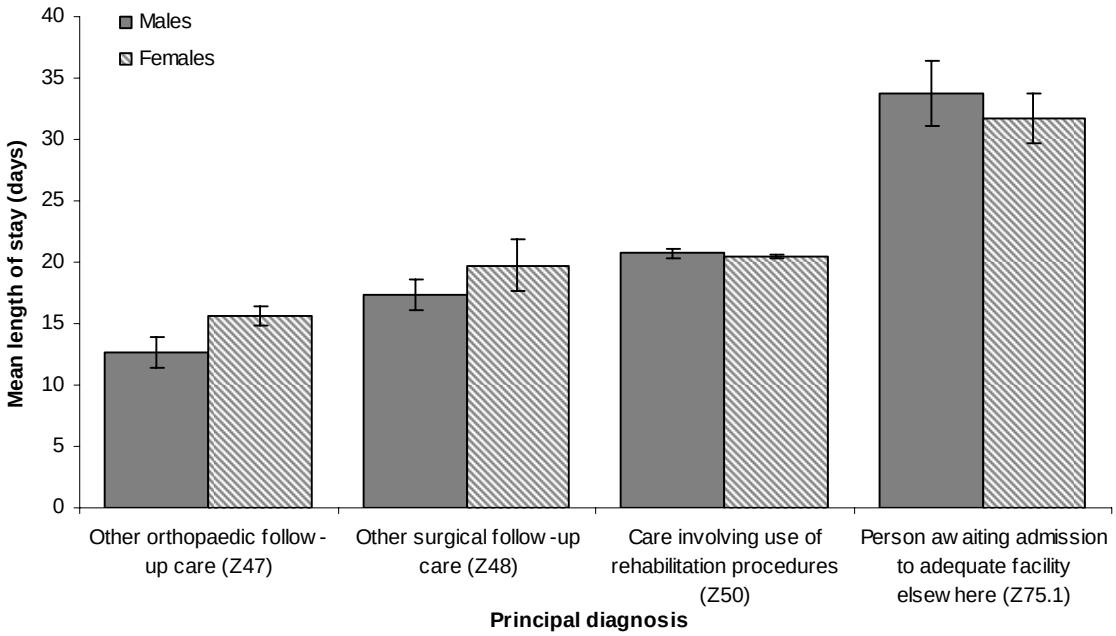


Figure 25: Mean length of stay (days ± SE) for fall-related follow-up care separations—principal diagnosis types, males and females aged 65+ years, Australia, 2003–04

'Other fall-related' separations (i.e. not fall injury incidents, inward transfers or fall-related follow-up care separations) for people aged 65 years and older accounted for 320,600 bed-days in 2003–04, representing 2.8% of all bed-days for hospitalisations for this population in this year. The length of stay for 'other fall-related' separations ranged from 1 day (11.1% n=1,995) to more than 5,000 days (n=1). Eleven separations had a length of stay of more than 1,000 days (0.06%). These cases were all female and most (72.7%, n=8) were aged 80 years or older. Eight of these very-long stay cases had a principal diagnosis of Z75.3—unavailability and inaccessibility of health-care facilities.

It is not surprising, then, that the mean length of stay for 'other fall-related' separations for females (19.1 days ± 89.5 SD) was significantly higher than the mean length of stay for males (16.1 days ± 23.3 SD t-test, $p<0.001$). When the 11 very long stay separations were removed from the analysis the mean length of stay for females reduced to 16.6 days (± 27.8 SD), which was not significantly different to that for males (t-test, $p=0.19$). The overall mean length of stay for all 'other fall-related' separations for persons aged 65+ years (excluding the 11 long stay separations) was 16.4 days (± 25.9 SD). Unlike other types of falls separations (i.e. injury incidents, inward transfers and fall-related follow-up care), mean length of stay did not differ significantly according to age (ANOVA, $p=0.20$. Figure 26).

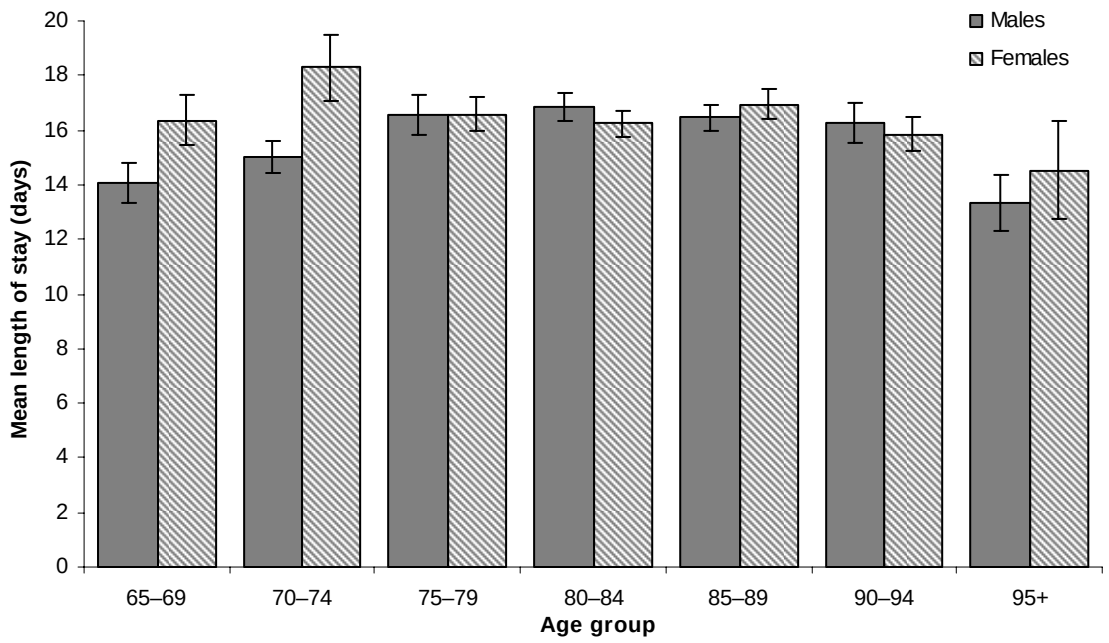
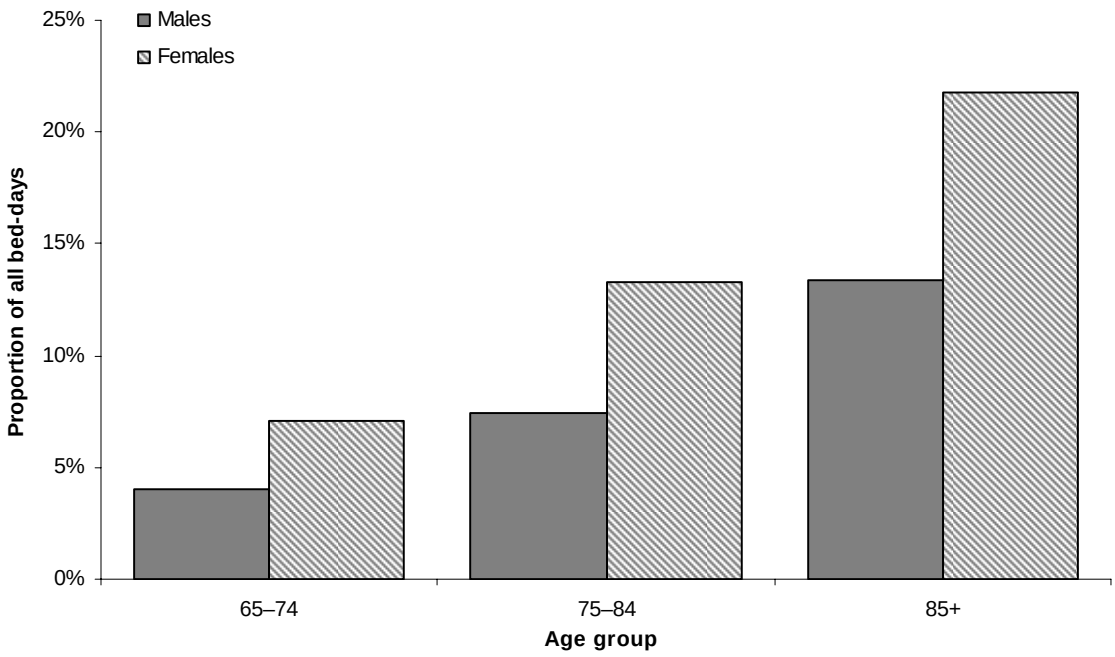


Figure 26: Mean length of stay (days ± SE) for 'other fall-related' separations, males and females aged 65+ years, Australia, 2003–04

In total, 101,644 separations were identified as being related to injury due to a fall for people aged 65 years and older in 2003–04. This represents 4.3% of all hospital separations for any cause for this population. Further, 1,246,214 bed-days were utilised by fall-related separations by people aged 65 years and older in 2003–04, 10.9% of all hospital bed days for this population. Hospitalisations related to falls by males accounted for 7.2% of all bed-days for males aged 65+ years while hospitalisations related to falls by females accounted for a much higher proportion of all bed-days for females aged 65+ years—13.9%. Bed-days occupied by fall-related separations as a proportion of all bed-days increased with age for both males and females (Figure 27).



Note: All-causes hospitalisation (denominator) data sourced from *Australian hospital statistics 2003–04* (AIHW 2005a).

Figure 27: Total burden of fall-related hospitalisations as a proportion of all bed days for the population aged 65+ years, males and females, Australia, 2003–04

The length of stay analysis presented above considers four groups of fall-related separation records separately. Fall injury inward transfers (Chapter 4) and fall-related follow-up care episodes (Chapter 5) are normally preceded by an initial episode for acute care (Chapter 2). This pattern has been found in analyses of person-linked data from Western Australia (Bradley & Harrison forthcoming). Hence, a valid estimate of the average total duration of hospital care for admitted incidents of fall-related injury should include the bed-days for all phases of care. On this basis, the estimated total mean length of stay for fall-related incident cases (n=60,497) is 15.3 days if bed-days for incident separations, inward transfers and fall-related follow-up care are included (n=925,614). The involvement of falls injury in 'other fall-related' separations is not entirely clear, but if these are also considered in calculations of total duration of hospital care for fall injury incidents, then the mean length of stay increases to 20.6 days per incident case.

Costs

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 2005a). Expenditure can then be estimated by applying cost weights to the AR-DRGs. Cost weights are defined by the Department of Health and Ageing 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 2005a).

Only acute episodes of care have been included in the analyses presented in this section. AR-DRG cost weights are only appropriate for acute episodes of care as they are based in part on length of stay data, and it is recognised that other types of episodes, rehabilitation for example, often require much longer hospital stays (John Goss, AIHW, personal communication. August 2006). As such, separations that were not coded as acute episodes of care have been excluded from this analysis. Additionally, separate cost weights are usually published for acute episodes of care in public and private institutions (e.g. DoHA 2004), allowing expenditure to be more accurately estimated. However, in 2003–04 (Round 8), private sector cost weights were not published. In this chapter, cost weights for acute care in public hospitals have been applied to acute care separations from other types of institutions to give an approximation of the total burden of hospitalised acute fall-related injuries.

Hospital separations in 2003–04 were coded to both version 4.2 and version 5.0 AR-DRGs. In AR-DRG v5.0, major updates were made to 'allied health combined' AR-DRGs (including physiotherapy, occupational therapy, speech therapy, nutrition and dietetics and social work), imaging AR-DRGs and AR-DRGs relating to pharmacy (among others, see DoHA 2005b). Given the frequency of such separations in the fall-related data, the analyses presented here use only the AR-DRG v5.0 classification.

This method for estimating the cost of fall-related hospitalisations is different to that used by some fall-injury researchers. Hall and Hendrie (2003) estimated the national cost of falls in older people by utilising a 'bottom-up' approach. In this prospective study, older fallers presenting to a teaching hospital's Emergency Department were recruited to complete a diary of the community and informal care they received due to their fall, and any associated expenses, for the three months following their fall. Clinical costing database information for the study's participants was added to the diary information. Total care costs, both direct and indirect, for the three month post-fall period were then extrapolated to give state and national cost estimates (Hall & Hendrie 2003). Moller (2003), on the other hand, followed the methodology of Mathers and Penm (1999) and utilised a 'top-down' approach to estimate the cost of falls-related injury as a proportion of the total national healthcare expenditure.

It was beyond the scope of this study to consider the indirect costs related to hospitalised fall-related injury. However, the AR-DRG method provides a more exact estimate of the direct hospital cost for the particular cases considered than an approach apportioning out total national healthcare expenditure. That is, as the actual AR-DRGs assigned to fall-related separations were analysed, this method gives a specific measure of the direct hospital expenditure for these episodes. Nonetheless, in using this method we have had to omit some fall-related episodes of care from our estimate (because appropriate cost weights for non-acute episodes are not available) and, accordingly, present an underestimate of the total cost of direct hospital care due to fall-related injury.

Estimated cost of falls by older people

A total of 84,420 fall-related hospital separations for people aged 65 years and older were considered in the cost estimate. As described above, all of these separations had been coded with an acute type of episode of care. Most separations were from public hospitals (79.5%, n=66,113). The remaining separations included in this analysis were for acute care in other types of hospital. Together, acute care separations from public and other types of hospitals represent 83.1% of the total number of fall-related separations for people aged 65 years and older in 2003–04 (Table 16). The great majority of the episodes omitted from the analysis were fall-related follow-up care separations, 89.2% of which were coded as rehabilitation and other types of non-acute care.

Table 16: Fall-related separations for people aged 65+ years, 2003–04: type of episode of care by type of institution

		Public hospitals	Other institutions [2]	Total
Fall injury incidents	Acute care	48,714 (99%)	11,001 (99%)	59,715 (99%)
	Other types of care [1]	680 (1%)	102 (1%)	782 (1%)
Fall injury inward transfer separations	Acute care	4,796 (89%)	1,881 (99%)	6,677 (92%)
	Other types of care [1]	581 (11%)	16 (1%)	597 (8%)
Fall-related follow-up care separations	Acute care	1,175 (11%)	533 (11%)	1,708 (11%)
	Other types of care [1]	9,691 (89%)	4,426 (89%)	14,117 (89%)
Other fall-related separations	Acute care	12,428 (89%)	3,892 (95%)	16,320 (90%)
	Other types of care [1]	1,516 (11%)	212 (5%)	1,728 (10%)
All fall-related separations	**Acute care**	**67,113 (84%)**	**17,307 (78%)**	**84,420 (83%)**
	Other types of care [1]	12,468 (16%)	4,756 (22%)	17,224 (17%)

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

2. Other institutions include private hospitals, repatriation hospitals, public psychiatric, private freestanding day hospital facilities and private hospitals in Tasmania.

The total estimated direct hospital cost of acute admissions for fall-related conditions by people aged 65 years and older in 2003–04 was $565,952,111 (Table 17). Of this, $444,699,386 (78.6%) was due to the cost of fall-related acute episodes of care in public hospitals while $121,252,725 was due to care in other types of institution. The major cost components contributing to these estimates are described in Tables A2–A5. Note that the relatively small cost estimate for fall-related follow-up care reflects the fact that available cost weights were not appropriate for application to non-acute episodes of care.

Table 17: Estimated cost for acute-care fall-related separations, using AR-DRG v5.0 cost weights for public hospitals: males, females and persons aged 65+ years, 2003–04

		Fall injury incidents	Fall injury inward transfers	Fall-related follow-up care	Other fall-related separations	Total
Males	Public hospitals	$84,565,193	$14,741,210	$ 1,921,356	$ 38,713,314	$139,941,073
	Other institutions	$19,416,712	$4,224,832	$ 895,650	$ 12,090,516	$36,627,710
	Total	$103,981,905	$18,966,042	$ 2,817,006	$ 50,803,830	$176,568,783
Females	Public hospitals	$220,238,928	$32,868,421	$ 6,461,503	$ 45,189,461	$304,758,313
	Other institutions	$56,749,998	$10,576,007	$ 2,820,516	$ 14,478,494	$84,625,015
	Total	$276,988,926	$43,444,428	$ 9,282,019	$ 59,667,955	$389,383,328
Persons	Public hospitals	$304,804,121	$47,609,631	$ 8,382,859	$ 83,902,775	$444,699,386
	Other institutions	$76,166,710	$14,800,839	$ 3,716,166	$ 26,569,010	$121,252,725
Total		**$380,970,831**	**$62,410,470**	**$12,099,025**	**$110,471,785**	**$565,952,111**

As mentioned above, AR-DRG cost weights are calculated, in part, on the basis of average lengths of stay, which are published along with cost weights (DoHA 2005c). The observed lengths of stay for fall-related acute episodes of care were generally longer than expected from these values.

While older people commonly have longer lengths of stay in hospital than younger people, nearly three-quarters of the AR-DRGs assigned to fall-related acute-care hospitalisations explicitly or implicitly accounted for age-related factors. For example, some AR-DRGs specified an age range for the separations to which they may be applied (e.g. AR-DRG X60B: 'Injuries, age greater than 64 years without complications and co-morbidities'). In other situations, the AR-DRGs did not specify a particular age range, but were for conditions strongly associated with older ages (e.g. AR-DRG I78A: 'Fractures of neck of femur with catastrophic or severe complications and co-morbidities'). Thus, while it might be thought that the long mean lengths of stay (relative to the means published with cost weight data) for fall-related acute episodes of care is due to the age-profile of the fall-related cases, these findings suggest that much of the age-effect has been taken into account in the way that AR-DRGs have been specified. Further work, beyond the scope of this report, would be required to determine the extent to which the relatively long mean length of stay observed for falls cases is due to a residual age-effect, not accounted for in the specification of AR-DRGs, and the extent to which it is due to other characteristics of falls cases.

The lengths of stay observed for fall injury incident episodes exceeded the expected length of stay for the AR-DRG by 1.2 days on average (± 9.1 SD). While the observed lengths of stay varied widely, from -28 days less to +200 days in relation to the expected values, falls incident cases generally had lengths of stay similar to those expected for the specific AR-DRGs (median difference = -1.1 days). For fall injury inward transfers, the lengths of stay observed differed from the expected length of stay for the AR-DRG by 2.9 days on average (± 12.6 SD). This reflects the high probability that transferred injury cases were severe.

The lengths of stay observed for acute care fall-related follow-up care separations and other acute fall-related separations were generally longer than expected. The lengths of stay observed for follow-up care separations exceeded the expected length of stay for their AR-DRGs by 5.1 days on average (± 17.4 SD) while the lengths of stay observed for 'other fall-related' separations differed from the expected length of stay for these case types by 6.9 days on average (± 43.2 SD). Consequently, it is likely that the cost of these acute-care falls related separations was much higher, in actual terms, than is indicated by estimates based on cost weights for episodes of expected duration.

Tables 18 to 20 list the ten most costly AR-DRGs for acute falls incident cases, inward transfers and 'other fall-related' separations for people aged 65 years and older in 2003–04. Separations from both public hospitals and other institutions are combined for these tables. Hip and femur procedures and injuries to the arms were common for both fall injury incidents and inward transfers. The AR-DRG A06Z (tracheostomy or ventilation >95 hours) also featured in the inward transfers, indicative of the more severe nature of transferred cases.

As expected, costly AR-DRGs for 'other fall-related' separations described serious cardiac and ischemic conditions as well as other chronic conditions associated with increasing age. Interestingly, a relatively common, and costly, AR-DRG in these 'other fall-related' separations was 901Z (extensive OR procedure unrelated to principal diagnosis). The first-listed procedure block codes for 53.4% (n=117) were for procedures relating to injuries to the hip and thigh[1], confirming that the presence of fall injury codes in the record, despite a non-injury principal diagnosis, indicates a serious injury in these cases.

Due to the very few cases of fall-related follow-up care separations coded as acute episodes, common AR-DRGs are not presented here. However, two specific AR-DRGs (I73A—aftercare of musculoskeletal implants/prostheses, age >59 years with catastrophic or severe complications and co-morbidities and Z63A—other aftercare with catastrophic or severe complications and co-morbidities) accounted for 64.2% (n=1,096) of the 1,708 fall-related follow-up care separations considered in this analysis.

[1] Specifically, blocks 1479: fixation of fracture of pelvis or femur, 1489: arthroplasty of hip, and 1486: reduction of fracture of pelvis or femur.

Table 18: The ten most costly AR-DRGs for acute falls incident cases (public hospitals and other institutions), people aged 65+ years, 2003–04

AR-DRG v5.0	Description	Count	Cost
I08A	Other hip and femur procedures with catastrophic or severe complications and co-morbidities	4,464	$68,915,232
I03B	Hip replacement with catastrophic or severe complications and co-morbidities or hip revision without catastrophic or severe complications and co-morbidities	2,614	$43,768,816
I08B	Other hip and femur procedures without catastrophic or severe complications and co-morbidities	3,709	$35,450,622
I03C	Hip replacement without catastrophic or severe complications and co-morbidities	1,660	$22,655,680
X60A	Injuries, age >64 with complications and co-morbidities	4,113	$17,356,860
I75A	Injury to shoulder, arm, elbow, knee, leg or ankle, age >64 years with complications and co-morbidities	2,518	$17,253,336
I77A	Fractures of pelvis with catastrophic or severe complications and co-morbidities	1,316	$13,346,872
I75B	Injury to shoulder, arm, elbow, knee, leg or ankle, age >64 years or with complications and co-morbidities	4,283	$12,467,813
J65A	Trauma to the skin, subcutaneous tissue and breast, age >69 years	3,546	$9,751,500
I19Z	Other elbow or forearm procedures	1,903	$9,286,640

Table 19: The ten most costly AR-DRGs for acute falls inward-transfer separations (public hospitals and other institutions), people aged 65+ years, 2003–04

AR-DRG v5.0	Description	Count	Cost
I08A	Other hip and femur procedures with catastrophic or severe complications and co-morbidities	813	$12,551,094
I03B	Hip replacement with catastrophic or severe complications and co-morbidities or hip revision without catastrophic or severe complications and co-morbidities	516	$8,639,904
I08B	Other hip and femur procedures without catastrophic or severe complications and co-morbidities	748	$7,149,384
I03C	Hip replacement without catastrophic or severe complications and co-morbidities	358	$4,885,984
A06Z	Tracheostomy or ventilation, >95 hours	35	$2,465,925
I75A	Injury to shoulder, arm, elbow, knee, leg or ankle, age >64 years with complications and co-morbidities	326	$2,233,752
I77A	Fractures of pelvis with catastrophic or severe complications and co-morbidities	166	$1,683,572
I13B	Humerus, tibia, fibula and ankle procedures, age >59 years without catastrophic or severe complications and co-morbidities	193	$1,531,648
I78A	Fractures of neck of femur with catastrophic or severe complications and co-morbidities	212	$1,364,432
B02A	Craniotomy with catastrophic complications and co-morbidities	39	$1,126,554

Table 20: The ten most costly AR-DRGs for acute 'other fall-related' separations (public hospitals and other institutions), people aged 65+ years, 2003–04

AR-DRG v5.0	Description	Count	Cost
A06Z	Tracheostomy or ventilation >95 hours	94	$6,622,770
B63Z	Dementia and other chronic disturbances of cerebral function	616	$5,481,784
B70A	Stroke with catastrophic complications and co-morbidities	355	$5,266,780
E62A	Respiratory infections/inflammations with catastrophic complications and co-morbidities	385	$3,183,565
901Z	Extensive O.R. procedure unrelated to principal diagnosis	219	$2,987,817
F62A	Heart failure and shock with catastrophic complications and co-morbidities	271	$2,267,999
B81A	Other disorders of the nervous system with catastrophic or severe complications and co-morbidities	292	$2,174,232
I08A	Other hip and femur procedures with catastrophic or severe complications and co-morbidities	137	$2,115,006
F73A	Syncope and collapse with catastrophic or severe complications and co-morbidities	540	$2,101,140
B70B	Stroke with severe complications and co-morbidities	237	$1,914,723

6 Discussion

Falls are common among older people and often result in fractures or other serious injuries. In Australia, approximately one in three older persons living at home experience a fall annually (Lord et al. 1993; Dolinis et al. 1997; Morris et al. 2004; Gill et al. 2005). A substantial proportion of falls in community-dwelling older people result in hospitalisation (Sattin et al. 1990; Hall & Hendrie 2003; Hendrie et al. 2004).

This report confirms that the rate of hospitalised falls for people aged 65 years and older remained high in 2003–04 and that hospitalisations for injuries due to falls and other fall-related conditions constituted a substantial proportion of the burden of disease and health expenditure for this population. Fall-related hospitalisations accounted for 4.3% of all hospitalisations for Australians aged 65 years and older in 2003–04. Further, fall-related hospitalisations accounted for 1,246,214 bed-days for people aged 65 years and older in 2003–04, representing 10.9% of all hospital bed-days for this population in this age group.

Other NISU reports show that age-standardised incidence rates of hospitalised fall injury due to falls (Berry & Harrison 2006) and injury deaths due to falls (Kreisfeld et al. 2004) have remained nearly constant in recent years. Since the population at most risk of this type of injury (i.e. people aged 65 years and older) is increasing, so is the annual number of cases. Hospitalised fall-related injury of older persons is predicted to increase almost threefold in the next fifty years, requiring over three quarters of a million additional bed days per year and an estimated 3,320 nursing home places in 2051 (Moller 2003).

Falls injuries and circumstances

The estimated number of injury events due to falls in people aged 65 years and over in 2003–04 which resulted in hospitalisation was 60,341. The age-standardised rate of fall injury incidents was 2,295.3 per 100,000 population and rates of fall injury incidents increased exponentially after the age of 75 years. While convention maintains that fall injury indicators include all people aged 65+ years, following Pointer et al. (2003) age-standardised rates of fall injury incidents were also calculated specifically for the population 75 years and older. In this older aged population, the rate of fall injury incidents was 3,926.1 per 100,000 persons. Age-specific rates of fall injury incidents peaked at 9,653.7 per 100,000 for persons aged 90–94 years, nearly 10% per year.

Reflective of the general population aged 65 years and older, females made up a higher proportion of fall-related hospitalisations in 2003–04. In addition, age-specific rates of hospitalised fall injury incidents suggest that older females have a much higher risk of serious falls than males. While injuries to the hip and thigh were the most common type of injury sustained in a serious fall incident for both males and females, a high proportion of hospitalised falls, particularly for males, resulted in head injuries. This was also the case for fall injury inward transfers and fall-related follow-up care separations. Head injuries were even more prominent in the 'other fall-related' separations analysed. These findings confirms similar results by other researchers (e.g. Peel et al. 2002) and supports suggestions that falls prevention interventions should be designed to explicitly target these very severe, and costly, head injuries in addition to hip fractures.

External cause coding of fall-related injuries for people aged 65 years and older provides little insight into the circumstances of occurrence in most cases. For fall injury incidents, the most common type of fall for both males and females was a fall on the same level due to slipping, tripping and stumbling (W01). Six in ten of these types of falls were attributed to tripping specifically. The second most common type of fall injury incident was an 'unspecified fall' (W19) and the third most common type of fall injury incident was an 'other fall on same level' (W18). While W01 can be coded with a fourth digit to separate slips, trips and stumbles, no further information can be ascertained for the common W18 and W19 codes, making it difficult to understand, and therefore prevent, these falls.

Similarly, W01, W18 and W19 were also the most commonly-listed external causes for other types of fall-related hospitalisations. However, for all fall-related separations other than injury incidents (i.e. inward transfers, follow-up care separations and 'other fall-related' separations), unspecified falls (W19) were the most frequently listed external cause. This suggests that some information regarding the circumstances of a fall is lost from records after the original hospitalisation for the injury event, compounding difficulties for strategically targeting falls prevention programs and accurately attributing the burden of disease due to particular types of falls.

Most likely related to the observation of a higher proportion of head injuries sustained in all types of fall-related separations for older males, a higher proportion of males aged 65 years and older sustained falls from ladders (W11) than for females and the age-standardised rate of fall injury incidents involving ladders was more than four times higher for males than for females. Most falls from ladders were sustained in the home. These findings support observations by other researchers (e.g. Driscoll et al. 2003; Cassell & Clapperton 2006) and the suggestion that the difference in incidence for this type of injury may be exposure-related in that males may undertake riskier home maintenance tasks than females, and undertake these tasks in a riskier manner (Mwanri & Fuller 2003; Kent & Pearce 2006).

As has also been highlighted by recent research on ladder-related falls injuries (Cassell & Clapperton 2006; Kent & Pearce 2006), the age-standardised rate of hospitalised falls from ladders is increasing. In 1997–98, the rate of falls from ladders or scaffolding (ICD-9-CM external cause code 881) for males aged 65 years and older was 50.8 per 100,000 (Cripps & Carman 2001), while in 2003–04 the rate of falls from ladders (excluding scaffolding, ICD-10-AM 3rd edition external cause code W11) for males 65+ years was 69.0 per 100,000. In the same period, the rate of falls from ladders (± scaffolding) for females aged 65 years and older also increased, but only slightly (from 15.7 per 100,000 to 16.9 per 100,000). Given the increasing trend of ladder-related injury events and the fact that such falls often result in serious head injuries and fatalities, it is suggested that falls prevention programs expand initiatives aimed at older men and ladder use. It is also suggested that coding refinements be made so that the height of such falls may be ascertained in order to better target prevention strategies.

Seven out ten fall injury incidents were recorded as having occurred in the home or in aged care facilities (place was recorded as 'unspecified' for another 16.7% of fall incidents). Recent revisions of the ICD-10-AM have included expansion of the categories available to record place of occurrence. However, nearly half of all falls in older persons occur in 'other and unspecified places in the home' (with no further detail) and this observation strongly supports further revision of place of occurrence coding. As outlined by Henley and Harrison (2006), one suggested change to the 'home' place of occurrence coding is to include subdivisions in the category which describe which room of the home the injury was sustained.

Rates of fall injury incidents in aged care facilities were calculated using estimates of the population in residential aged care at June 30 2004. These rates were markedly higher than the corresponding rates of fall injury incidents in the home for people resident in the general community. Rates for falls in aged care facilities calculated using the population known to reside in aged care facilities may be artificially inflated by the inclusion of falls by aged care facility visitors or, perhaps, staff. However, such cases are not likely to be a substantial proportion of the total. Serious falls by older people may be better understood, and therefore prevented, by the addition of a flag item in NHMD data, recording whether an injury event occurred at the injured person's usual place of residence.

Enhancement of activity coding in hospital separations could also be beneficial for surveillance of fall injury in older people. In 2003–04, nearly two thirds of fall injury incidents were given the activity code 'unspecified activity'. While it may be related to the large number of fall injury incidents classed as 'unspecified falls' (W19) and/or occurring in an 'unspecified place' (Y92.9), many more falls were given an unspecified activity code than would be predicted by this. Further investigation is needed to determine why 'unspecified' codes are used so frequently; generally and for activity coding in particular. Study of samples of hospital records should shed light on this.

One possible explanation for the large number of fall injury incidents coded as 'unspecified activity' is that the current suite of ICD-10-AM activity codes does not adequately describe activities typical of older people. There are currently over 250 activity codes in use in the third edition of the ICD-10-AM but these are predominantly related to sports and leisure activities. In forthcoming hospital data collections the 4th and 5th editions of the ICD-10-AM are used, but the activity coding here will be very similar to that of the 3rd edition. While half of falls incidents in older people occur in and around the home, comparatively few falls incidents are coded as U72 (leisure activity not elsewhere classified), U73.1 (while engaged in other types of work) or U73.2 (while resting, sleeping, eating or engaging in other vital activities). Relatively little explanation is provided regarding the inclusions and exclusions for these activity codes (see NCCH 2002) and no subcategories are provided to record more specific activity information. As such, it is suggested that future revisions of the ICD-10-AM activity codes explicitly address activities such as housework, home maintenance and/or DIY, gardening and volunteer work in fourth- or fifth-character subcategories and/or provide more specific information regarding included activities for each code.

The most common place code for 'other fall-related' separations was Health Service Area (39.7%, n=7,163) and the most common activities for 'other fall-related' separations were 'unspecified activity' (57.8%, n=10,425) and while resting, sleeping or engaging in other vital activities (22.4%, n=4,036). While the exact circumstances of the fall injuries included in 'other fall-related' separations are difficult to interpret, it is possible that a large proportion of these injuries occurred in hospital (e.g. involving complications of care or whilst receiving care for another condition). This finding supports suggestions that a revision of activity coding include a category of the type 'while receiving medical care' to better understand the nature of these 'other fall-related' separations and iatrogenic injuries (following Henley & Harrison 2006). Similarly, an activity code describing 'while being cared for' in a more general sense would also be beneficial for understanding injuries which occur outside of the health care sector (e.g. in the home).

The burden of fall-related injury

The additional types of separations identified in this report as being fall-related significantly increase the already-substantial burden of hospitalised fall injury incidents among people aged 65 years and older in 2003–04. Fall-related follow-up care separations and 'other fall-related' separations contributed 1.13 times the bed-days of those occupied due to initial episodes due to fall injury (incidents) and inward transfers due to falls and brought the total number of fall-related hospital bed-days for people aged 65 years and older in 2003–04 to over 1.2 million.

Recent work by NISU using person-linked data suggests that, in Western Australia, a large proportion of fall injury incidents resulting in injuries to the hip and thigh were associated with subsequent separations coded to four specific principal diagnoses from Chapter XXI of the ICD-10-AM—factors influencing health status and contact with health services (Kreisfeld & Newson 2006; Bradley & Harrison forthcoming). This report has confirmed that a large number of additional fall-related separations can be identified using this criterion in the national (de-identified) hospital data collection. Analyses here suggest that the principal diagnosis Z50.9, in conjunction with a falls external cause, is a particularly common type of follow-up care separation. It is also interesting to note that a sizeable proportion of fall-related follow-up care separations are coded with Z75.1 principal diagnoses, indicating that the person was awaiting admission to a residential aged care service, which supports observations that serious falls in older people often result in admission to residential care (Tinetti & Williams 1997). It is suggested, however, that in future these separations would be more appropriately classed not as fall-related follow-up care separations but as a distinct category of fall-related hospitalisations.

'Other fall-related' separations presented a widely varying array of records that are often overlooked by fall injury indicator surveillance but which, nevertheless, contribute to the burden of fall-related injury in older people. Many of these episodes were for serious chronic diseases and co-morbidities as expected in the older population. Additionally, a proportion of 'other fall-related' separations were for complications of surgical and medical care and/or included a place of occurrence code of Health Service Area (Y92.22). Lacking an iatrogenic injury flag in the data collection, however, it is not possible to determine whether or not these falls occurred during an episode of care for another condition. As discussed above, revision of activity coding to include a category indicating 'while receiving medical care' may help here.

Estimating the cost to hospitals for fall injury incidents and 'other fall-related' separations was complicated by two factors; firstly, cost weights for private hospitals were not available for 2003–04, and secondly, cost weights are only appropriate for acute care episodes and a large proportion of fall-related follow-up care and 'other fall-related' separations were not coded as acute episodes. It was estimated, however, that acute care episodes in public hospitals for fall injury incidents in people aged 65 years and older cost over $300 million. Approximating expenditure estimates by applying public hospital cost weights to all types of fall-related separations coded as acute episodes of care (i.e. falls injury incidents, inward transfers, follow-up care and 'other fall-related' separations in both public and private institutions) resulted in a total cost of $566.0 million for hospitalised falls for people aged 65 years and older in 2003–04. Given that a large number of cases were excluded from the set on which our estimate was calculated (on the basis of type of episode of care) this finding indicates that the total cost of fall injury in older people is likely to be higher than that reported by Moller (2003).

Moller (2003) reported that total hospital costs for injury due to falls in the population aged 65 years and older was $211.9 million for public hospital inpatients and $317.6 million for both public and private inpatients and non-inpatient care in 2001, but did not specify exact case inclusion criteria. Utilising a prospective study design, Hall and Hendrie (2003) estimated the national cost of fall injury in older people to be $287 million, which included consideration of emergency department presentations and the cost of care in the three months post-hospitalisation. Our national cost estimate for public hospital acute-care fall injury incident admissions alone exceeds the figures presented in these reports.

However, these studies utilised different methodologies to calculate costs and our use of AR-DRGs is a different methodology again. While we were not able to estimate the indirect cost of fall-related injury in older people, we consider the application of AR-DRG cost weights to be a more exact measure of the cost of the direct cost to hospitals due to fall-related injuries as it utilises the same data from which hospital budgets are disbursed. With the addition of the costs for other acute-care fall-related separations in public hospitals and fall-related separations in the private sector, our estimate of the direct cost of fall-related hospitalisations is brought to $566.0 million. As this estimate omits non-acute episodes of care for fall-related injuries and the indirect costs incurred due to falls, as well as the observation that mean lengths of stay for included cases are generally longer than those upon which AR-DRG cost weights are calculated, it is feasible to suggest that the $1 billion annual 'lifetime' cost of falls in older people calculated by Moller (1998) may be, if anything, an underestimate.

Data issues

Data sources

Hospital separations data were provided by the Australian Institute of Health and Welfare (AIHW 2005a). 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 was also obtained from the AIHW (similar to the figures presented in ABS 2004). Population estimates of residents of aged care facilities were obtained from the AIHW report *Residential aged care in Australia 2003–04: a statistical overview* (2005b). The number of people aged 65 years and older resident in the community (i.e. home) were then estimated by subtracting the number of residents of aged care facilities from the general population.

Australian Refined Diagnosis Related Groups (Round 8) public hospital cost weights were obtained from the Australian Government Department for Health and Ageing (DoHA 2005c). AR-DRG version 5.0 was introduced in September 2002 and hospitalisation costs were calculated here using this version.

ICD-10-AM

This report is based on hospital separations data coded according to the third edition of the Australian clinical modification of ICD-10, ICD-10-AM (NCCH 2002).

Selection criteria

Incident cases and inward transfer separations (groups 1 and 2)

Incident cases were defined as all separations which met the following specifications:

- The patient was aged 65 years or older;
- The principal diagnosis was in the range S00–T75 or T79;
- The leftmost external cause code was in the range W00–W19; 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' in recent NISU reports (e.g. Berry & Harrison 2006). Selection has been based on principal diagnosis because this refers to the condition chiefly accounting for the episode in hospital. The leftmost (first-listed) external cause code was chosen as a selection criterion as this is considered to be most highly correlated with principal diagnosis.

Inward transfers from other acute hospitals were omitted from incidence estimates because this reduces multiple counting of cases that generate more than one separation record. This specification is based on recent validation work by NISU (Bradley & Harrison forthcoming). The National Hospital Morbidity Database 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, readmissions relating to the same incident 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 incidents which led to hospitalisation.

Separations with a principal diagnosis S00–T75 or T79, a leftmost 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' (group 2).

Follow-up care separations due to falls (group 3)

NISU's analysis of person-linked data also 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 (see Kreisfeld & Newson 2006). These cases contribute to a non-negligible proportion of the burden of injury due to falls in older people.

In this report, follow-up care separations due to falls were defined as separations which met the following specifications:

- The patient was aged 65 years 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), or
    - 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 (1–31) contained a code in the range W00–W19.

The principal diagnoses specified above accounted for over 95% of the total number of Z-coded separations containing a W00–W19 code for people 65 years and over.

Other separations related to falls (group 4)

A final group was specified, which 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 which are not included in any of the groups above. This group includes separations where:

- The patient was aged 65 years or older;
- Any diagnosis variable contained a code in the range S00–T75 or T79;
- Any external cause code variable (1–31) contained a code in the range W00–W19;
- The separation was not classed as a fall injury incident case (group 1) or inward transfer (group 2); and,
- The separation was not classed as a fall-related follow-up care separation (group 3).

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 leftmost external cause and injury separations which 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.

Table 21: Case selection criteria for fall-related separations for people aged 65 years and older, Australia, 2003–04

	Males	Females	Persons
Incident cases (group 1):			
• 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.	16,779	43,718	60,497
Inward transfer separations (group 2):			
• Principal diagnosis is S00–T75 or T79,			
• First external cause is W00–W19, and			
• Mode of admission is a transfer from another acute hospital.	2,031	5,243	7,274
Fall-related follow-up care separations (group 3):			
• Principal diagnosis is Z47, Z48, Z50 or Z75.1, and			
• Any external cause is W00–W19.	4,078	11,747	15,825
'Other fall-related' separations (group 4):			
• Any diagnosis S00–T75 or T79,			
• Any external cause W00–W19,			
• Not an incident case or inward transfer, and			
• Not a rehabilitation separation.	7,786	10,262	18,048
Total number of fall-related separations in 2003–04	**30,674**	**70,970**	**101,644**

Calculation of rates

Age-specific rates were calculated for age-groups (five-year bands up to 90–94 years, and a group for ages 95 years and older) using final population estimates as at 31 December 2003 (the mid-point of the financial year). This data was obtained from the AIHW and similar to data presented in the Australian Demographic Statistics series (ABS 2004).

Population estimates according to Australian Standard Geographical Classification of remoteness are only available from the ABS for the year ending 30 June. Values for 31 December were calculated using the mean of the population estimates for 2003 and 2004 and these were used to compute age-specific rates by remoteness of usual residence for hospitalisation in 2003–04.

The 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 *Residential aged care in Australia 2003–04: a statistical overview* (2005b). The number of people aged 65 years and older resident in the community (i.e. home) 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 years 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 years and older have been adjusted using the direct method, in order to allow comparisons after accounting for differences in age-composition. The Australian population at 30 June 2001 has been used as the standard.

Small case count issues

Cell counts in Tables that are 5 cases or fewer have been suppressed to protect patient confidentiality. In the instances where only one cell in a row or column has a count of 5 or less, all other cells in the same row or column have also been suppressed. Age-based rates have not been calculated using such data.

Australian Refined Diagnosis Related Groups

A new version of the AR-DRG classification structure was introduced for the financial year 2003–04. Separations in this year were coded to both the previous version (AR-DRG v4.2) and the new AR-DRG v5.0. Cost weights were published for both AR-DRG versions, however only for admissions to public sector hospitals. These cost weights are only appropriately applied to acute episodes of care (John Goss, AIHW, personal communication. August 2006).

Some of the limitations of cost weight data available for 2003–04 could have been overcome by applying 2002–03 cost weights (which are available for both the public and private sector) to the 2003–04 data, as has been done in similar reports (e.g. AIHW 2005a). However, cost weights for AR-DRG v4.2 were calculated from data that was more than eight years old. AR-DRG v5.0 recalibrated many cost weights to reflect more modern clinical practice and was the first costing data to be coded in accordance with the third edition of the ICD-10-AM. Importantly for this report, major updates were made to 'allied health combined' AR-DRGs (including physiotherapy, occupational therapy, speech therapy, nutrition and dietetics and social work), imaging AR-DRGs

and AR-DRGs relating to pharmacy (among others, see DoHA 2005b). Given the frequency of such separations in the fall-related data, the analyses presented in this report use only the AR-DRG v5.0 classification (thus 2003–04 cost weights for public hospitals) for acute episodes of care.

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 NISU. The geographical spread of the data and the large number of people involved in its processing increases 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.

Appendices

Table A1: Common procedure types by sex for fall injury incidents. Males, females and persons 65+ years, Australia, 2003–04

	Males			Females			Persons		
Procedure *	**Count**	**Per cent**	**Rank**	**Count**	**Per cent**	**Rank**	**Count**	**Per cent**	**Rank***
Allied health intervention, physiotherapy	8,667	19%	1	24,656	21%	1	33,323	20%	1
Allied health intervention, occupational therapy	3,931	9%	2	11,093	9%	2	15,024	9%	2
Allied health intervention, social work	2,906	6%	3	7,620	6%	3	10,526	6%	3
Computerised tomography of brain	2,415	5%	4	4,128	3%	6	6,543	4%	4
Transfusion of packed cells	1,466	3%	6	4,450	4%	5	5,916	4%	5
Internal fixation of fracture of trochanteric or subcapital femur	1,385	3%	7	4,489	4%	4	5,874	4%	6
Allied health intervention, dietetics	1,547	3%	5	3,717	3%	7	5,264	3%	7
Hemiarthroplasty of femur	932	2%	9	2,868	2%	8	3,800	2%	8
General anaesthesia, ASA 99	789	2%	10	2,536	2%	9	3,325	2%	9
General anaesthesia, ASA 39	755	2%	12	2,279	2%	10	3,034	2%	10
Allied health intervention, speech pathology	1,176	3%	8	1,788	2%	13	2,964	2%	11
General anaesthesia, ASA 29	517	1%	15	2,220	2%	11	2,737	2%	12
General anaesthesia, ASA 30	515	1%	16	1,782	2%	14	2,297	1%	13
Closed reduction of fracture of distal radius	181	0%	36	2,092	2%	12	2,273	1%	14
Open reduction of fracture of femur with internal fixation	531	1%	13	1,598	1%	15	2,129	1%	15
Sum	**27,713**	**61%**		**77,316**	**65%**		**105,029**	**64%**	

* *Note:* procedures listed in rank order for persons aged 65+.

Shading over 'closed reduction of distal radius' for males highlights the low rank for this procedure compared to females and persons overall.

Table A2: Major diagnostic category cost estimates for fall injury incident acute episodes of care for people aged 65 years and older, 2003–04

Major Diagnostic Category (MDC)	AR-DRG v5.0	Public hospitals (N)	Other institutions (N)	Total (N)
Major procedures where the principal diagnosis may be associated with any MDC	A01Z-A41Z	$5,706,855 (81)	$634,095 (9)	$6,340,950 (90)
Diseases and disorders of the nervous system	B01Z-B81B	$11,572,408 (2,479)	$1,988,244 (346)	$13,560,652 (2,825)
Diseases and disorders of the eye	C01Z-C63B	$639,730 (345)	$138,945 (68)	$778,675 (413)
Diseases and disorders of the ear, nose, mouth and throat	D01Z-D67Z	$1,330,632 (676)	$360,160 (151)	$1,690,792 (827)
Diseases and disorders of the respiratory system	E01A-E75C	$8,582,149 (1,742)	$2,880,813 (565)	$11,462,962 (2,307)
Diseases and disorders of the circulatory system	F01Z-F75C			
Diseases and disorders of the digestive system	G01A-G70B	$39,107 (*)	$3,875 (*)	$42,982 (5)
Diseases and disorders of the hepatobiliary system and pancreas	H01A-H64B	$19,719 (*)	$9,444 (*)	$29,163 (*)
Diseases and disorders of the musculoskeletal system and connective tissue	I01Z-I76C	$236,086,588 (30,827)	$61,380,578 (7,577)	$297,467,166 (38,404)
Diseases and disorders of the skin, subcutaneous tissue and breast	J01Z-J67B	$8,460,020 (3,081)	$2,040,208 (736)	$10,500,228 (3,817)
Endocrine, nutritional and metabolic diseases and disorders	K01Z-K64B			
Diseases and disorders of the kidney and urinary tract	L01A-L67C	$81,518 (22)	$11,725 (*)	$93,243 (24)
Diseases and disorders of the male reproductive system	M01Z-M64Z	$2,518 (*)		$2,518 (*)
Diseases and disorders of the female reproductive system	N01Z-N62B			
Diseases and disorders of the blood and blood forming organs and immunological disorders	Q01Z-Q62B	$78,372 (12)	$54,226 (6)	$132,598 (18)
Neoplastic disorders (haematological and solid neoplasms)	R01A-R64Z			
Infectious and parasitic diseases	S60Z-T64B	$194,238 (26)	$46,192 (9)	$240,430 (35)
Mental diseases and disorders	U40Z-U68Z			
Alcohol/drug use and alcohol/drug induced organic mental disorders	V60Z-V64Z			
Injuries, poisoning and toxic effects of drugs	W01Z-X64B	$31,255,425 (9,350)	$6,107,918 (1,489)	$37,363,343 (10,839)
Burns	Y01Z-Y62B	$22,716 (*)		$22,716 (*)
Factors influencing health status and other contacts with health services	Z01A-Z65Z			
Error DRGs	901Z–963Z	$732,126 (62)	$510,287 (40)	$1,242,413 (102)
Total		**$304,804,121 (48,714)**	**$76,166,710 (11,001)**	**$380,970,831 (59,715)**

Note: Table omits MDCs Pregnancy, childbirth and the puerperium (O01A–O65B) and Newborns and other neonates (P01Z–P67D). Small case numbers have also been suppressed in this table, denoted by (*).

Table A3: Major diagnostic category cost estimates for fall injury inward transfer acute episodes of care for people aged 65 years and older, 2003–04

Major Diagnostic Categories	AR-DRG v5.0	Public hospitals (N)	Other institutions (N)	Total (N)
Major procedures where the principal diagnosis may be associated with any MDC	A01Z-A41Z	$2,043,195 (29)	$422,730 (6)	$2,465,925 (35)
Diseases and disorders of the nervous system	B01Z-B81B	$3,344,507 (310)	$549,941 (64)	$3,894,448 (374)
Diseases and disorders of the eye	C01Z-C63B	$75,201 (17)	$13,580 (6)	$88,781 (23)
Diseases and disorders of the ear, nose, mouth and throat	D01Z-D67Z	$114,073 (33)	$27,144 (13)	$141,217 (46)
Diseases and disorders of the respiratory system	E01A-E75C	$545,502 (103)	$501,832 (91)	$1,047,334 (194)
Diseases and disorders of the circulatory system	F01Z-F75C			
Diseases and disorders of the digestive system	G01A-G70B	$3,875 (*)		$3,875 (*)
Diseases and disorders of the hepatobiliary system and pancreas	H01A-H64B	$7,427 (*)		$7,427 (*)
Diseases and disorders of the musculoskeletal system and connective tissue	I01Z-I76C	$38,222,444 (3,890)	$12,083,228 (1,428)	$50,305,672 (5,318)
Diseases and disorders of the skin, subcutaneous tissue and breast	J01Z-J67B	$241,714 (81)	$212,138 (79)	$453,852 (160)
Endocrine, nutritional and metabolic diseases and disorders	K01Z-K64B			
Diseases and disorders of the kidney and urinary tract	L01A-L67C	$55,561 (8)		$55,561 (8)
Diseases and disorders of the male reproductive system	M01Z-M64Z			
Diseases and disorders of the female reproductive system	N01Z-N62B			
Diseases and disorders of the blood and blood forming organs and immunological disorders	Q01Z-Q62B			$21,766 (*)
Neoplastic disorders (haematological and solid neoplasms)	R01A-R64Z			
Infectious and parasitic diseases	S60Z-T64B	$4,724 (*)	$32,842 (*)	$37,566 (*)
Mental diseases and disorders	U40Z-U68Z			
Alcohol/drug use and alcohol/drug induced organic mental disorders	V60Z-V64Z			
Injuries, poisoning and toxic effects of drugs	W01Z-X64B	$2,861,427 (313)	$919,586 (189)	$3,781,013 (502)
Burns	Y01Z-Y62B			
Factors influencing health status and other contacts with health services	Z01A-Z65Z			
Error DRGs	901Z–963Z	$68,215 (*)	$ 37,818 (*)	$ 106,033 (8)
Total		**$47,609,631 (4,796)**	**$14,800,839 (1,881)**	**$62,410,470 (6,677)**

Note: Table omits MDCs Pregnancy, childbirth and the puerperium (O01A–O65B) and Newborns and other neonates (P01Z–P67D). Small case numbers have also been suppressed in this table, denoted by (*).

Table A4: Major diagnostic category cost estimates for fall-related follow-up care acute episodes of care for people aged 65 years and older, 2003–04

Major Diagnostic Categories	AR-DRG v5.0	Public hospitals (N)	Other institutions (N)	Total (N)
Major procedures where the principal diagnosis may be associated with any MDC	A01Z-A41Z	$70,455 (*)		$70,455 (*)
Diseases and disorders of the nervous system	B01Z-B81B			
Diseases and disorders of the eye	C01Z-C63B			
Diseases and disorders of the ear, nose, mouth and throat	D01Z-D67Z			
Diseases and disorders of the respiratory system	E01A-E75C			
Diseases and disorders of the circulatory system	F01Z-F75C			
Diseases and disorders of the digestive system	G01A-G70B			
Diseases and disorders of the hepatobiliary system and pancreas	H01A-H64B			
Diseases and disorders of the musculoskeletal system and connective tissue	I01Z-I76C	$3,347,119 (431)	$710,355 (103)	$4,057,474 (534)
Diseases and disorders of the skin, subcutaneous tissue and breast	J01Z-J67B			
Endocrine, nutritional and metabolic diseases and disorders	K01Z-K64B			
Diseases and disorders of the kidney and urinary tract	L01A-L67C			
Diseases and disorders of the male reproductive system	M01Z-M64Z			
Diseases and disorders of the female reproductive system	N01Z-N62B			
Diseases and disorders of the blood and blood forming organs and immunological disorders	Q01Z-Q62B			
Neoplastic disorders (haematological and solid neoplasms)	R01A-R64Z			
Infectious and parasitic diseases	S60Z-T64B			
Mental diseases and disorders	U40Z-U68Z			
Alcohol/drug use and alcohol/drug induced organic mental disorders	V60Z-V64Z			
Injuries, poisoning and toxic effects of drugs	W01Z-X64B			
Burns	Y01Z-Y62B			
Factors influencing health status and other contacts with health services	Z01A-Z65Z	$4,951,642 (742)	$3,005,811 (430)	$7,957,453 (1,172)
Error DRGs	901Z–963Z	$ 13,643 (*)		$ 13,643 (*)
Total		**$8,382,859 (1,175)**	**$3,716,166 (533)**	**$12,099,025 (1,708)**

Note: Table omits MDCs Pregnancy, childbirth and the puerperium (O01A–O65B) and Newborns and other neonates (P01Z–P67D). Small case numbers have also been suppressed in this table, denoted by (*).

Table A5: Major diagnostic category cost estimates for 'other fall-related' separations acute episodes of care for people aged 65 years and older, 2003–04

Major Diagnostic Categories	AR-DRG v5.0	Public hospitals (N)	Other institutions (N)	Total (N)
Major procedures where the principal diagnosis may be associated with any MDC	A01Z-A41Z	$5,777,022 (81)	$1,100,314 (16)	$6,877,336 (97)
Diseases and disorders of the nervous system	B01Z-B81B	$20,825,978 (2,677)	$4,840,445 (646)	$25,666,423 (3,323)
Diseases and disorders of the eye	C01Z-C63B	$121,531 (36)	$44,621 (14)	$166,152 (50)
Diseases and disorders of the ear, nose, mouth and throat	D01Z-D67Z	$412,215 (159)	$141,589 (47)	$553,804 (206)
Diseases and disorders of the respiratory system	E01A-E75C	$8,413,080 (1,374)	$2,394,319 (440)	$10,807,399 (1,814)
Diseases and disorders of the circulatory system	F01Z-F75C	$14,669,812 (3,104)	$4,613,679 (824)	$19,283,491 (3,928)
Diseases and disorders of the digestive system	G01A-G70B	$3,638,149 (623)	$1,696,373 (282)	$5,334,522 (905)
Diseases and disorders of the hepatobiliary system and pancreas	H01A-H64B	$1,134,878 (164)	$402,735 (58)	$1,537,613 (222)
Diseases and disorders of the musculoskeletal system and connective tissue	I01Z-I76C	$8,318,299 (937)	$4,370,084 (483)	$12,688,383 (1,420)
Diseases and disorders of the skin, subcutaneous tissue and breast	J01Z-J67B	$2,809,628 (475)	$865,130 (149)	$3,674,758 (624)
Endocrine, nutritional and metabolic diseases and disorders	K01Z-K64B	$2,671,811 (455)	$789,311 (131)	$3,461,122 (586)
Diseases and disorders of the kidney and urinary tract	L01A-L67C	$4,750,759 (798)	$936,856 (176)	$5,687,615 (974)
Diseases and disorders of the male reproductive system	M01Z-M64Z	$310,135 (54)	$271,032 (46)	$581,167 (100)
Diseases and disorders of the female reproductive system	N01Z-N62B	$91,038 (*)	$92,212 (*)	$183,250 (37)
Diseases and disorders of the blood and blood forming organs and immunological disorders	Q01Z-Q62B	$755,415 (181)	$237,322 (53)	$992,737 (234)
Neoplastic disorders (haematological and solid neoplasms)	R01A-R64Z	$1,215,034 (112)	$870,156 (91)	$2,085,190 (203)
Infectious and parasitic diseases	S60Z-T64B	$2,396,702 (257)	$450,215 (49)	$2,846,917 (306)
Mental diseases and disorders	U40Z-U68Z	$1,176,672 (145)	$460,449 (58)	$1,637,121 (203)
Alcohol/drug use and alcohol/drug induced organic mental disorders	V60Z-V64Z	$213,877 (112)	$51,115 (21)	$264,992 (133)
Injuries, poisoning and toxic effects of drugs	W01Z-X64B	$969,503 (199)	$194,294 (46)	$1,163,797 (245)
Burns	Y01Z-Y62B	$273,480 (*)	$44,441 (*)	$317,921 (17)
Factors influencing health status and other contacts with health services	Z01A-Z65Z	$838,638 (286)	$581,800 (161)	$1,420,438 (447)
Error DRGs	901Z–963Z	$2,119,119 (162)	$1,120,518 (84)	$3,239,637 (246)
Total		**$83,902,775 (12,428)**	**$26,569,010 (3,892)**	**$110,471,785 (16,320)**

Note: Table omits MDCs Pregnancy, childbirth and the puerperium (O01A–O65B) and Newborns and other neonates (P01Z–P67D). Small case numbers have also been suppressed in this table, denoted by (*).

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