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# **Trends in hospitalised injury due to falls in older people 2007–08 to 2016–17**

**AIHW**





**Australian Government**

**Australian Institute of  
Health and Welfare**

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# **Trends in hospitalised injury due to falls in older people**

**2007–08 to 2016–17**

Australian Institute of Health and Welfare  
Canberra

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# Summary

This report focuses on trends in hospitalised (serious) fall-related injury for people aged 65 and over that occurred over the period 2007–08 to 2016–17. Information is also presented on the hospital care provided.

## Fall-related injury cases

An estimated 125,021 people aged 65 and over were hospitalised due to *Falls* in 2016–17. Three-quarters of all injury hospitalisations for people aged 65 and over are a result of a fall.

Women accounted for most of these fall-related injury cases, and rates of cases were higher for women than for men for all age groups 65 and over. Age-standardised rates of hospitalised fall-related injury cases increased over the period 2007–08 to 2016–17 for both men (a rate of increase of 3% per year) and women (2%).

For people aged 65 and over in 2016–17, injuries to the hip and thigh (22%) and head (26%) were the most common types of injury resulting from a fall. Rates of head injury were particularly high in Australians aged 85 and over. *Fractures of the neck of the femur* (also commonly called 'hip fractures') accounted for the majority of injuries to the hip and thigh (90%). Rates of injury to the head almost doubled over the period 2007–08 to 2016–17 for both men and women. In 2007–08, the rates of head injury among men and women were 469 and 477 cases per 100,000 population, respectively, compared with 832 and 865 cases per 100,000 in 2016–17.

The most common cause of fall-related injury cases for those aged 65 and over in 2016–17 was *Fall on the same level from slipping, tripping and stumbling* (34%). Falls from household objects (15% combined)—such as beds (5,417 cases); chairs (3,809 cases), stairs and steps (7,850 cases); and ladders (2,155 cases)—comprised the next largest proportion of cases.

Most fall-related injury cases in 2016–17 were recorded as having occurred in either the home (51%) or in residential aged care (21%); the place of occurrence was not identified in 14% of records. The age-standardised rate of falls in the home for older people living in the community was 1,888 per 100,000 population, while the rate of falls for older people living in residential aged care was 11,403 per 100,000 population. These rates are likely to be underestimated, because of missing information on the places in which falls occurred.

## Hospital care attributable to fall-related injury

In addition to the initial hospitalisations for these fall-related injury cases, there were more than 40,000 other fall-related hospital episodes (mainly for rehabilitation care) for people aged 65 and over in 2016–17. Taken together with the initial hospitalisation for a fall, there were 1.2 million days of patient care over the year, with the average total length of stay per fall-related injury case estimated to be 10 days. Overall, 1 in every 8 days spent in hospital by a person aged 65 and over in 2016–17 was attributable to an injurious fall.

# 1 Introduction

This report focuses on trends in hospitalised fall-related injury for people aged 65 and over that occurred over the period 2007–08 to 2016–17 using data from the National Hospital Morbidity Database (NHMD). The main topics addressed in this report are:

- an overview of hospitalised cases of injury due to falls by people aged 65 and over in 2016–17
- trends in hospitalised injury cases due to falls by people aged 65 and over, over the period 2007–08 to 2016–17.

Falls are common among older people and can result in fractures, head injuries, other serious injuries and even death. In Australia, a study of older community care clients found that 45% had fallen in the previous year (Smith & Lewin 2008). A substantial proportion of falls involving older people result in hospitalisation (Hendrie & Miller 2004).

The cost to the health system due to fall-related injuries is considerable. The most comprehensive estimate of the national ‘lifetime’ cost of falls (including indirect costs such as costs borne by the family or community) exceeded \$1 billion per year (Moller 2003). Moller’s study, however, is now over a decade old and more recent analyses suggest that \$1 billion may be a considerable under-estimate. The AIHW report on hospitalised falls in 2007–08 conservatively estimated the cost of acute care alone—excluding rehabilitation and any ongoing detriments to health—due to falls by older people to be \$648.2 million (Bradley 2012). Further, analysis of the cost of health care associated with falls by older people in New South Wales in 2006–07—about one-third of the Australian population—estimates a total cost of nearly \$560 million (Watson et al. 2010). Most recently, in Western Australia, falls were found to account for 32.5% of fatal injuries, 32.5% of non-fatal hospitalisations, and \$2.2 billion in costs (Hendrie et al. 2016).

From the AIHW’s 2015–16 Disease expenditure study, the estimated recurrent health service expenditure on falls was about \$3.9 billion nationally (AIHW 2019a). The largest area of spending was public hospital admitted patient services (\$1.6 billion, 40.5%) followed by private hospital services (\$756.1 million, 19.5%) and public hospital emergency department services (\$459.4 million, 11.8%).

## Report structure

**Chapter 2** presents an overview of fall-related injury cases involving people aged 65 and over in Australia in 2016–17 and over the period 2007–08 to 2016–17. Information is also included on falls by Indigenous Australians aged 65 and over. **Chapters 3 to 5** present information on the types of injuries, external causes and places of occurrence of fall-related injuries. **Chapter 6** presents information on additional episodes of hospital care due to falls by older people, including hospital care following transfers after initial fall-related injury episodes and fall-related rehabilitation separations.

Generally, summary tables and figures are placed immediately below the discussion in related text. Where appropriate, tables and figures within the chapter are accompanied by notes referring readers to additional statistical tables available for download from the AIHW website.

**Appendix A: Data issues** provides summary information on the hospital data sources and includes notes on the presentation of data; the population estimates used to calculate population rates; and methods of analysis. Relevant terms for the data used in this report are summarised in boxes 1.1, 1.2 and 1.3.

**Additional material** relevant to this report is available online, including:

- data quality statement for the NHMD
- supplementary data tables.

## Methods

This report uses data from the NHMD to provide information on fall-related injury in Australia for the years 1 July 2007 to 30 June 2017. Diagnosis and external-cause information for the hospital separations reported here were coded according to 7 editions of the International Statistical Classification of Diseases and Related Health Problems, tenth revision, Australian modification (ICD-10-AM) that were current during parts of the period 2007 to 2017.

### What data are reported?

The data are presented by:

- age
- sex
- external cause of injury
- diagnosis
- remoteness of the patient's area of usual residence
- Indigenous status.

### Selection criteria for records, and data terms and definitions

The report examines all NHMD records for people aged 65 and over that included both an ICD-10-AM injury diagnosis in the range S00–T75 or T79 and an external-cause code signifying an unintentional fall (W00–W19). These codes could appear anywhere within the record (that is, analysis was not restricted to records that had a principal diagnosis indicating that the injury was the chief reason for the episode of hospital care).

However, our definition of fall-related injury cases is restricted to records where the principal diagnosis is an injury—excluding any cases with Z50 *Care involving use of rehabilitation procedures* appearing in any additional diagnosis field (see 'Appendix A: Data issues'). Hence, patients who fell while in hospital, and had an injury reported only as an additional diagnosis (rather than as the principal diagnosis), would not have been counted as cases.

Chapters 2 to 5 focus on cases of fall-related injury. Some injuries result in more than 1 episode in hospital and, accordingly, generate more than 1 NHMD record. As the NHMD does not include information that enables a set of records belonging to a particular injury case to be recognised as such, case numbers need to be estimated. In this report, eligible separations were excluded from case numbers if their *Mode of admission* was a transfer from another acute hospital, as inclusion of such separations would be likely to result in the multiple counting of some cases. While this approach corrects for overestimation of hospital admissions that are simply transfers, it cannot correct for overestimation that is due to re-admissions.

Chapter 6 describes 2 additional forms of hospital care due to falls by older people: fall-related injury hospital transfers (episodes where the Mode of admission was '*Admitted patient transferred from another hospital*'), and fall-related rehabilitation episodes. Detailed selection criteria can be found in 'Appendix A: Data issues'.

In 2017, there were 3.8 million Australians aged 65 and over (comprising 15% of the total population) (AIHW 2016). As Australia's population ages, the profile of the older population is also projected to change. In 2017, more than half of older people (57%, or 2.2 million) were aged 65–74; one-third (30%, or 1.2 million) were aged 75–84; and 13% (497,000) were aged 85 and over. Rates are generally age-standardised, because the risk of fall-related injury varies greatly with age and the age distribution of the Australian population aged 65 and over changed during the study period.

In tables and charts, unless stated otherwise:

- the patient's age is calculated at the date of admission
- in tables by age group and sex, separations for which age and/or sex were not reported were included in totals
- percentages may not sum to 100, due to rounding
- rates were age-standardised (as detailed in 'Appendix A: Data issues')
- trends were analysed using the negative binomial distribution regression technique, as described in Berry and Harrison (2006). (See also 'Appendix A: Data issues'.)
- the use of the terms 'significant' or 'significantly' throughout this report indicates an outcome that was statistically significant ( $p = 0.05$  or less).

Further information about the methods used in this report can be found in 'Appendix A: Data issues'.

### **Box 1.1: Summary of terms and classifications relating to hospitalised injury**

Statistics on admitted patients are compiled when an **admitted patient** (a patient who undergoes a hospital's formal admission process) completes an episode of admitted patient care and 'separates' from the hospital. This is because most of the data on the use of hospitals by admitted patients are based on information provided at the end of the patients' episodes of care, rather than at the beginning. The length of stay and the procedures carried out are then known and the diagnostic information is more accurate.

**Separation** is the term used to refer to the episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). 'Separation' also means the process by which an admitted patient completes an episode of care by being discharged, dying, transferring to another hospital or changing type of care.

The **principal diagnosis** is the diagnosis established, after study, to be chiefly responsible for occasioning the patient's episode of admitted patient care. An **additional diagnosis** is a condition or complaint that either coexists with the principal diagnosis or arises during the episode of admitted patient care. Additional diagnoses are reported if the conditions affect patient management.

An **external cause** is defined as the environmental event, circumstance or condition that was the cause of injury or poisoning. Whenever a patient has a principal or additional diagnosis of an injury or poisoning, an external-cause code should be recorded.

The **injury separation records** included in this report are those that have a principal diagnosis code in the ICD-10-AM range S00–T75 or T79. Whenever a patient has a principal or additional diagnosis of an injury or poisoning, an external-cause code should be recorded. This is recorded when the main reason for the episode in hospital was a recent injury—such as a fracture, laceration or burn to any part of the body—or poisoning.

*(continued)*

**Box 1.1 (continued): Summary of terms and classifications relating to hospitalised injury**

Injury separations records also include a small number of episodes that were mainly due to complications of surgical and medical care or due to sequelae present a year or more after injury, or other late effects.

**Injury cases** are estimated as the number of injury separations, less those records where the *Mode of admission* was *Admitted patient transferred from another hospital*. These transfers are omitted to reduce over-counting. The criteria for injury cases retain a small number of records with a first external-cause code that is invalid or refers to a sequelae (late effect) or complication of care.

The **average length of stay (ALOS)** is the average number of days each patient stayed in hospital. This is calculated by dividing the total number of patient days for **injury separations** by the number of **injury cases**, estimated as above. Patients who were admitted and discharged from hospital on the same day are counted as staying for 1 day.

**Box 1.2: Indigenous status reporting for time-series analyses**

In this report, the terms **Indigenous** and **non-Indigenous** are used to refer to persons identified as such in Australian hospital separations data and population data collections. Separations for which Indigenous status was 'not stated' have been excluded in the 'non-Indigenous' category. There were 1,558 hospitalised fall-related injury cases in 2016–17 with Indigenous status recorded as 'not stated'.

From 2010–11 onwards, Indigenous status information within hospital separations data from all jurisdictions were of sufficient quality for statistical reporting purposes (AIHW 2013). An AIHW study found that an estimated 88% of Indigenous patients were correctly identified in Australian public hospital admission records in 2011–12.

The report recommends that the data for all jurisdictions are used in analysis of Indigenous hospitalisation rates, and for hospitalisations in total in national analyses of Indigenous admitted patient care for data from 2010–11 onwards.

Injury rates were age-standardised to 85+ by the direct method.

Further information is available in 'Appendix A: Data issues'.

**Box 1.3: Calculation of aged care place-specific rates**

About 6 in every 7 fall-related injury cases with a specified place of occurrence in 2016–17 were reported to have happened either in the home or in an aged care facility. We have calculated the age-standardised rate of falls reported to have occurred in residential aged care and involving people aged 65 and over by using population estimates provided by the AIHW National Aged Care Data Clearinghouse.

We have similarly calculated the rate of falls reported to have occurred in the home for people aged 65 and over and resident in the community (that is, the population who were not residents of residential aged care in 2016–17). Some of the 17% of fall-related injury cases that either had an 'unspecified' place of occurrence code or 'no place code recorded' may have occurred in either of these locations, and were not included in this analysis.

## 2 Overview

This chapter presents an overview of hospitalised fall-related injury cases for people aged 65 and over in Australia in 2016–17 and over the period 2007–08 to 2016–17.

### Key findings

About 125,000 cases of hospitalised fall-related injury occurred in Australia in 2016–17.

### Sex of patient

In 2016–17, women made up 65% of cases. Women had higher rates of fall-related injury than men in all age groups examined.

### Age of patient

Age-specific rates of fall-related injury cases increased markedly with age for both men and women. In 2016–17, the highest rate observed was for women aged 95 and over: 17,200 cases per 100,000 population.

### Indigenous status

For Indigenous Australians aged 65 and over, the age-standardised rate of fall-related injury in 2016–17 was only slightly higher than that for non-Indigenous people.

## Age and sex

There were an estimated 125,021 hospitalised fall-related injury cases for Australians aged 65 or older in 2016–17 (Table 2.1). Three-quarters of all injury hospitalisations for people aged 65+ are the result of a fall.

**Table 2.1: Key indicators for hospitalised fall-related injury, 2016–17**

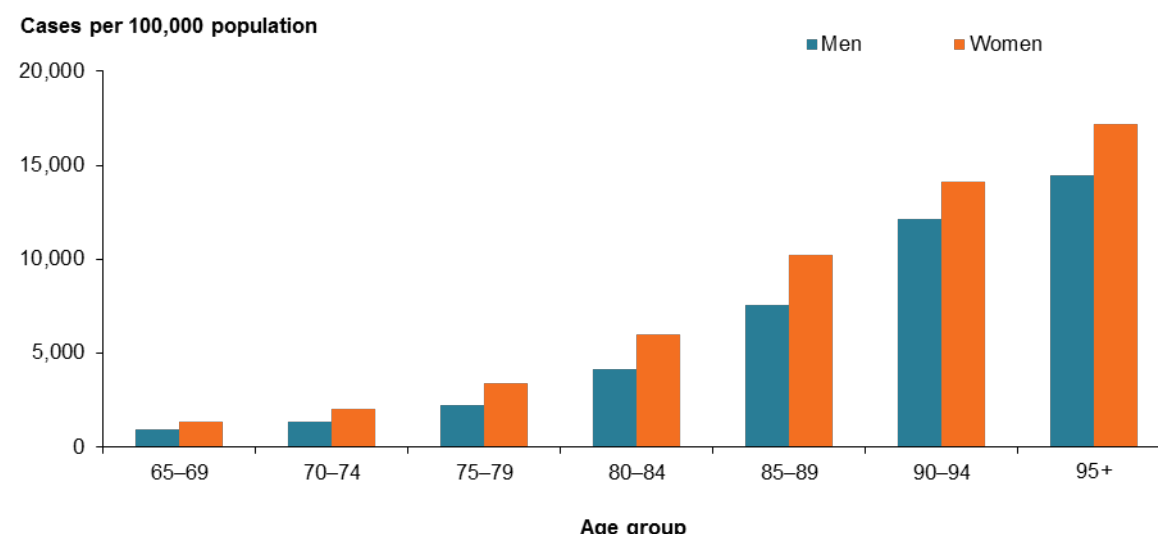
| Key indicators                                                    | Men     | Women   | People  |
|-------------------------------------------------------------------|---------|---------|---------|
| All hospitalised injury cases 2016–17, all ages                   | 293,130 | 240,553 | 533,701 |
| All hospitalised injury cases 2016–17, people aged 65+            | 64,446  | 101,214 | 165,660 |
| Estimated fall-related injury cases, people aged 65+              | 43,640  | 81,381  | 125,021 |
| As percentage of all injury hospital separations, people aged 65+ | 67.7    | 80.4    | 75.5    |

Note: 'People' includes cases for which sex was not reported.

Unlike most other types of injury, women aged 65 and over sustained a greater number of hospitalised fall-related injuries than men, constituting 65% of the cases in 2016–17 (81,381). The age-standardised rate of fall-related injury for women aged 65 and over was 3,754 per 100,000 population, compared with 2,629 per 100,000 population for fall cases involving men aged 65 and over.

Age-specific rates of hospitalised fall-related injury cases increased markedly with age for both men and women (Figure 2.1). The rate of fall-related injury cases was higher for women than for men in all age groups. In 2016–17, the highest rate observed was for women aged 95 and over, at 17,200 cases per 100,000 population.

**Figure 2.1: Age-specific rates of hospitalised fall-related injury cases, by age group, by sex, 2016–17**

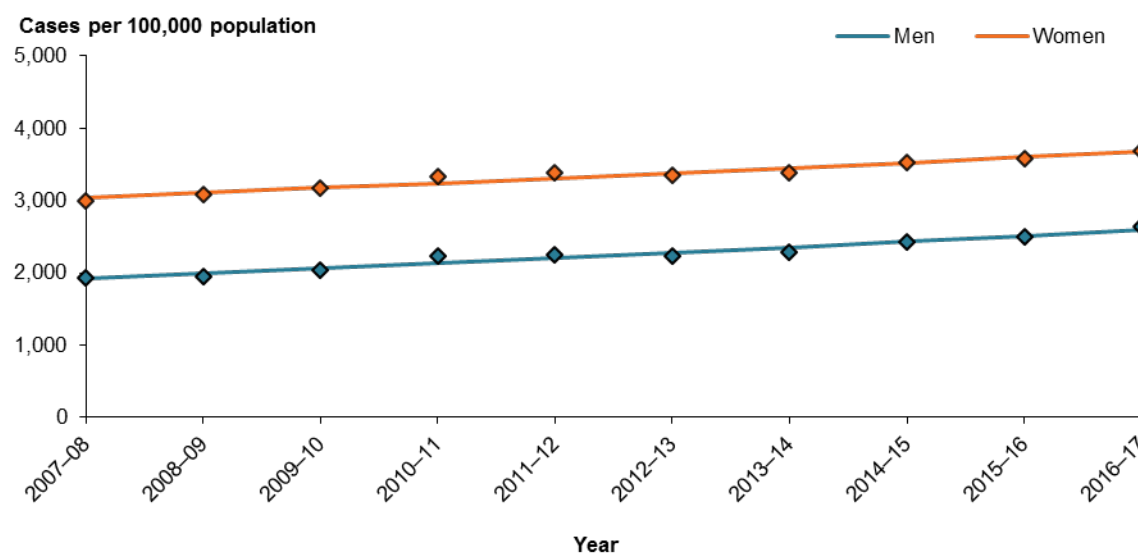


Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## How have fall-related injury cases changed over time?

The age-standardised rate of fall-related injury cases for both men and women aged 65 and over increased over the 10-year period 2007–08 to 2016–17 (Figure 2.2). The rate of fall-related injury cases for men increased by a greater magnitude (3.4% per year, CI: 3.2%, 3.5%) than for women (2.1% per year, CI: 2.0%, 2.2%).

**Figure 2.2: Modelled age-standardised rates for hospitalised fall-related injury cases, by sex, 2007–08 to 2016–17**

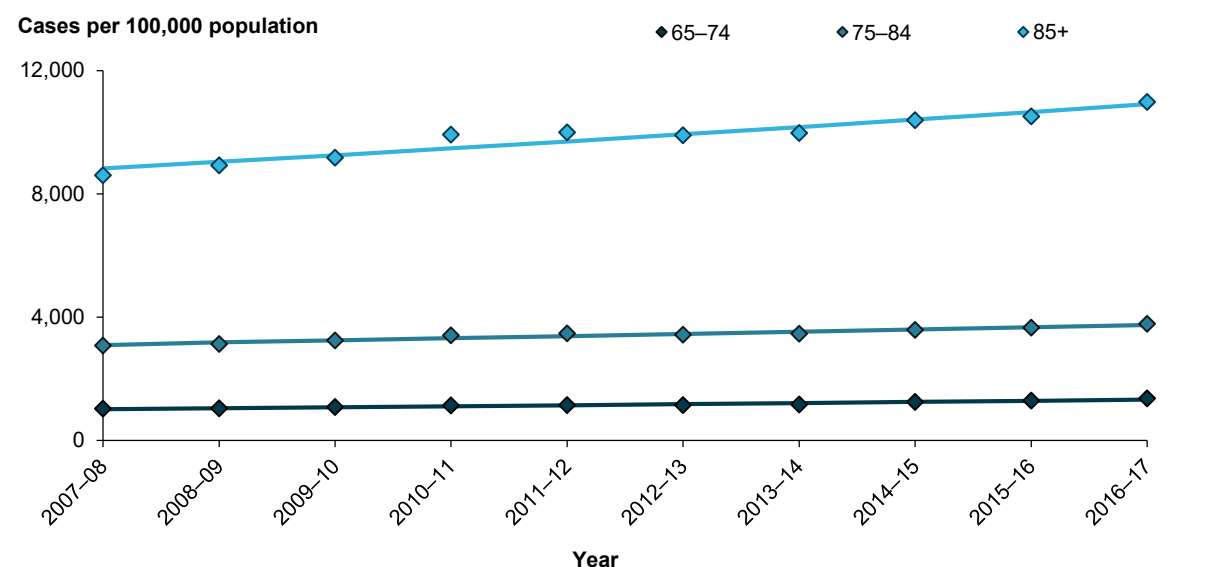


### Notes

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Statistically significant increases in the rate of fall-related injury were seen across all age groups in the older population (Figure 2.3). For those aged 65–74, the increase was 3.0% per year between 2007–08 and 2016–17 (CI: 2.9%, 3.2%); 2.1% per year for people aged 75–84 (CI: 2.0%, 2.2%); and 2.4% per year for people aged 85+ (CI: 2.3%, 2.5%).

**Figure 2.3: Modelled age-standardised rates for hospitalised fall-related injury cases, by age group, 2007–08 to 2016–17**



**Notes**

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Indigenous Australians

There were 912 hospitalised fall-related injury cases for Indigenous Australians aged 65 and over during 2016–17 (Table 2.2). More Indigenous women than men were hospitalised as a result of a fall. For Indigenous Australians aged 65 and over, the age-standardised rate of fall-related injury in 2016–17 was slightly higher than that for non-Indigenous people. This was true for both male and female Indigenous Australians. (For more information about Indigenous reporting, see Box 1.2.)

**Table 2.2: Key indicators for cases hospitalised fall-related injury, by Indigenous status, by sex, 2016–17**

| Indicator                                | Indigenous |       |         | Non-Indigenous |        |         |
|------------------------------------------|------------|-------|---------|----------------|--------|---------|
|                                          | Men        | Women | Persons | Men            | Women  | Persons |
| Estimated fall-related injury cases      | 325        | 587   | 912     | 42,791         | 79,760 | 122,551 |
| Age-standardised rate/100,000 population | 2,935      | 4,047 | 3,553   | 2,601          | 3,686  | 3,205   |

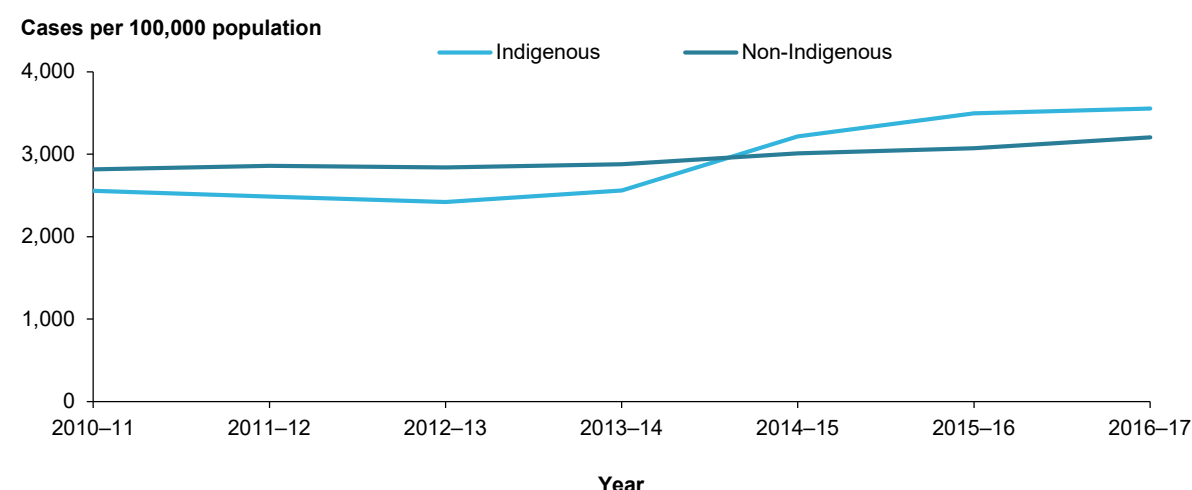
*Note:* The non-Indigenous category excludes cases for which Indigenous status was not reported.

## How have fall-related injuries for Indigenous people changed over time?

The following section presents data for all jurisdictions for the period 2010–11 to 2016–17 (see Box 1.2. for more information on time-series analysis of Indigenous data). In the 7-year period from 2010–11, case numbers of fall-related injury hospitalisations for Indigenous people rose by 424 cases, from 488 to 912—which represents an 87% increase. In comparison the number of fall-related injuries for non-Indigenous people rose from 90,029 to 122,551, an increase of 36%. This reflects the increased size of both the Indigenous and non-Indigenous populations aged 65 and over. The greater increase in percentage change is a result of the elderly Indigenous population growing even more rapidly than the population of elderly non-Indigenous people (ABS 2017).

Figure 2.4 presents age-standardised rates of hospitalised fall-related injury from 2010–11 to 2016–17 for Indigenous people and non-Indigenous people aged 65 and over. Up until 2013–14, the rate of fall-related injury among non-Indigenous people has been higher than that of Indigenous people. In 2016–17, the rate of fall-related injury among Indigenous people was 3,553 cases per 100,000 population, compared with 3,205 for non-Indigenous people.

**Figure 2.4: Age-standardised rates for hospitalised fall-related injury cases, by Indigenous status, 2010–11 to 2016–17**



**Notes**

1. 'Non-Indigenous' excludes cases for which Indigenous status was not reported.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

The interpretation of the results in this section requires care. Uncertainty due to the relatively small annual numbers of cases for Indigenous people is exacerbated by the possibility that the completeness of Indigenous identification has changed over time.

The current results provide some evidence of rising rates of hospitalised fall-related injury for Indigenous people. However, increasing completeness of Indigenous identification could also produce, or steepen, these upward trends—so is important to be cautious in interpreting them.

### 3 Type of injury

This chapter presents information on the body region injured and type of injury sustained by people aged 65 and over in Australia as a result of a fall, both in 2016–17 and over the period 2007–08 to 2016–17.

#### Key findings

The largest proportions of body regions injured as a result of a fall for people aged 65 and over in 2016–17 were to the head (26%) and hip and thigh (22%).

#### Sex of patient

In 2016–17, men had a larger proportion of injuries to the head as a result of a fall (32%), compared with women (23%).

#### Age of patient

Fall-related head injuries and hip and thigh injuries increased in each successive age group.

#### Nature of injury

More than half of people aged 65 and over who were hospitalised due to an injurious fall in 2016–17 had a principal diagnosis of a fracture (65,150 cases, or 52%).

#### Trends over time

The age-standardised rate of hip fracture decreased by about 1% per year over the 10 years to June 2017. In contrast, the rate of head injury due to falls over the same period increased on average of 7% per year for both men and women.

### Body region injured

The most common body regions injured as a result of a fall for people aged 65 and over in 2016–17 were the head (26%) and the hip and thigh (22%) (Table 3.1). *Fracture of the neck of the femur* cases (those with a principal diagnosis of S72.0–S72.2, also commonly called ‘hip fractures’) accounted for 72% of injuries to the hip and thigh (20,027 cases) and these cases are discussed more fully at the end of this chapter.

Among men, the proportion of fall injuries that were to the head was 32%, compared with 23% among women.

**Table 3.1: Body region injured for hospitalised fall-related injury cases, by sex, 2016–17**

| Body region injured, by principal diagnosis  | Men    |      | Women  |      | People |      |
|----------------------------------------------|--------|------|--------|------|--------|------|
|                                              | Count  | %    | Count  | %    | Count  | %    |
| Head                                         | 13,737 | 31.5 | 19,055 | 23.4 | 32,792 | 26.2 |
| Neck                                         | 901    | 2.1  | 1,136  | 1.4  | 2,037  | 1.6  |
| Thorax                                       | 4,381  | 10.0 | 4,998  | 6.1  | 9,379  | 7.5  |
| Abdomen, lower back, lumbar spine and pelvis | 3,907  | 9.0  | 8,661  | 10.6 | 12,568 | 10.1 |
| Shoulder and upper arm                       | 3,273  | 7.5  | 8,159  | 10   | 11,432 | 9.1  |
| Elbow and forearm                            | 2,626  | 6.0  | 8,408  | 10.3 | 11,034 | 8.8  |
| Wrist and hand                               | 1,214  | 2.8  | 1,592  | 2    | 2,806  | 2.2  |

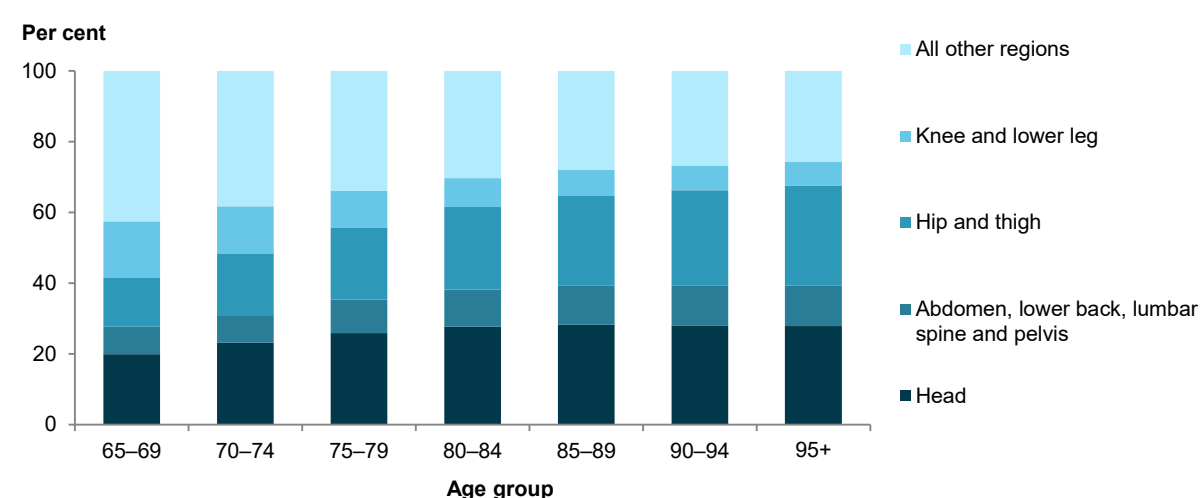
(continued)

**Table 3.1 (continued): Body region injured for hospitalised fall-related injury cases, by sex, 2016–17**

| Body region injured, by principal diagnosis             | Men           |              | Women         |              | People         |              |
|---------------------------------------------------------|---------------|--------------|---------------|--------------|----------------|--------------|
|                                                         | Count         | %            | Count         | %            | Count          | %            |
| Hip and thigh                                           | 8,817         | 20.2         | 19,190        | 23.6         | 28,007         | 22.4         |
| Knee and lower leg                                      | 3,611         | 8.3          | 8,218         | 10.1         | 11,829         | 9.5          |
| Ankle and foot                                          | 594           | 1.4          | 1,188         | 1.5          | 1,782          | 1.4          |
| Other, multiple and incompletely specified body regions | 125           | 0.3          | 194           | 0.2          | 319            | 0.3          |
| Injuries not described in terms of body region          | 454           | 1            | 582           | 0.7          | 1,036          | 0.8          |
| <b>Total</b>                                            | <b>43,640</b> | <b>100.0</b> | <b>81,381</b> | <b>100.0</b> | <b>125,021</b> | <b>100.0</b> |

As a proportion of the most common body regions injured, hip and thigh injuries rose higher in successive age categories (Figure 3.1). Among those aged 95 and over, injuries to the hip and thigh accounted for 28% of all fall-related hospitalisations. In contrast, knee and lower leg injuries were proportionately more common among the younger age groups. For the 65–69 age group, knee and lower leg injuries accounted for 42% of all fall-related hospitalisations. Head injuries also tended to increase in each successive age group, accounting for 20% in those 65–69 and 28% in those aged 95+.

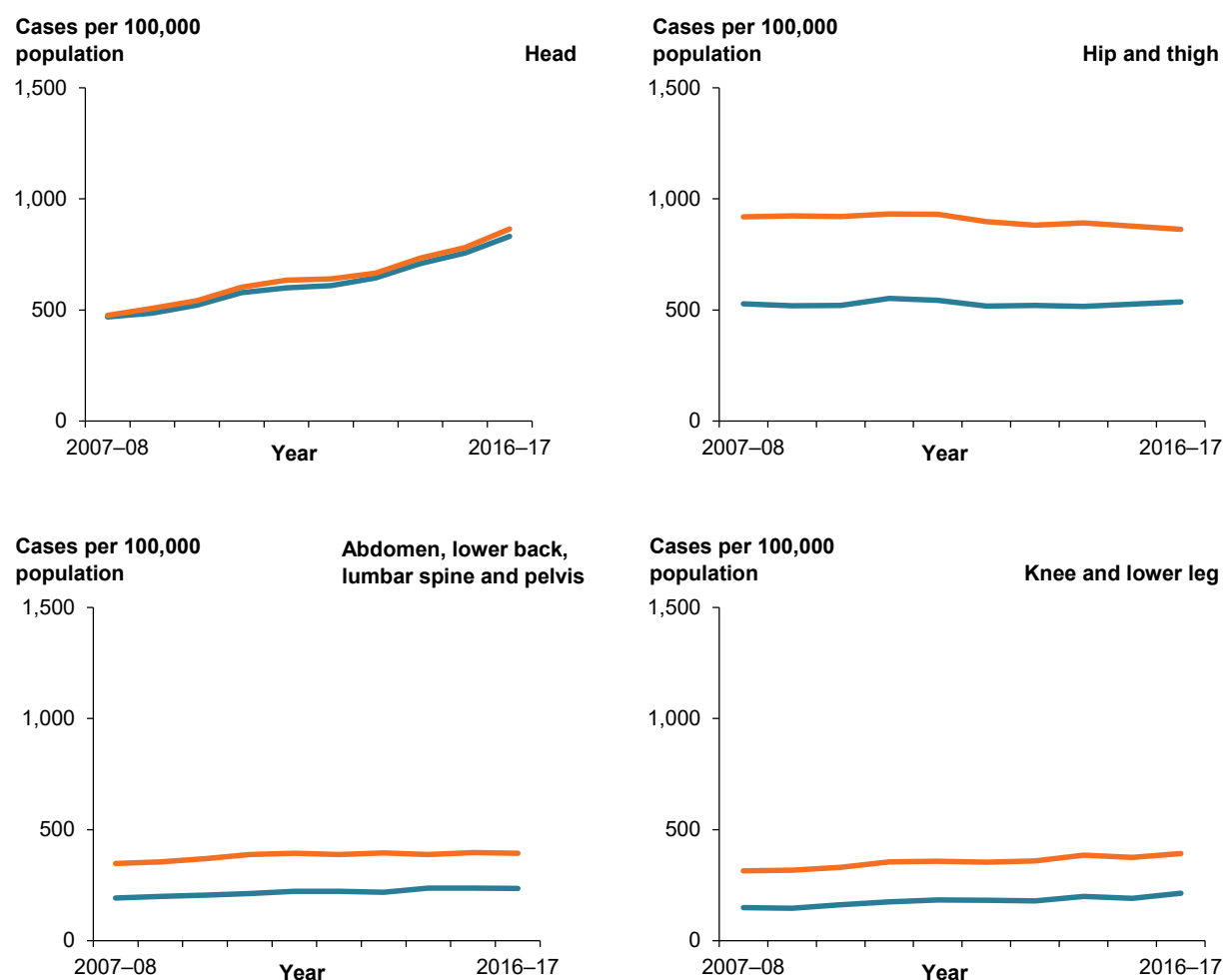
**Figure 3.1: Selected major body region injured for hospitalised fall-related injury cases, by age group, 2016–17**



Analyses of fall-related injury cases, to identify the most common body regions injured over the 2007–08 to 2016–17 study period, are shown in Figure 3.2. Rates of injury to the head almost doubled over the period for both men and women. In 2007–08, head injury rates among men and women were 469 and 477 cases per 100,000 population, respectively, compared with 832 and 865 cases per 100,000 in 2016–17.

Smaller rises in the rates of abdomen, lower back, lumbar spine and pelvis fall-related injuries, along with knee and lower leg injuries, were seen for both men and women over the period. For men, in particular, the rate of fall-related knee and lower leg injuries increased, from 149 cases per 100,000 population in 2007–08 to 214 cases per 100,000 in 2016–17. By contrast, rates of fall-related injuries to the hip and thigh among females decreased from 920 cases per 100,000 population in 2007–08 to 863 cases per 100,000 in 2016–17. Separate analyses of hip fracture injuries are presented later in this chapter.

**Figure 3.2: Age-standardised rates for hospitalised fall-related injury cases, by selected body region of injury, by sex, 2007–08 to 2016–17**



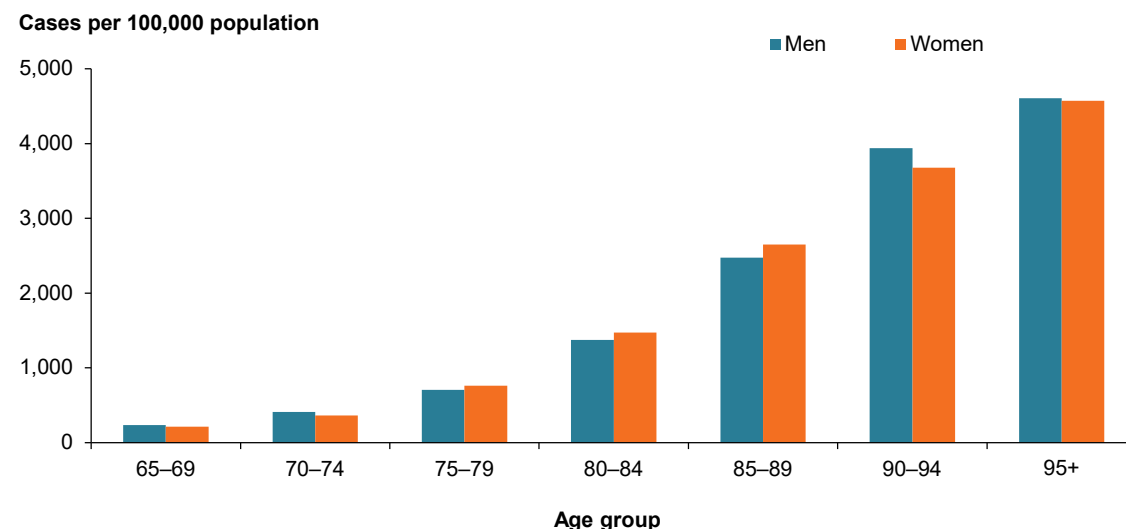
**Notes**

1. Rates for men are indicated by the blue line and rates for women by the orange line in all charts.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Head injuries

There was very little difference between men and women in the rate of fall-related head injury, by age group, in 2016–17 (Figure 3.3). The rate of head injury was much higher for those aged 85 and over and was at its highest level among the oldest patients. For those aged 95 and over, the rate of fall-related head injury among men was 4,607 cases per 100,000 population and among women it was 4,573 cases per 100,000.

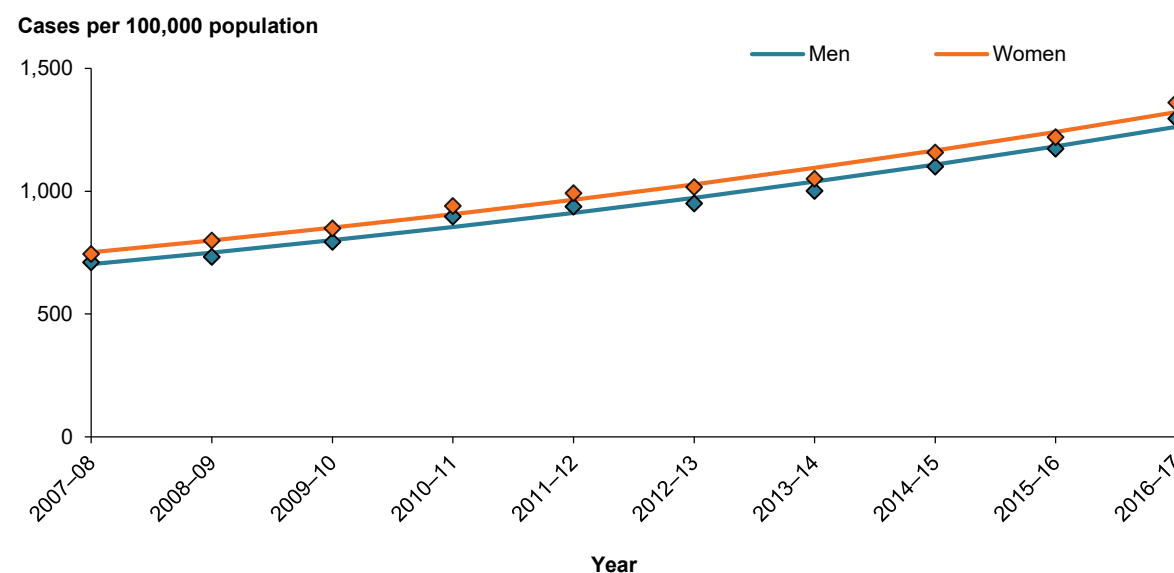
**Figure 3.3: Age-specific rates of hospitalised head injury cases due to falls, by age group, by sex, 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

The rates of hospitalised head injury cases due to falls in people aged 65 and over increased over the period 2007–08 to 2016–17 (Figure 3.4). The increase in the age-standardised rate of head injury due to falls over the 10 years to June 2017 was estimated to be 6.5% per year (CI: 6.3%, 6.7%) for women and the rate for men increased by 6.7% (CI: 6.5%, 6.9%).

**Figure 3.4: Modelled age-standardised rates for hospitalised head injury cases due to falls, by sex, 2007–08 to 2016–17**

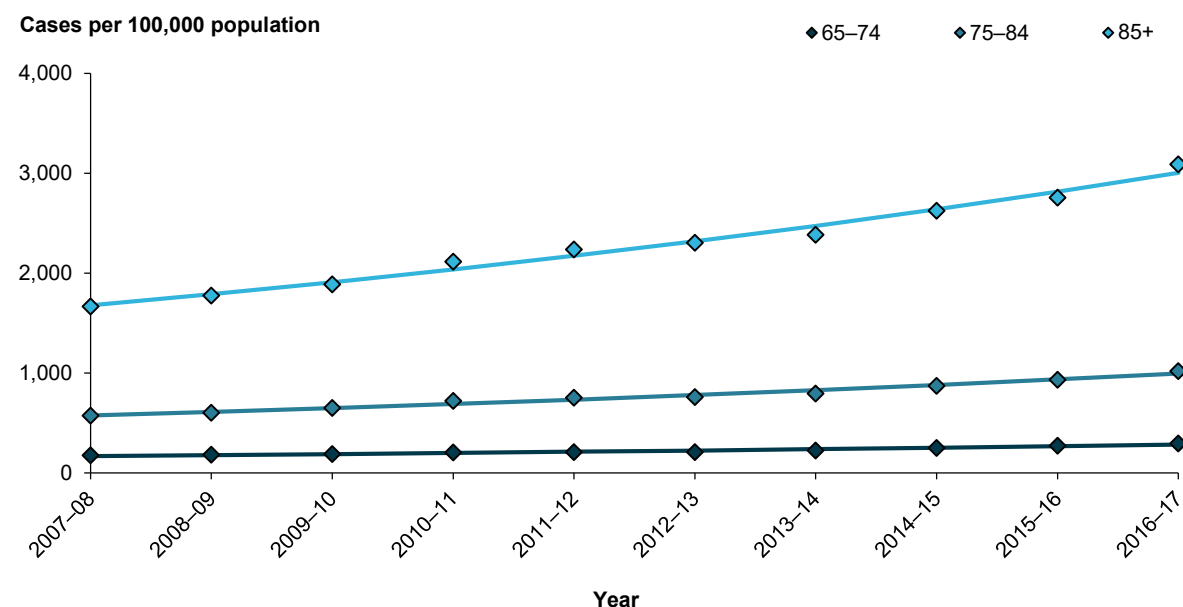


**Notes**

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

The magnitude of the rise in fall-related head injuries over time was greater for those in older age groups (Figure 3.5). For those aged 85 and over, the increase in the rate of head injury due to falls was estimated to be 6.7% per year (CI: 6.4%, 6.9%), compared with increases of 6.3% per year for 75–84 year olds (CI: 6.0%, 6.6%) and 5.9% per year for 65–74 year olds (CI: 5.6%, 6.3%). All results were statistically significant.

**Figure 3.5: Modelled age-standardised rates for hospitalised head injury cases due to falls, by age group, 2007–08 to 2016–17**



**Notes**

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

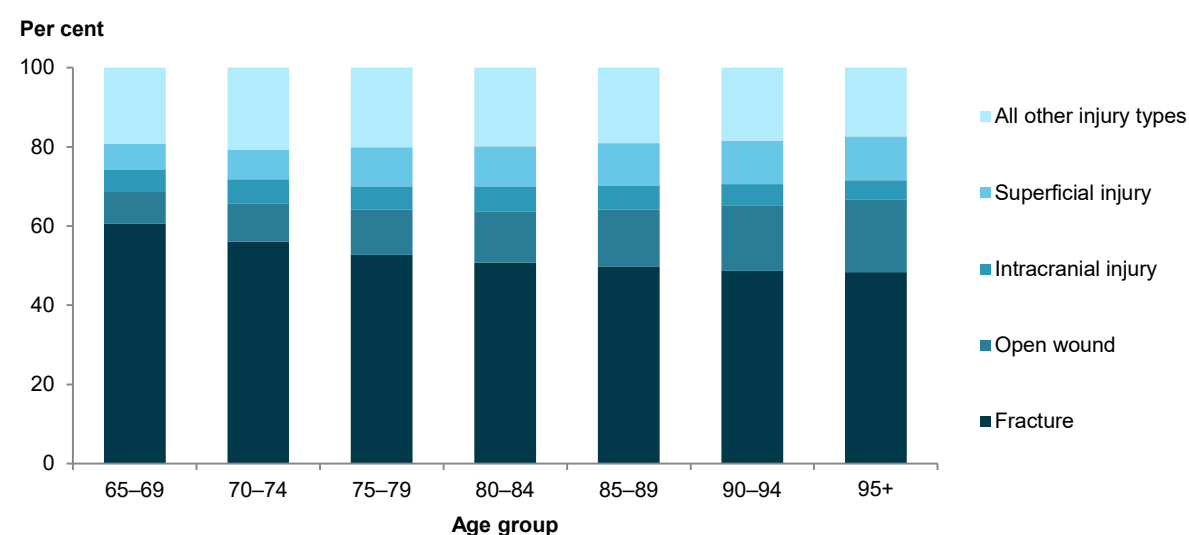
## Nature of injury

More than half of people aged 65 and over who were hospitalised due to a fall-related injury in 2016–17 had a principal diagnosis of a *Fracture* (65,150 cases, or 52%). Fractures were a proportionately more common principal diagnoses for women than for men, whereas open wound and intracranial injury were more common for men (Table 3.2).

**Table 3.2: Type of injury for hospitalised fall cases, by sex, 2016–17**

| Type of injury                    | Men           |              | Women         |              | People         |              |
|-----------------------------------|---------------|--------------|---------------|--------------|----------------|--------------|
|                                   | Count         | %            | Count         | %            | Count          | %            |
| Fracture                          | 18,972        | 43.5         | 46,178        | 56.7         | 65,150         | 52.1         |
| Dislocation                       | 693           | 1.6          | 1,224         | 1.5          | 1,917          | 1.5          |
| Soft-tissue injury                | 1,642         | 3.8          | 2,310         | 2.8          | 3,952          | 3.2          |
| Open wound                        | 7,320         | 16.8         | 8,829         | 10.8         | 16,149         | 12.9         |
| Intracranial injury               | 3,563         | 8.2          | 3,813         | 4.7          | 7,376          | 5.9          |
| Internal organ or vessel of trunk | 400           | 0.9          | 255           | 0.3          | 655            | 0.5          |
| Burn                              | 3             | 0            | 4             | 0            | 7              | 0            |
| Superficial injury                | 4,248         | 9.7          | 7,822         | 9.6          | 12,070         | 9.7          |
| Poisoning or toxic effect         | 0             | 0            | 0             | 0            | 0              | 0            |
| Other specified nature of injury  | 1,526         | 3.5          | 2,295         | 2.8          | 3,821          | 3.1          |
| Unspecified nature of injury      | 5,273         | 12.1         | 8,651         | 10.6         | 13,924         | 11.1         |
| <b>Total</b>                      | <b>43,640</b> | <b>100.0</b> | <b>81,381</b> | <b>100.0</b> | <b>125,021</b> | <b>100.0</b> |

Fracture principal diagnoses were common for older people of all ages, although the proportion of fracture diagnoses for people aged 65–69 (61%) was higher than for people aged 95+ (48%). The proportion of cases with principal diagnoses of an open wound or superficial injury, in particular, was higher in each successive age group (Figure 3.6).

**Figure 3.6: Selected types of injury for hospitalised fall-related injury cases, by age group, 2016–17**

Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Fractures

Over time, fracture has been the most frequent nature of injury, followed by open wound and superficial injury. In 2016–17, fractures accounted for half (52%) of all fall-related injuries sustained by people aged 65 and over. The principal diagnosis in 13% of cases was an open wound and in 10% of cases a superficial injury was sustained. Together, these 3 types of injury accounted for over three-quarters of all injuries.

Nearly 3 in every 5 people aged 65 and over who were hospitalised due to an injurious fall in 2016–17 sustained at least 1 fracture (68,617 cases, or 55%). A higher proportion of women than men sustained fractures (59% and 47%, respectively).

Table 3.3 describes the location of the fracture for fall-related injury cases with at least 1 fracture. Fractures to the hip and thigh accounted for the greatest proportion of all fracture-related fall-related injury cases: about 1 in every 3 such injuries (33%). The vast majority of these hip and thigh fracture cases had a principal diagnosis of *Fractured neck of femur* (20,027 cases, or 90%).

**Table 3.3: Fracture location by body region for hospitalised fall-related injury cases involving a fracture, by sex, 2016–17**

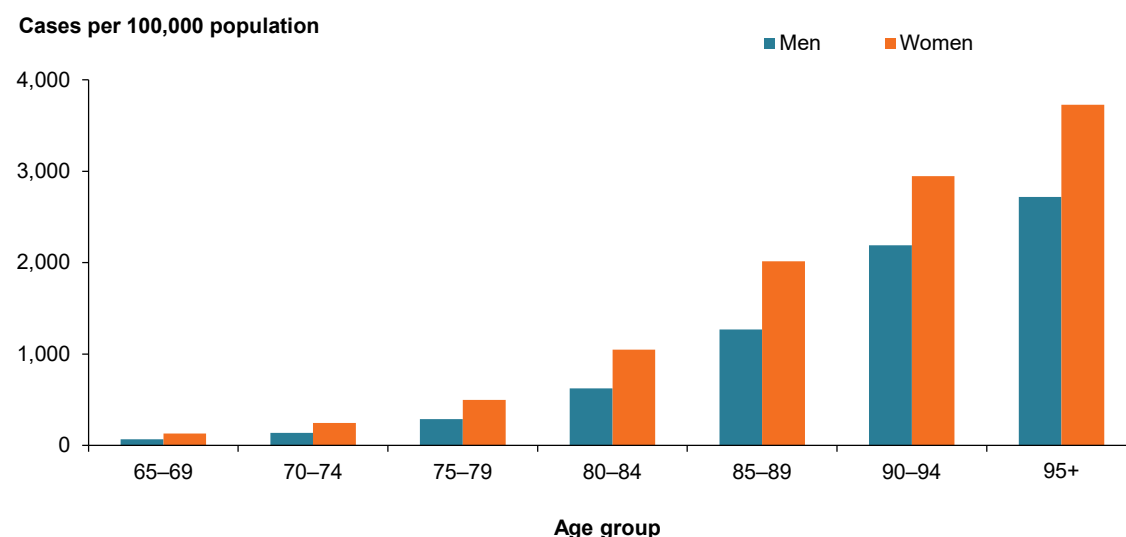
| Fracture location by body region                        | Men           |              | Women         |              | People        |              |
|---------------------------------------------------------|---------------|--------------|---------------|--------------|---------------|--------------|
|                                                         | Count         | %            | Count         | %            | Count         | %            |
| Head                                                    | 1,975         | 9.6          | 2,815         | 5.9          | 4,790         | 7            |
| Neck                                                    | 591           | 2.9          | 714           | 1.5          | 1305          | 1.9          |
| Thorax                                                  | 3,351         | 16.3         | 3,716         | 7.7          | 7,067         | 10.3         |
| Abdomen, lower back, lumbar spine and pelvis            | 2,449         | 11.9         | 6,162         | 12.8         | 8,611         | 12.5         |
| Shoulder and upper arm                                  | 1,871         | 9.1          | 5,955         | 12.4         | 7,826         | 11.4         |
| Elbow and forearm                                       | 1177          | 5.7          | 7,073         | 14.7         | 8,250         | 12           |
| Wrist and hand                                          | 457           | 2.2          | 793           | 1.6          | 1250          | 1.8          |
| Hip and thigh                                           | 6,751         | 32.9         | 15,578        | 32.4         | 22,329        | 32.5         |
| Knee and lower leg                                      | 1,581         | 7.7          | 4,606         | 9.6          | 6,187         | 9            |
| Ankle and foot                                          | 291           | 1.4          | 637           | 1.3          | 928           | 1.4          |
| Other, multiple and incompletely specified body regions | 3             | 0            | 6             | 0            | 9             | 0            |
| Injuries not described in terms of body region          | 40            | 0.2          | 25            | 0.1          | 65            | 0.1          |
| <b>Total</b>                                            | <b>20,537</b> | <b>100.0</b> | <b>48,080</b> | <b>100.0</b> | <b>68,617</b> | <b>100.0</b> |

## Hip fractures

Fall-related injury cases that had a principal diagnosis of hip fracture (*Fractured neck of femur*) occurred at an age-standardised rate of 514 per 100,000 population in 2016–17.

Women aged 65 and over in 2016–17 had a higher rate of fall-related hip fracture (621 cases per 100,000) than men (375 per 100,000). Age-specific rates of fall-related *Fractured neck of femur* injuries were highest for those aged 95 and over (Figure 3.7).

**Figure 3.7: Age-specific rates of hospitalised hip fracture cases due to falls, by age group, by sex, 2016–17**

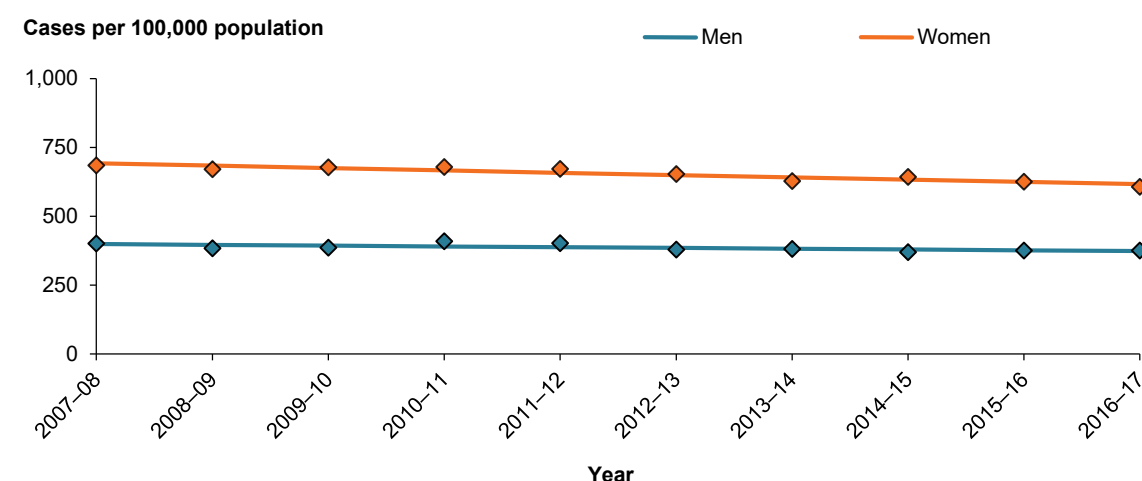


Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

In contrast to fall-related injury cases generally, and to head injuries specifically, the rates of hospitalised cases of hip fracture (principal diagnoses S72.0–S72.2) due to *Falls* in people aged 65 and over decreased over the period 2007–08 to 2016–17 (Figure 3.8). While changes in admission practices over time may affect the rate of all hospitalised fall-related injury cases, it is thought that hip fracture is serious enough to be admitted to hospital in nearly every instance.

The decrease in the age-standardised rates of hip fracture over the 10 years to June 2017 was estimated to be 1.3% per year (CI: –1.5%, –1.1%) for women and 0.7% (CI: –1.0%, –0.5%) for men. Both decreases were statistically significant.

**Figure 3.8: Modelled age-standardised rates for hospitalised hip fracture cases due to falls, by sex, 2007–08 to 2016–17**

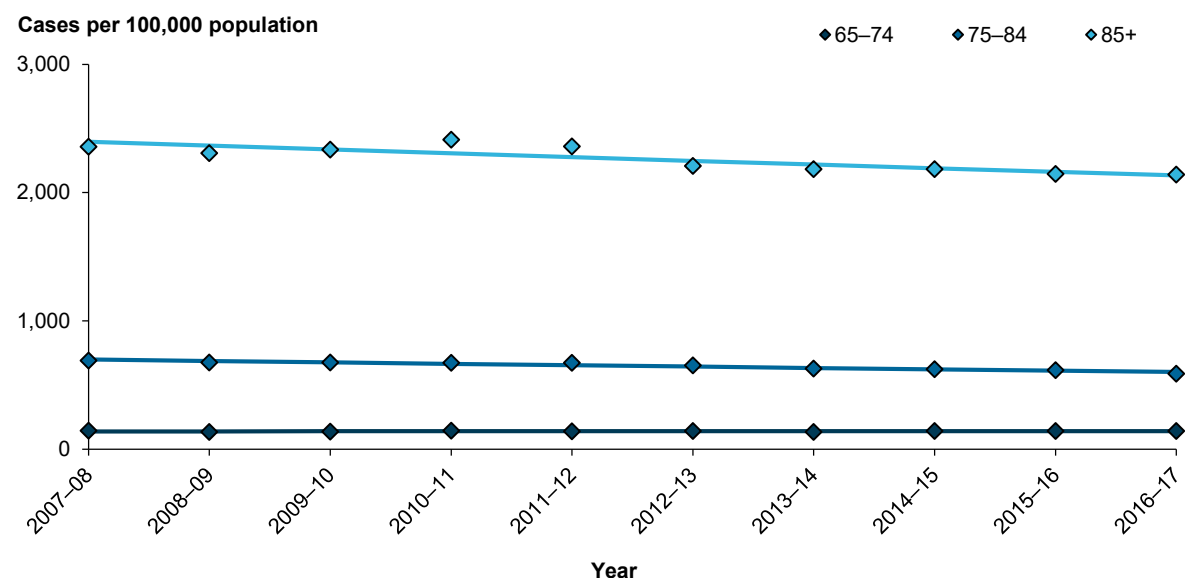


**Notes**

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Decreases in the rate of hip fractures were not consistent across all age groups in the older population (Figure 3.9). The decrease in the rate of hospitalised hip fracture due to *Falls* was significant in the 2 older groups: an estimated decrease of 1.6% per year for people in the 75–84 age group (CI: –1.9%, –1.1%) and of 1.3% per year for people aged 85 and over (CI: –1.5%, –1.1%). There was no significant decrease in the 65–74 group (0.1% per year).

**Figure 3.9: Modelled age-standardised rates for hospitalised hip fracture cases, by age group, Australia 2007–08 to 2016–17**



#### Notes

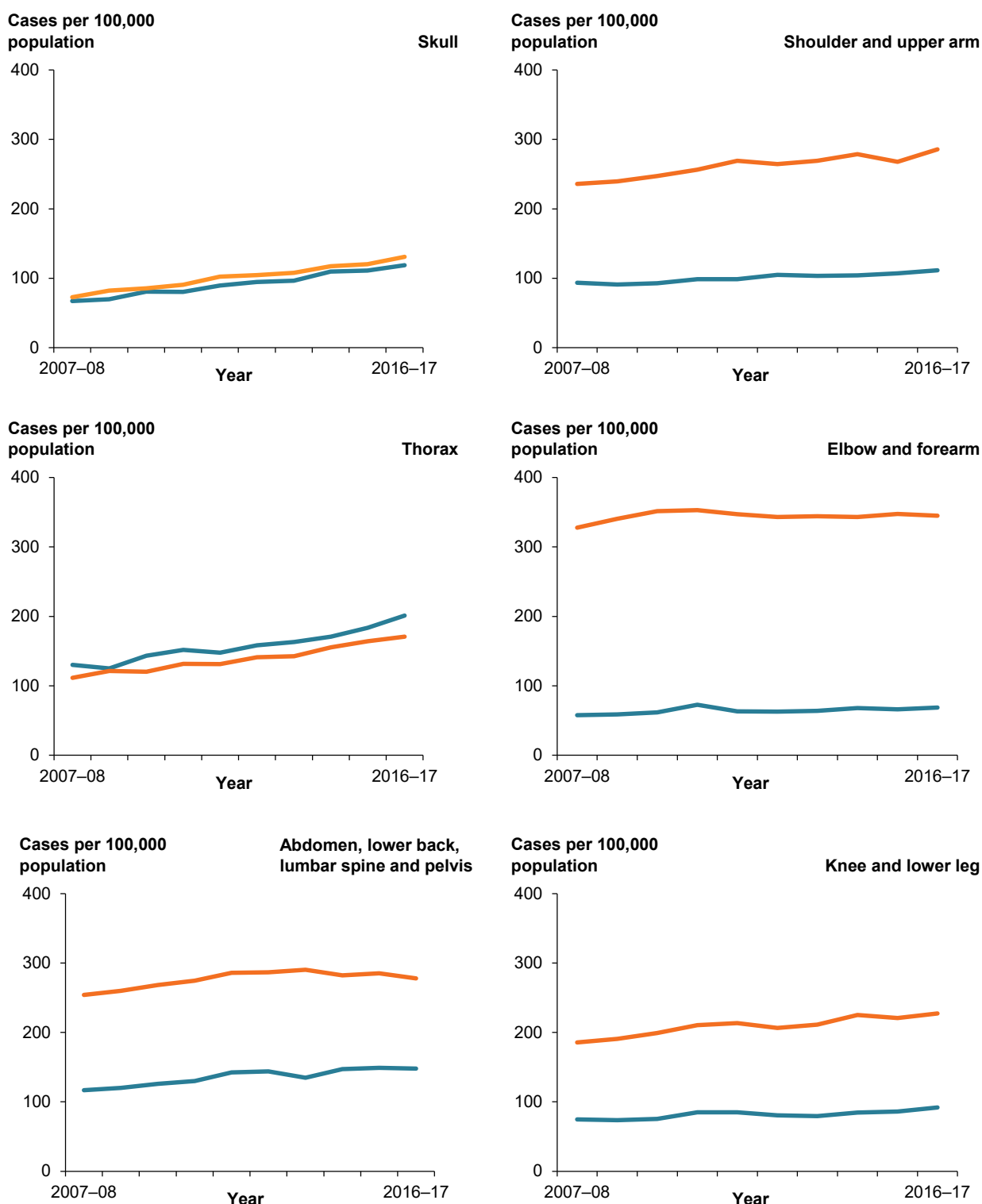
1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Other types of fracture

Rates of many other types of fracture (that is, fractures other than hip fractures) were estimated to have increased over the study period (Figure 3.10). Of the 6 types of fall-related fractures presented in Figure 3.10, only fractures to the elbow and forearm remained steady over the period.

With respect to gender differences, women had higher rates of all types of fractures due to *Falls*, other than thorax fractures. The greatest difference occurred in elbow and forearm fractures, where, for the entire period, rates of injury were 5 times higher among women, compared with men.

**Figure 3.10: Age-standardised rates for hospitalised fracture cases, by selected body region of injury, by sex, 2007–08 to 2016–17**



**Notes**

1. Rates for men are indicated by the blue line and rates for women by the orange line in all charts.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## 4 Causes of fall-related injury

This chapter presents information on the causes of hospitalised injury in people aged 65 and over in Australia, as a result of a fall, in 2016–17 and over the period 2007–08 to 2016–17.

### Key findings

The most common cause of hospitalised fall-related injury for those aged 65 and over in 2016–17 was a *Fall on same level from slipping, tripping and stumbling* (34%).

### Sex of patient

Overall, men and women had similar causes of fall-related injury.

### Age of patient

The proportion of injuries due to *Fall on same level from slipping, tripping and stumbling* decreased by age group, with the largest proportions occurring among the younger age groups.

### Trends in injury

Small increases in age-standardised rates were seen for falls from to beds, chairs and ladders over the time period. Falls involving stairs and steps showed the steepest increase year on year: in 2007–08, the rate of injury due to *Fall on and from stairs and steps* was 157 cases per 100,000 population, while in 2016–17 it had risen to 210 cases per 100,000.

The most common cause of hospitalised fall-related injury for those aged 65 and over in 2016–17 was a *Fall on same level from slipping, tripping and stumbling* (34%) (Table 4.1). Slips, trips and stumbles were proportionately more common for women than for men and, for both sexes, most of these types of fall (61%) were attributed to *Fall on same level from tripping*.

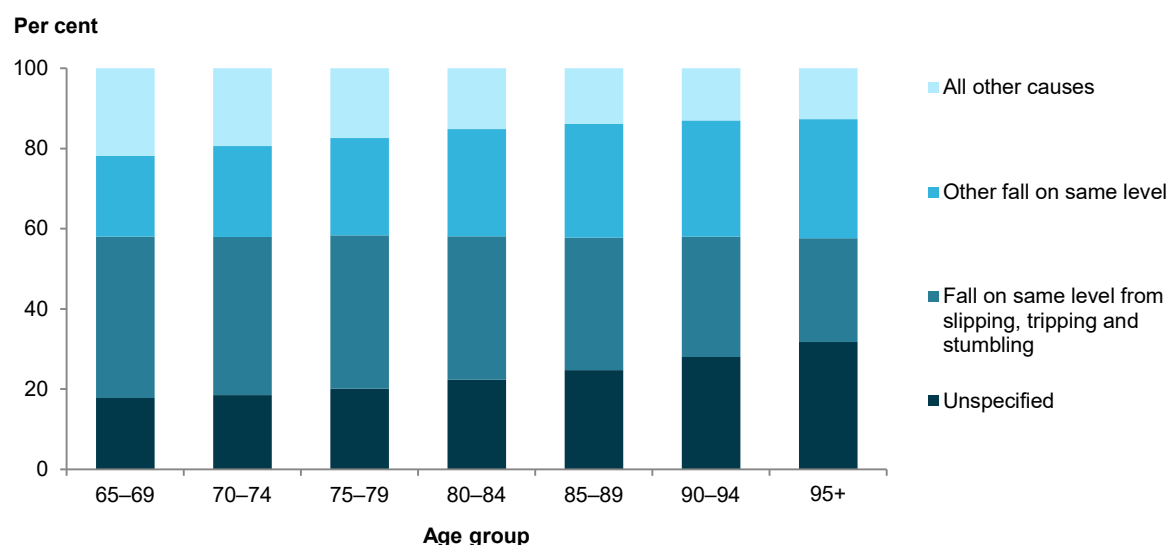
**Table 4.1: Causes of hospitalised fall-related injury cases, by sex, 2016–17**

| External cause                                                                | Men           |              | Women         |              | People         |              |
|-------------------------------------------------------------------------------|---------------|--------------|---------------|--------------|----------------|--------------|
|                                                                               | Count         | %            | Count         | %            | Count          | %            |
| Fall on same level from slipping, tripping and stumbling                      |               |              |               |              |                |              |
| Fall on same level from slipping                                              | 3,476         | 26.1         | 7631          | 26.4         | 11107          | 26.3         |
| Fall on same level from tripping                                              | 7,981         | 59.9         | 17,909        | 61.9         | 25,890         | 61.3         |
| Fall on same level from stumbling                                             | 1,861         | 14           | 3,402         | 11.8         | 5,263          | 12.5         |
| <i>Subtotal</i>                                                               | <i>13,318</i> | <i>30.5</i>  | <i>28,942</i> | <i>35.6</i>  | <i>42,260</i>  | <i>33.8</i>  |
| Fall on same level involving ice and snow                                     | 3             | 0            | 8             | 0            | 11             | 0            |
| Fall involving ice-skates, skis, roller-skates or skateboards                 | 275           | 0.6          | 240           | 0.3          | 515            | 0.4          |
| Other fall on same level due to collision with, or pushing by, another person | 66            | 0.2          | 170           | 0.2          | 236            | 0.2          |
| Fall while being carried or supported by other persons                        | 22            | 0.1          | 58            | 0.1          | 80             | 0.1          |
| Fall involving wheelchair                                                     | 379           | 0.9          | 494           | 0.6          | 873            | 0.7          |
| Fall involving bed                                                            | 2,016         | 4.6          | 3,401         | 4.2          | 5,417          | 4.3          |
| Fall involving chair                                                          | 1,370         | 3.1          | 2,439         | 3.0          | 3,809          | 3.0          |
| Fall involving other furniture                                                | 49            | 0.1          | 81            | 0.1          | 130            | 0.1          |
| Fall involving playground equipment                                           | 2             | 0.0          | 12            | 0.0          | 14             | 0.0          |
| Fall on and from stairs and steps                                             | 2,825         | 6.5          | 5,025         | 6.2          | 7,850          | 6.3          |
| Fall on and from ladder                                                       | 1,668         | 3.8          | 487           | 0.6          | 2,155          | 1.7          |
| Fall on and from scaffolding                                                  | 31            | 0.1          | 4             | 0.0          | 35             | 0.0          |
| Fall from, out of or through building or structure                            | 407           | 0.9          | 182           | 0.2          | 589            | 0.5          |
| Fall from tree                                                                | 55            | 0.1          | 9             | 0.0          | 64             | 0.1          |
| Fall from cliff                                                               | 45            | 0.1          | 42            | 0.1          | 87             | 0.1          |
| Diving or jumping into water causing injury other than drowning or submersion | 18            | 0            | 8             | 0            | 26             | 0            |
| Other fall from one level to another                                          | 820           | 1.9          | 822           | 1            | 1,642          | 1.3          |
| Other fall on same level                                                      | 10,767        | 24.7         | 20,707        | 25.4         | 31,474         | 25.2         |
| Unspecified fall                                                              | 9,504         | 21.8         | 18,250        | 22.4         | 27,754         | 22.2         |
| <b>Total</b>                                                                  | <b>43,640</b> | <b>100.0</b> | <b>81,381</b> | <b>100.0</b> | <b>125,021</b> | <b>100.0</b> |

*Unspecified fall* (accounting for 22% of cases) and *Other fall on same level* (25%) were the second- and third-most common types of external cause of hospitalised fall-related injury in 2016–17.

Three external causes of hospitalised fall-related injury accounted for 4 in 5 (81%) of cases (*Fall on same level from slipping, tripping and stumbling*, 34%; *Other fall on same level*, 25%; and *Unspecified fall*, 22%). Examining these selected causes of fall-related injury by age reveals increasing proportions of *Other fall on same level* and *Unspecified fall* (Figure 4.1). For those in the 65–69 age group, *Other fall on same level* accounted for 20% of all fall-related injuries, compared with 30% for those aged 95 and over. Conversely, the proportion of injuries due to *Fall on same level from slipping, tripping and stumbling* decreased by age group, with the largest proportions occurring among the younger age groups.

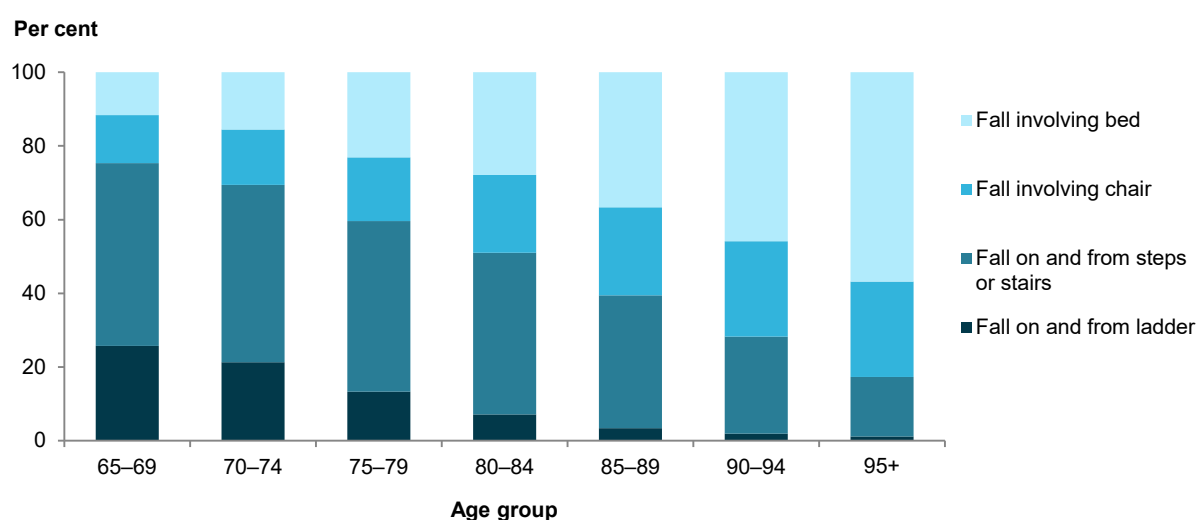
**Figure 4.1: Selected causes of injury for hospitalised fall-related injury cases, by age group, 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

While not as large in number, falls from household objects such as beds (5,417 cases), chairs (3,809 cases), stairs and steps (7,850 cases), and ladders (2,155 cases) are preventable and comprise the next largest proportion of combined cases (15%). Figure 4.2 shows the change in the proportion of fall-related injuries caused by these objects, by age. The proportion of fall-related hospitalisations due to ladders and stairs and steps was smaller in each successive age group. For the 65–69 age group, 50% of fall-related hospitalisations involved stairs and steps, decreasing to just 16% among those aged 95 and over. In comparison, the proportion of fall-related hospitalisations due to falling from a bed was greater in each successive age group. For the 65–69 age group, the proportion of cases due to a fall from a bed was 12%, compared with 57% among those aged 95 and above.

**Figure 4.2: Additional selected causes of injury for hospitalised fall-related injury cases, by age group, 2016–17**

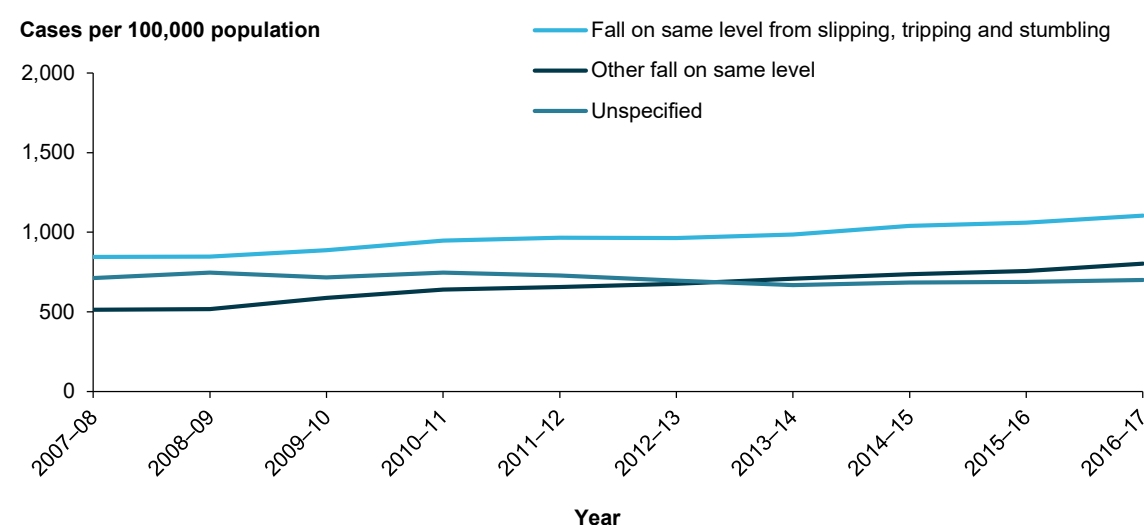


Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## How have the causes of fall-related injury cases changed over time?

Trends in the rates for the 3 main external causes of fall-related injury (*Fall on same level from slipping, tripping and stumbling*; *Other fall on same level*; and *Unspecified fall*) are shown in Figure 4.3. The age-standardised rate for 2 out of 3 categories of *Falls* increased over the period; the exception was cases where the external cause was *Unspecified*. The small decrease in the rate of *Unspecified* cases over recent years may account for some of the increase in more specific categories—however, this was unlikely to be a major contributor.

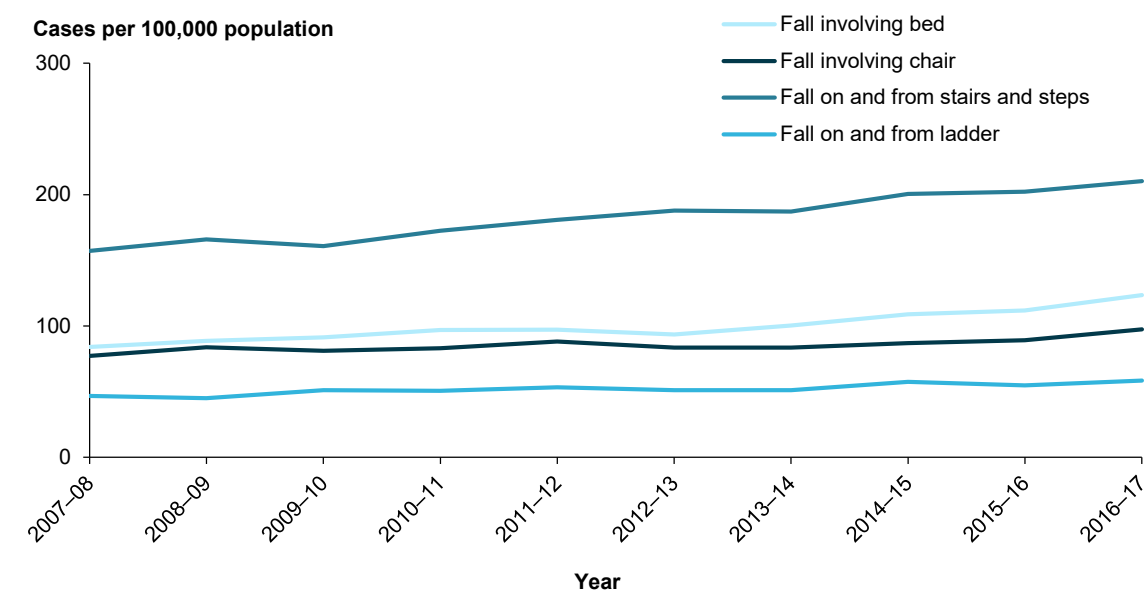
**Figure 4.3: Age-standardised rates for hospitalised fall-related injury cases, by selected external causes, 2007–08 to 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

The results of an analysis of hospitalised *Falls* caused over time by beds; chairs; stairs and steps; and ladders can be seen in Figure 4.4. Small increases in age-standardised rates were seen for falls from to beds; chairs; and ladders over the time period. Falls involving *Stairs and steps* showed the steepest increase year on year: in 2007–08, the rate of injury due to *Fall on and from stairs and steps* was 157 cases per 100,000 population, while in 2016–17 it had risen to 210 cases per 100,000.

**Figure 4.4: Age-standardised rates for hospitalised fall-related injury cases, by additional selected external causes, 2007–08 to 2016–17**



*Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.*

## 5 Place of occurrence

This chapter presents information on the place of occurrence of hospitalised fall-related injury in people aged 65 and over in Australia in 2016–17 and over the period 2007–08 to 2016–17. Information is presented on falls that occurred in the home for those resident in the community, and for those that occurred in residential aged care—which is where the largest number of falls occur.

### Key findings

Half of all hospitalised fall-related injury cases involving people aged 65 and over in 2016–17 occurred in the home (64,033 cases, or 51%).

### Residential aged care

The age-standardised rate of fall-related injury cases occurring in residential aged care in 2016–17 was 6 times as high as the rate of falls in the home involving people resident in the community.

### Type of injury

Rates of hip fracture and head injury were much higher for residents of residential aged care than for people falling while resident in the community.

### Remoteness of usual residence

Age-adjusted rates of fall-related injury were higher in *Major cities* but varied less across other remoteness classifications.

### Trends in injury

Age-standardised rates of fall-related injury, both in the home and in residential aged care, showed a small but significant decline between 2007–08 and 2016–17. In contrast, strong upward trends were observed for rates of head injuries due to falls, particularly for people in residential aged care.

A specific place of occurrence was not identified in 14% of records for fall-related injury cases in 2016–17 (Table 5.1). Half of all hospitalised fall-related injury cases involving people aged 65 and over in 2016–17 occurred in the home (64,033 cases, or 51%).

Looking only at cases that occurred in the home, many of these cases were recorded as occurring in *Other and unspecified place in home* (24,720 cases, 39% of falls specified as occurring in the home). A further 18% of falls were recorded as occurring in *Outdoor areas* of the home (11,588 cases), with falls occurring in the *Bathroom* and *Bedroom* also relatively common (12% and 10% of falls in the home, respectively).

Residential aged care was the reported place of occurrence for a further 21% of hospitalised fall-related injury cases in 2016–17 (26,812 cases). In all, about 6 in every 7 fall-related injury cases with a specified place of occurrence were reported to have happened in either the home or in an aged care facility (60% and 25% of specified places, respectively).

**Table 5.1: Place of occurrence for hospitalised fall-related injury cases, by sex, 2016–17**

| Place of occurrence                                        | Men           |              | Women         |              | People         |              |
|------------------------------------------------------------|---------------|--------------|---------------|--------------|----------------|--------------|
|                                                            | Count         | %            | Count         | %            | Count          | %            |
| Home                                                       |               |              |               |              |                |              |
| Driveway to home                                           | 569           | 1.3          | 766           | 0.9          | 1,335          | 1.1          |
| Outdoor areas                                              | 4,551         | 10.4         | 7,037         | 8.6          | 11,588         | 9.3          |
| Garage                                                     | 444           | 1.0          | 364           | 0.4          | 808            | 0.6          |
| Bathroom                                                   | 2,563         | 5.9          | 5,099         | 6.3          | 7,662          | 6.1          |
| Kitchen                                                    | 1,264         | 2.9          | 3,283         | 4.0          | 4,547          | 3.6          |
| Bedroom                                                    | 2,150         | 4.9          | 4,300         | 5.3          | 6,450          | 5.2          |
| Laundry                                                    | 93            | 0.2          | 318           | 0.4          | 411            | 0.3          |
| Indoor living areas, n.e.c.                                | 2,128         | 4.9          | 4,384         | 5.4          | 6,512          | 5.2          |
| Other and unspecified place in home                        | 8,347         | 19.1         | 16,373        | 20.1         | 24,720         | 19.8         |
| <i>Subtotal</i>                                            | <i>22,109</i> | <i>50.7</i>  | <i>41,924</i> | <i>51.5</i>  | <i>64,033</i>  | <i>51.2</i>  |
| Residential institution                                    |               |              |               |              |                |              |
| Residential aged care                                      | 8,416         | 19.3         | 18,396        | 22.6         | 26,812         | 21.4         |
| All other residential institution                          | 158           | 0.3          | 208           | 0.3          | 366            | 0.3          |
| <i>Subtotal</i>                                            | <i>8,574</i>  | <i>19.6</i>  | <i>18,604</i> | <i>22.9</i>  | <i>27,178</i>  | <i>21.7</i>  |
| Other specified institution and public administrative area | 135           | 0.3          | 398           | 0.5          | 533            | 0.4          |
| Health services area                                       | 665           | 1.5          | 971           | 1.2          | 1,636          | 1.3          |
| School, other institution and public administration area   | 21            | 0.0          | 60            | 0.1          | 81             | 0.1          |
| Sports and athletics area                                  | 267           | 0.6          | 369           | 0.5          | 636            | 0.5          |
| Street and highway                                         | 2,135         | 4.9          | 3,371         | 4.1          | 5,506          | 4.4          |
| Trade and service area                                     | 1,641         | 3.8          | 2,991         | 3.7          | 4,632          | 3.7          |
| Industrial and construction area                           | 69            | 0.2          | 13            | 0.0          | 82             | 0.1          |
| Farm                                                       | 121           | 0.3          | 60            | 0.1          | 181            | 0.1          |
| Other specified place of occurrence                        | 1,011         | 2.3          | 1,624         | 2.0          | 2,635          | 2.1          |
| Unspecified/not reported                                   | 6,892         | 15.8         | 10,996        | 13.5         | 17,888         | 14.3         |
| <b>Total</b>                                               | <b>43,640</b> | <b>100.0</b> | <b>81,381</b> | <b>100.0</b> | <b>125,021</b> | <b>100.0</b> |

## Residential aged care

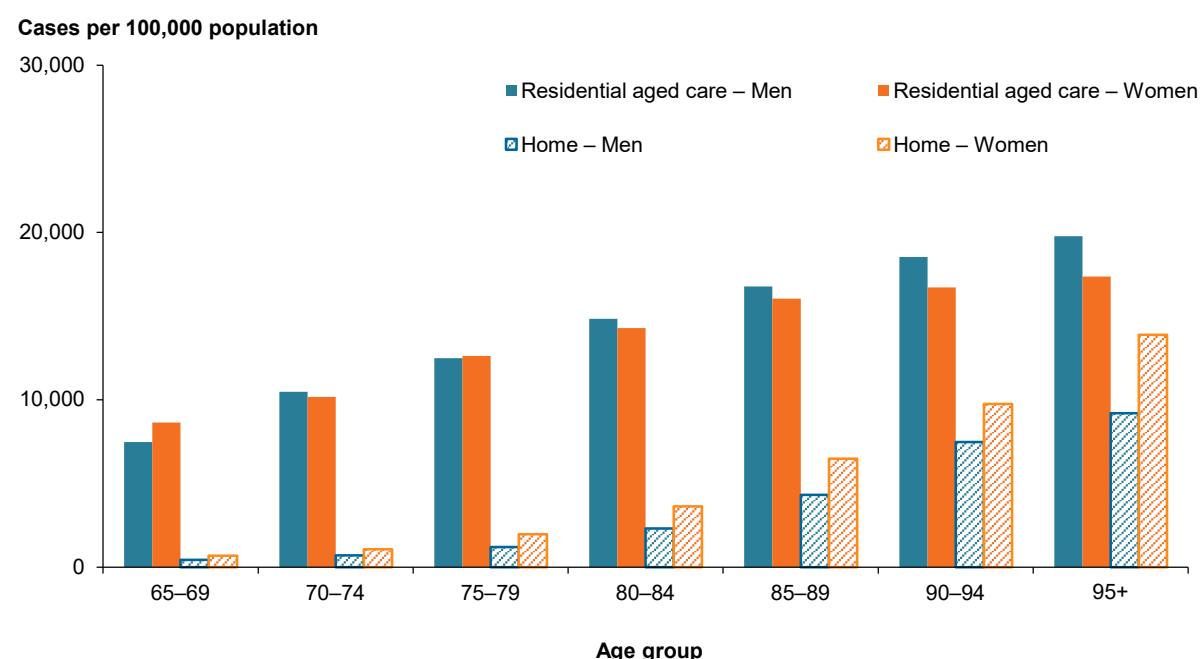
The estimated age-standardised rate of fall-related injury cases occurring in residential aged care for people aged 65 and older living in residential facilities in 2016–17 was 11,403 cases per 100,000 population—6 times as high as the rate of falls in the home involving people aged 65 and over resident in the community (1,888 cases per 100,000 population). (Information about the calculation of rates of fall-related injury in residential aged care can be found in Box 1.3.)

The age-standardised rate of fall-related injury cases for female residents of residential aged care (11,492 per 100,000 population) was very similar to that of male residents (11,410 per 100,000). This compares to a rate of 2,231 per 100,000 for women and 1,467 per 100,000 for men resident in the community and falling at home.

The age-specific rates of fall-related injury cases that occurred in the home and in residential aged care in 2016–17, by sex, are presented in Figure 5.1. Rates of fall-related injury were

higher in each successive age category for males and females, regardless of place of residence. Rates of falls in the home by older people living in the community present a pattern very similar to that for all cases, with rates higher for women than for men, especially for the oldest age groups. Among those living in residential aged care, rates of fall-related injury were similar between men and women other than in the 2 older age groups, where rates of fall-related injury for men were higher.

**Figure 5.1: Age-specific rates of falls, by place of residence, by age group, by sex, 2016–17**



**Notes**

1. Age-specific rates for residential aged care were calculated using population estimates supplied by the AIHW National Aged Care Data Clearinghouse (see Box 1.3).
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## How have the places where fall-related injuries occurred changed over time?

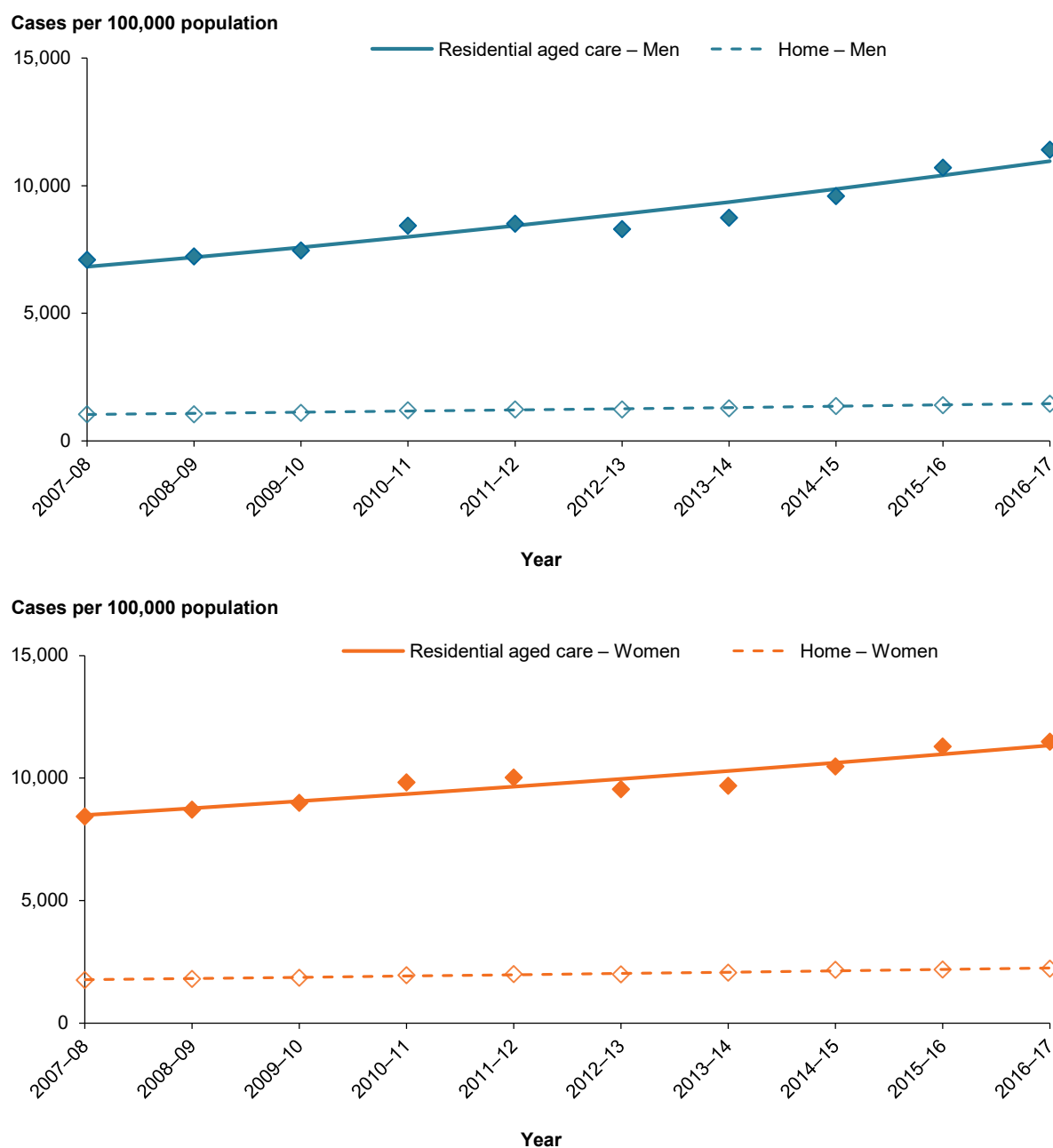
The 2 most common places of occurrence recorded for hospitalised fall-related injury cases for people aged 65 and over are the home and in residential aged care. Figure 5.2 presents the rates over time for fall-related injury cases resulting in hospitalisation, recorded as occurring either in residential aged care or in the home.

In each year of the analysis, residents of residential aged care had considerably higher rates of fall-related injury than people falling in the home, and both sets of rates increased significantly over the study period. Age-standardised rates of fall-related injury cases for those aged 65 and over, occurring in the home, increased significantly between 2007–08 and 2016–17—for men, an increase of 3.9% per year (CI: 3.7%, 4.1%); for women, an increase of 2.7% per year (CI: 2.6%, 2.8%). However, rates of *Falls* that occurred in an aged care facility increased faster—men: 5.4% per year (CI: 5.0%, 5.7%); women: 3.3% per year (CI: 3.1%, 3.5%).

Higher rates of fall-related injuries in residents of residential aged care are not surprising, given the higher levels of frailty in this population relative to people of the same age who

remain resident in the community. The faster annual increase in rates of falls for residents of residential aged care—and the widening difference in injury risk—suggest a continuing need for interventions designed for the aged care setting.

**Figure 5.2: Modelled age-standardised rates of hospitalised fall-related injury cases, by place of residence, by sex, 2007–08 to 2016–17**



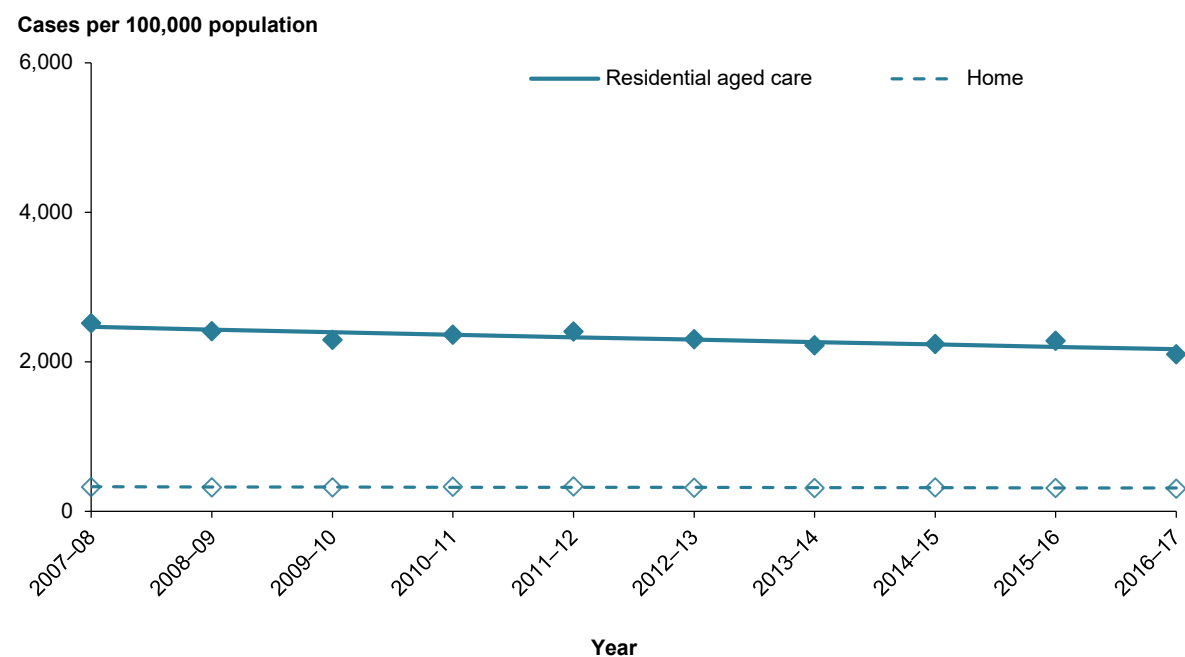
**Notes**

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Age-standardised rates for residential aged care were calculated using population estimates supplied by the AIHW National Aged Care Data Clearinghouse (see Box 1.3).
3. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Changes in type of injury by place over time

Rates of *Hip fractures* due to a fall-related injury were also much higher for residents of residential aged care than for people falling at home (Figure 5.3). Age-standardised rates of *Falls* for those aged 65 and over occurring in both locations showed a small but significant decline between 2007–08 and 2016–17—*Residential aged care*: a decrease of 1.4% per year (CI: –1.8%, –1.1%); *Home*: a decrease of 0.6% per year (CI: –0.9%, –0.4%).

**Figure 5.3: Modelled age-standardised rates of hospitalised hip fracture due to falls, by place of residence, 2007–08 to 2016–17**

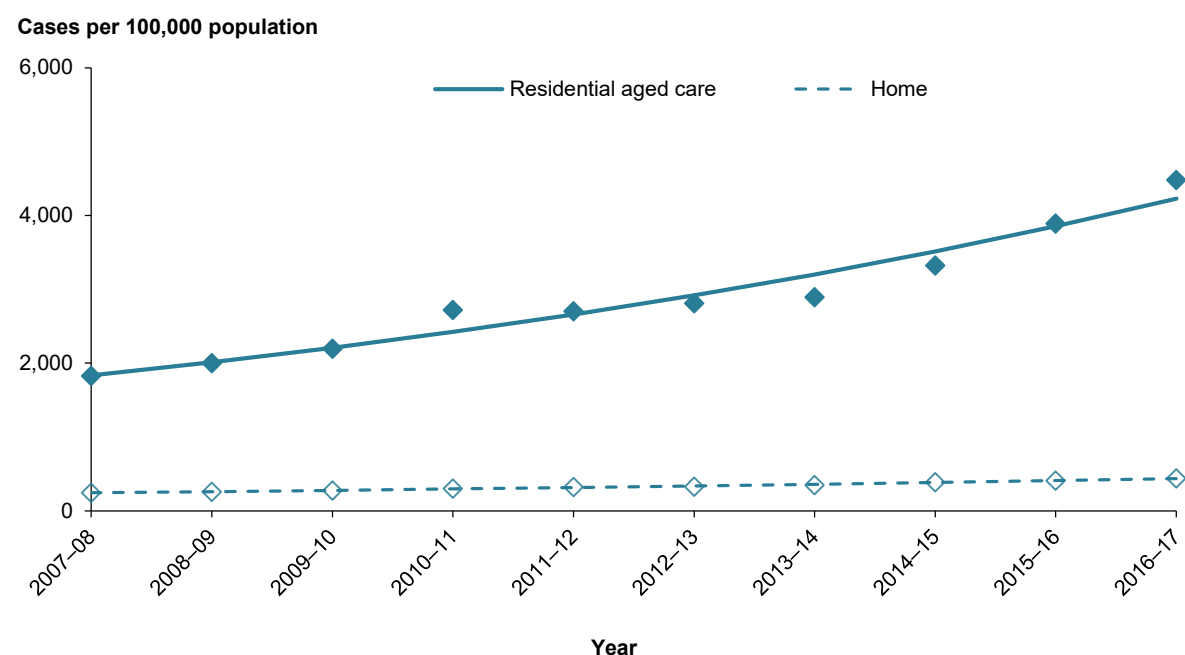


### Notes

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Age-standardised rates for residential aged care were calculated using population estimates supplied by the AIHW National Aged Care Data Clearinghouse (see Box 1.3).
3. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Rates of head injury due to a fall were much higher for residents of residential aged care than for people falling at home (Figure 5.4). Strong upward trends in rates were observed for head injuries due to falls, particularly for people in residential aged care. Age-standardised rates of fall-related injury for those aged 65 and over occurring in home or aged care locations showed a significant increase between 2007–08 and 2016–17—*Residential aged care*: 9.7% per year (CI: 9.4%, 10.1%); *Home*: 6.7% per year (CI: 6.4%, 6.9%).

**Figure 5.4: Modelled age-standardised rates of hospitalised head injury due to falls, by place of residence, 2007–08 to 2016–17**



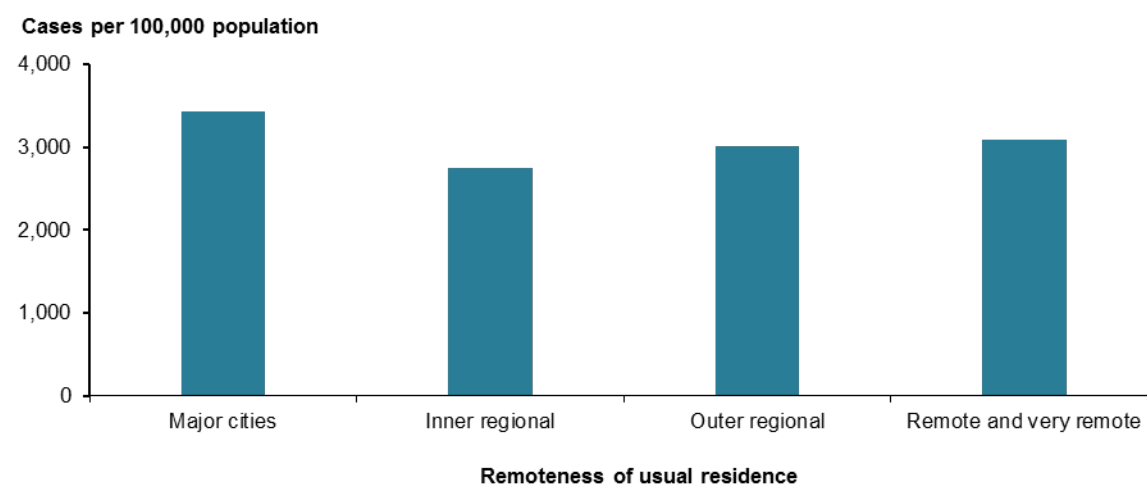
**Notes**

1. The solid line represents the modelled rate from 2007–08 to 2016–17. The filled symbols represent the observed age-standardised rate value for each year.
2. Age-standardised rates for residential aged care were calculated using population estimates supplied by the AIHW National Aged Care Data Clearinghouse (see Box 1.3).
3. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Remoteness of usual residence

The rate of hospitalised fall-related injury cases varied with remoteness of usual residence (Figure 5.5). Typically, rates for most external causes of injury are considerably higher in *Remote* and *Very remote* zones (AIHW: Pointer 2019). In contrast, age-adjusted rates of fall-related injury were higher in *Major cities* (at 3,425 per 100,000 population) but varied less across the other remoteness areas. (Due to small case numbers, the remoteness categories *Remote* and *Very remote* have been combined.)

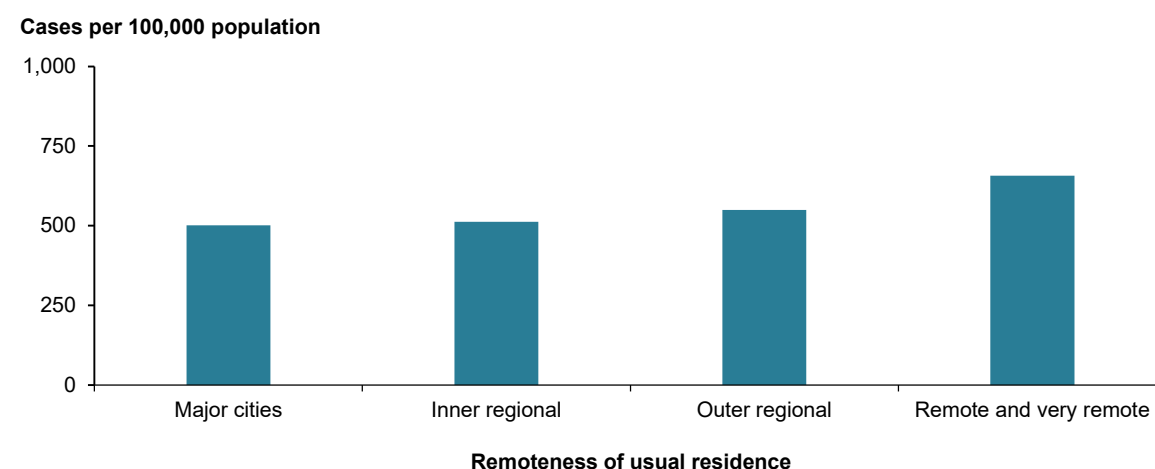
**Figure 5.5: Age-standardised rates of hospitalised fall-related injury cases, by remoteness of usual residence, 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Figure 5.6 presents rates of *Hip fracture* due to *Falls* in older people, by remoteness of usual residence. The highest rate of *Hip fracture* cases was observed for residents of *Remote and very remote* areas (657 per 100,000 population).

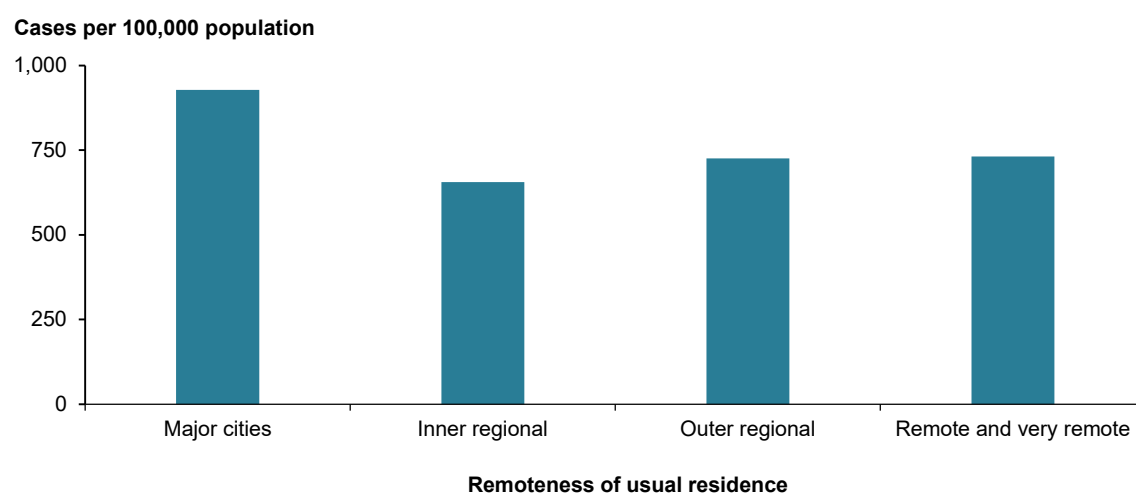
**Figure 5.6: Age-standardised rates of hospitalised fall hip fracture cases, by remoteness of usual residence, 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Figure 5.7 shows that the pattern for head injuries due to *Falls* in 2016–17 was similar to that for all types of fall-related cases, in that the highest rate of head injury due to *Falls* cases was observed for residents of *Major cities* (928 per 100,000 population).

**Figure 5.7: Age-standardised rates of hospitalised fall head injury cases, by remoteness of usual residence, 2016–17**



*Note:* Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## 6 Additional episodes of hospital care due to falls by older people

The previous chapters described numbers and rates of cases of hospitalised injury due to *Falls* in older people, based on the initial hospitalisation for each person having a fall. Many falls that result in an initial episode of hospital care go on to involve transfers between hospitals and inpatient follow-up care (for example, rehabilitation). This represents additional care of older people who have sustained injuries due to *Falls*, rather than additional cases.

In previous editions of this report this section has included 2 distinct types of additional care: fall-related injury hospital transfer separations and fall-related rehabilitation and related care separations. Both of these types of additional care were impacted by the change to coding practice for ICD-10-AM code Z50 *Care involving the use of rehabilitation procedures* (see *Appendix A: Data issues* for details). As a result, changes to the selection criteria of fall-related injury hospital transfer separations have been made and analyses of fall-related rehabilitation and related care separations have been restricted in scope to fall-related rehabilitation separations only. Trend analyses have also been discontinued.

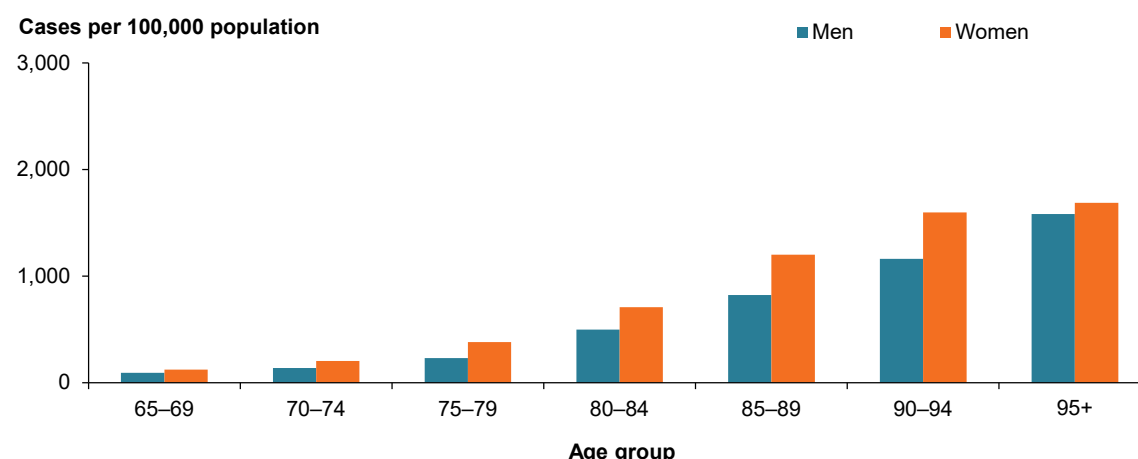
### Fall-related injury hospital transfer separations

Fall-related injury hospital transfers are those separations where the Mode of admission was *Admitted patient transferred from another hospital*. Fall-related injury hospital transfer separations are not included in estimates of the number of older people who sustained a serious injury due to a fall, because the inclusion of these records in case counts would be likely to lead to over-counting. (As hospital transfers are from one acute hospital to another, they probably represent a second episode of admitted patient care following an initial episode of admitted patient care for a particular fall-related injury event.)

A total of 13,761 fall-related injury hospital transfer separations were identified for the 2016–17 study period. These transfers occurred at an age-standardised rate of 356 separations per 100,000 population—about the same as that reported for previous years, prior to the changes to coding of Z50 *Care involving the use of rehabilitation procedures*. Hospital transfer separations occurred at a higher rate for women (412 per 100,000) than for men (288 per 100,000), with women accounting for 66% (9,025) of all fall-related injury hospital transfer separations.

Age-specific rates of fall-related injury hospital transfer separations, by age group, were similar for men and women (Figure 6.1). Rates were higher among the older age groups, with the highest rates for men and women aged 95 or over (1,462 separations per 100,000 population and 1,608 separations per 100,000 population, respectively).

**Figure 6.1: Age-specific rates of fall-related injury hospital transfer separations, by age group, by sex, 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

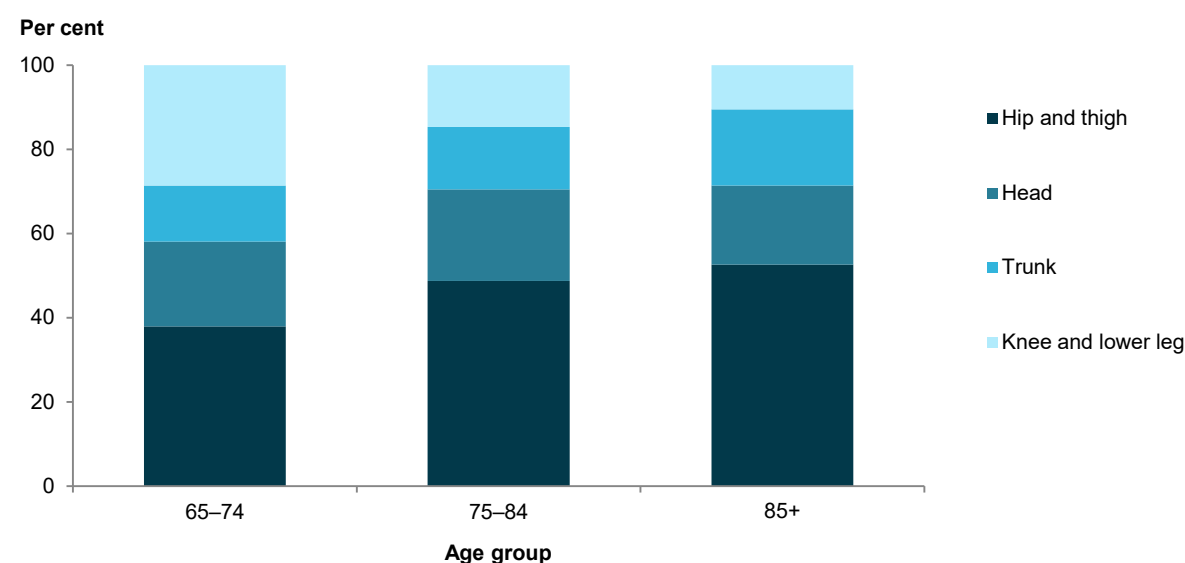
Over a third of fall-related injury hospital transfers were injuries to the hip and thigh, a much higher proportion than for all fall-related injury cases (35% of hospital transfer separations—see Table 6.1). Head injuries were a relatively common principal diagnosis for hospital transfers; however, they accounted for a much lower proportion than they did for fall-related injury cases (14% versus 26%, respectively). Head injuries accounted for a larger proportion of hospital transfer separations among men (20%) than among women (12%).

**Table 6.1: Body region injured for fall-related injury hospital transfer separations, by sex, 2016–17**

| Body region injured, by principal diagnosis             | Men          |              | Women        |              | People        |              |
|---------------------------------------------------------|--------------|--------------|--------------|--------------|---------------|--------------|
|                                                         | Count        | %            | Count        | %            | Count         | %            |
| Head                                                    | 951          | 20.1         | 1,034        | 11.5         | 1,985         | 14.4         |
| Neck                                                    | 160          | 3.4          | 199          | 2.2          | 359           | 2.6          |
| Thorax                                                  | 482          | 10.2         | 520          | 5.8          | 1,002         | 7.3          |
| Abdomen, lower back, lumbar spine and pelvis            | 499          | 10.5         | 1,074        | 11.9         | 1,573         | 11.4         |
| Shoulder and upper arm                                  | 316          | 6.7          | 912          | 10.1         | 1,228         | 8.9          |
| Elbow and forearm                                       | 161          | 3.4          | 649          | 7.2          | 810           | 5.9          |
| Wrist and hand                                          | 84           | 1.8          | 94           | 1.0          | 178           | 1.3          |
| Hip and thigh                                           | 1,511        | 31.9         | 3,244        | 35.9         | 4,755         | 34.6         |
| Knee and lower leg                                      | 450          | 9.5          | 1,092        | 12.1         | 1,542         | 11.2         |
| Ankle and foot                                          | 46           | 1.0          | 115          | 1.3          | 161           | 1.2          |
| Other, multiple and incompletely specified body regions | 9            | 0.2          | 16           | 0.2          | 25            | 0.2          |
| Injuries not described in terms of body region          | 67           | 1.4          | 76           | 0.8          | 143           | 1.0          |
| <b>Total</b>                                            | <b>4,736</b> | <b>100.0</b> | <b>9,025</b> | <b>100.0</b> | <b>13,761</b> | <b>100.0</b> |

An analysis of body region injured, by age, for fall-related injury hospital transfer separations is shown in Figure 6.2. The proportion of injuries to the hip and thigh was larger in each successive age group and, conversely, the proportion of knee and lower leg injuries was larger in each successive age group.

**Figure 6.2: Selected major body region injured for fall-related injury hospital transfer separations, by age group, 2016–17**



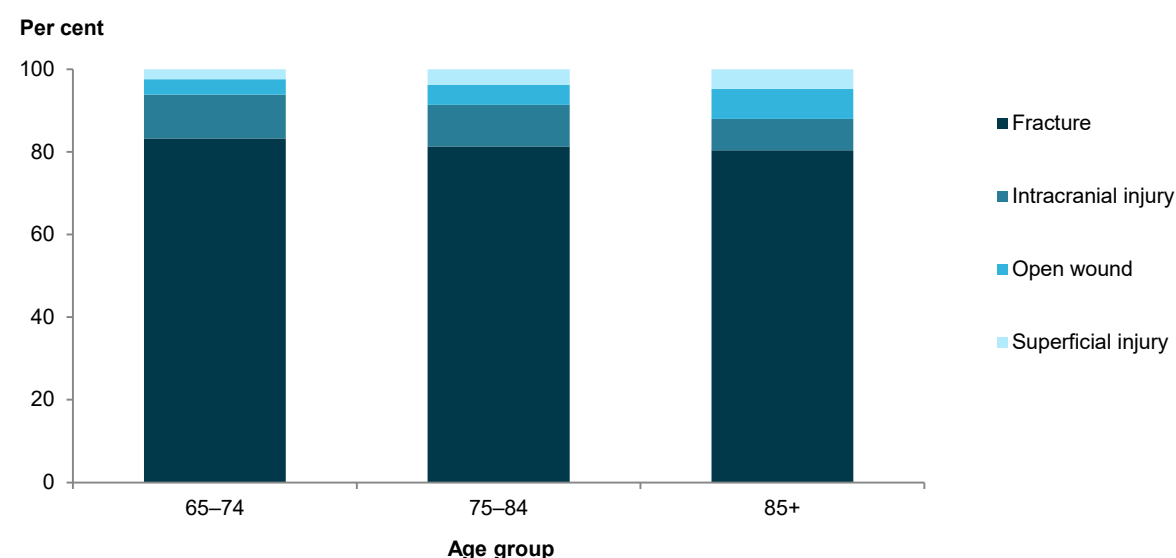
About three-quarters (73%) of all fall-related injury hospital transfer separations involved a fracture (Table 6.2), which accounted for the largest proportion of injuries for both men (65%) and women (77%)—although the proportion of women with a fracture was slightly higher. *Intracranial injury* (8%) and open wound (5%) were the next most common injuries associated with fall-related injury hospital transfer separations.

**Table 6.2: Type of injury for fall-related injury hospital transfer separations, by sex, 2016–17**

| Type of injury                    | Men          |              | Women        |              | People        |              |
|-----------------------------------|--------------|--------------|--------------|--------------|---------------|--------------|
|                                   | Count        | %            | Count        | %            | Count         | %            |
| Fracture                          | 3,061        | 64.6         | 6,988        | 77.4         | 10,049        | 73.0         |
| Dislocation                       | 62           | 1.3          | 86           | 1.0          | 148           | 1.1          |
| Soft-tissue injury                | 99           | 2.1          | 152          | 1.7          | 251           | 1.8          |
| Open wound                        | 308          | 6.5          | 389          | 4.3          | 697           | 5.1          |
| Intracranial injury               | 599          | 12.6         | 524          | 5.8          | 1,123         | 8.2          |
| Internal organ or vessel of trunk | 71           | 1.5          | 39           | 0.4          | 110           | 0.8          |
| Superficial injury                | 162          | 3.4          | 323          | 3.6          | 485           | 3.5          |
| Poisoning or toxic effect         | 0            | 0.0          | 1            | 0.0          | 1             | 0.0          |
| Other specified nature of injury  | 155          | 3.3          | 180          | 2.0          | 335           | 2.4          |
| Unspecified nature of injury      | 219          | 4.6          | 343          | 3.8          | 562           | 4.1          |
| <b>Total</b>                      | <b>4,736</b> | <b>100.0</b> | <b>9,025</b> | <b>100.0</b> | <b>13,761</b> | <b>100.0</b> |

Figure 6.3 shows that fractures among fall-related injury hospital transfers varied little by age. Diagnoses of *Intracranial injury* were more common for the youngest age groups, while principal diagnoses of open wound and superficial injury were more common for the older age groups.

**Figure 6.3: Type of injury for fall-related injury hospital transfer separations, by age group, 2016–17**



As for fall-related injury cases, the vast majority of hospital transfers were attributed to 3 external causes: *Fall on same level from slipping, tripping and stumbling* (30% of hospital transfer separations); *Other fall on same level* (22%); and *Unspecified fall* (31%) (data not shown).

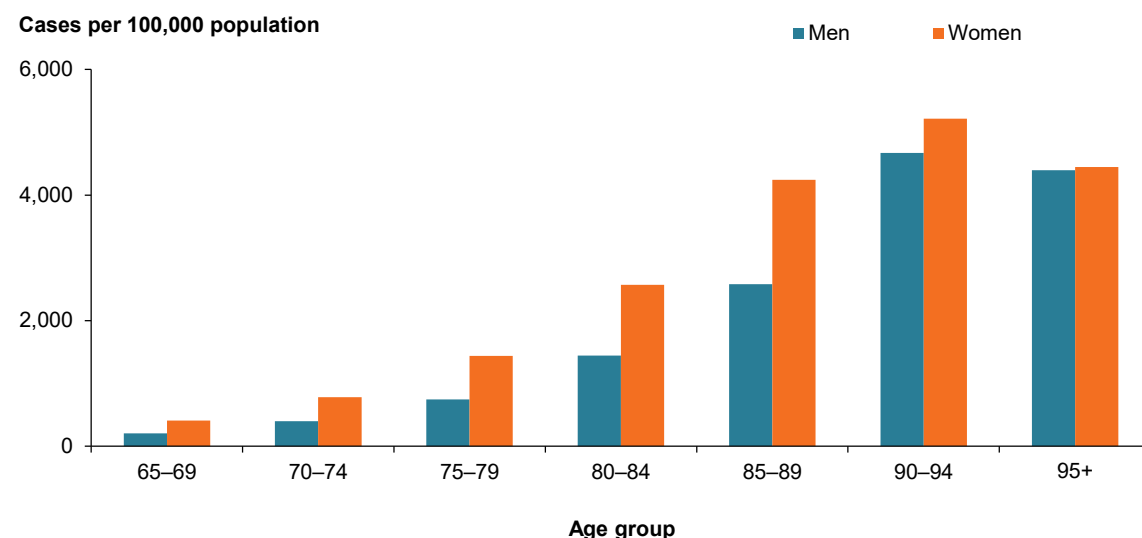
## Fall-related rehabilitation separations

Many fall-related injury cases require rehabilitation and related care. This aspect of hospital care is typically recorded in a different separation record to the acute care phase. In this section, rehabilitation separations were identified by selecting fall-related injury records with at least 1 additional diagnosis of *Z50 Care involving use of rehabilitation procedures*, where the type of episode of care was not 'acute' (see 'Appendix A: Data issues').

Almost 30,000 fall-related rehabilitation separations were identified for people aged 65 and over in 2016–17 (28,287), and nearly three-quarters involved women (19,815 separations, or 70%).

The age-standardised rate of fall-related rehabilitation separations was 739 separations per 100,000 population. The age-standardised rate for women (923 separations per 100,000) was much higher than that for men (513 per 100,000). Figure 6.4 shows that, as with most other types of fall-related hospital care, age-specific rates of fall-related rehabilitation separations in 2016–17 increased considerably with age, for both men and women—until very old age, when rates decline.

**Figure 6.4: Age-specific rates of fall-related rehabilitation separations, by age group, by sex, 2016–17**



Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

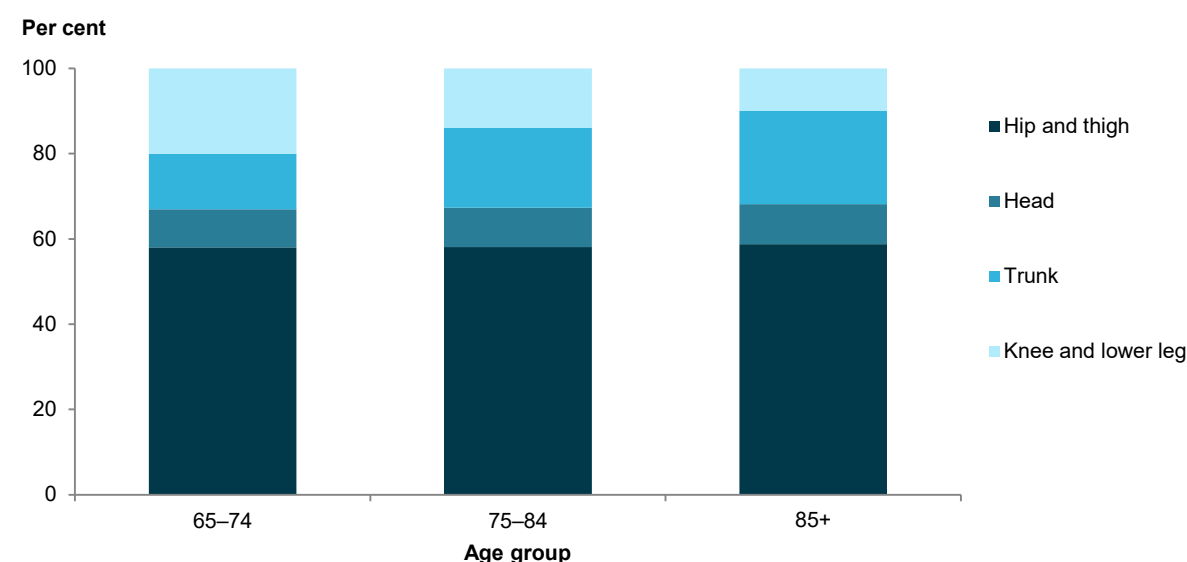
Almost a half of fall-related rehabilitation separations were injuries to the hip and thigh—almost twice the proportion seen for all fall-related injury cases (45% of fall-related rehabilitation separations: see Table 6.3). Injuries to the trunk, including the abdomen, lower back, lumbar spine and pelvis, was the next most common principal diagnosis; however, injuries to the trunk accounted for a slightly higher proportion of fall-related rehabilitation separations than they did for fall-related injury cases (15% versus 10%, respectively). Head injuries accounted for a larger proportion of fall-related rehabilitation separations among men (11%) than among women (6%).

**Table 6.3: Body region injured for fall-related rehabilitation separations, by sex, 2016–17**

| Body region injured, by principal diagnosis             | Men          |              | Women         |              | People        |              |
|---------------------------------------------------------|--------------|--------------|---------------|--------------|---------------|--------------|
|                                                         | Count        | %            | Count         | %            | Count         | %            |
| Head                                                    | 921          | 10.9         | 1,102         | 5.6          | 2,023         | 7.2          |
| Neck                                                    | 240          | 2.8          | 200           | 1.0          | 440           | 1.6          |
| Thorax                                                  | 586          | 6.9          | 857           | 4.3          | 1,443         | 5.1          |
| Abdomen, lower back, lumbar spine and pelvis            | 1,047        | 12.4         | 3,068         | 15.5         | 4,115         | 14.5         |
| Shoulder and upper arm                                  | 619          | 7.3          | 1,914         | 9.7          | 2,533         | 9.0          |
| Elbow and forearm                                       | 173          | 2.0          | 909           | 4.6          | 1,082         | 3.8          |
| Wrist and hand                                          | 72           | 0.8          | 150           | 0.8          | 222           | 0.8          |
| Hip and thigh                                           | 3,789        | 44.7         | 9,006         | 45.5         | 12,795        | 45.2         |
| Knee and lower leg                                      | 761          | 9.0          | 2,227         | 11.2         | 2,988         | 10.6         |
| Ankle and foot                                          | 181          | 2.1          | 280           | 1.4          | 461           | 1.6          |
| Other, multiple and incompletely specified body regions | 9            | 0.1          | 21            | 0.1          | 30            | 0.1          |
| Injuries not described in terms of body region          | 74           | 0.9          | 81            | 0.4          | 155           | 0.5          |
| <b>Total</b>                                            | <b>8,472</b> | <b>100.0</b> | <b>19,815</b> | <b>100.0</b> | <b>28,287</b> | <b>100.0</b> |

An analysis of body region injured, by age, for fall-related rehabilitation separations is shown in Figure 6.5. The proportion of injuries to the hip and thigh and to the head were similar in each successive age group. However, the proportion of injuries to the trunk (including the abdomen, lower back, lumbar spine and pelvis) increased in each successive age group. Conversely, the proportion of injuries to the knee and lower leg decreased in each successive age group.

**Figure 6.5: Selected major body region injured for fall-related rehabilitation separations, by age group, 2016–17**



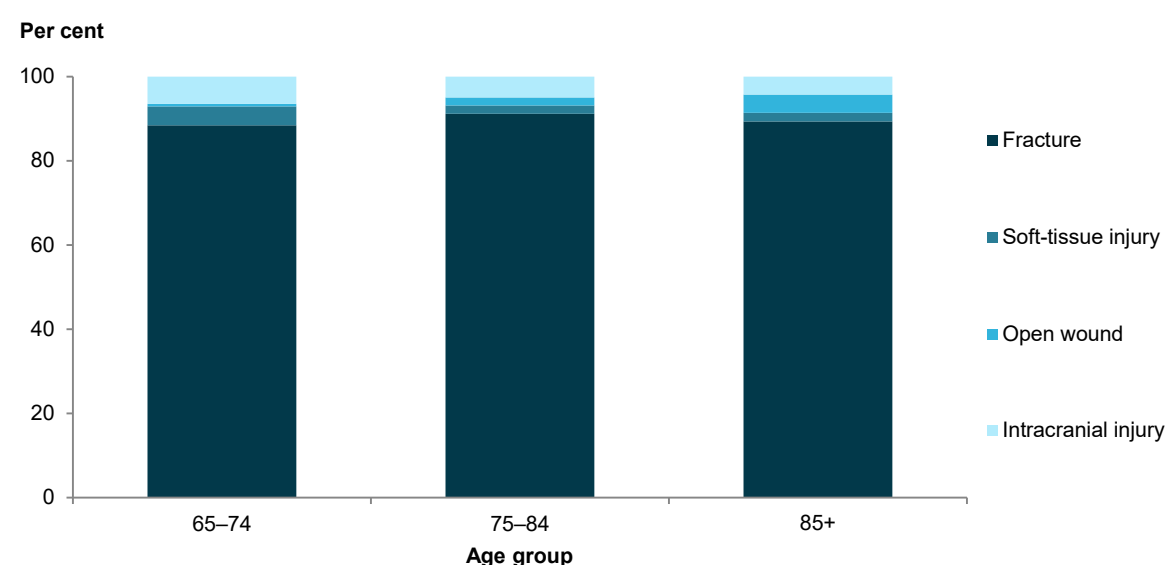
Over three-quarters (83%) of all fall-related rehabilitation separations involved a fracture (Table 6.4)—the largest proportion of injuries for both men (77%) and women (86%), although the proportion of women with a fracture was slightly higher. *Intracranial injury* (5%) was the next most common injury associated with fall-related rehabilitation separations.

**Table 6.4: Type of injury for fall-related rehabilitation separations, by sex, 2016–17**

| Type of injury                    | Men          |              | Women         |              | People        |              |
|-----------------------------------|--------------|--------------|---------------|--------------|---------------|--------------|
|                                   | Count        | %            | Count         | %            | Count         | %            |
| Fracture                          | 6,550        | 77.3         | 16,988        | 85.7         | 23,538        | 83.2         |
| Dislocation                       | 65           | 0.8          | 164           | 0.8          | 229           | 0.8          |
| Soft-tissue injury                | 225          | 2.7          | 440           | 2.2          | 665           | 2.4          |
| Open wound                        | 245          | 2.9          | 443           | 2.2          | 688           | 2.4          |
| Intracranial injury               | 667          | 7.9          | 641           | 3.2          | 1,308         | 4.6          |
| Internal organ or vessel of trunk | 52           | 0.6          | 29            | 0.1          | 81            | 0.3          |
| Superficial injury                | 133          | 1.6          | 416           | 2.1          | 549           | 1.9          |
| Other specified nature of injury  | 262          | 3.1          | 246           | 1.2          | 508           | 1.8          |
| Unspecified nature of injury      | 273          | 3.2          | 448           | 2.3          | 721           | 2.5          |
| <b>Total</b>                      | <b>8,472</b> | <b>100.0</b> | <b>19,815</b> | <b>100.0</b> | <b>28,287</b> | <b>100.0</b> |

Figure 6.6 shows that fractures among fall-related rehabilitation cases varied little by age and were the dominate type of injury for all age groups.

**Figure 6.6: Type of injury for fall-related rehabilitation separations, by age group, 2016–17**



As for fall-related injury cases, the majority of fall-related rehabilitation separations were attributed to 3 external causes: *Fall on same level from slipping, tripping and stumbling* (33% of fall-related rehabilitation separations); *Other fall on same level* (20%); and *Unspecified fall* (31%) (data not shown).

## Length of stay

Over a million (1,218,463) patient days were required for hospital care related to injurious falls (that is, fall-related injury cases; hospital transfers; and fall-related rehabilitation separations) by people aged 65 and over in 2016–17 (Table 6.5). This figure represents 8% of all patient days for people aged 65+ in 2016–17.

**Table 6.5: Total patient days for fall-related hospitalisations, by sex, 2016–17**

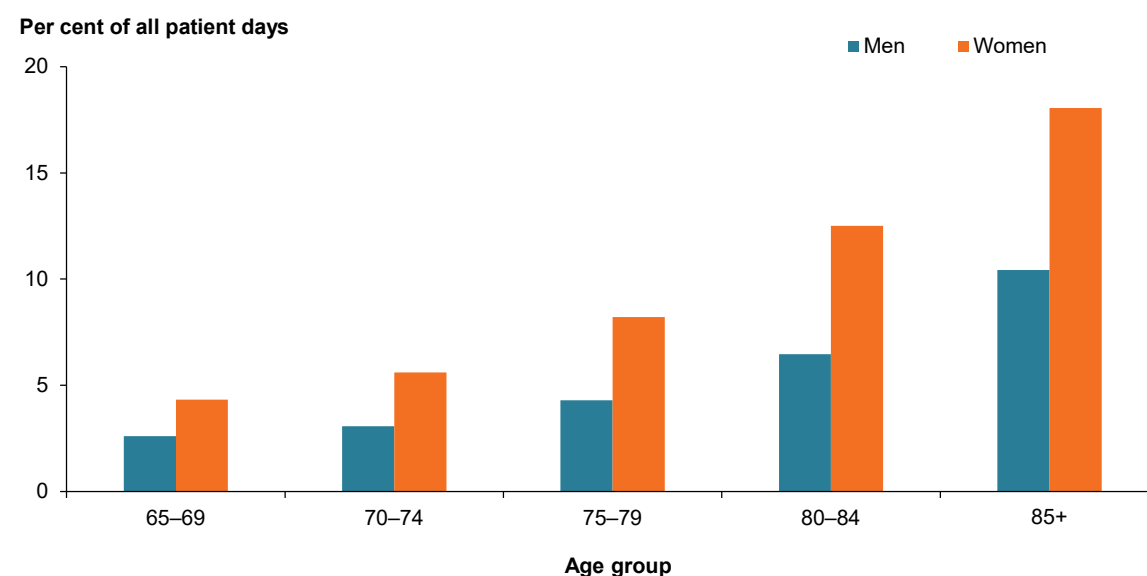
| Type of fall-related hospitalisation              | Men            | Women          | People           | % of fall-related | % of all patient days 65+ <sup>(a)</sup> |
|---------------------------------------------------|----------------|----------------|------------------|-------------------|------------------------------------------|
| Fall-related injury cases                         | 208,392        | 422,159        | 630,551          | 51.7              | 4.2                                      |
| Fall-related injury hospital transfer separations | 54,689         | 111,767        | 166,456          | 13.7              | 1.1                                      |
| Fall-related rehabilitation separations           | 130,893        | 290,563        | 421,456          | 34.6              | 2.8                                      |
| <b>Total fall-related hospitalisations</b>        | <b>393,974</b> | <b>824,489</b> | <b>1,218,463</b> | <b>100.0</b>      | <b>8.2</b>                               |

(a) Patient days for total episodes due to all causes at ages 65+.

Source: Australian hospital statistics 2016–17 (AIHW 2019b).

The patient days for fall-related separations in 2016–17, as a proportion of all patient days for any cause, increased with age for both men and women (Figure 6.7). For people aged 85 and over, fall-related separations accounted for 15% of the total number of patient days for this age group. Differences were evident by sex, with much higher proportions of patient days attributed to injurious falls among women in 2016–17.

**Figure 6.7: Total fall-related patient days as a proportion of all patient days, by age group, by sex, 2016–17**



*Note:* Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

## Total average length of stay (ALOS)

As described above, this report considers 3 groups of hospital separations that contribute to the admitted patient care provided due to a fall-related injury: fall-related injury hospital transfers and fall-related rehabilitation episodes are typically preceded by an initial episode for acute care for a fall-related injury case. Accordingly, a valid estimate of the average total duration of hospital care for admitted incidents of fall-related injury should include the patient days for all 3 of these types of record. That is, an average total length of stay may be calculated by dividing the sum number of patient days reported for fall-related separations by the number of cases for the period. On this basis, the estimated total ALOS for fall-related injury cases in 2016–17 (125,021 cases) was 10 days.

# Appendix A: Data issues

## Data sources

The data on hospital separations were from the Australian Institute of Health and Welfare's (AIHW) National Hospital Morbidity Database (NHMD). The NHMD is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. The data supplied are based on the Admitted Patient Care National Minimum Data Set (APC NMDS) and include demographic, administrative and length-of-stay data, as well as data on the diagnoses of the patients, the procedures they underwent in hospital and external causes of injury and poisoning.

The purpose of the APC NMDS is to collect information about care provided to admitted patients in Australian hospitals. The scope of the NMDS is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, free-standing day hospital facilities, and alcohol and drug treatment centres in Australia. Hospitals operated by the Australian Defence Force, corrections authorities and in Australia's offshore territories are not in scope, but some are included.

Nearly all fall-related injury cases admitted to hospitals in Australia are thought to be included in the NHMD data reported.

In 2016–17, diagnoses and external causes of injury were recorded using the 9th edition of the *International Statistical Classification of Diseases and Related Health Problems, tenth revision, Australian modification* ICD-10-AM (ACCD 2014). It comprises classifications of diseases and external causes of injuries and poisoning, based on the World Health Organization's version of ICD-10.

Data covering the period 2007 to 2017 were coded according to 5 editions of the ICD-10-AM. Changes across the ICD-10-AM over the revisions have not impacted on the analysis overall. Where analyses have been limited to specific editions of the ICD-10-AM, due to changes to the coding, this has been noted within the text.

The ICD-10-AM classification is hierarchical, with 19 disease chapters which are divided into a large number of more specific disease groups (represented by 3-character codes). Chapter 19 provides codes for injury conditions, such as *Fracture of neck of femur*. External causes of morbidity and mortality comprise Chapter 20 of the ICD-10-AM and are used in conjunction with injury diagnoses to describe the mechanism of injury (for example, injury due to a transport crash; or, as in this report, injury due to a fall) and the role of human intent (for example, unintentional injuries or intentional self-harm).

Denominators for most age-specific and age-standardised rates are estimated resident population (ERP) values as at 31 December of the relevant year. Australian ERPs for 30 June 2001 (persons, by 5-year age groups, concluding with the same oldest group present in the population denominator data) were used as the standardising population throughout the report. Data from other sources, mostly based on ERPs, were used as denominators for rates by remoteness of usual residence, Indigenous status and residence in residential aged care (see 'Rates', below).

## Selection criteria

This report describes the incidence of fall-related injuries newly occurring in the older Australia population and which resulted in admission to a hospital (*Fall-related injury* cases). For some purposes, particularly concerning length of stay and total patient days, several other types of fall-related separation records warrant attention. This section describes the criteria that were used to select NHMD records to achieve these purposes.

### Period

This report is restricted to admitted patient episodes that ended in the period 1 July 2016 to 30 June 2017 for the single-year analyses; and admitted patient episodes that ended in the period 1 July 2007 to 30 June 2017 for the multi-year trend analyses.

### Fall cases

Fall-related injury cases were defined as all NHMD records that met all of the following 4 criteria:

- The patient was aged 65 or older when admitted.
- The principal diagnosis was in the ICD-10-AM range S00–T75 or T79 using *Chapter XIX Injury, poisoning and certain other consequences of external causes* codes but excluding any with Z50 *Care involving use of rehabilitation procedures* appearing in any additional diagnosis field.
- The first-reported external cause code was in the range W00–W19 *Falls*.
- The mode of admission was not a transfer from another hospital.

Selection has been based on the principal diagnosis, because this refers to the condition 'chiefly responsible for occasioning the episode of admitted patient care'. The first-reported external cause code was chosen as a selection criterion, as this is most likely to be related to the principal diagnosis.

### Adjusting for changes to rehabilitation coding

A change in coding practice for ICD-10-AM Z50 *Care involving the use of rehabilitation procedures* has necessitated a change to the standard record inclusion criteria for AIHW National Injury Surveillance Unit (NISU) reports of hospital admitted injury cases. The change applies to episodes that ended on 1 July 2015 or later. For details of the change, see Box 4.2 in *Admitted patient care 2015–16: Australian hospital statistics* (AIHW 2017).

Due to the change in coding practice, an increase occurred in the numbers of separations in 2015–16 and 2016–17 with a principal diagnosis in the ICD-10-AM *Chapter 19: Injury, poisoning and certain other consequences of external causes* (S00–T98) range (approximately, an additional 60,000 records).

In order to minimise the effect of the coding change on the estimation of injury occurrence and trends, a change to the case estimation method used by NISU was required. Records with Z50 either as principal diagnosis or as additional diagnosis are now omitted by the NISU in data-years both before and after the coding change. The change to data prior to 2015–16 amounts to an adjustment of less than 0.1% of records. Where injury trends are presented by principal diagnosis for years prior to 2015–16, data will not be directly comparable for previous reporting periods.

## Hospital transfer separations

For fall-related injury hospital transfers, the number of separations in scope using our established inclusion criteria doubled after the introduction of changes to Z50 coding practice. In the report *Trends in hospitalised injury due to falls in older people, 2002–03 to 2014–15* (AIHW: Pointer 2018), a total of 12,946 fall-related injury hospital transfers were identified. Using the same selection criteria, in 2016–17 there were 25,374 separations. Exclusion of separations with Z50 *Care involving use of rehabilitation procedures* appearing in any additional diagnosis field among 2016–17 separations resulted in 13,761 fall-related injury hospital transfers being identified. Analysis of previous years' data revealed a decrease of about 200 cases a year since 2007–08, when separations containing Z50 were excluded.

In this report, fall-related injury hospital transfer separations are now defined as all NHMD records that met all of the following 4 criteria:

- The patient was aged 65 or older when admitted.
- The principal diagnosis was in the range S00–T75 or T79 but excluding any with Z50 *Care involving use of rehabilitation procedures* appearing in any additional diagnosis field.
- The first-reported external cause code was in the range W00–W19 *Falls*.
- The mode of admission was a transfer from another hospital.

Fall-related injury hospital transfer separations are not included in estimates of the number of older people who sustained a serious injury due to a fall, because the inclusion of these records in case counts would be likely to lead to over-counting. (As hospital transfers are from one acute hospital to another, they probably represent a second episode of admitted patient care following an initial episode of admitted patient care for a particular fall-related injury event.) Hospital transfer separations were analysed separately from cases, but included in measures of patient days and length of stay due to fall-related injuries.

## Fall-related rehabilitation separations

In the past, many separations following an episode of admitted patient care, and recognisable as an injury case, were coded with a principal diagnosis from ICD-10-AM *Chapter 21: Factors influencing health status and contact with health services*, particularly for older people with fall-related injuries and most such separations were coded as Z50 *Care involving use of rehabilitation procedures*. In 2014–15, 89% of *Fall-related rehabilitation and related care* separations (38,758 separations) had a principal diagnosis of Z50 *Care involving use of rehabilitation procedures*. The changes to Z50 coding practice mean that Z50 is no longer available to be used as a principal diagnosis.

In order to continue to capture the additional burden that hospitalised fall-related injuries have on the health system, changes have been made to the selection criteria used to identify fall-related rehabilitation separations.

In this report, fall-related rehabilitation *care* separations were defined as all NHMD records that met all of the following 5 criteria:

- The patient was aged 65 or older when admitted.
- The principal diagnosis was in the ICD-10-AM range S00–T75 or T79.
- At least 1 additional diagnosis was Z50 *Care involving use of rehabilitation procedures*.
- The first-reported external cause code was in the range W00–W19 *Falls*.

- The type of episode of care was not 'acute'.

## Estimating incident cases

Each record in the NHMD refers to a single episode of admitted patient care in a hospital. Some fall-related injuries result in more than 1 episode in hospital and, hence, more than 1 NHMD record. This can occur in 2 main ways:

- a person is admitted to 1 hospital, then transferred to another
- a person has an episode of admitted patient care in hospital, is discharged home (or to another place of residence) and is then admitted for further treatment for the same injury, to the same hospital or to another one.

The NHMD does not include information designed to enable the set of records belonging to the 'same fall' injury case to be recognised as such. Hence, there is potential for some cases to be counted more than once, when 2 or more NHMD records are generated, all of which satisfy the selection criteria being used.

Information in the NHMD enables this problem to be reduced, though not eliminated. The approach used to estimate fall-related injury cases in this report makes use of the *Mode of admission* variable, which indicates whether the episode of admitted patient care commenced with hospital transfer from another acute care hospital. Episodes of this type (hospital transfers) are likely to have been preceded by another episode that also meets the selection criteria for *Fall-related injury* cases, so are omitted from our estimates of case counts.

This procedure should largely correct for overestimation of cases due to the double-counting of transfers, but will not correct for overestimation due to re-admissions.

## Length of stay

Older people who have been injured as a result of a fall often require long stays in hospitals, frequently involving more than 1 episode of admitted patient care. Analyses restricted to incident cases (the first admission to hospital after a fall, and the focus of the first part of this report) do not fully account for the extent of admitted patient health-service utilisation among this group. Multiple episodes of admitted patient care for a single fall event also make it difficult to estimate the total duration of care (in terms of days of patient care) attributable to an injurious fall.

The patient days in hospital attributable to a fall-related injury include those associated with 3 of the types of record defined above: Fall-related injury cases, fall-related injury hospital transfers and fall-related rehabilitation separations. Length of stay values reported here are sums of these 3 types (except where specified as being limited to 1 of these types).

Average length of stay (ALOS) values were calculated as the sum of patient days for these 3 types of record, divided by the number of fall-related injury cases.

## Rates

### Age standardisation

Cases per 100,000 population are reported as directly age-standardised rates, based on the Australian population as at 30 June of the year of interest. The Australian population as at 30 June 2001 was used as the reference population. Age-standardisation of rates enables

valid comparison across years and/or jurisdictions, without being affected by the differences in age distributions.

### **Changes in rates due to changes in underlying population data**

All populations, except those used for analyses by Indigenous status, are based on the 2011 Census data. The age-standardised rates (per 100,000 population) presented in this report for the years 2007–08 to 2016–17 in time-series tables have been calculated using ‘rebased’ ERPs. Therefore, the separation rates reported for 2007–08 to 2016–17 in this report are not comparable to the separation rates presented in earlier hospitalised injury statistics reports.

## **Population denominators**

### **General population**

Where possible, rates were calculated using the final ERP as at 31 December in the relevant year as the denominator (for example, 31 December 2006 for 2006–07 data). Where tables of 31 December ERPs were not available but tables of 30 June ERPs were available, population denominators were calculated as the average of 30 June estimates for adjacent years.

Where possible, rates were calculated using denominator data in 5-year age groups—from 65–69 to an oldest group aged 95 and over. Some population denominator data were not available with these age groups, so populations by remoteness of usual residence and Indigenous status were available in 5-year groups to 85 and over.

Negative binomial regression modelling for all trends in rates of *Fall* incident cases used denominator data in 5-year age groups from 65–69 up to an oldest group aged 95 and over, unless otherwise specified.

### **Community and residential aged care population**

Rates of *Falls* occurring in the home or in residential aged care were calculated using denominator data reflecting the estimated place of residence for the population. Population estimates of residents of residential aged care were obtained from the AIHW National Aged Care Data Clearinghouse.

The populations resident in residential aged care as at 30 June in adjacent years were averaged to estimate this population as at 31 December, the midpoint of the financial years analysed. The number of people aged 65 and over who were resident in the community was then estimated by subtracting the number of residents of residential aged care from the general population (as at 31 December).

## Indigenous population

Separation rates by Indigenous status were directly age-standardised, using the projected Indigenous population (low series) as at 30 June 2017. The population for non-Indigenous Australians was based on the estimated resident population as at 30 June 2017, based on 2011 Census data.

Rates for Indigenous Australians in this report are only reported by financial year. Hence, all rates were calculated using, as the denominator, the final estimate of the estimated resident Indigenous population as at 31 December for the relevant period (for example, 31 December 2006 for 2006–07 cases). Since estimates of resident Indigenous populations are only provided for 30 June, estimates for 31 December are calculated by adding 2 consecutive 30 June estimates and dividing by 2 (for example, the estimate for 31 December 2006 is calculated by adding estimates for 30 June 2006 and 30 June 2007 and dividing by 2).

## Changes in rates due to changes in underlying population data

All populations, except those used for analyses by Indigenous status, are based on the 2011 Census data. The age-standardised rates (per 100,000 population) presented in time series tables in this report for the years 2007–08 to 2011–12 have been calculated using 'rebased' ERPs. Therefore, the separation rates reported for 2007–08 to 2011–12 in this report are not comparable to the separation rates presented in earlier hospitalised injury statistics reports.

## Estimated change in rates over time

Population-based rates of injury tend to have a similar value in 1 year and the next. Exceptions to this can occur (for example, due to a mass-casualty disaster) but are unusual in Australian injury data. Some year-to-year variation and other short-run fluctuations are to be expected, due to unknown and essentially random factors, so small changes in rates over a short period normally do not provide a firm basis for asserting that a trend is present.

However, the period covered by this report is long enough for noteworthy changes to occur. The fundamental questions concerning a series of annual estimates of population-based rates are whether they show a statistically significant rise or fall over the period and, if so, the average rate of change. Analysis in this report is limited to those characteristics of change.

Estimated trends in rates of fall-related separations were reported as annual percentage change, obtained using negative binomial regression modelling using Stata 15 (StataCorp 2017). Additional information about the statistical methods used for trend analyses can be found in Berry & Harrison (2006).

Confidence intervals (95%, based on a Poisson assumption about the number of cases in a time period) have been placed around rates in trends analyses as a guide to the size of variation. Chance variation alone would be expected to lead to a rate outside the interval only once in 20 occasions.

The use of the terms 'significant' or 'significantly' throughout this report indicates an outcome which was statistically significant ( $p = <0.05$  or less).

## Classification of remoteness area

Data on geographical location of the patient's usual residence and of the hospital location are defined using the Australian Bureau of Statistics (ABS) Australian Statistical Geography Standard (ASGS). Data on remoteness area of usual residence are defined using the ABS's ASGS Remoteness Structure 2011 (ABS 2011). The period examined in this report is limited

to 2001–02 to 2016–17, due to changes in the Remoteness Structure at the time of the 2006 Census (see ABS 2006).

Australia can be divided into several regions based on their distance from urban centres. This is considered to determine the range and types of services available. In this report, 'remoteness area' refers to the place of usual residence of the person who was admitted to hospital, assigned on the basis of the reported Statistical Local Area (SLA) of residence. These data are specified in the NMDS as state or territory of residence and Statistical Area level 2 (SA2), a small area unit within the ABS's ASGS.

The remoteness areas were specified according to the ABS Australian Standard Geographical Classification (ASGC). Remoteness categories were defined in a manner based on the Accessibility/Remoteness Index of Australia (ARIA). According to this method, remoteness is an index applicable to any point in Australia, based on road distance from urban centres of 5 sizes. The reported areas are defined as the following ranges of the index:

*Major cities* (for example, Sydney, Geelong, Gold Coast), ARIA index 0 to 0.2

*Inner regional* (for example, Hobart, Ballarat, Coffs Harbour), ARIA index >0.2 and ≤2.4

*Outer regional* (for example, Darwin, Cairns, Coonabarabran), ARIA index >2.4 and ≤5.92

*Remote* (for example, Alice Springs, Broome, Strahan), ARIA index of >5.92 and ≤10.53

*Very remote* (for example, Coober Pedy, Longreach, Exmouth), ARIA index >10.53.

Most SLAs lie entirely within 1 of the 5 areas. If this was so for all SLAs, then each record could simply be assigned to the area in which its SLA lies. However, some SLAs overlap 2 or more of the areas. Records with these SLAs were assigned to remoteness areas in proportion to the area-specific distribution of the resident population of the SLA according to the 2006 Census. Each record in the set having a particular SLA code was randomly assigned to one or other of the remoteness areas present in it, in proportion to the resident population of that SLA.

## Indigenous status

In this report, the terms *Indigenous* and *non-Indigenous* are used to refer to persons identified as such in Australian hospital separations data and population data collections. Separations for which Indigenous status was *Not stated* have been excluded in the category *non-Indigenous*.

## Quality of Indigenous status data

The AIHW report *Indigenous identification in hospital separations data: quality report* (AIHW 2013) presents the latest findings on the quality of Indigenous identification in hospital separations data, based on studies conducted in public hospitals during 2011. Private hospitals were not included in the assessment. The results of the study indicate that, overall, the quality of Indigenous identification in hospital separations data was similar to that achieved in a previous study (AIHW 2010). However, the survey for the 2013 report was performed on larger samples for each jurisdiction/region and is therefore considered more robust than in the previous study.

The report recommends using data from all jurisdictions in national analyses of Indigenous admitted patient care for data from 2010–11 onwards. Therefore, the trend analyses presented in this report commence from that year.

## **Data quality statement: National Hospital Morbidity Database (NHMD)**

A data quality statement for the NHMD is available online at [www.meteor.aihw.gov.au](http://www.meteor.aihw.gov.au).

The reference period for this data set is 2016–17. The data set includes records for admitted-patient separations between 1 July 2016 and 30 June 2017.

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# Abbreviations

|           |                                                                                               |
|-----------|-----------------------------------------------------------------------------------------------|
| ABS       | Australian Bureau of Statistics                                                               |
| AIHW      | Australian Institute of Health and Welfare                                                    |
| APC NMDS  | Admitted Patient Care National Minimum Data Set                                               |
| ASGS      | Australian Statistical Geography Standard                                                     |
| ARIA      | Accessibility and Remoteness Index of Australia                                               |
| ERP       | estimated resident population                                                                 |
| ICD-10-AM | International Statistical Classification of Diseases, tenth revision, Australian Modification |
| METeOR    | Metadata Online Registry                                                                      |
| ALOS      | average length of stay                                                                        |
| NCCC      | National Casemix and Classification Centre                                                    |
| NHMD      | National Hospital Morbidity Database                                                          |
| NISU      | National Injury Surveillance Unit                                                             |
| NMDS      | National Minimum Data Set                                                                     |
| SLA       | Statistical Local Area                                                                        |

# Symbols

|        |                          |
|--------|--------------------------|
| n.e.c. | not elsewhere classified |
| CI     | confidence interval      |

# Glossary

Registry (METeOR). METeOR is Australia's central repository for health, community services and housing assistance metadata, or 'data about data'. It provides definitions for data for health and community services-related topics and specifications for related national minimum data sets (NMDs). METeOR can be viewed on the AIHW website at [www.aihw.gov.au](http://www.aihw.gov.au).

**activity when injured:** The type of activity being undertaken by a person at the time of injury. METeOR identifier: 391320.

**acute:** Having a short and relatively severe course.

**acute care:** See **care type**.

**acute care hospital:** See **establishment type**.

**admitted patient:** A patient who undergoes a hospital's admission process to receive treatment and/or care. This treatment and/or care is provided over a period of time and can occur in hospital and/or in the person's home (for **hospital-in-the-home** patients). METeOR identifier: 268957.

**age-standardisation:** A set of techniques used to remove, as far as possible, the effects of differences in age when comparing 2 or more populations.

**care type:** The care type defines the overall nature of a clinical service provided to an admitted patient during an episode of admitted patient care (*Admitted care*), or the type of service provided by the hospital for boarders or posthumous organ procurement (*Care other than admitted care*). METeOR identifier: 491557.

*Admitted patient care* consists of the following categories:

- acute care
- rehabilitation care
- palliative care
- geriatric evaluation and management
- psychogeriatric care
- maintenance care
- newborn care
- other admitted patient care (where the principal clinical intent does not meet the criteria for any of the above).

*Care other than admitted care* includes:

- posthumous organ procurement
- hospital boarder.

**episode of admitted patient care:** The period of admitted patient care between a formal or statistical admission and a formal or statistical separation, characterised by only 1 care type (see **care type** and **separation**). METeOR identifier: 491557 (Care type), METeOR identifier: 268956 (Episode of admitted patient care).

**establishment type:** Type of establishment (defined in terms of legislative approval, service provided and patients treated) for each separately administered establishment. METeOR identifier: 269971.

**external cause:** The environmental event, circumstance or condition as the cause of injury, poisoning and other adverse effect. METeOR identifier: 514295.

**hospital:** A health-care facility established under Australian Government, state or territory legislation as a hospital or a free-standing day procedure unit and authorised to provide treatment and/or care to patients. METeOR identifier: 268971.

**hospital-in-the-home care:** Provision of care to hospital admitted patients in their place of residence as a substitute for hospital accommodation. Place of residence may be permanent or temporary. METeOR identifier: 327308.

**Inpatient:** See **admitted patient**. METeOR identifier: 268957.

**International Classification of Diseases and Related Health Conditions (ICD):** The World Health Organization's internationally accepted classification of diseases and related health conditions. The tenth revision, Australian modification (ICD-10-AM) is currently in use for admitted patients in Australian hospitals.

**length of stay:** The length of stay of an overnight patient is calculated by subtracting the date the patient is admitted from the date of separation and deducting days the patient was on leave. A same-day patient is allocated a length of stay of 1 day. METeOR identifier: 269982.

**mode of admission:** The mechanism by which a person begins an episode of admitted patient care. For example, an admitted patient transferred from another hospital or a statistical admission representing an episode type change. METeOR identifier: 269976.

**mode of separation:** Status at separation of person (that is, discharge/transfer/death) and place to which person is released (where applicable). METeOR identifier: 270094.

**patient days:** The total number of days for all patients who were admitted for an episode of admitted patient care and who separated during a specified reference period. A patient who is admitted and separated on the same day is allocated 1 patient day. METeOR identifier: 70045.

**principal diagnosis:** The diagnosis established, after study, to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care or an attendance at the health-care establishment. METeOR identifier: 514273.

**private hospital:** A privately owned and operated institution, catering for patients who are treated by a doctor of their own choice. Patients are charged fees for accommodation and other services provided by the hospital and relevant medical and paramedical practitioners. Acute care and psychiatric hospitals are included, as are private free-standing day hospital facilities. See also **establishment type**.

**public hospital:** A hospital controlled by a state or territory health authority. Public hospitals offer free diagnostic services, treatment, care and accommodation to all eligible patients. See also **establishment type**.

**residential aged care:** Residential aged care provides permanent care in residential aged care facilities for people who have frailty or disability (such as medical conditions or loss of physical, cognitive or social functioning) and can no longer be supported to live at home, as well as time-limited respite care for people still living at home.

**same-day patient:** An admitted patient who is admitted and separates on the same date.

**separation:** An episode of admitted patient care for an **admitted patient**, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). 'Separation' also means the process by which an admitted patient completes an episode of admitted patient care—either by being discharged, dying, transferring to another hospital or by changing type of care.

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# Related publications

Related reports can be downloaded free from the AIHW publications website <http://www.aihw.gov.au/publications>. The website also includes information on ordering printed copies.

The following AIHW publications relating to falls by older Australians might also be of interest:

- AIHW 2015. Musculoskeletal fact sheet: osteoarthritis. Arthritis series no. 22. Cat. no. PHE 186. Canberra: AIHW.
- AIHW: Bradley C 2013. Trends in hospitalisations due to falls by older people, Australia 1999–00 to 2010–11. Injury research and statistics no. 84. Cat. no. INJCAT 160. Canberra: AIHW.
- AIHW: Karmel R, Lloyd J & Anderson P 2008. Movement from hospital to residential aged care. Data linkage series no. 6. Cat. no. CSI 6. Canberra: AIHW.
- AIHW: Kreisfeld R, Pointer S & Bradley C 2017. Trends in hospitalisations due to falls by older people, Australia 2002–03 to 2012–13. Injury research and statistics series no. 106. Cat. no. INJCAT 182. Canberra: AIHW.
- Tovell A, Harrison JE & Pointer S 2014. Hospitalised injuries in older Australians: 2011–12. Injury research and statistics series 90. Cat. no. INJCAT 166. Canberra: AIHW.





This report focuses on trends in fall-related hospital care for people aged 65 and over from 2007–08 to 2016–17. Rates of fall-related injury increased over the period for men (3% per year) and women (2%). The rate of fall-related hip fractures decreased by 2% per year between 2007–08 and 2016–17; in contrast, falls resulting in head injuries increased at a rate of 7% per year.

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