Head injuries in Australia 2020-21

Web report | Last updated: **16 Nov 2023** | Topic: Injury | Media release

About

Every 4 minutes, someone in Australia is hospitalised for a head injury. This web report presents data on 2020–21 hospitalisations, emergency department presentations and deaths due to injuries to the head including injuries to the eye and orbit, and traumatic brain injury. It describes the main types and causes of injury, variation among specific populations, and the severity of head injuries compared with all injuries. Additionally, the report presents a 10-year time series to assess trends.

Cat. no: INJCAT 231

Findings from this report:

- Head injuries contributed to around half of all injury ED presentations and hospitalisations for children aged 0–4 years

- Sports injuries contributed to 24% of all concussive hospitalisations

- Males made up 2 in 3 head injury ED presentations and deaths

- Falls were the leading cause of head injury hospitalisation and death, followed by transport

Summary

Every four minutes, someone in Australia is hospitalised for a head injury. This report focuses on a broad range of injuries to the head alone and to both head and neck. Injuries to the eye and orbit are included, as well as Acquired Brain Injury such as Traumatic Brain Injury.

Many visits to hospitals and emergency departments (EDs) are due to a head injury. Although some head injuries are minor, serious or repeated head injuries contribute significantly to the costs of healthcare in Australia . This report presents data on head injuries that resulted in presentation to an emergency department (ED), hospitalisation or death. Additionally, in a first for the AIHW, this report examines medical cause of death free-text fields in the National Coronial Information System (NCIS).

In 2020–21, head injuries resulted in 406,000 ED presentations, 142,000 hospitalisations, and 2,400 deaths. 1,300 deaths were referred to and finalised by the coroner. Head injuries accounted for 21% of all injury ED presentations, 25% of all injury hospitalisation cases, and 17% of all injury deaths. For brevity, injury hospitalisation cases are referred to here as injury hospitalisations.

Key findings

- Males made up 2 in 3 head injury ED presentations and deaths, and 55% of head injury hospitalisations
- Some age groups are over-represented in head injury statistics
  - Children have higher rates of ED presentations for head injuries than adults. Those aged 0–4 years had the highest rate (1 per 20 population), followed by 5–14 year olds (1 per 50)
  - Head injuries contributed to around half of all injury ED presentations and hospitalisations for children aged 0–4 years
  - Australians aged 65 and over tend to have higher rates of head injury hospitalisation and death
- Aboriginal and Torres Strait Islander (First Nations) people, people living in rural and remote parts of Australia and people living in areas of greater socioeconomic disadvantage are disproportionately affected by head injuries
- Falls and transport were the top two causes for head injury hospitalisations and deaths
  - Head injuries contributed to 1 in 3 fall-related hospitalisations (33%), and more than 1 in 4 fall-related deaths (27%)
  - 63% of all transport hospitalisations in the 0–4 age group involved a head injury
- 69% of all injury hospitalisations for assault had at least one head injury
- 24% of all concussive hospitalisations were caused by sport
- Cycling was associated with the greatest number of sports-related head injury hospitalisations
- Head injury hospitalisations were more severe than total injury hospitalisations for 4 out of 5 severity measures
- Nearly a third of head injury hospitalisations involved multiple head injuries
- Open wounds were the most common type of head injury for ED presentations and hospitalisations (28% and 27% respectively)
- 1 in 5 head injury ED presentations were for injuries to the eye and orbit
- Intracranial injuries were the most common site of head injury (22%) among those hospitalised
- 69% of ED presentations for head injuries were seen within the recommended time following presentation to an ED
- 1 in 3 ED presentations for head injuries were on a weekend

Introduction

Content warning: this content contains information some readers may find distressing. If you or someone you know needs help, contact Lifeline on **13 11 14**. Go to the support services page for a list of support services.

Head injuries are a major cause of hospitalisation, disability, and death in Australia. Effects can range from temporary or short-term impacts through to permanent and severe disability or death. A head injury can encompass injuries of all severities and care requirements, ranging from a small cut to a traumatic brain injury (TBI).

Short-term effects can include loss of consciousness, amnesia, headaches, sensitivity to light and disorientation. Permanent effects include Acquired Brain Injury (ABI) in the form of changes in physical, cognitive and sensory functioning, personality, speech, behaviour, sleeping patterns, memory, seizures, and mental health (Health Direct 2021, Synapse 2023).

In this report, head injuries are broadly defined as those due to an external cause where the site of injury is the head, or both head and neck. This is different to Acquired Brain Injury (ABI) which describes disability arising from any damage to the brain that occurred after birth (AIHW 2007).

Common causes of ABI include accidents, stroke, lack of oxygen and degenerative neurological disease. A subset of ABI, Traumatic Brain Injury (TBI) involves an external assault to the head that results in damage to the brain or an alteration in brain function (Helps et al. 2008). This might result from a blow or blunt force (perhaps caused by an assault or a fall), or may be caused by rapid back and forward motion such as might be experienced in rapid or sudden deceleration (as in a motor vehicle accident).

In 2020-21, head injuries resulted in: 406,000 ED visits, 1,600 per 100,000 population. 142,000 hospitalisations, 517 per 100,000 population. 2,4000 deaths, 9.3 per 100,000 population

The impact of a head injury may extend beyond the individual, through to family and support networks as well as an increased load on the health system. Traumatic brain injuries (TBIs) alone are estimated to have a lifetime cost between $2.5 million to $4.8 million per individual (Department of Health and Aged Care 2019).

Most head injury events are preventable (AIHW 2023b). Injuries may be:

- unintentional – causes include falls, contact with objects, and transport accidents
- **intentional – caused by assault, homicide, self-harm and suicide**
- of undetermined intent.

Further details on each of these categories of injury are included in Injury in Australia.

Scope

This report presents information on the 406,000 head injury related emergency department (ED) presentations, 142,000 hospitalisations and the 2,400 deaths between 1 July 2020 to 30 June 2021. Deaths that occurred during hospitalisation may be counted in both the hospitalisations and deaths data. Deaths recorded in National Coronial Information System (NCIS) data may also be counted in the National Mortality Database (NMD) data. While the NMD includes both open and closed cases from the NCIS, analysis of the NCIS database only includes closed cases, which accounts for the smaller number of deaths among these records.

In this report, head injuries are defined as any hospitalisation or death due to an external cause where the site of injury is the head, or head and neck. Where the site of injury is only the neck, cases are excluded from this report.

Head injury hospitalisations were included if they were recorded as:

- The **principal diagnosis**. The principal diagnosis is established after study to be chiefly responsible for occasioning an episode of admitted patient care (AIHW METEOR).
- An **additional diagnosis**. Additional diagnoses are the one or more conditions or complaints either coexisting with the principal diagnosis or arising during the episode of admitted patient care (AIHW METEOR).

4 in 5 head injury hospitalisations in 2020-21 involved head injury as the principal diagnosis. The head or neck was the body part most often identified as the main site of injury in all injury hospitalisations in 2020-21 (AIHW 2023b), which to some extent probably reflects the serious nature of head and neck injuries.

This report does not include information on head injuries that did not result in an ED presentation, hospitalisation or death. There are many more cases that are treated by general practitioners, allied health professionals or outpatient clinics that are not reflected in this report. Methods for identifying and counting head injury hospitalisations and deaths are detailed in the technical notes accompanying this report.

References

AIHW (Australian Institute of Health and Welfare) (2007) _Disability in Australia: acquired brain injury_. Bulletin no. 55. Cat no. AUS 96. Canberra: AIHW.

AIHW (2023b) _Injury in Australia_, AIHW, Australian Government, accessed 6 July 2023.

DoHAC (Department of Health and Aged Care) (2019) _$50 million for traumatic brain injury medical research_, Department of Health and Aged Care, Australian Government, accessed 15 May 2023

HealthDirect (2021) _Head injuries_, HealthDirect, Australian Government, accessed 15 May 2023.

Helps Y, Henley G & Harrison JE (2008) _Hospital separations due to traumatic brain injury, Australia 2004-05_. Injury research and statistics series number 45. (Cat no. INJCAT 116) Adelaide: AIHW
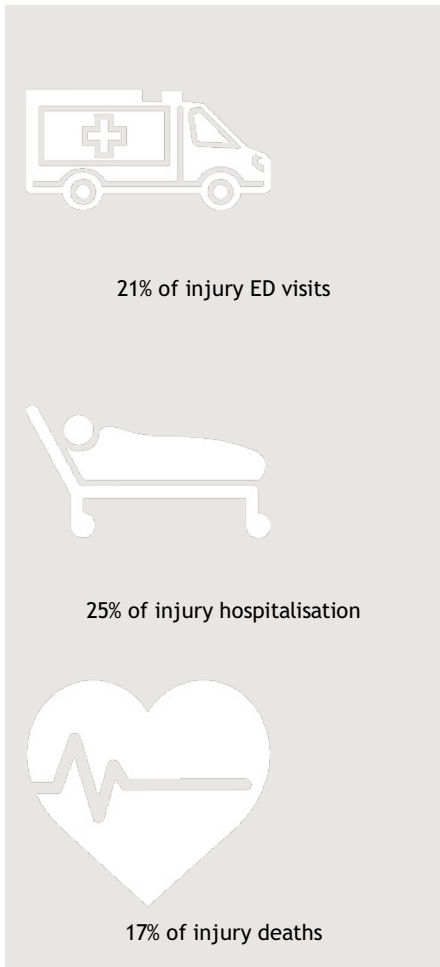
Synapse (2023) _Effects of brain injury_, Synapse, accessed 15 May 2023.
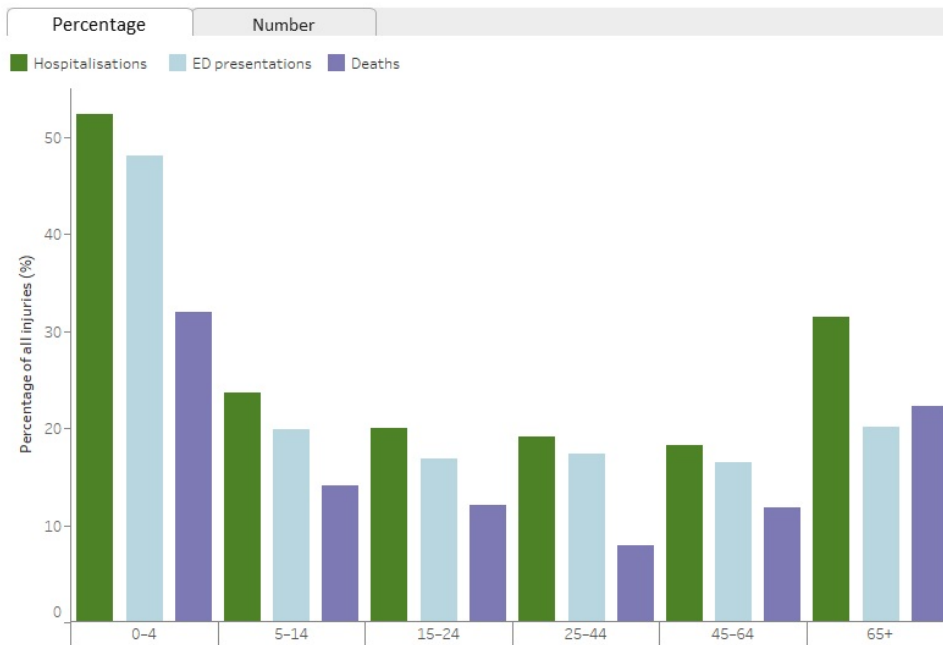

Head injuries compared with all injuries

Injuries are the sixth leading contributor to the burden of disease for Australians (AIHW 2022a). In 2020–21, head injuries contributed to:

21% of injury ED visits

25% of injury hospitalisation

17% of injury deaths

The 0–4 age group was especially afflicted by head injuries. Figure 1 shows that around half of all injury ED presentations and hospitalisations for this group were for head injuries (48% and 52% respectively). Head injuries additionally contributed to 32% of injury deaths for the 0–4 age group (AIHW 2023b).

Figure 1: Number and proportion of head injury ED presentations, hospitalisations, and deaths compared with all injuries, by age, 2020–21

The graph has 2 tabs, number and percentage of head injuries compared with all injuries for hospitalisations, ED presentations, and deaths. The graphs present data in stage-of-life age groups from age 0 to 4 up to age 65 and over. Head injuries in the 0–4 age group make up around half of all injury ED presentations and hospitalisations.

Percentage | Number

- Hospitalisations
- ED presentations
- Deaths

Percentage of all injuries (%)

50
40
30
20
10
0

0–4   5–14   15–24   25–44   45–64   65+

Sources: AIHW National Hospital Morbidity Database. AIHW Non-Admitted Patient Emergency Department Care Database. AIHW National Mortality Database.
https://www.aihw.gov.au/

Data tables

References

AIHW (2022a) *Australian Burden of Disease Study 2022*, AIHW, Australian Government, accessed 25 May 2023.

AIHW (2023b) *Injury in Australia*, AIHW, Australian Government, accessed 6 July 2023.

Variation between population groups

Head injuries do not affect all Australians equally. Populations that are more likely to have a head injury hospitalisation or death include:

- males
- 0–4 year-olds and those aged 65+
- First Nations people
- people living in rural and remote parts of Australia
- people living in areas of greater socioeconomic disadvantage.

Males are overrepresented in head injuries

Males tend to have higher numbers and rates across most age groups, cause groups, injury types, and sites of the head that are injured. In 2020–21, males contributed:

- nearly two-thirds (64%) of ED presentations and deaths due to a head injury
- 55% of head injury hospitalisations.

Females aged 75 and over had higher numbers and rates of head injury hospitalisation than their male counterparts.

### Children are more likely to present to emergency departments

The 0–4 age group had the highest rates of ED presentations for head injuries (1 per 20 population), followed by the 5–14 age group (1 per 50). This is in contrast with hospitalisations and deaths data, where Australians aged 65 and over tend to have higher rates of head injury.

Most deaths are in people aged 65 years and over

The 65 and over age group made up almost three-quarters of all head injury deaths (73%) with a rate of 42 head injury deaths per 100,000 (Figure 2). Males in this age group had the highest rate of head injury deaths (52 per 100,000).

Figure 2: ED presentations, hospitalisations, and deaths caused by head injuries, by age and sex, 2020-21

The graph has 3 tabs, one for emergency department presentations, one for hospitalisations, and one for deaths. The hospitalisations graph presents data for 5-year age groups from age 0 to 4 up to age 85 and over. The emergency department and deaths graphs present data in stage-of-life age groups from age 0 to 4 up to age 65 and over. The 0–4 age group had the highest rates of ED presentations for head injuries, while for hospitalisations it is the 85 and over age group, and for deaths the 65 and over age group. Males tend to have higher rates than females across all age groups and tabs, except for females aged 75 and over for head injury hospitalisations.
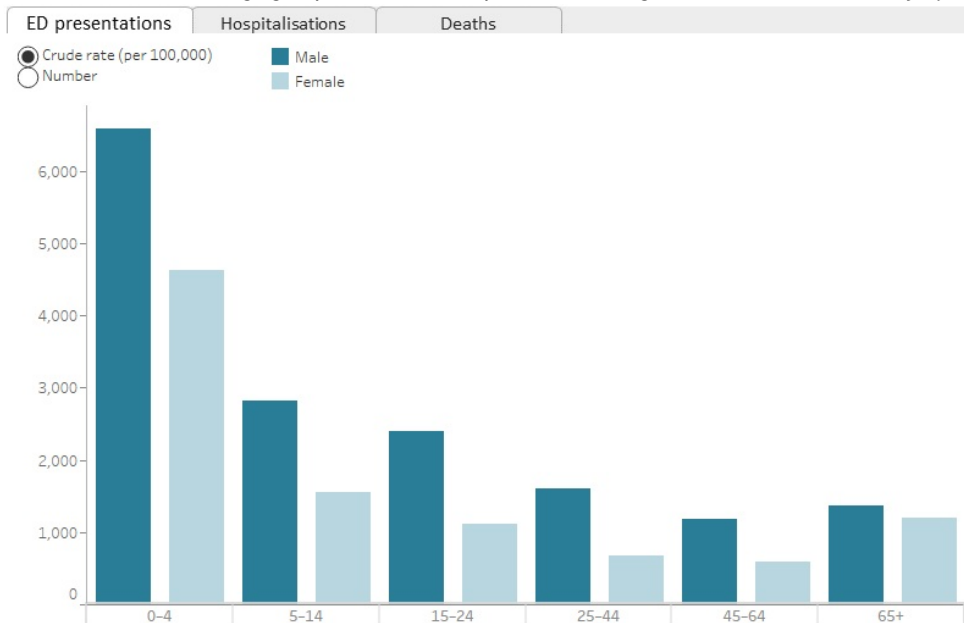
Notes: Rates are crude per 100,000
Source: AIHW Non-Admitted Patient Emergency Department Care Database
https://www.aihw.gov.au

Data tables

Priority populations

The priority populations highlight groups that disproportionately experience greater instances of and impacts from head injuries. These groups include First Nations people, people living in rural and remote parts of Australia, and people living in areas of greater socioeconomic disadvantage.

Factors that may contribute to this include:

- increased risk of suicide and self-harm (AIHW 2022c)
- reduced access to health care, including emergency services (AIHW 2022b, AIHW 2022f)
- employment in high-risk workplaces (e.g. transport and warehousing, agriculture) (SafeWork Australia 2022).
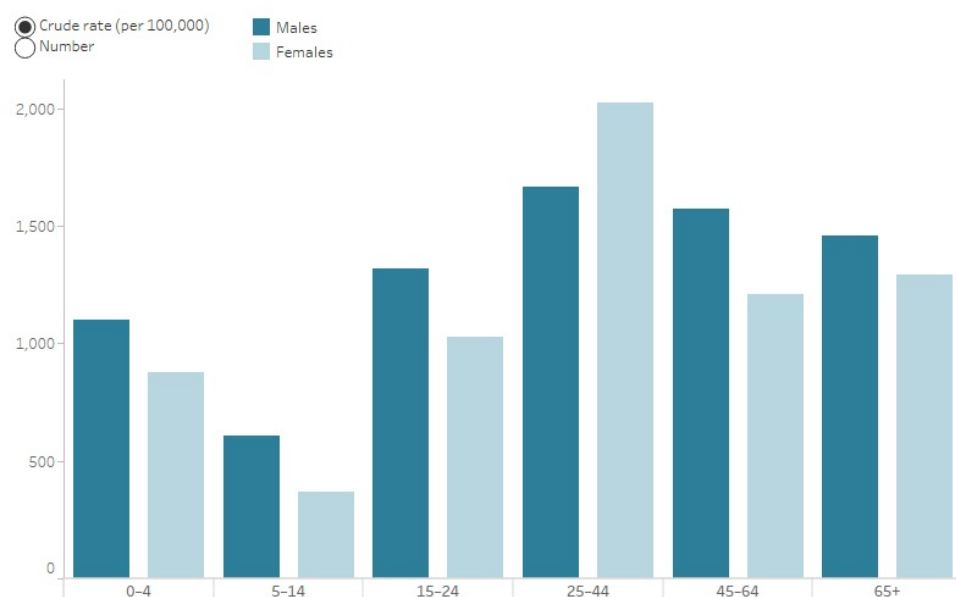
First Nations people

Injuries are the second leading contributor to the burden of disease for First Nations people (AIHW 2022b).

For head injuries in 2020-21, Figure 3 shows that among First Nations people:

- over a quarter of injury hospitalisations involved head injuries
- there were 10,600 hospitalisations due to head injuries, contributing 7% of total head injury hospitalisations
- 55% of hospitalisations were for males
- males had a higher rate of head injury hospitalisation (1,300 per 100,000 population) than females (1,200 per 100,000) and had higher rates of hospitalisation across most cause groups
- females had higher rates of head injuries for assault than males (660 and 490 per 100,000 respectively)
- those aged 25–44 had the highest rate of head injury hospitalisation (1,800 per 100,000)
- the 25–44 age group was the only group where the hospitalisation rate for females (2,000 per 100,000) was higher than the rate for males (1,700 per 100,000).

Figure 3: Number and rate of head injury hospitalisations, First Nations people, by age group and sex, 2020-21

Bar chart showing that male First Nations people have higher numbers and rates of head injury hospitalisations across all age groups except for the 25-44 age group, where females are higher.

Notes:
1. Rates are crude per 100,000 population.
2. Records where Indigenous status is missing or not stated are excluded.
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au/

Data tables

There were 65 head injury deaths among First Nations people in 2020–21 in the 5 states and territories for which data are available (New South Wales, Queensland, Western Australia, South Australia, and the Northern Territory).

Males were 2.8 times as likely to die from a head injury as females, using crude rates (13 and 4.5 per 100,000 respectively) (Table 1).

Table 1: Number and rate of head injury deaths in First Nations people by sex, 2020–21

	Males	Females	People
Number of Deaths	48	17	65
Crude Rate (per 100,000 population)	12.7	4.5	8.6
Age standardised Rate (per 100,000 population)	15.4	n.p.	10.3

n.p. Not publishable because of data volatility.

Source: AIHW National Mortality Database.

First Nations and non-Indigenous Australians hospitalisations

First Nations people were 2.8 times as likely to have a head injury hospitalisation than non-Indigenous Australians. This is slightly higher than for injury hospitalisations overall, where First Nations people were 2.1 times as likely to be hospitalised.

The disparity was largest in First Nations females who were 3.2 times as likely than non-Indigenous Australian females to be hospitalised for head injury. For First Nations males the corresponding rate was 2.5 times that of non-Indigenous Australian males.
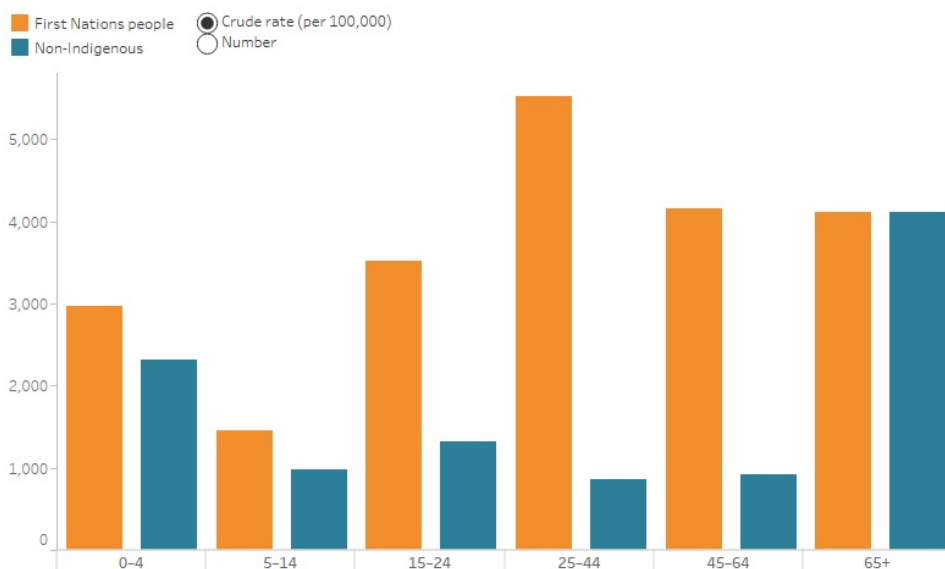
Across all age groups, First Nations people had higher rates of head injury hospitalisations than non-Indigenous Australians except for the 65 and over age group, where rates were comparable (1,400 per 100,000), shown in Figure 4.

Those aged 25–44 were particularly affected and in 2020–21 this age group:

- was 6.4 times as likely to have a head injury hospitalisation compared to non-Indigenous Australians in the same age group
- had rates of head injury caused by assault 18 times higher compared to non-Indigenous Australians
- Had rates of head injury caused by intentional self-harm 7 times higher compared to non-Indigenous Australians
- had the highest rates amongst First Nations people, (compared with being the lowest among non-Indigenous Australians).

Figure 4: Number and rate of head injury hospitalisations, by First Nations status and age group, 2020–21

Bar chart showing that First Nations people have higher numbers and rates of head injury hospitalisations across all age groups except for the 65 and over age group, where numbers are comparable with other Australians.

Notes:
1. Rates are crude per 100,000 population.
2. Records where Indigenous status is missing or not stated are excluded.
Source: AIHW National Hospital Morbidity Database.
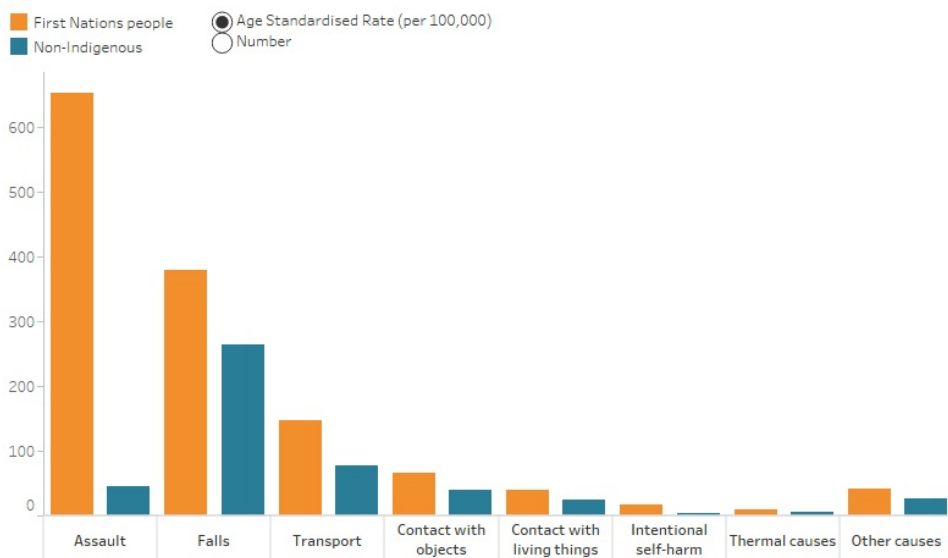https://www.aihw.gov.au/

Data tables

Across all groups of injury causes, First Nations people had higher age-standardised rates than non-Indigenous Australians (Figure 5). The causes where First Nations people most disproportionately experienced head injury hospitalisations were:

- assault (15 times more likely than non-Indigenous Australians)
- intentional self-harm (5.5 times more likely than non-Indigenous Australians).

Figure 5: Number and age-standardised rate of head injury hospitalisations, by Indigenous status and cause of injury, 2020-21

Bar chart showing that First Nations people have higher numbers and rates of head injury hospitalisations across all cause groups.

Legend: First Nations people / Non-Indigenous
Age Standardised Rate (per 100,000) / Number

Chart categories: Assault, Falls, Transport, Contact with objects, Contact with living things, Intentional self-harm, Thermal causes, Other causes

Notes:
1. Rates are age standardised per 100,000 population.
2. Records where Indigenous status is missing or not stated are excluded.
3. 'Other and unspecified' includes *Other unintentional causes, Drowning and submersion, Accidental poisoning, Choking and suffocation, Electricity and air pressure, Forces of nature, Undetermined intent* and *Overexertion*.
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au

Data tables

Remoteness

People living in *very remote* areas had over three times the rate of head injury hospitalisations as those in *major cities*, (1,600 and 490 per 100,000 population respectively) (Table 2).

Table 2: Number and age-standardised rate of head injury hospitalisations by remoteness, 2020-21

	Number of Hospitalisations	Age standardised Rate (per 100,000 population)
Major city	96,865	487
Inner regional	24,599	490
Outer regional	13,115	609
Remote	2,901	1,059
Very remote	3,105	1,597

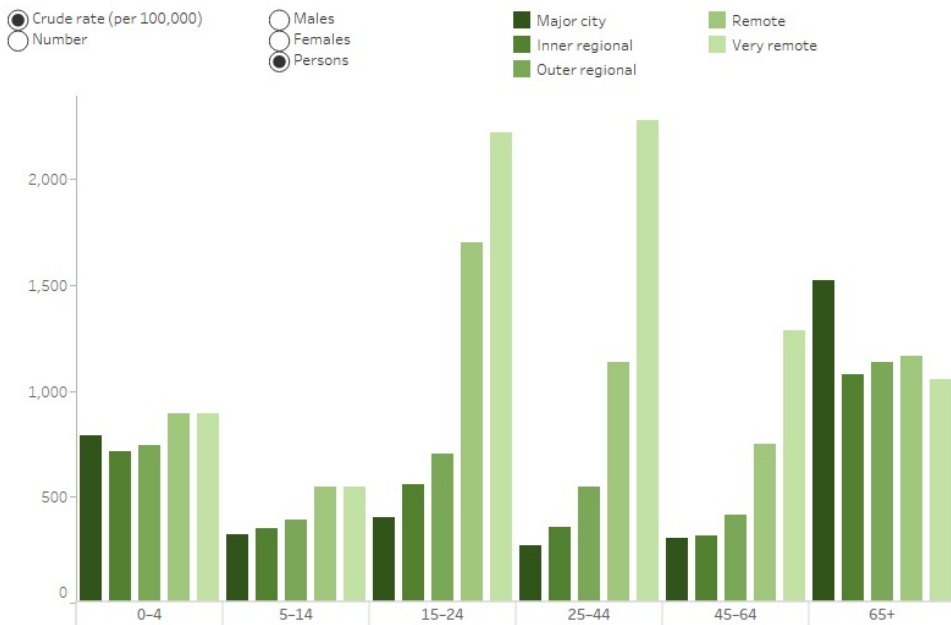Source: AIHW National Mortality Database.

Females in v*ery remote* areas were 1.3 times more likely to be hospitalised than males.

In *very remote* areas, females in the 25–44 age group had:

- the highest rate of hospitalisations, with 3 cases per 100 people
- double the rate of head injury hospitalisation compared to their male counterparts.
- rates 5.4 times higher than the national average (550 per 100,000)
- rates nearly 17 times higher than females the same age living in *Major cities*.

Figure 6: Number and rate of head injury hospitalisations, by remoteness area, age group and sex, 2020-21

Bar chart showing that numbers and rates of head injury hospitalisations are highest in remote and very remote areas across all age groups except for the 65 and over age group.

Note: Rates are crude per 100,000 population.
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au

Data tables

Head injury deaths followed the pattern of all injury deaths with a higher rate in more remote areas (AIHW 2023b). People living in *very remote* areas had the highest age-standardised rate (14 per 100,000) and were more than twice as likely to die from a head injury as those in *major cities*, who had the lowest rate (6 per 100,000) (Table 3).

Table 3: Number and age-standardised rate of head injury deaths by remoteness, 2020–21

	Number of deaths	Age standardised rate (per 100,000 population)
Major city	1,360	6.1
Inner regional	533	8.7
Outer regional	277	10.8
Remote	38	13.3
Very remote	23	13.7

Source: AIHW National Mortality Database.

Socioeconomic status

The highest number and crude rates of head injury hospitalisations were observed for people living in the lowest areas of socioeconomic status. Those in the lowest socioeconomic area were 1.1 times as likely to be hospitalised for a head injury as those in the highest socioeconomic group (580 and 515 per 100,000 respectively).

After adjusting for differences in age across populations, Australians in both the middle socioeconomic area (area 3) and the most disadvantaged (area 1) had the highest age-standardised rates of head injury hospitalisation (540 per 100,000).

Males had higher rates of hospitalisation across most socioeconomic areas and age groups except for females aged 65 and over.

References

AIHW (2022b) *Australian Burden of Disease Study: impact and causes of illness and death in Aboriginal and Torres Strait Islander people 2018*, AIHW, Australian Government, accessed 25 May 2023.

AIHW (2022c) *Deaths by suicide by remoteness areas*, AIHW, Australian Government, accessed 25 May 2023.

AIHW (2022f) *Rural and remote health*, AIHW, Australian Government, accessed 25 May 2023.

AIHW (2023b) *Injury in Australia*, AIHW, Australian Government, accessed 6 July 2023.

Safe Work Australia (2023) *Work-related fatalities*, Safe Work Australia, Australian Government, accessed 15 May 2023.

Causes of head injury

External cause relates to the circumstance in which an injury has occurred. Almost all head injury hospitalisations (over 99%) have an external cause recorded. No external cause data is available for emergency department presentations. The technical notes section of this report provides detail on how external causes are classified and counted for hospitalisations and deaths.

Falls were the most common cause of both hospitalisations and deaths from head injuries in Australia, followed by transport (Table 4).

Table 4: Top 3 causes of head injury hospitalisation and death, 2020-21

Head injury hospitalisations	%	All injury hospitalisations	%	Head injury deaths	%	All injury deaths	%
Falls	57	Falls	43	Falls	67	Falls	42
Transport	14	Contact with objects	15	Transport	12	Suicide	23
Assault	11	Transport	11	Suicide	9	Transport	10

Source: AIHW National Hospitals Morbidity Database and AIHW National Mortality Database

Head injury hospitalisations contributed to:

- 69% of assault-related injury hospitalisations
- 33% of fall-related injury hospitalisations
- 30% of transport-related injury hospitalisations (Figure 7).

Of deaths related to injury, head injuries contributed to:

- 37% of deaths caused by homicide
- around a quarter of deaths caused by falls (27%) or contact with objects (24%) (AIHW 2023b)
- 21% of deaths caused by transport.

Figure 7: Proportion of head injury hospitalisations, by cause, 2020-21

An interactive chart where users can toggle between head injury hospitalisations and deaths as a proportion of all injury hospitalisations, by cause. Assault has the highest proportion of head injury hospitalisations, followed by falls and transport.
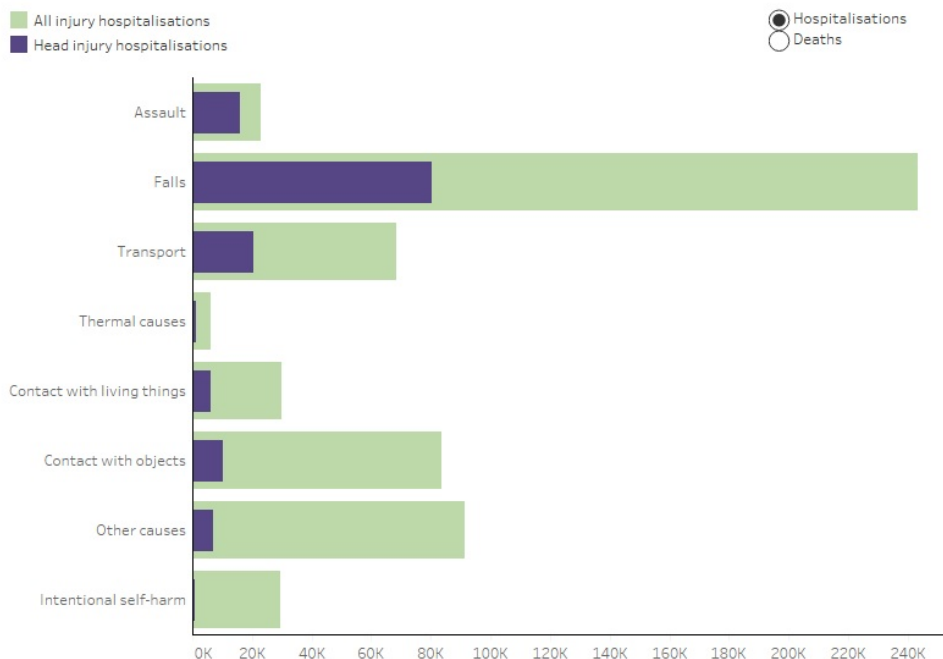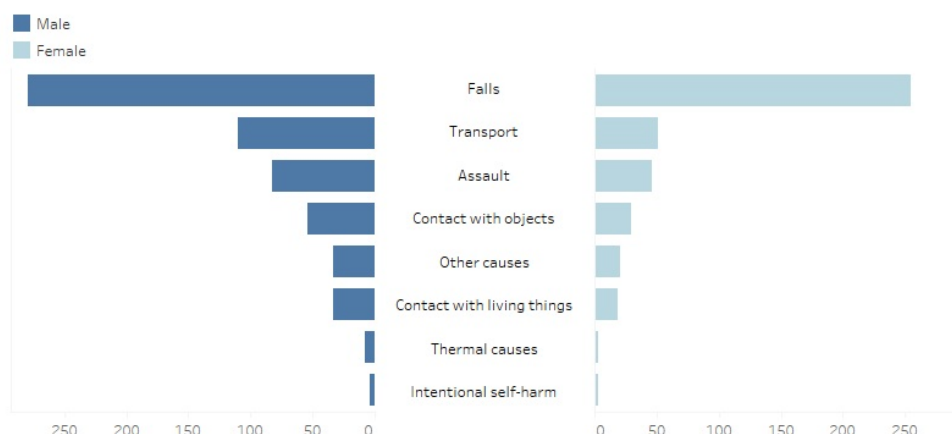

Notes:
'Other causes' includes *Other intentional causes, Drowning and submersion, Choking and suffocation, Electricity and air pressure, Forces of nature, Undetermined intent, Overexertion, and Accidental poisoning.*
Source: AIHW National Hospitals Morbidity Database
https://www.aihw.gov.au

Data tables

Males had higher age-standardised rates than females across all hospitalised injury cause groups, most notably for thermal causes (2.6 times higher) and transport (2.1 times higher) (Figure 8).

Figure 8: Age-standardised rates of head injury hospitalisations, by cause and sex, 2020-21

A hurricane chart showing that for all cause groups, males had higher age-standardised rates of head injury hospitalisation compared to females.

Notes:
1. Rates are age-standardised per 100,000 population
2. 'Other causes' includes *Drowning and submersion, Choking and suffocation, Electricity and air pressure, Forces of nature, Accidental poisoning, Undetermined intent and Overexertion.*
Source: AIHW National Hospital Morbidity Database
https://www.aihw.gov.au

Data tables

Link to downloadable data table (XLS 20.0KB)

Assault

Assault was the leading cause of injuries to the cheek and jaw. Nearly 2 in 3 (64%) of head injury hospitalisations caused by assault were for males (comparable to 62% of all injury hospitalisations).

Females were over 9 times more likely to have been assaulted by their spouse or domestic partner (22 per 100,000) compared to the rate for males with a head injury hospitalisation due to assault (2 per 100,000).

Out of the total 23,000 assault-related hospitalisations in 2020–21 head injuries were involved in:

- 4 in 5 male hospitalisations (82%) caused by *assault by bodily force*
- 78% of assault injury hospitalisations perpetrated by a person/s unknown to the victim
- 3 in 4 injury hospitalisations caused by *assault by blunt object* (77%) or *assault by unspecified means* (74%).

Falls

Falls contribute a higher proportion of head injury hospitalisations compared to overall injury hospitalisations regardless of sex.

In 2020–21:

- among females, falls contributed to 66% of head injury versus 52% of all injury hospitalisations
- among males, falls contributed to 49% of head injury versus 34% of all hospitalisations

Out of the total 243,000 fall-related hospitalisations in 2020–21:

- 0–4-year-olds were the age group with the highest proportion of head injuries (74% of the 10,300 fall-related hospitalisations)
- falls while being carried or supported by other people was the type of fall with the highest proportion of head injuries (76%).

Transport

Transport was the leading cause of head injury hospitalisation in the 15–24 age group. Males were twice as likely as females to be hospitalised for all transport related injuries, which is also reflected in head injury hospitalisations (110 and 52 cases per 100,000 respectively).

63% of all transport-related hospitalisations in the 0–4 age group involved a head injury.

References

AIHW (2023b) *Injury in Australia*, AIHW, Australian Government, accessed 6 July 2023.

Head injuries caused by sports

Sports injuries contributed to 9% of head injury hospitalisations (12,900). This represents 19% of the total number of sports injury hospitalisations in 2020–21 (AIHW 2023e).

Males were more likely than females to have a head injury as a result of sport, making up 12% of all head injury hospitalisations for males compared with 6% for females.

In 2020–21:

- cycling was related to the highest number of sports head injury hospitalisations overall (20%) and for males (24%)
- equestrian activities was the sport with the highest number of head injury hospitalisations for females (16%)
- intracranial injuries were the most common head injury caused by sports (36%).

Compared with all sports injury hospitalisations:

- Among males, 1 in 3 injuries for recreational walking were head injuries (33%)
- Around 3 in 10 injuries for hockey (29%), cycling (29%), and recreational walking (28%) were head injuries (Table 5)
- Around 1 in 4 injuries for equestrian activities (26%), surfing (26%), rugby (25%), golf (24%), and AFL (23%) were head injuries.

Table 5: Top 5 sports ranked by percentage of injuries to the head, 2020–21

	Number of head injuries	Total number of sports injuries	Head injuries as per cent (%) of sports injuries
Hockey	144	496	29
Cycling	2,803	9,774	29
Recreational walking	617	2,187	28
Surfing	299	1,138	26
Equestrian activities	670	2,584	26
Total	12,941	66,513	19

Source: AIHW National Hospital Morbidity Database.

Transport was the primary cause of head injuries from sports, making up over a third of cases (36%). This can be explained due to a similar proportion of injuries occurring in transport-based sports of cycling, wheeled motor sports, and equestrian activities (35%).

Falls (30%) and contact with living things (including people, animals and plants) (20%) were the next most common causes of head injury as a result of sport. For all sports injury hospitalisations, falls were the leading cause of injury (31%), followed by transport (24%).

References

AIHW (2023e) *Sport injury in Australia*, AIHW, Australian Government, accessed 14 June 2023.

Types of head injury

This report discusses common injury types including:

- **Fracture:** A partial or complete break in a bone
- **Soft-tissue injury:** Sprain or strain of muscles, ligaments or joints
- **Open wound:** A break in the skin such as a cut, puncture or bite
- **Intracranial injury:** inside the skull (often a concussion)
- **Dislocation:** A separation of different bones where they join
- **Superficial injury:** An injury to the skin surface such as abrasion, bruising or blistering.

The most common type of head injury for ED presentations and hospitalisations was an open wound (28% and 27% respectively). This was followed by:

- superficial injuries, and foreign object (through orifice) for ED presentations (14% and 11%)
- intracranial injuries, and fractures for hospitalisations (22% and 16%) (Table 6).

In contrast, the top three types of injuries for all injury hospitalisations and ED presentations were:

- Fractures
- Open wounds
- Soft-tissue injuries (sprains or strains of muscles, ligaments or joints).

Table 6: Top 3 specified types of head injury, 2020–21

Head injury ED presentations	%	All injury ED presentations	%	Head injury hospitalisations	%	All injury hospitalisations	%
Open wound	28	Fracture	22	Open wound	27	Fracture	38
Superficial injury	14	Open wound	17	Intracranial injury	22	Open wound	16
Foreign object (through orifice)	11	Soft-tissue	15	Fracture	16	Soft-tissue	10

Source: AIHW National Hospitals Morbidity Database and AIHW National Non-admitted Patient Emergency Department Care (NNAPEDC) Database

An *injury to the eye membrane without a foreign body* was the most common ED head injury diagnosis with a specified bodily location (19,900). For hospitalisations, it was an *open wound of the scalp* (14,000).

Types of injuries and presentation patterns changed depending on age and sex.

## Children had the highest rates of ED presentations for nearly half of all injury types

Those aged 0–4 had the highest rate of ED presentations for head injuries (5,600 per 100,000), and Figure 9 shows that they had the highest rates for:

- open wounds (2,200 per 100,000)
- other unspecified and not reported injuries (1,900 per 100,000)
- superficial injuries (930 per 100,000)
- intracranial injuries (230 per 100,000)
- burns (46 per 100,000)
- crushing injuries (14 per 100,000)

The rate of fractures, dislocations, and soft-tissue injures were all highest among 15–24-year-olds.

Figure 9: Number and rate of ED presentations and hospitalisations for head injuries, by injury type and age group, 2020-21

A stacked bar chart showing that the 0–4 age group had the highest rates of ED presentations for head injuries across open wound, superficial, intracranial, and burns. Among hospitalisations, the top types of head injuries were open wound for those aged 0–14, and 65 and over. Fracture was the top type for those aged 15–44 and intracranial injury for those aged 45–64.
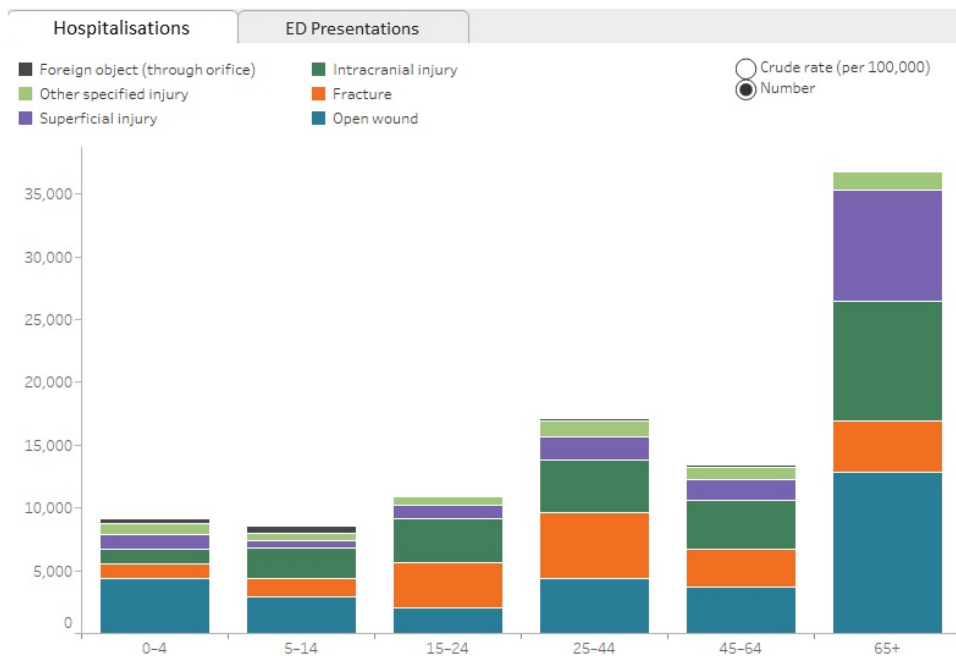
Notes:
1. Includes cases where the principal diagnosis was an in scope head injury diagnosis.
2. Rates are crude per 100,000 population.
3. 'Other specified injury' includes *Soft-tissue injury, Dislocation, Nerve injury, Burn, Amputation, Crushing injury, Blood vessels* and *Other specified and/or multiple injuries*.
4. Other unspecified and not report are excluded (17,131 cases).
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au/

Data tables

People 65 years and older had the highest rates of hospitalisation across most head injury types

The 65 and over age group were particularly prone to head injury hospitalisations involving open wounds (310 per 100,000), and had the highest rates across most other head injury types.

Notable exceptions were:

- the 15–24 age group had the highest rates of *fractures* (112 per 100,000)
- the 0–4 age group had the highest rates of *foreign object (through orifice)* injuries (25 per 100,000 population)
- the 0–4 age group had the highest rates of *dislocation* injuries (18 per 100,000 population).
- the 0–4 age group had the highest rate of *burns* (13 per 100,000 population)

Males have the highest numbers for 9 of the top 10 ED head injury diagnoses

Figure 10 shows that a *foreign body in the ear* is the only ED head injury diagnosis where females have higher numbers of presentations (6,900 and 6,600 comparatively)

For hospitalisations, females have higher numbers for:

- a *bruise to other parts of the head* (6,800 and 4,700 comparatively)
- a *bruise to the scalp* (6,000 and 4,500 comparatively).

Figure 10: Top 10 head injury diagnoses by sex, 2020-21

Butterfly chart showing that *open wound of other parts of head* was the most common diagnosis, and that overall, there were more cases in males than females. This trend was reversed *for bruise of scalp, and superficial injury of head, contusion*, where females had more cases than males.
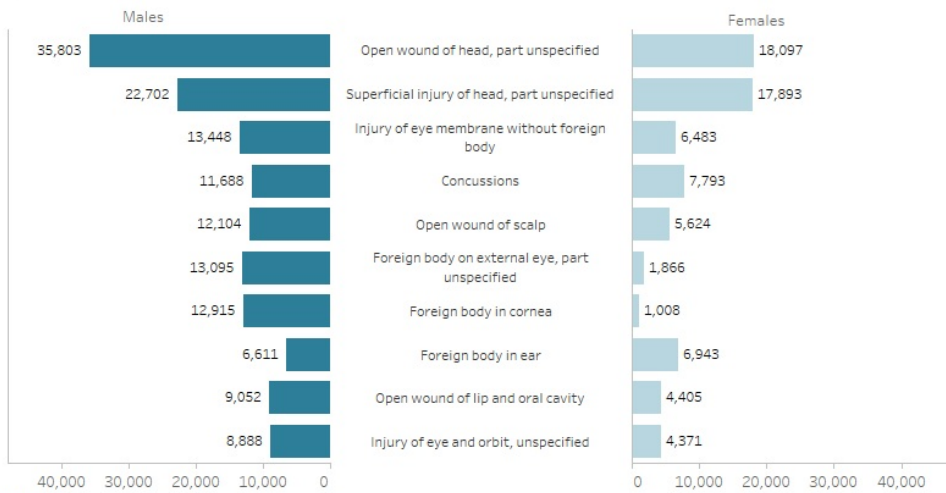
Notes:
Diagnoses use a plain English equivalent of ICD-10 descriptions. See the technical notes for more information.
Source: AIHW National Hospital Morbidity Database and AIHW National Non-admitted Patient Emergency Department Care
https://www.aihw.gov.au

Data tables

> **Concussion**
>
> Concussions are typically associated with contact sports, however they can occur in nearly every sport (AIHW 2023e). Sports injuries contributed to 3,100 hospitalisations (24%) for concussive injuries.
>
> **People under 25 made up 63% of concussion hospitalisations.**
>
> *Concussion:*
>
> - was the most common head injury for those aged 5-14 and hospitalised with a head injury (1,500 cases), and the third most common for 15–24-year-olds (1,500 cases)
> - was the third most frequent type of head injury for females presenting to ED (7,800)
> - in males presenting to the ED had 1.5 times the number of diagnoses (11,700 cases) than females
> - was among the top ten head injury diagnoses during hospitalisation for people aged under 45.

Nearly a third of head injury hospitalisations involved multiple head injuries

Multiple head injury diagnoses were more frequently recorded in:

- males (35%) compared to females (29%)
- People aged 25–44 (40%) compared with other age groups

The 65 and over age group had a higher proportion of hospitalisations with multiple head injuries compared to the 0–4 age group (30% and 22% respectively).

Males and females see similar drop-off rates in the number of head injury diagnoses (Figure 11).

Falls caused over half of hospitalisations with multiple head injuries

Out of all causes of head injury hospitalisations:

- falls had the largest number of hospitalisations with multiple head injury diagnosis (24,700)
- transport and assault had the highest average number of head injury diagnoses per hospitalisation (1.9)
- nearly half of assaults (49%) resulting in head injury hospitalisations had multiple head injury diagnoses recorded.

Figure 11: Number of head injury diagnosis by sex, 2020-21

Stacked bar chart showing that for both males and females, the most common number of head injury diagnoses was one.

Number of head injury diagnoses:
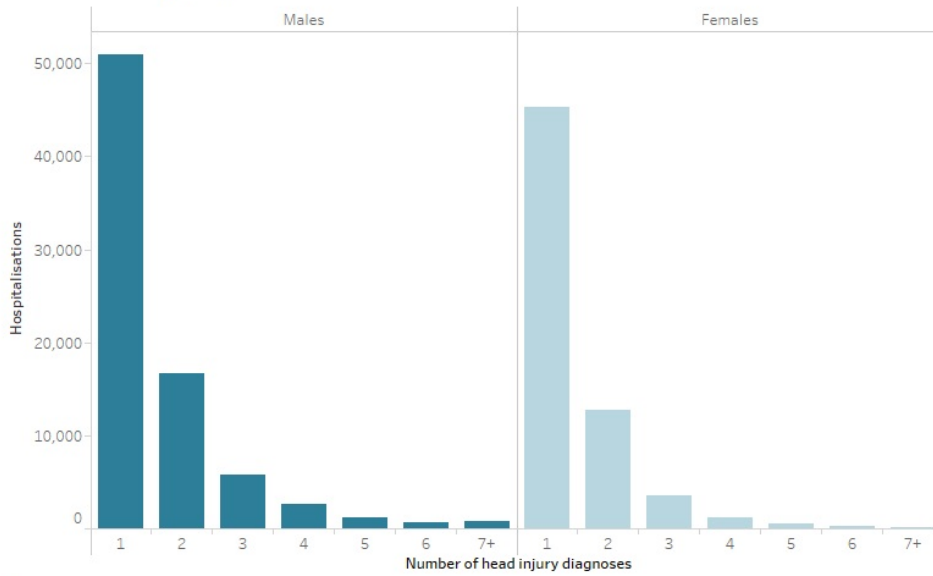
Notes:
Source: AIHW National Hospital Morbidity Database
https://www.aihw.gov.au

Data tables

References

AIHW (2023e) *Sport injury in Australia*, AIHW, Australian Government, accessed 14 June 2023.

Site of head injury

The *eye and orbit* was the leading specified site of injury (79,700), making up 1 in 5 head injury presentations to ED (Table 7). Among hospitalisations, *intracranial injuries* were the most common (24,700, 22%).

Table 7: Top 3 specified sites of head injury, 2020–21

| Head injury hospitalisations	n	%	Head injury ED presentations	n	%
Intracranial	24,693	22	Eye and orbit	79,694	20
Scalp and skull	14,878	13	Intracranial	32,858	8
Eye and orbit	10,225	9	Scalp and skull	22,657	6

Sources: AIHW National Hospital Morbidity Database and AIHW National Non-admitted Patient Emergency Department Care (NNAPEDC) Database

Males made up nearly three-quarters of cheek and jaw injury hospitalisations (73%), and around 60% of intracranial, nose, or ear injuries.

Click the interactive head display in Figure 12 to explore the top causes and injury types by site of head injury.

Figure 12: Number of ED presentations and hospitalisations for head injuries, by site of injury, 2020–21
An interactive head visualisation showing that the leading specified sites of head injuries was the eye and orbit for ED presentations, and intracranial injuries for hospitalisations.
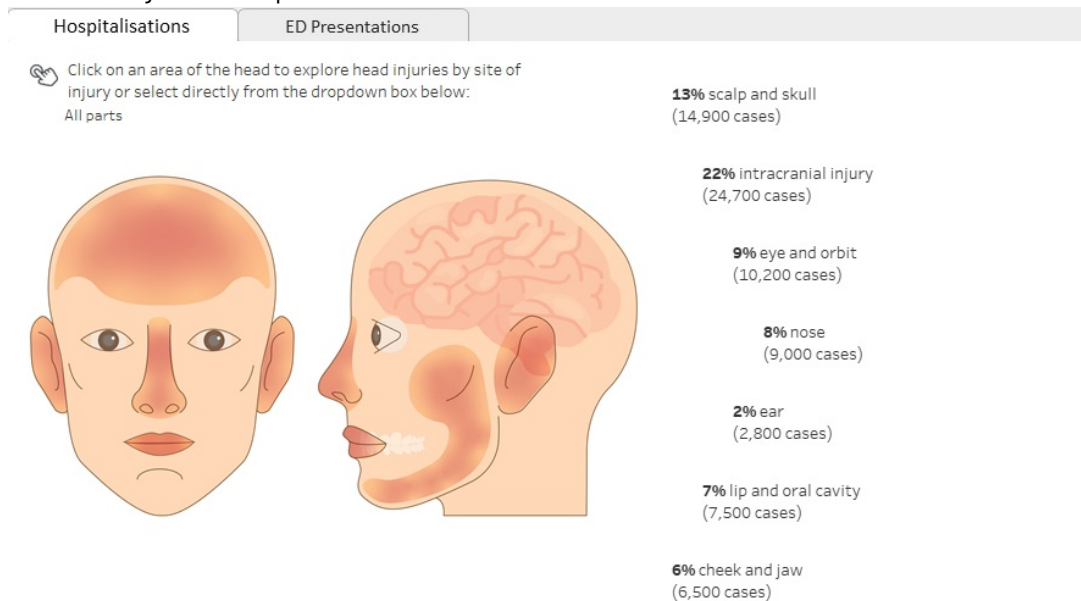
Notes:
Includes cases only where the principal diagnosis was an in scope head injury diagnosis and excludes the Other, multiple and incompletely specified head regions (33%, 37,800 cases).
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au

Data tables

Site of head injuries by age and sex

Age and sex have distinct differences across injury sites.

The 65 and over group had the highest rates of injury involving the:

- *scalp and skull*
- *eye and orbit*
- *intracranial injuries*
- *nose* (Figure 13).

The 0–4 age group had the highest rates for injuries to the *lip and oral cavity* and *ear,* and the 15–24 age group had the highest rates for injuries to the *cheek and jaw.*

The *scalp and skull* is the only head injury where females have a slightly higher rate than males.

Figure 13: Numbers and rates of head injuries as principal diagnoses for hospitalisations by site of injury and sex, 2020-21

A bar graph showing the rates and numbers for males and females across head injury site. The 65 and over age group has the highest rates for most head injury sites.
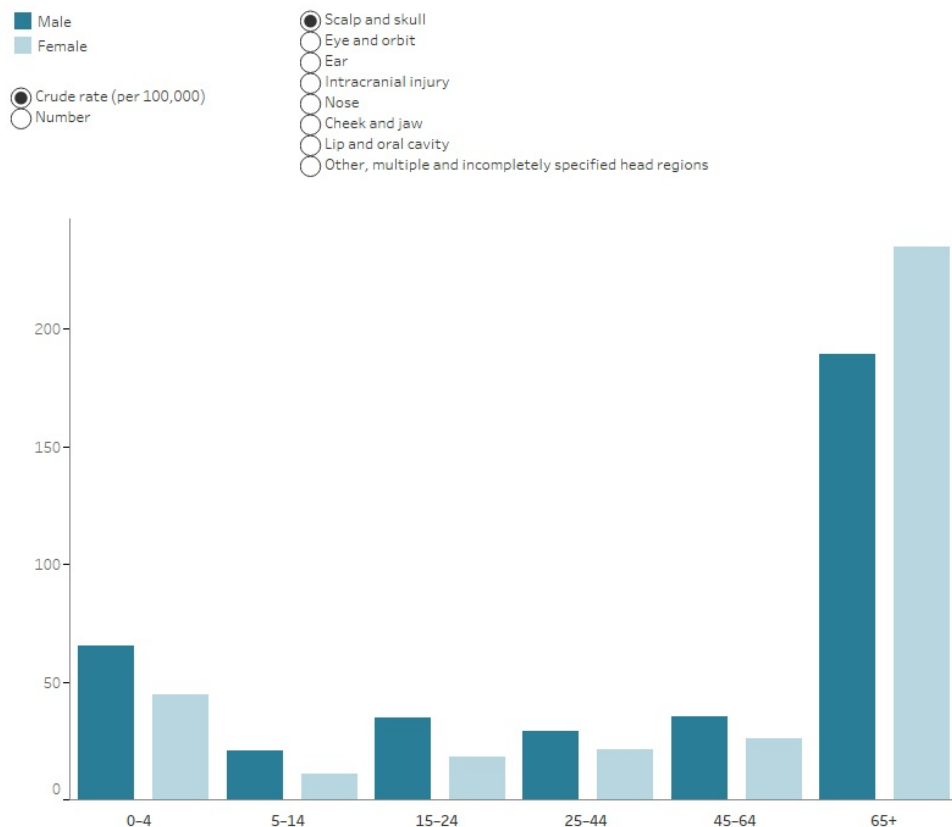
Notes:
1. Rates are crude per 100,000 population
2. Includes cases only where the principal diagnosis was an in scope head injury diagnosis
Source: AIHW National Hospital Morbidity Database
https://aihw.gov.au

Data tables

Diagnoses per hospitalisation

The *cheek and jaw* had the highest number of head injury diagnoses per hospitalisation, with an average of 2.1 diagnoses per hospitalisation (Table 8). This was followed by *intracranial* injuries (2.0). *Cheek and jaw* injuries also had the highest average number of procedures per hospitalisation (2.3).

Table 8: Average number of head injury principal diagnoses and procedures, by site of head injury 2020-21

	Head diagnoses per hospitalisation	Procedures per hospitalisation
Cheek and jaw	2.1	2.3
Intracranial injury	2.0	2.1
Nose	1.6	1.7
Eye and orbit	1.5	1.5
Scalp and skull	1.4	1.3
Lip and oral cavity	1.4	2.1
Other, multiple and incompletely specified head regions	1.4	0.9
Ear	1.2	1.9
Total	1.6	1.5

Source: AIHW National Hospital Morbidity Database.

Place of occurrence

**The home was the most common place where head injuries occurred**

About 74% (105,200) of head injury hospitalisations had a place of occurrence listed. Of these, nearly half occurred in the home (46%) with 48,500 hospitalisations, followed by the road (15%) and in aged care facilities (13%) (Figure 14).

Males and females had some differences in place of occurrence, including:

- a higher proportion of head injuries for males occurred on the *road* (13%) compared to females (8.3%)
- females had a higher proportion of head injuries occurring in *aged care facilities* (13%) than males (6.5%), although this might reflect the fact that there are nearly twice as many females in aged care facilities as males (AIHW 2023d)
- females had a higher proportion of head injuries occur in the *home* (41%) than males (29%).

Figure 14: Number and percentage of head injury hospitalisations by place of occurrence and sex, 2020-21

Stacked bar graph showing the top specified place of occurrence for head injury hospitalisations was the home. For males this was followed by the road, and for females, aged care facilities.
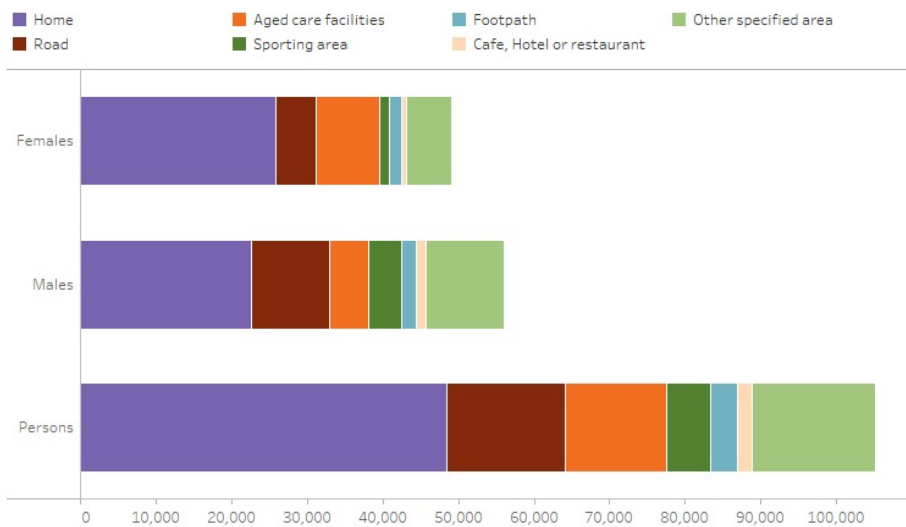
Notes:
1. 'Other specified area' includes *Farm, Health service area, Industrial and construction, Other residential institution, Other school or public institution, Other specified, Other trade or service area* and *Shop.*
2. 'Home' includes *Driveway, Outdoor areas, Garage, Bathroom, Kitchen, Bedroom, Laundry, Indoor living areas* and *Other and unspecified in the home.*
3. Unspecific place of occurrence (37,152 cases, 26%) is excluded.
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au/

Data tables

References

AIHW (2023d) *Older Australians*, AIHW, Australian Government, accessed 18 August 2023.

Severity

There are many ways the severity, or seriousness, of an injury can be measured. Measures that may indicate the severity of an injury are:

- ED triage categories and waiting times
- patient's status at end of ED episode and urgency of hospital admission
- length of stay in hospital
- time in intensive care unit (ICU) and receipt of continuous ventilator support (CVS)
- deaths in hospital
- numbers and types of injuries and procedures.

ED triage categories and waiting times

Every presentation to an ED is assigned 1 of 5 triage categories based on the urgency with which the patient requires medical care. Each category has a clinically appropriate waiting time cut-off between the patient being triaged and seen for medical assessment (NSW Health 2022). Based on these waiting time cut-offs, 69% of ED presentations for head injuries were seen within recommended time limits. (Table 9).

Table 9: Number of ED presentations for head injuries, by triage category, 2020–21

Triage category	Clinically appropriate waiting time cut-off	Presentations	Percentage (%) of head injuries	Percentage (%) seen on time
Resuscitation	Immediate (within seconds)	3,058	0.8	99.7
Emergency	Within 10 minutes	34,638	9	70.8
Urgent	Within 30 minutes	143,550	35	62.4
Semi-urgent	Within 60 minutes	197,577	49	70.3
Non-urgent	Within 120 minutes	27,037	7	84.1
Total	Total	405,866	100	68.7

Source: AIHW National Non-admitted Patient Emergency Department Care (NNAPEDC) Database

In 2020–21:

- Just under half of ED presentations for head injuries were triaged as *Semi-urgent* (49%).
- the 0–4 age group made up a quarter of *semi-urgent* cases (25%) (Figure 15).
- over half of cases in the 65 and over age group were triaged as *Urgent* (51%)
- Nearly a quarter of cases had a waiting time over one hour
- Almost a third (31%) of ED presentations for head injuries were attended to within 10 minutes.

Figure 15: Number of ED presentations for head injuries, by triage category and age group, 2020-21

A stacked bar chart showing the proportion age groups make up for each triage category. The 25–44 age group makes up the largest proportion of presentations across all triage categories except for semi-urgent, where the 0–4 age group has 25% of cases.
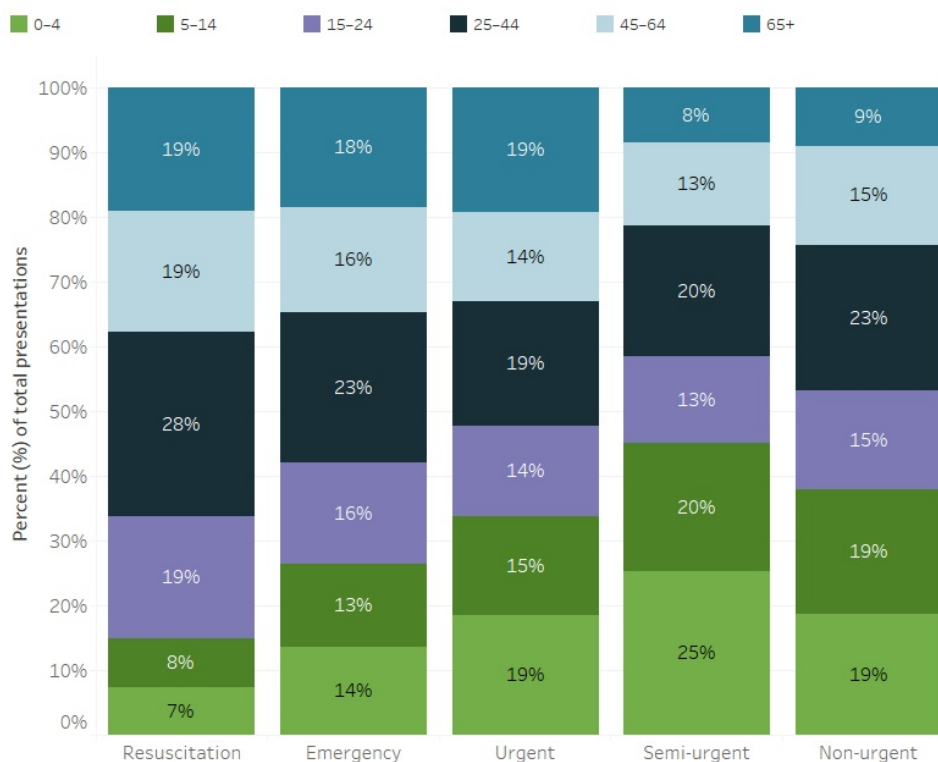
Data tables

Compared to all injury ED presentations, head injuries saw a higher proportion of cases classified as *Urgent* (27% and 35% respectively), and a lower proportion of cases classified as *Semi-urgent* (53% and 49% respectively) or *Non-urgent* (11% and 7% respectively). Proportions for *Resuscitation* and *Emergency* are comparable.

ED end status and urgency of hospital admission

Most ED presentations for head injuries had an end status of *departed without being admitted or referred to another hospital* (83%).

- 58,400 presentations resulted in being *admitted to hospital* (14%), with an additional 1.2% referred to another hospital for admission.
- Presentations for those aged 65 and over made up over a third of cases *admitted to hospital* (37%), with a proportion 2.5 times greater than the population at large.
- Compared with all injury ED presentation, head injuries saw a slightly lower proportion of patients *admitted to hospital* (17% and 14% respectively) and slightly higher proportion of patients who *departed without being admitted or referred to another hospital* (81% and 83% respectively).

Concussive injuries were most likely to be admitted to hospital

17% of concussive injuries were triaged as either *Resuscitation* or *Emergency*, nearly double the proportion for all head injuries (9%). Of the top 5 ED head injury diagnoses, *concussive injuries* had the highest proportion of cases *admitted to hospital* (29%).

Head injury hospitalisations were generally more severe than total injuries

For 2020–21 hospitalisations, head injury hospitalisations were more severe compared with total injuries for all measures apart from average length of stay (AIHW 2023b). Head injuries representing an additional diagnosis had hospitalisations that were severe than where head injury was the primary diagnosis for all measures apart from in-hospital deaths (Table 10).

Table 10: Severity of head injury hospitalisations by diagnosis, and all injury hospitalisations, 2020–21

	Principal diagnosis of head injury	*Additional* diagnosis of head injury	All injuries
Average length of stay (days)	3.2	6.6	4.4
Percentage (%) with time in ICU	2.2	6.0	2.2
Percentage (%) with time on CVS	1.7	3.3	1.2
Percentage (%) with urgent admission	89	98	80
Deaths in hospital (per 1,000 cases)	10.2	9.4	5.3

Intracranial injuries were the most severe head injury across all five measures of severity (Figure 16).

Figure 16: Hospitalisations: severity of head injury by injury site, 2020-21

An interactive dashboard comparing head injury hospitalisation measures of severity against all injury hospitalisations. All five measures of severity show that intracranial injuries are the most severe out of all head injury sites.

Head injury hospitalisations are generally more severe compared to all injury hospitalisations

Click to explore each severity measure

92% of head injuries had an emergency admission

Head injuries had an average length of stay of 3.9 days

3.0% of head injuries spent time in the ICU

2.0% of head injuries spent time on CVS

Head injuries had **10.0** in-hospital deaths per 1000

Notes:

1. Breakdown by head injury site only includes cases where the principal diagnosis was an in-scope head injury diagnosis.
2. Approved level 3 adult ICU, NICU or an approved paediatric ICU.

Source: AIHW National Hospital Morbidity Database.

Data tables

References

AIHW (2023b) *Injury in Australia*, AIHW, Australian Government, accessed 6 July 2023.

NSW Health (New South Wales Health) (2022) *Hospital triage*, NSW Health, NSW State Government, accessed 13 July 2023.

Numbers and types of injuries and procedures

The *cheek and jaw* had the highest number of head injury diagnoses per hospitalisation, with an average of 2.1 diagnoses per hospitalisation (Table 11). This was followed by *intracranial* injuries (2.0). *Cheek and jaw* injuries also had the highest average number of procedures per hospitalisation (2.3).

Table 11: Average number of head injury diagnoses and procedures, by head site of injury 2020–21

	Head diagnoses per hospitalisation	Procedures per hospitalisation
Cheek and jaw	2.1	2.3
Intracranial injury	2.0	2.1
Nose	1.6	1.7
Eye and orbit	1.5	1.5
Scalp and skull	1.4	1.3
Lip and oral cavity	1.4	2.1
Other, multiple and incompletely specified head regions	1.4	0.9
Ear	1.2	1.9
Total	1.6	1.5

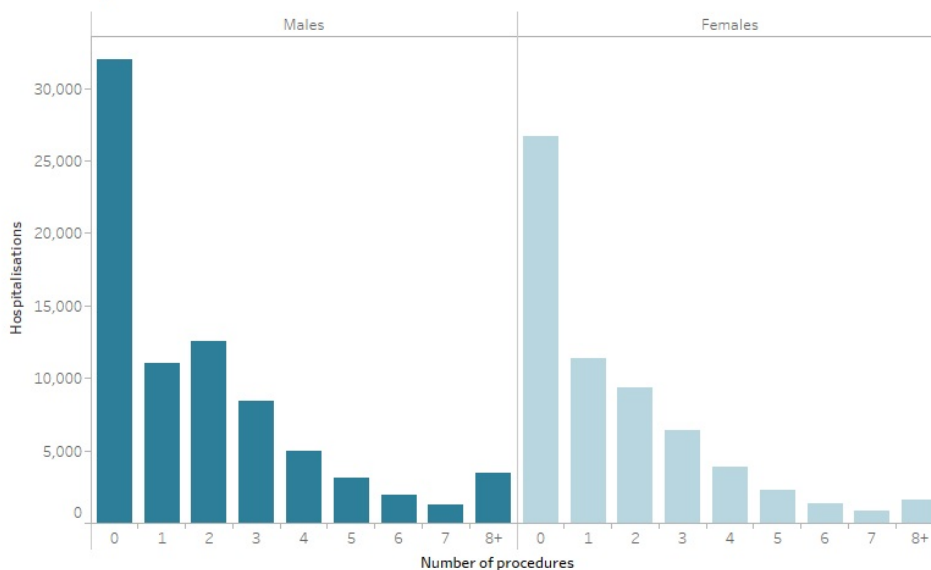Source: AIHW National Hospital Morbidity Database.

267,000 procedures were conducted for 142,000 head injury hospitalisations during 2020-21 – approximately 2 procedures per hospitalisation. A person can have multiple procedures during their hospital stay:

- 43% of cases (61,300) had multiple recorded procedures
- just over 2 in 5 head injury hospitalisations (41%) did not have any procedure carried out (Figure 17). Most of these were for same-day discharges – short stays in hospital less than a day (66%).

Figure 17: Number of head injury hospitalisation procedures by sex, 2020-21

Stacked bar chart showing that for both males and females, the most common number of head injury procedures was zero.

Number of procedures:

Notes:
A hospitalisation can have multiple procedures, therefore the procedures count may be greater than the hospitalisations count.
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au

Data tables

As the number of head injury diagnoses increased, the proportion of hospitalisations requiring multiple procedures also increased. Over half of hospitalisations with more than two head injuries required multiple procedures. This increased to 88% in cases with 6 or more head injuries.

Nerve injuries had the greatest proportion of hospitalisations requiring more than one procedure (85%), with over a quarter of nerve injuries requiring 11 or more procedures (25%).
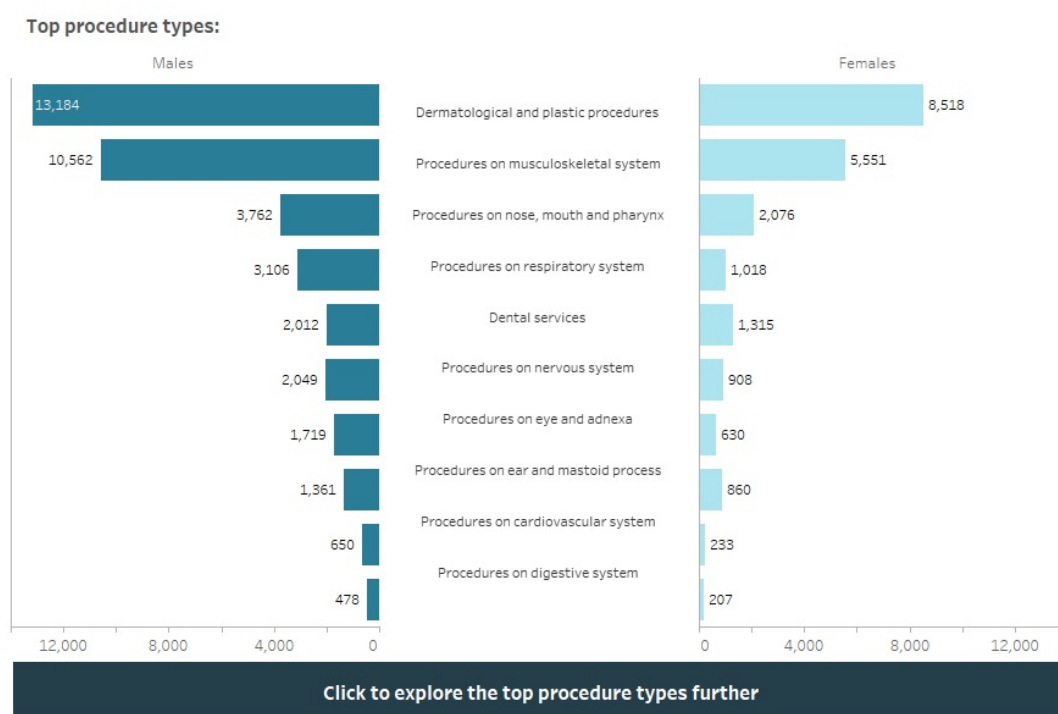
Types of procedures

The top classified procedure type was *Dermatological and plastic procedures* (Figure 18). However, most procedures for head injury hospitalisations are grouped under *Interventions, not elsewhere classified* (69%). These broad procedure types were most commonly differentiated into the following blocks:

- *generalised allied health interventions* (mainly physiotherapy), recorded in 39% of hospitalisations (55,700) representing 49% of procedures (131,000)
- *cerebral anaesthesia* (31,400 hospitalisations and 34,100 procedures)
- *repair of wound to skin structures* (14,700 hospitalisations and 15,500 procedures).

Figure 18: Top 10 head injury hospitalisation procedure types by sex, 2020-21

An interactive chart illustrating the top procedure types, and top procedure blocks within each type. Butterfly chart showing the top 10 procedure types, and that *dermatological and plastic procedures* was the top procedure type for males and females. Males had more procedures than females across all procedure types.

Top procedure types:

Males	Procedure type	Females
13,184	Dermatological and plastic procedures	8,518
10,562	Procedures on musculoskeletal system	5,551
3,762	Procedures on nose, mouth and pharynx	2,076
3,106	Procedures on respiratory system	1,018
2,012	Dental services	1,315
2,049	Procedures on nervous system	908
1,719	Procedures on eye and adnexa	630
1,361	Procedures on ear and mastoid process	860
650	Procedures on cardiovascular system	233
478	Procedures on digestive system	207

Click to explore the top procedure types further

Notes: A hospitalisation can have multiple procedures, therefore the procedures count may be greater than the hospitalisations count.
Source: AIHW National Hospital Morbidity Database.
http://www.aihw.gov.au

When do head injuries present?

1 in 3 ED presentations were on a weekend | 15% of ED visits were between 6-8pm

Presentation time

The busiest time for head injury presentations to EDs was between 6:00 to 7:59pm (15%) and the quietest was 4:00 to 5:59am (1.7%).

7.4% presentations occurred between midnight and 6am, and of these 34% were aged 25-44 and 22% aged 15-24 years.

Figure 19 shows the most common presentation days and times for head injury ED presentations.

Presentation day

Relatively more ED presentations occurred over weekends. Saturday was the busiest day, with 68,500 presentations (16.9%). Those aged 15-24 were 1.8 times more likely to present with a head injury on a Saturday compared with a Thursday (21% and 12% respectively) The 65 and over age group saw the least variation in cases across the week.

Figure 19: Number of head injury ED presentations by day and time, 2020-21

A heat map showing that the most common presentation time and day to the ED for a head injury was on Saturday afternoons between 4:00pm and 5:59pm (20,252 cases).
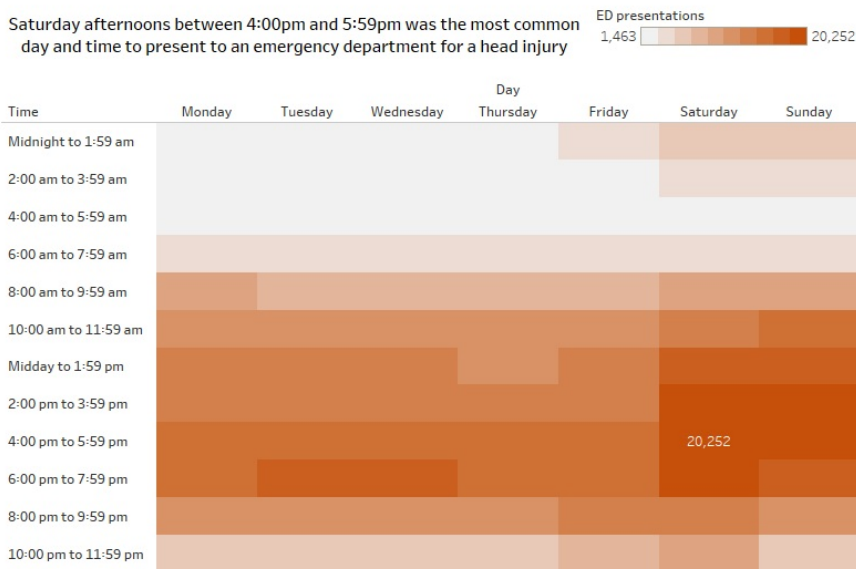
Notes:
Source: AIHW National Non-Admitted Patient Emergency Department Care Database
https://www.aihw.gov.au

Data tables

Seasonality

Head injuries demonstrate similar patterns of seasonality compared with all injuries. Explore the interactive display as part of Injury in Australia. Causes of injury such as assault exhibit significant seasonality, with hospitalisations peaking in December each year.

Intracranial injuries exhibit the most seasonality for head injuries, with ED presentations peaking between March and June. This potentially coincides with the start of rugby and football seasons.

Head injuries over the past decade

This section compares hospitalisations data over time and includes the first 16 months of the COVID-19 pandemic. The effect of the COVID-19 pandemic on the data is considered in the underlined technical notes of this report.

Hospitalisation data are divided into two distinct time periods: 2011-12 to 2016-17 and 2017-18 and 2020-21. Comparisons of hospitalisations data between these two time periods is not recommended due to a change in data collection methods between 2016-17 and 2017-18 (see technical notes for more details). Comparisons presented here are for within each of the two time periods.

Figure 20 shows that the number and rate of head injury hospitalisations continues to increase over time. Between 2017-18 and 2020-21, the rate of head injury hospitalisations has increased by an average of 1.4% each year.

Following a decline in 2019-20 (likely due to the impacts of COVID-19), age-standardised rates of head injury hospitalisations in 2020-21 increased by 6.7%. Males had a greater increase (7.1%) than females (6.2%).

Deaths have remained fairly steady over time, with an average annual increase of 0.4% since 2011-12. Males demonstrate a slight decreasing trend in age standardised rates from 2016-17, however this increased back to similar baseline levels in 2020-21.

Over time, the gap between male and female rates of head injury hospitalisations has decreased. In 2011-12, males were 1.7 times more likely to have a head injury hospitalisation than females, while in 2020-21, this has reduced to 1.4 times. This can be explained in part by the larger increase in the average annual increase in hospitalisations between 2017-18 and 2020-21 for females (2%) compared with 0.9% for males.

Figure 20: Age-standardised rate and number of head injury hospitalisations, by sex, 2011-12 to 2020-21

Line chart showing change in the number and rate of head injury hospitalisations over the ten financial years since 2011-12. Decreased numbers can be seen in 2019-2020, followed by a 6.7% increase in 2020-21.
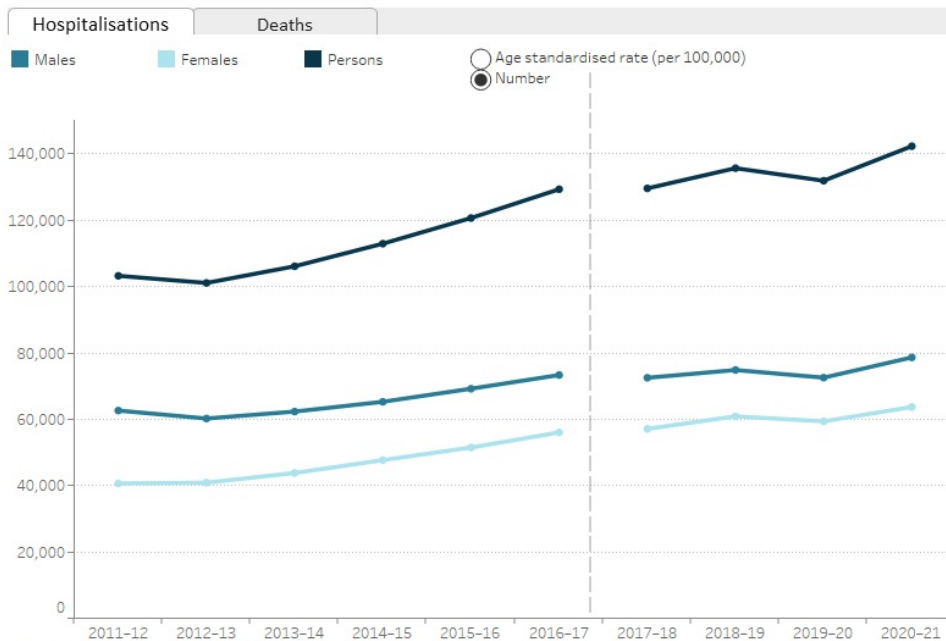
Note: Break in series between 2016-17 and 2017-18. See technical notes for discussion.
Source: AIHW National Hospital Morbidity Database.
https://www.aihw.gov.au/

Data tables

Deaths referred to the coroner

In 2020–21, there were 2,400 head injury deaths recorded in the AIHW National Mortality Database (NMD). There were 1,300 finalised records of deaths that were referred to the coroner in the National Coronial Information System (NCIS), which may or may not also be included as head injury deaths in the NMD. These NCIS deaths only include closed cases, where the coronial investigation has been completed and cause of death established.

A death is usually referred to a coroner if the death:

- is unexpected
- is caused by an accident or injury
- occurred while in care or custody
- is healthcare related
- is for a person with an unknown identity (NCIS 2023)

Injury deaths make up a large proportion of deaths referred to the coroner. In 2019, the NCIS reported that 43.5% of reportable deaths were caused by an injury (NCIS 2022). In 2020–21, 70% of all injury deaths in the NMD were referred to the coroner. This is substantially higher than the proportion of all deaths referred to the coroner, which the ABS estimates to be between 11-14% (ABS 2023), meaning that injury deaths are much more likely to receive a coronial investigation than other causes of death.

Variation by age and sex

Of the 1,300 head injury deaths referred to the coroner in 2020–21:

- 2 in 3 were male (66.6%)
- most (65%) were aged 65 and over (Figure 21).

Figure 21: NCIS head injury deaths, by age group and sex, 2020-21

A chart showing that the 65 and over age group had the highest numbers of head injury deaths, and that males have higher numbers than females across all age groups except for the 0–14 age group where numbers are similar.
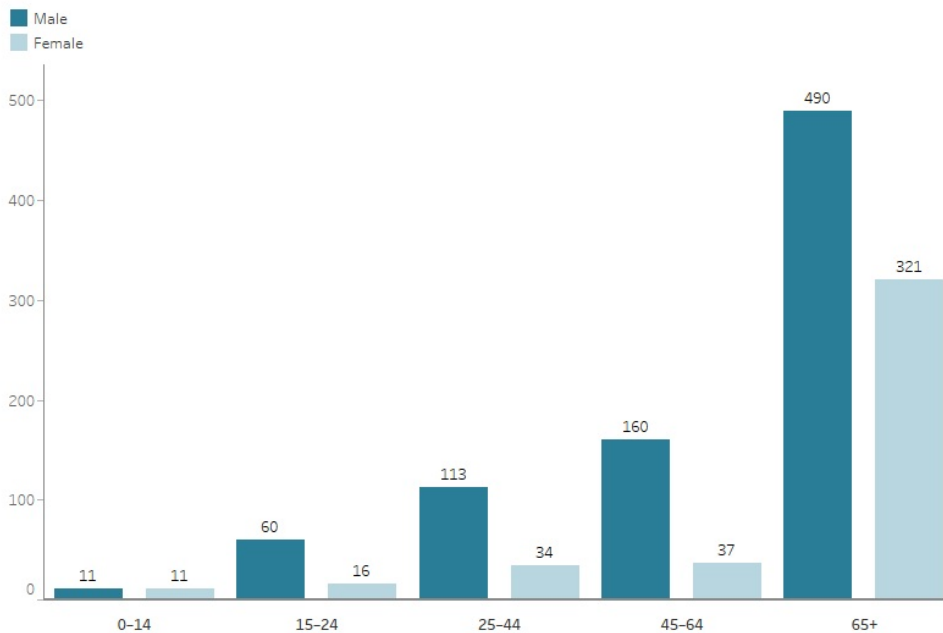
Data tables

Intracranial bleeds were the most frequently reported cause of death

Among deaths with recorded ICD-10 head injuries, the most common head injury diagnosis was *traumatic subdural haemorrhage* (425). This was followed by *unspecified injury of head* (330) and *other intracranial injuries* (145).

Among all deaths, the most common terms used in the cause of death fields after head (724) and injury (690) were:

- fall (419)

- intracranial bleed (340)
- elderly (134) (Figure 22).

This text analysis reinforces that head injury deaths disproportionately affect older Australians, and that falls are the most common cause of injury death among people aged 65 and over in Australia (AIHW 2022e).

**Figure 22: Word cloud of most frequent terms used in the NCIS medical cause of death fields, 2020-21**
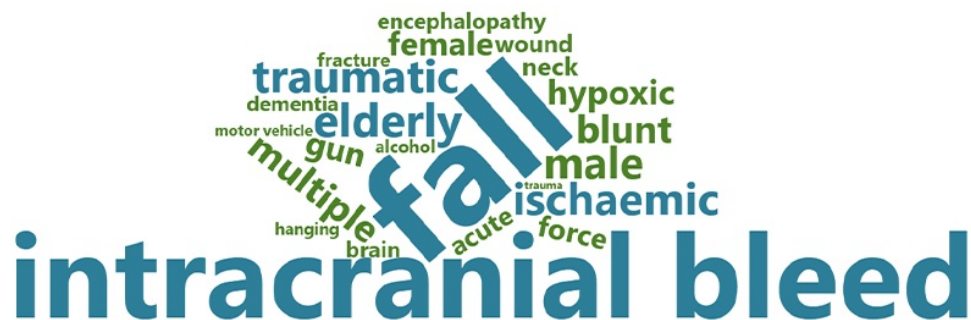
Alcohol was also mentioned 50 times, indicating that intoxication may have been partially responsible for those head injury deaths. This is consistent with the findings for all alcohol-related injury hospitalisations and deaths, where the head and neck are the most common body parts injured (AIHW 2023a).

Place of death and place of incident causing death may differ

The most frequent places where incidents causing death occurred were the *home* (50%), *medical service areas* (22%) and *transport areas* (15%) (Figure 23).

Over half (51%) of head injury deaths did not occur at the same location as the incident that caused death. The most frequent place where deaths occurred were *medical service areas* (73%).

Figure 23: NCIS head injury deaths, by place of fatal incident and death occurrence, 2020-21
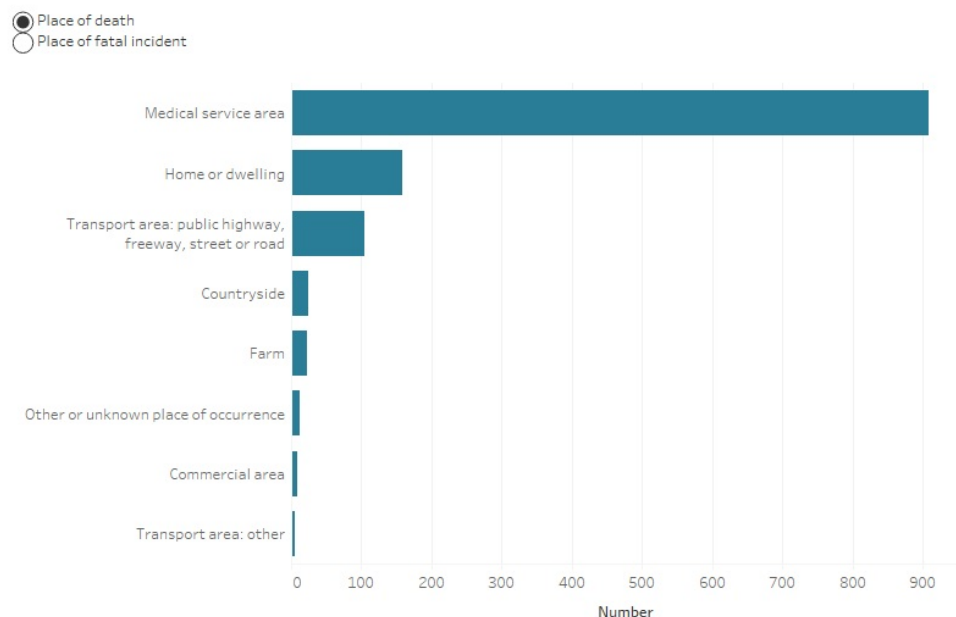
Notes:
a. 'Other or unknown place of occurrence' includes school, education area, sports and athletics area, wharf, pier, jetty, bridge, overpass, aircraft, watercraft, land vehicle, boat ramp, and unlikely to be known.
b. 'Transport area: other' includes parking area, airport, aerodrome, public transport station/facilities, railway, airstrip, helipad, bus stop, taxi rank, loading bay, dock, and other specified or unspecified transport area.
c. Place of death excludes recreational area, cultural area, or public building, and residential institution area due to small or suppressed numbers.
Source: National Coronial Information System.
https://www.aihw.gov.au

Data tables

Blunt force was the most common primary mechanism

Over 4 in 5 head injury deaths had blunt force as their primary mechanism of fatal injury (81%). Of these:

- 740 cases (73%) were aged 65 and over
- males made up 640 cases (63%)
- 89% of female deaths and 77% of male deaths were attributed to blunt force

The 65 and over age group had the highest number of deaths across all primary mechanism groups, except for threat to breathing, where the 25-44 had the highest number.

Primary mechanism can be further differentiated into specific mechanism. In 2020-21, the leading specific mechanisms of fatal injury were (Figure 24):

- contact with static, stationary object (61%), of which the most common objects were:
    1. floor or related fitting/feature (45%)
    2. unspecified object (25%)
    3. ground surface (18%).
- vehicle occupant (9.4%)
- shot by firearm, gun (>7%).

Figure 24: NCIS head injury deaths, by specific mechanism, 2020-21

A bar chart showing that the most common specific mechanism is contact with static, stationary object, making up over 60% of NCIS deaths.
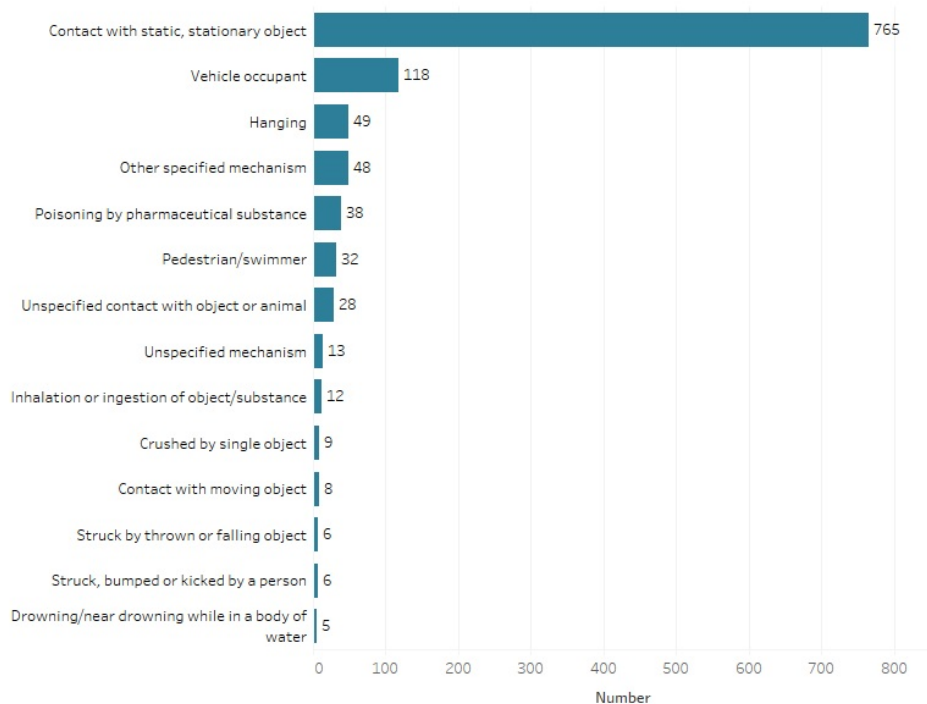
Notes:
a. For 'Other specified mechanism' inclusions, see data table F9.
b. Excludes shot by firearm, gun and motoryclist/motorcycle rider due to small or suppressed numbers.
Source: National Coronial Information System.
https://www.aihw.gov.au

In some cases, the cause of death can be attributed to a specific object or substance that produced the injury. In 2020-21:

- 399 deaths were caused by building components or fittings (floors, walls, stairs etc)
- 180 deaths were caused by a land vehicle or land transport
- 96 deaths were caused by a weapon, which can include firearms, sharp objects, and combat weapons. People aged 45 and over made up 77% of these cases.

Most deaths were unintentional

Over 4 in 5 head injury deaths were unintentional (84%). The second highest proportion of head injury deaths were due to suicide (14%) which was 7.2 times more common in males than females (151 and 21 deaths respectively).

Suicide

170 head injury deaths were attributed to suicide. This represents 5.5% of the total injury suicide deaths recorded in 2020-21 (AIHW 2023c).

Males have consistently made up the majority of suicide deaths in Australia (AIHW 2023). Head injury deaths by suicide have a higher proportion of males (88%) compared with all injuries (76%).

Suicides due to head injuries differ by mechanism between males and females, with:

- firearms being used in over half of male suicides (58%)
- hanging as the most common mechanism for females (52%).

This differs from all suicide deaths, where hanging is the leading mechanism for both males and females (AIHW 2022d). Ambiguity in classifying hanging as a suicide caused by a head injury (hypoxic brain injury) could explain this difference.

Transport

180 head injury deaths were caused by transport. Patterns in age and sex are very similar to all injury deaths caused by transport (AIHW 2023):

- males made up over three-quarters of head injury and all injury deaths (77% each)
- the 25–44 age group made up over a quarter of deaths (27% and 28% respectively)

Children and young adults are disproportionately affected by transport deaths. A land vehicle or land transport caused 64% of deaths in the 0–14 age group, and 59% of deaths in the 15–24 age group.

In 2020–21:

- Light transport vehicles were the most common mode of transport (45%).
- 2 in 3 deaths occurred when the person was the driver, rider or operator of the vehicle
- 30% of deaths were a result of the vehicle colliding with a fixed or stationary object

Activity

Over a quarter of fatal injuries occurred while the person was undertaking a vital personal activity (27%), which includes sleeping, eating, showering, and walking (Figure 25). This was followed by being taken care of (23%).

In 2020–21:

- 1 in 3 females were being taken care of (33%)
- 1 in 4 males were undertaking a vital personal activity (25%)
- being taken care of was the leading activity during injury for the 65 and over age group (34%).

Figure 25: NCIS head injury deaths, by activity and sex, 2020-21

A bar chart showing that the most common activity for males at the time of the head injury-related fatal incident was a vital personal activity, and for females, being taken care of. Males had higher numbers than females across all activity groups except for leisure, play, sports and exercise, and paid work, where a sex breakdown is unavailable.
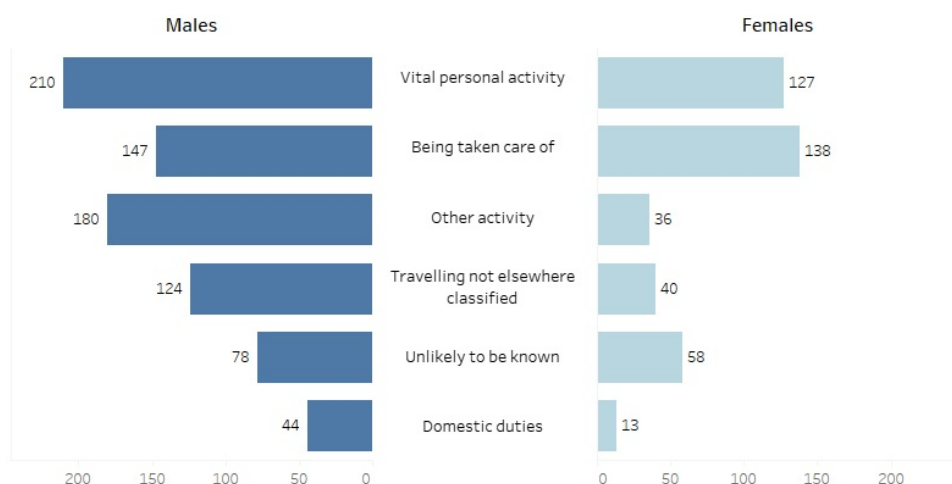
Notes:
Excludes leisure, play, sports and exercise, and paid work as breakdown by sex is unavailable due to small numbers.
Source: National Coronial Information System.
https://www.aihw.gov.au

Data tables

References

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Technical notes

Introduction

This report counts and describes injury cases that result in hospital admission, presentation to the emergency department, and/or death.

Our counting method is different to some other AIHW reporting (such as MyHospitals), where each use of a service may be counted rather than each incident. A single incident can lead to more than one use of a service. Our exclusion method minimises the associated double counting but does not eliminate it.

If a person dies from an injury after being admitted to hospital, both the hospitalisation and the death were counted for this report.

Injury hospitalisations

The terms 'injury hospitalisation', 'hospitalised injury' and 'hospitalised case' in this report refer to incidents where a person was admitted to hospital with injury as the main reason, an injury case. If a single incident led to an admission in more than one hospital, the incident has only been counted once.

Exclusions

To minimise double-counting of hospitalisations for injuries, we have excluded admissions that are transfers from another hospital and admissions with rehabilitation procedures (except for acute hospital admissions).

Injuries caused by complications of surgery or other medical care, or injuries that are a subsequent condition caused by a previous injury, are not included in this report.

Date of admission versus separation

The seasonal differences figures and tables in this report were based on date of admission data, to approximate the dates of the injuries leading to hospitalisations. All other annual totals were based on year of separation. Separation does not necessarily occur in the same month (or year) as admission. Partly because of this, summing the counts in the seasonal differences tables would produce slightly different numbers than the annual totals. Also, the admission counts were adjusted to suit comparison between months of different length.

Injury emergency department presentations

Emergency department (ED) care is a form of non-admitted hospital care and is different to a hospitalisation which involves an admission to hospital. While emergency department presentation records have many of the same fields as hospital records, there are key differences in the way they are structured.

A notable difference in ED records compared with hospitalisations and deaths, is the lack of external cause data. External cause and related data on the injury include details such as place of occurrence, mechanism of the injury, activity being undertaken at the time, intent and perpetrator. Additionally, there are unique variables only found within ED records such as triage category and waiting time that cannot be compared against hospitalisations and deaths.

Injury deaths

Death records have many of the same fields as hospital records and emergency department presentations, however there are differences in the way they are structured.

It is not always possible to determine the main cause of death when multiple causes are involved. For this reason, a different selection criterion must be applied to reasonably identify where injuries played a role. As a result, each death where injury played a role has been counted once in the total for this report, but in some cases counted in more than one injury cause category.

To understand the analysis in more detail, please find below:

- Head injury hospitalisations in Australia, 2020–21: about the data
- Head injury emergency department presentations in Australia, 2020–21: about the data
- Head injury deaths in Australia, 2020–21: about the data
- Appendix tables specifying the ICD-10 codes used for each cause category

Technical notes

Head injury hospitalisations in Australia, 2020–21: about the data

This report aims to count and describe incidents of injuries to the head that lead to hospital admission, classified by cause.

For ease of reading, in this report, cases of hospitalisation for injury are referred to as 'head injury hospitalisations'. However, throughout this technical note we have referred to a 'case' of hospitalisation for injury. This is deliberate to differentiate our count of injury hospitalisations from the usual counting unit for hospital patients which is a 'separation'. A single incident of injury may result in multiple consecutive hospital separations, which we count as one 'case' of hospitalisation for injury to represent the one incident of injury.

A person may have more than one incident of injury resulting in hospitalisation in a financial year and each case of hospitalisation will be counted separately in this report. This is because we are counting incidents of injury resulting in hospitalisation, rather than the number of people who were hospitalised due to injury, in a given financial year.

Scope

The aim of this report is to count and describe the number of head injury hospitalisations in Australia from 1 July 2020 to 30 June 2021, inclusive. In all cases, patients had a head injury diagnosis code (as either a principal or additional diagnosis) in their hospitalisation record.

Only a small proportion of all incidents of injury result in admission to a hospital. For each admission, many more people with injuries are treated in an emergency department but not admitted, or visit a general practitioner rather than a hospital. A larger number of minor injuries do not receive any medical treatment. A smaller number of severe injuries that result in death do not include a stay in hospital but are captured in mortality data. Where a hospitalisation for injury resulted in death, the case will be counted both in hospitalisations and deaths data.

Head injury cases account for a quarter of hospitalised injury cases. The head or neck was the body part most often identified as the main site of injury in all injury hospitalisations in 2020–21 (AIHW 2023), which to some extent probably reflects the serious nature of head and neck injuries.

This document covers:

- definitions and classifications used
- presentation of data in this report
- analysis methods.

Data sources

The data on hospitalised injuries are from the Australian Institute of Health and Welfare's (AIHW) National Hospital Morbidity Database (NHMD). The NHMD is effectively considered to contain the complete picture of acute injuries that result in hospital admission across Australia. Comprehensive information on the quality of data is available on the AIHW MyHospitals website.

Admitted patient care data

In the NHMD, records are presented by hospital *separations* (discharges, transfers, deaths, or changes in care type) by time period. Records from any selected period will include data on patients who were admitted before that period— if they separated during that period. A record is included for each separation, not each patient, so patients who separated more than once in the period will have more than one record.

Patient days is the number of days between the separation date and date of admission, not including any hospital leave days. Patient day statistics can provide information on hospital activity that, unlike separation statistics, accounts for differences in length of stay.

It is expected that patient days for patients who separated in 2020–21, but who were admitted before 1 July 2020, will be counterbalanced overall by the patient days for patients in hospital on 30 June 2021 who will separate in future reporting periods.

Estimated resident populations

All populations are based on the estimated resident population (ERP) or Indigenous projected population as at 30 June immediately prior to the reporting period (that is, for the reporting period 2020–21, the population at 30 June 2020 is used). The population is used as the denominator for age-specific and age-standardised rates.

The ERP as at 30 June 2001 is used as the standardising population throughout the report (ABS 2003).

The COVID-19 pandemic and resulting Australian Government closure of the international border from 20 March 2020 disrupted the usual Australian population trends. The ERP for 30 June 2020, used in this report, reflects this disruption.

All population data are sourced from the Australian Bureau of Statistics (ABS) as follows:

- General populations are from <u>National, state and territory population</u>
- Indigenous populations are from Estimates and Projections, Aboriginal and Torres Strait Islander Australians (ABS 2019)
- Remoteness populations (available on request from ABS)
- Socio-Economic Indexes For Areas (SEIFA) Index of Relative Socio-Economic Disadvantage (IRSD) quintile populations are from AIHW analysis of Census of Population and Housing: Socio-Economic Indexes for Areas (ABS 2018) and <u>Regional population</u>.

Estimating cases of injury

This report estimates the number of incidents of head injuries that lead to hospitalisation. This is less than the number of injury-related records in the NHMD.

Each record in the NHMD refers to a single episode of care in a hospital. Some injury incidents result in more than one episode of care and, hence, more than one record.

This can occur in 2 main ways:

- a person is admitted to one hospital, then transferred to another or has a change in care type (for example, from acute to rehabilitation) within the same hospital
- a person has an episode of 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 another.

The NHMD does not allow for the identification of multiple separations belonging to the same instance of injury. This means there is the potential for overcounting injury events if we are simply counting the number of injury separations. To minimise this, the mode of admission is taken into account. Separations with a mode of admission of *transferred from another hospital* (1) are excluded from injury case counts. This is because separations of this type (transfers) are likely to have been preceded by another separation that met the case selection criteria. Similarly, separations where the mode of admission is *statistical admission – episode type change* (2) and the care type is not listed as acute (1, 7.1, 7.2), are also excluded as they are likely to have been preceded by an acute episode of care that met the case selection criteria.

When deriving average length of stay, however the patient days from all applicable separations, regardless of admission mode, are included in the totals for the numerator. See the 'Length of stay' section for more information.

This process should largely correct for overestimation of cases due to transfers (both internal and external) but will not correct for overestimation due to re-admissions.

Selection criteria

The following criteria were used to estimate numbers of cases of head injury hospitalisations in Australia, by cause of injury.

Period

Selection was based on the financial year of separation, from 1 July 2020 to 30 June 2021.

Standard separations

Standard separations were included, that is records were excluded where the care type was *newborn with unqualified days only* (7.3), *organ procurement - posthumous* (9), or *hospital boarder* (10).

Head injury

For the purposes of this report, head injury cases are defined as records meeting either of the criteria below:

1. **principal diagnosis** in the ICD-10-AM range S00–S09, T00.0, T01.0, T02.0, T03.0, T04.0, T06.0, T15, T16, T20, T26, T33.0, T34.0, T35.2 using 'Chapter 19 Injury, poisoning and certain other consequences of external causes'. **or**
2. **additional diagnosis** in the ICD-10-AM range S00–S09, T00.0, T01.0, T02.0, T03.0, T04.0, T06.0, T15, T16, T20, T26, T33.0, T34.0, T35.2.

This scope excludes injuries due to *Complications of surgical and medical care* (T80 – T88) and *Sequelae of injuries, of poisoning and of other consequences of external causes* (T90 – T98).

Records where *Care involving use of rehabilitation procedures* (Z50) has been coded in any additional diagnosis field are excluded from this analysis, except if the care type for the separation was acute. Nearly all injury separations are thought to be included in the data reported, representing minimal risk of counting error.

External causes

The external cause classification (Chapter 20 of ICD-10-AM) consists of 3-character category codes in the range of U50–Y98 (including place of occurrence and activity when injured).

The NHMD is structured so that the first listed external cause for a record relates to the first listed injury diagnosis.

While multiple external causes may be recorded for a separation, we report only one cause for each injury, referred to as 'nominal external cause' in these notes. The following steps are followed to determine the nominal external cause for each injury hospitalisation:

1. The first reported external cause is taken to be the nominal external cause
2. If the nominal external cause, as determined by step 1, is U90.0 (*Staphylococcus aureus*) or a *supplementary factor* (Y90–Y98), then the second reported code is taken to be the nominal external cause
3. If the nominal external cause, after steps 1 and 2, relates to *complications of medical and surgical care* (Y40–Y84), *sequelae of external causes of morbidity and mortality* (Y85–Y89), or a *supplementary factor* code (Y90–Y98), then the record is excluded.

A new cause code, *Exposure to or contact with allergens* (Y37) was introduced in the 11th edition of ICD-10-AM. Aside from *Allergy to animals* (Y37.6), cases where Y37 is the first reported external cause code are excluded from this report.

Principal diagnosis analysis

The hospitalisations analysed within this report may have had a head injury diagnosis as their principal diagnosis or as an additional diagnosis. Some sections of the report can only include analysis cases with head injury as the principal diagnosis due to the structure of the dataset.

Injury type, body location of injury, and external cause are three variables that have principal and additional codes. The principal diagnosis is mapped to the principal injury type, body location and external cause. However additional injury types, body locations and external causes cannot be linked with other additional diagnoses. For these variables, the report typically only analyses based on principal diagnosis. Consequently, statistics obtained for these variables are likely to be underreporting the true number of relevant hospitalisations.

External cause is treated slightly differently, in that the external cause is analysed for both principal and additional diagnoses. Given the likelihood of the principal external cause code being responsible for causing both principal and additional diagnoses, it was decided that including both types of diagnoses would still be representative of the true causes of head injuries.

The three fictional examples below show how these inclusion criteria are expressed in this project under different circumstances.

Example 1: Kai's story

Kai had a fall from a bike. Their friend drove Kai to hospital, where they were admitted with a principal diagnosis of a *concussion* (S06.00). Kai also had an additional diagnosis of an *abrasion of forearm* (S50.81).

In this report, deidentified data about Kai's hospitalisation would be included under the principal diagnosis of head injury. Information about the principal diagnosis would be included in analysis of injury type, body location, and external cause. *Pedal cyclist injured in noncollision transport accident* (V18) could be used for the external cause code (dependent on individual hospital clinical coders). Kai's forearm injury is not counted as an additional diagnosis within this report, as it is not a head injury.

Example 2: Brian's story

Brian was at a swimming hole with some friends, when he dove into a shallow region of water and hurt his neck. An ambulance was called, and Brian was admitted with a principal diagnosis of a *traumatic rupture of the cervical intervertebral disc* (S13.0). Brian also had an additional diagnosis of an *open wound to the scalp* (S01.0).

In this report, deidentified data about Brian's story would be included despite the principal spine injury diagnosis, because of the additional head injury diagnosis. Information about Brian would be excluded from analysis of injury type and body location of injury. *Diving or jumping into water striking or hitting bottom* (W16.0) could be used for the external cause code (dependent on individual hospital clinical coders). Brian's spine injury principal diagnosis is not analysed within the report, as it is not a head injury.

Example 3: Leanne's story

Leanne was working on scaffolding when she fell from a height. Having sustained multiple injuries, Leanne was transported to hospital by ambulance and was admitted with the principal diagnosis of a *fractured parietal bone* (S02.0). Leanne also had an additional diagnosis of a *fractured mandible* (S02.6), and *an open wound of the head communicating with a fracture* (S01.81).

In this report, deidentified data about Leanne's hospitalisation would be included under a principal head injury diagnosis. Information about the principal diagnosis would be included in analysis of injury type, body location, and external cause. *Fall on and from scaffolding* (W12) could be used for the external cause code (dependent on individual hospital clinical coders). While Leanne's additional diagnoses are head injury diagnoses, these are only included for analysis for total diagnoses counts, and are not counted as cases under the additional diagnoses since the principal diagnosis takes precedence.

Presentation of data

Due to rounding, percentages in tables may not add up to 100.0. Percentages and rates reported as 0.0 or 0 usually indicate a zero.

Body part and injury type are derived from the principal diagnosis of the case. The sum of injuries by body part may not equal the total number of hospitalised injury cases because some injuries are not described in terms of body region.

Head location, body part and injury type analysis are only included where there is a head injury code as the principal diagnosis.

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 are included in the totals.

Suppression of data

The AIHW operates under a strict privacy policy based on Section 29 of the *Australian Institute of Health and Welfare Act 1987* (AIHW Act). Section 29 requires that confidentiality of data relating to persons (living and deceased) and organisations be maintained. The *Privacy Act 1988* (Privacy Act) governs confidentiality of information about living individuals.

The AIHW is committed to reporting that maximises the value of information released for users while being statistically reliable and meeting legislative requirements described in the *AIHW Act* and the *Privacy Act*.

Data (cells) in tables may be suppressed to maintain the privacy or confidentiality of a person or organisation, or because a proportion, rate (numerator or denominator) or other measure is related to a small number of events (and may therefore not be reliable). Data may also be suppressed to avoid attribute disclosure. The abbreviation 'n.p.' (not published) has been used in tables to denote these suppressions. In these tables, the suppressed information is included in the totals.

Analysis methods

Scale up factor for bimonthly admission data

The NHMD is structured by date of hospital separation (discharge, transfer, death or change in care type). This means, for example, that records are included in the 2020–21 NHMD if the date of hospital separation is in the period 1 July 2020 to 30 June 2021. Therefore, some records will be admitted in one financial year, but not reported until a future financial year, when the hospital separation is complete. This particularly affects records with an admission date in mid to late June. This is not considered an issue when reporting total injury cases for the year, as it is expected that admissions not yet separated at the end of the year are counterbalanced by separations at the start of the year that were admitted in the previous year. However, it presents an issue when comparing hospitalisation cases by month of admission.

Where data are presented in this report by month of admission, a scale-up factor is applied to the data for June to estimate cases that were admitted but not yet separated. The scale-up factor is determined by calculating the average percent completion (separated from hospital in the same financial year as admission) across the previous 9 years of data for cases admitted on each day of June, for each analysis variable. For each day in June, the average percent of incomplete cases (i.e. separated in the following financial year) is then added to the case numbers to create the scaled-up case numbers. For consistency, the scale-up factor is applied to each year, not just the 2020–21 data.

This method ensures that causes and types of injury which average varying lengths of stay (thereby impacting on how many records are still receiving care into the next reporting year) are accounted for in the calculation. Additionally, while the final presentation of data is at the bimonthly level, the scaling is calculated for each day in June, from 1 June to 30 June. This means that the degree of scaling applied reflects the decreasing completeness of the data approaching 30 June.

The efficacy of scaling up reported admissions by the above method has been tested on 2017–18 and 2018–19 years (where a complete record was available for June admissions) and has found the resulting estimate to closely match the true case numbers.

In addition to the scale up factor, the number of admissions for each bimonthly period has been standardised to a 30-day month to enable comparison of trends over months of unequal days. Each month is split into two periods: 1st-15th, and the 16th – end of month. The standardisation is applied to the latter period.

As a result, the numbers presented in monthly analysis tables cannot be directly summed to the annual totals reported elsewhere in the report.

Historic data

Over time, minor changes have been made to the method for counting cases of injury, therefore data presented in previous AIHW reports may not match the data presented in this report.

Length of stay

Patient days reported during the separations that were omitted to reduce overestimation of incident cases are an integral part of the hospital care provided for these injuries. The patient days in these subsequent admissions are therefore included when calculating average length of stay for causes of injury.

Note that 'length of stay', as presented in this report, does not include some patient days potentially attributable to injury. It does not include days for most aspects of injury rehabilitation, which cannot be reliably assigned without information enabling identification of all admitted episodes associated with an injury case.

Rates

Age-standardised rates

Age-standardisation of rates enables valid comparison across years and/or jurisdictions without being affected by differences in age distributions. All populations are based on ABS ERP data. Unless noted otherwise, population rates were age-standardised using the direct standardisation method and 5-year age groups, with a highest age group of 85 and over. Cases of injury are reported as a rate per 100,000 population.

Population data for age specific and age-standardised rates by Indigenous status are produced using a slightly different method to other rates.

Head injury hospitalisation rates by Indigenous status were directly age-standardised, using the projected Indigenous population (series B) (ABS 2019). The population for non-Indigenous Australians was derived by subtracting the First Nations population from the general population. Importantly, this will include individuals where Indigenous status is unknown or not reported, and therefore does not represent a strictly non-Indigenous population. See Quality of Indigenous status data below for further detail.

Due to data quality issues, the ERP Indigenous population data are limited to a highest age group of 65 and over. Therefore, standardised rates calculated by Indigenous status are not directly comparable with other standardised rates, which used a highest age group of 85 and over.

Changes in rates due to changes in underlying population data

The age-standardised rates (per 100,000 population) presented in this report for the year 2011–12 of time-series tables have been calculated using 'rebased' ERPs following the 2016 Census. Therefore, rates reported for 2011–12 in this report should not be compared with earlier reports.

Estimated change in rates over time

Estimated trends in rates of hospitalised injury were reported as annual percentage change. Due to a break in series between 2016–17 and 2017–18 reporting years (see 'changes in New South Wales admission practice' below), the average annual change has been calculated for the six years from 2011–12 to 2016–17, and for the four years from 2017-18 to 2020–21. The percent change to 2020–21 from 2019-20 is also presented.

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

For 2019–20 and 2020–21 data, the COVID-19 pandemic resulted in lockdowns and social distancing measures from March 2020, which resulted in changed behaviour, and thus the counts of head injury hospitalisations may be different to previous years. Also, the pandemic and resulting Australian Government closure of the international border from 20 March 2020 caused significant disruption to the usual Australian population trends. The ERPs for 30 June 2020 and 30 June 2021, used in this report, reflect this disruption. Because of these issues, head injury hospitalisation rates for 2019–20 and 2020–21 should be interpreted with this in mind.

Geographical classifications

The ABS's Australian Geography Standard (ASGS) Remoteness Structure 2016 (ABS 2016a) is a hierarchical classification system of geographical regions and consists of interrelated structures. The ASGS provides a common framework of statistical geography and enables the production of statistics that are comparable and can be spatially integrated.

The structure has seven hierarchical levels listed here from smallest to largest:

- Mesh Blocks
- Statistical Area Level 1 (SA1)
- Statistical Area Level 2 (SA2)
- Statistical Area Level 3 (SA3)
- Statistical Area Level 4 (SA4)
- Greater Capital City Statistical Areas
- State and Territory.

Each level directly aggregates to the level above. For example, SA1s are aggregates of Mesh Blocks, and themselves aggregate to SA2s. At each level, the units collectively cover all of Australia.

Remoteness area of usual residence of the patient

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,
 data on geographical location are collected on the area of usual residence of patients in the NHMD. These data are specified in the Admitted patient care National Minimum Data Set (NMDS) as state or territory of residence and SA2. For 2020–21, the area of usual residence was provided by some jurisdictions in the form of a Statistical Area level 1 (SA1). Where SA1 data were available, remoteness areas were allocated by the AIHW based on the SA1 information. If SA1 data were not available, the SA2 data were used to allocate remoteness areas.

Data on the remoteness area of usual residence are defined using the ABS's ASGS Remoteness Structure 2016 (ABS 2016b). The ASGS Remoteness Structure 2016 categorises geographical areas in Australia into remoteness areas, described at www.abs.gov.au.

Remoteness is an index applicable to any point in Australia, based on road distance from urban centres of 5 categories. The categories are:

- *Major cities* (for example, Sydney, Geelong, Gold Coast)
- *Inner regional* (for example, Hobart, Ballarat, Coffs Harbour)
- *Outer regional* (for example, Darwin, Cairns, Coonabarabran)
- *Remote* (for example, Alice Springs, Broome, Strahan)
- *Very remote* (for example, Coober Pedy, Longreach, Exmouth)

Socioeconomic groups

Data on socioeconomic groups are defined using the ABS's Socio-Economic Indexes for Areas (SEIFA) 2016 (ABS 2018).

The ABS generated the SEIFA 2016 data using a combination of 2016 Census data such as income, education, health problems/disability, occupation/unemployment, wealth and living conditions, dwellings without motor vehicles, rent paid, mortgage repayments, and dwelling size. Composite scores are averaged across all people living in areas and defined for areas based on the Census collection districts, and are also compiled for higher levels of aggregation. The SEIFA is described in detail at www.abs.gov.au.

The SEIFA Index of Relative Socio-Economic Disadvantage (IRSD) indicates the collective socioeconomic status (SES) or situation of the people living in an area, with reference to the situation and standards applying in the wider community at a given point in time. A relatively disadvantaged area is likely to have a high proportion of relatively disadvantaged people. However, such an area is also likely to contain people who are not disadvantaged, as well as people who are relatively advantaged.

The AIHW generated separation rates by SES using the IRSD scores for the statistical area level 2 (SA2) of usual residence of the patient reported for each separation. The '1—lowest' group represents the areas containing the 20% of the national population with the most disadvantage, and the '5—highest' group represents the areas containing the 20% of the national population with the least disadvantage. These SES groups do not necessarily represent 20% of the population in each state or territory. Disaggregation by SES group is based on the area of usual residence of the patient, not the location of the hospital.

The following labels for each socioeconomic group have been used throughout this report:

Label	Socioeconomic area
1—lowest	Most disadvantaged
2	Second-most disadvantaged
3	Middle
4	Second-least disadvantaged
5—highest	Least disadvantaged.

Indigenous status

The term 'First Nations people' is used to refer to persons identified as such in Australian hospital separations data and population data collections. The term 'non-Indigenous Australians' is used where NHMD records the status is explicitly stated as non-Indigenous. 'Other Australians' refers to people with an Indigenous status of 'no' or 'not recorded'.

When calculating First Nations and non-Indigenous rates, records where Indigenous status is missing or not stated are not included in the analysis.

Quality of Indigenous status data

The AIHW report First Nations identification in hospital separations data: quality report (AIHW 2013) presents the latest findings on the quality of Indigenous identification in hospital separations data in Australia, 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 First Nations 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 the previous study. An estimated 88% of First Nations patients were correctly identified in Australian public hospital admission records in 2011-12 (AIHW 2013). This under counting of First Nations patients is a known issue across states and territories too with proportions ranging from 58% (confidence interval, 46-69%) in the Australian Capital Territory and 98% (96-99%) in the Northern Territory over the same time period.

Definitions and classifications

Unless otherwise indicated, data elements were defined according to their definitions in the AIHW's Metadata Online Registry (METEOR), and summarised in the Glossary.

In particular, data element definitions for the Admitted patient care National Minimum Data Set (NMDS) are available online at the METEOR website.

Injury classifications from ICD-10-AM/ACHI

Unless otherwise indicated, data elements were defined according to their definitions in the AIHW's Metadata Online Registry (METEOR), and summarised in the Glossary.

In particular, data element definitions for the Admitted patient care National Minimum Data Set (NMDS) are available online at the METEOR website.

Diagnosis, intervention and external cause data for 2020-21 was reported to the NHMD by all states and territories using classifications from the 11th edition of the *International statistical classification of diseases and related health problems, 10th revision, Australian modification* (ICD-10-AM) (ACCD 2019a).

In tables and figures, information on diagnoses, external causes, and interventions are presented using the codes and abbreviated descriptions of the ICD-10-AM and the 11th edition of the *Australian classification of health interventions* (ACHI). Full descriptions of the categories are available in ICD-10-AM/ACHI publications (ACCD 2019a, ACCD 2019b, ACCD 2019c).

Where data are presented in a time series incorporating previous reporting periods,
these have been coded according to the following editions of ICD-10-AM:

- 7th edition for 2011–12 and 2012–13 hospital data
- 8th edition for 2013-14 and 2014-15 hospital data
- 9th edition for 2015-16 and 2016-17 hospital data
- 10th edition for 2017-18 and 2018-19 hospital data
- 11th edition for 2019-20 hospital data.

This report simplified the most common ICD-10-AM codes and ACHII chapter procedure types into plain English terms.

The table of simplified plain English ICD-10-AM codes is shown in Table 1.

Table 1: ICD-10-AM codes used to report principal diagnoses

ICD-10-AM Code	Diagnosis	Report terminology
S00	Superficial injury of head	
S00.05	Superficial injury of scalp, contusion	Bruise of scalp
S00.1	Contusion of eyelid and periocular area	Bruise of eyelid and surrounding skin
S00.81	Superficial injury of other parts of head, abrasion	Abrasion of other parts of head
S00.85	Superficial injury of other parts of head, contusion	Bruise of other parts of head
S01	Open wound of head	
S01.0	Open wound of scalp	
S01.1	Open wound of eyelid and periocular area	Open wound of eyelid and surrounding skin
S01.51	Open wound lip	
S01.88	Open wound of other parts of head	
S02	Fracture of skull and facial bones	Skull fracture
S02.2	Fracture of nasal bones	Nose fracture
S03	Dislocation, sprain and strain of joints and ligaments of head	Dislocation, sprain and strain involving head
S04	Injury of cranial nerves	
S05	Injury of eye and orbit	
S05.0	Injury of conjunctiva and corneal abrasion without mention of foreign body	Injury of eye membrane without foreign body
S06	Intracranial injury	
S06.02	Loss of consciousness of brief duration [less than 30 minutes]	Loss of consciousness (<30 min)
S06.5	Traumatic subdural haemorrhage	
S07	Crushing injury of head	
S08	Traumatic amputation of part of head	
S09	Other and unspecified injuries of head	
T00.0	Superficial injuries involving head with neck	
T01.0	Open wounds involving head with neck	
T02.0	Fractures involving head with neck	

T03.0	Dislocations, sprains and strains involving head with neck
T04.0	Crushing injuries involving head with neck
T06.0	Other injuries of brain and cranial nerves with injuries of nerves and spinal cord at neck level
T15	Foreign body on external eye
T16	Foreign body in ear
T20	Burn of head and neck
T26	Burn of eye and adnexa
T33.0	Superficial frostbite of head
T34.0	Frostbite with tissue necrosis of head

The table of simplified plain English ACHII chapter procedure types is shown in Table 2.

Table 2: ACHII chapter used to report procedure type

ACHII chapter	Procedure type	Report terminology
1–86	Procedures on nervous system	
110–129	Procedures on endocrine system	
160–256	Procedures on eye and adnexa	Procedures on eye
300–334	Procedures on ear and mastoid process	Procedures on ear and surrounding bone
370–422	Procedures on nose, mouth and pharynx	
450–490	Dental services	
520–572	Procedures on respiratory system	
600–777	Procedures on cardiovascular system	
800–817	Procedures on blood and blood-forming organs	
850–1011	Procedures on digestive system	
1040–1129	Procedures on urinary system	
1160–1203	Procedures on male genital organs	
1240–1299	Gynaecological procedures	
1330–1347	Obstetric procedures	
1360–1580	Procedures on musculoskeletal system	
1600–1718	Dermatological and plastic procedures	
1740–1759	Procedures on breast	
1786–1800	Radiation oncology procedures	
1820–1923	Interventions, not elsewhere classified	
1940–2016	Imaging services	

Additional information about external cause categories

Drowning and submersion

The cases included are those involving unintentional drowning and submersion. Note that this does not include unintentional drowning and submersion injuries due to water transportation, other transportation crashes, or acts of nature such as storms and floods—unless the first-mentioned external-cause code is one of those listed above. Cases of 'the bends' due to deep diving and rapid ascents are covered in the Electricity and air pressure cause category. A discussion of terms such as 'drowning' and 'submersion' can be found in WHO (2014).

Submersion: Brief submersion (or immersion) in water or other non-toxic liquid is usually harmless. However, injuries can occur while a person is submerged, particularly following
 a fall or dive into water. A submerged person may experience respiratory impairment
 (see 'drowning', below).

Drowning: Prolonged submersion (or brief submersion in some circumstances—for example, if a person is unconscious when entering the water), puts a person at immediate risk of death by drowning. The drowning process typically involves breath-holding; attempted inhalation triggering spasm of the larynx; depletion of oxygen and build-up of carbon dioxide; loss of consciousness; and, eventually, inhalation of water into the lungs.

Sometimes the process is interrupted before death (for example, by rescue), in which case the person may survive with harm, such as brain damage due to lack of oxygen. That situation was previously referred to as 'near-drowning' and is now called 'drowning with a non-fatal outcome', the term currently recommended by the WHO.

Choking and suffocation

This category covers the ICD-10-AM code group '*Other accidental threats to breathing (W75-W84)*', as well as W44 (*Foreign body entering into or through eye or natural orifice*) where a principal diagnosis indicates a likelihood that the hospital separation was principally due to a threat to breathing.

The external cause classification of foreign bodies with and without obstruction (or 'choking') is determined by the documentation within the clinical record and the hierarchy and essential modifiers of the ICD-10-AM classification.

If the documentation within the clinical record does not explicitly state 'asphyxia', 'obstruction' or 'suffocation' in relation to the foreign body, W44 must be assigned as the default code as indicated by the Alphabetic Index structure. A code from W80, W79 or W78 may only be assigned where there is clear documentation of the terms 'asphyxia, obstruction, suffocation' with a causal link to the foreign body.

For the purposes of this report, any case where the principal diagnosis is a foreign body in the mid-lower respiratory tract is considered a threat to breathing. Cases with a principal diagnosis of T17.2 – T17.8 (foreign body in pharynx, larynx, trachea, bronchus, or other and multiple parts of the respiratory tract), and an external cause of W44 are reported under the 'Choking and suffocation' category. In previous AIHW reports, these cases were reported under the 'Contact with objects' external cause category.

It is likely that some cases with a foreign body in the mouth or oesophagus (T18.0 & T18.1) and a code of W44 may also pose an accidental threat to breathing, however the majority will not. Therefore, these have been excluded from re-categorisation and remain in the 'Contact with objects' external cause group.

Contact with objects

The technical description of this category is 'Exposure to inanimate mechanical forces'.

A change in coding of *Contact with knife, sword or dagger* (W26) occurred between the 8th and 9th editions of ICD-10-AM and it was renamed *Contact with other sharp object(s)* (W26) and *Contact with knife, sword or dagger* became a subcategory (W26.0). The subcategories in W26 now include:

- *Contact with knife, sword or dagger* (W26.0)
- *Contact with other sharp object(s), not elsewhere classified* (W26.8) (including *Edge of stiff paper* and *Tin can lid*)
- *Contact with unspecified sharp object(s)* (W26.9).

In addition, the specific exclusion of 'Knife, sword or dagger' in *Foreign body or object entering through skin* (W45) is removed.

Ascertainment of 'Intentional self-harm'

According to inclusion notes in ICD-10-AM, hospitalisations for injury should be assigned codes in the range X60-X84 if they were purposely self-inflicted poisoning or injury, suicide, or attempted suicide (ACCD 2019c). Determining whether an injury is due to intentional self-harm is not always straightforward. Cases may appear to result from intentional self-harm, but the available information may be inconclusive and therefore preclude them being coded as intentional. In this situation, the case can be coded to an 'undetermined intent' category—for example, *Falling, jumping or pushed from a high place, undetermined intent* (Y30) or *Crashing of motor vehicle, undetermined intent* (Y32).

Some patients may choose not to disclose that their injuries resulted from intentional self-harm. Some may be unable to do so due to the nature of the injuries. For others, their motives may be ambiguous.

In very young children, confirming that an injury was due to intentional self-harm can be difficult and may involve a parent or caregiver's perception of the intent. Ability to form an intention to inflict self-harm, and to understand the implications of doing so, requires a degree of maturation that is absent in infancy and early childhood.

It is not possible to differentiate between acts of self-injury and acts of self-harm with suicidal intent within the NHMD, but it is likely that a proportion of cases of intentional self-harm are self-injurious in nature rather than suicidal in intent.

Due to the particular uncertainties around the intent of children, cases of intentional self-harm are presented in aggregate for ages up to and including 14, and suicide statistics are not presented for children aged under 10.

Ascertainment of injury due to assault

As with injury due to intentional self-harm, cases of injury due to intentional assault may be difficult to identify. Feelings of shame or embarrassment may underlie reticence to report either of these forms of intentional injury. In addition, most injuries due to interpersonal violence have potential legal implications. Pressures or incentives to not reveal assault may be particularly likely in circumstances such as injury of a child or other dependent person by a caregiver, or injury of one spouse by the other. Cases recognised as possibly being due to assault—but where doubt remains—may therefore be coded as *Undetermined intent*.

Perpetrator codes are used in ICD-10-AM when a code from the ICD-10-AM category *Assault* (X85–Y09) is present. A coding standard (ACCD 2019c) provides guidance to clinical coders in assigning codes identifying the perpetrator of assault, abuse, or neglect. The coding rules operate on a hierarchical basis, with coders required to code the closest relationship between the perpetrator and the victim. The 10 subcategories of perpetrator consist of the following:

- spouse or domestic partner
- parent
- other family member
- carer
- acquaintance or friend
- official authorities
- person unknown to the victim
- multiple persons unknown to the victim
- other specified person
- unspecified person.

Injuries inflicted through legal interventions and operations of war (Y35 – Y36) are included under the assault category but do not form part of the perpetrator analysis.

Missing or not reported causes

Some injury cases do not include an external cause, or the only cause code provided is invalid for the scope of this report (i.e., supplementary factor codes). These cases are included in this report as 'not reported' and are counted towards to the total injury cases.

Variation in state and territory coding practices

Changes in New South Wales admission practice

The emergency department admission policy was changed for New South Wales (NSW) hospitals in 2017–18. Episodes of care delivered entirely within a designated emergency department or urgent care centre are no longer categorised as an admission regardless of the amount of time spent in the hospital. This narrowing of the categorisation has had the effect of reducing the number of admissions recorded in NSW from the 2017–18 financial year. For NSW, the effect was a significant decrease (3.7%) in all public hospital admissions in 2017–18 compared to 2016–17. The impact of the change was felt disproportionately among hospitalisations for injury and poisoning. According to NSW Health, the number of hospitalisations for injury and poisoning in NSW decreased by 7.6% between 2016–17 and 2017–18, compared to a usual yearly increase of 2.8% (Centre for Epidemiology and Evidence 2019).

The change in NSW's emergency department admission policy may have had different effects on case numbers within different external cause categories. This is because different types of injury have a different likelihood of requiring prolonged care in an emergency department, but without an admission to a hospital ward.

Due to the size of the contribution of NSW data to the national total, Australian data from 2017–18 should therefore not be compared with data from previous years.

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Technical notes

This report aims to count and describe incidents of injuries to the head that lead to hospital emergency department presentations.

The data on emergency department presentations for head injuries are from the Australian Institute of Health and Welfare's (AIHW) National Non-Admitted Patient Emergency Department Care Database (NNAPEDCD). Comprehensive information on the quality of ED data is available on the AIHW MyHospitals website.

Scope

The aim of this section of the report is to count the number of head injury emergency department presentations in Australian public hospitals from 1 July 2020 to 30 June 2021, inclusive. In all cases included in this report, patients had a head injury diagnosis code in their record.

Emergency department presentations for injury incidents are generally more numerous than the number of hospitalisations. This is because many injuries can be treated in emergency departments and do not require admission to a hospital. Many more people with injuries are treated outside of a hospital such as at a general practice – these injuries are not captured in ED data. A small number of severe injuries result in the person being dead on arrival at the emergency department, these cases are counted in both the emergency department and deaths data sources. Cases that are hospitalised after presenting to emergency departments are counted in both ED and hospitals data sources.

Head injury emergency department presentations account for 21% of all emergency department injury presentations. This document covers:

- Definitions and classifications used
- Presentation of data in this report
- Analysis methods.

Data source

Non-Admitted Patient Emergency Department Care Data

The data supplied by state and territory health authorities for the Non-admitted Patient Emergency Department Care (NAPEDC) National Minimum Data Set (NMDS) were used by the AIHW to assemble the National Non-Admitted Patient Emergency Department Care Database (NNAPEDCD). The data cover waiting times and other characteristics of presentations to public hospital emergency departments.

From 2020–21, all jurisdictions provided data for the NNAPEDCD using the NAPEDC NMDS. The NNAPEDCD provides information on the care provided (including waiting times for care) for non-admitted patients registered for care in public hospital emergency departments that have:

- purposely designed and equipped area with designated assessment, treatment, and

resuscitation areas

- the ability to provide resuscitation, stabilisation, and initial management of all

emergencies

- availability of medical staff in the hospital 24 hours a day
- designated emergency department nursing staff 24 hours per day 7 days per week, and a designated emergency department nursing unit manager.

Emergency departments (including 'accident and emergency' or 'urgent care centres') that do not meet the criteria above are not in scope for the NMDS, but data may have been provided for some of these by some states and territories.

Patients who were dead on arrival are in scope if an emergency department clinician certified the death of the patient. Patients who leave the emergency department after being registered/triaged to receive care and then advised of alternative treatment options are also in scope.

The scope includes only physical presentations to emergency departments. Advice provided by telephone or video conferencing is not in scope, although it is recognised that advice received by telehealth may form part of the care provided to patients physically receiving care in the emergency department. Also excluded from the scope of the NMDS is care provided to patients in general practitioner co-located units.

Since 2003–04, data for the NNAPEDCD have been reported annually. The most recent reference period for this data set includes records for Non-admitted patient emergency department service episodes between 1 July 2020 and 30 June 2021.

This report is the first use of NNAPEDCD for AIHW national injury surveillance. Future injury reports may use slightly different procedures of extracting and analysing data from this source, and care should be considered when making direct comparisons to this report.

> **Summary of key data quality issues**
>
> Overall, the quality of the data in the NNAPEDCD is sufficient to be published in this report. However, the following limitations of the data should be taken into consideration when data are interpreted.
>
> States and territories are primarily responsible for the quality of the data they provide. However, the AIHW undertakes extensive validations on receipt of data. Potential errors are queried with jurisdictions, and corrections and resubmissions may be made in response to these edit queries. The AIHW does not adjust data to account for possible data errors or missing values, except where stated.
>
> The AIHW takes active steps to improve the consistency of these data over time.
>
> For 2020–21, the NNAPEDCD may not include emergency presentations to hospitals that have emergency departments that are not in scope for the NAPEDC NMDS. The inclusion criteria for emergency departments may exclude some smaller regional public hospitals.
>
> Prior to 2020–21, the following jurisdictions have provided data to the NNAPEDCD using the NAPEDC National Best Endeavours Data Set (NBEDS) specification:
>
> - Queensland (from 2015–16 to 2019–20);
> - Victoria and Western Australia (from 2016–17 to 2019–20).
>
> All other states and territories used the NAPEDC NMDS. The data provided using the NAPEDC NBEDS may not be entirely comparable with data provided using the NAPEDC NMDS.
>
> Although there are national standards for data on non-admitted patient emergency department services, the way those services are defined and counted varies across states and territories, and over time.

Missing or invalid data

In some cases, the data provided may include missing values (for example, the date/time of physical departure was not recorded), or invalid values (for example, if the time of physical departure was recorded as occurring before the time of presentation).

External cause data

The NNAPEDCD does not include a field for external cause of injury (such as a fall or transport accident) or other related data such as place of occurrence, mechanism of the injury, activity being undertaken at the time, intent and perpetrator. Australian injury surveillance systems have a major focus on the external causes of injuries, which is especially important from a prevention perspective. The absence of these national data obstructs direct comparisons between the causes of injury across hospitalisations, deaths, and ED presentation data.

Reporting diagnosis information

For the 2020–21 NAPEDC NMDS/NBEDS, diagnosis information was reported using the ED ICD-10-AM version 11 shortlist that can be found on the website of the Independent Hospital Pricing Authority.

Episode end status

There is a difference between the number of presentations with a type of visit of *Dead on arrival* and the number of presentations with an episode end status of *Dead on arrival*. All presentations with a type of visit of *Dead on* arrival had an episode end status of *Dead on arrival*. However, some presentations with an episode end status of *Dead on arrival* did not have a type of visit of *Dead on arrival*.

Estimated resident populations

All populations are based on the estimated resident population (ERP) population as at 30 June immediately prior to the reporting period (that is, for the reporting period 2020–21, the population at 30 June 2020 is used). The population is used as the denominator for age-specific and age-standardised rates.

The ERP as at 30 June 2001 is used as the standardising population throughout the report (ABS 2003).

The COVID-19 pandemic and resulting Australian Government closure of the international border from 20 March 2020 disrupted the usual Australian population trends. The ERP for 30 June 2020, used in this report, reflects this disruption.

All population data are sourced from the Australian Bureau of Statistics (ABS) as follows:

- General populations are from National, state and territory population
- Remoteness populations (available on request from ABS)
- Socio-Economic Indexes For Areas (SEIFA) Index of Relative Socio-Economic Disadvantage (IRSD) quintile populations are from AIHW analysis of Census of Population and Housing: Socio-Economic Indexes for Areas (ABS 2018) and Regional population.

Estimating cases of injury

This report estimates the number of incidents of head injuries that lead to an emergency department presentation. This represents 21% of injury-related emergency department presentations in the NAPEDC.

Selection criteria

The following criteria were used to estimate numbers of cases of head injury emergency department presentations in Australia.

1. Financial year of presentation, records dated from 1 July 2020 to 30 June 2021 inclusive
2. Head injury principal diagnosis in the ICD-10-AM range S00–S09, T00.0, T01.0, T02.0, T03.0, T04.0, T06.0, T15, T16, T20, T26, T33.0, T34.0, T35.2 (Table 1) using 'Chapter 19 Injury, poisoning and certain other consequences of external causes'.

Some analysis compared emergency department presentations for head injuries with all injuries. Alongside the scope above for head injuries, all injuries were identified through the following criteria:

1. Financial year of presentation, from 1 July 2020 to 30 June 2021
2. Principal diagnosis in the ICD-10-AM range S00–T75 or T79 using 'Chapter 19 Injury, poisoning and certain other consequences of external causes'.

This scope excludes injuries due to *Complications of surgical and medical care* (T80 – T88) and *Sequelae of injuries, of poisoning and of other consequences of external causes* (T90 – T98) in line with our reporting on injury hospitalisations.

While up to two additional diagnoses can be reported within the data collection, very few records within the NAPEDC contain additional diagnoses. 6.8% of observations in the 2020-21 NAPEDC database had a first additional diagnosis, while just 0.6% contained a second additional diagnosis. Consequently, only presentations with a relevant principal diagnosis were considered within the selection criteria.

Presentation of data

The totals in tables include data only for those states and territories for which data were available, as indicated in the tables. Throughout the report, percentages may not add up to 100.0 because of rounding. Percentages and rates shown as 0.0 or 0 indicate a zero.

Head location and injury type are derived from the principal diagnosis of the case. The sum of injuries by body part may not equal the total number of injury emergency department presentations because some injuries are not described in terms of body region.

The patient's age is calculated at the date of admission. In tables by age group and sex, presentations for which age and/or sex were not reported are included in the totals.

Suppression of data

The AIHW operates under a strict privacy policy based on Section 29 of the *Australian Institute of Health and Welfare Act 1987* (AIHW Act). Section 29 requires that confidentiality of data relating to persons (living and deceased) and organisations be maintained. The *Privacy Act 1988* (Privacy Act) governs confidentiality of information about living individuals.

The AIHW is committed to reporting that maximises the value of information released for users while being statistically reliable and meeting legislative requirements described in the *AIHW Act* and the *Privacy Act*.

Data (cells) in tables may be suppressed to maintain the privacy or confidentiality of a person or organisation; or because a proportion, rate (numerator or denominator) or other measure is related to a small number of events (and may therefore not be reliable). Data may also be suppressed to avoid attribute disclosure. The abbreviation 'n.p.' (not published) has been used in tables to denote these suppressions. In these tables, the suppressed information is included in the totals.

Analysis methods

Principal diagnosis reporting

From 2018–19, Principal diagnoses were provided using the ICD-10-AM Principal Diagnosis Short List, developed by the Independent Hospital Pricing Authority (IHPA) from the full version of ICD-10-AM.

For 2020–21, the short list was based on ICD-10-AM version 11.

The codes included in scope for head injury ED presentations were the same as those used for admitted patients. Since some jurisdictions code the principal diagnosis from the ICD-10-AM version 11 rather than the Principal Diagnosis Short List, these codes were included for completeness. In 2020–21, there were 21 head injury presentations for codes not on the Principal Diagnosis Short List.

Waiting time to commencement of clinical care

The waiting times are determined as the time elapsed between presentation to the emergency department and the commencement of clinical care. The calculation is restricted to presentations with a type of visit of *Emergency presentation*, and presentations were excluded if the waiting time was missing or invalid, or if the patient *Did not wait to be attended by a health care professional*, was *Dead on arrival* or *Registered, advised of another health service and left without being attended to*. See Appendix A for information on the completeness of the data provided for waiting times calculations.

Proportion of presentations seen on time

The proportion of presentations seen on time was determined as the proportion of presentations in each triage category with a waiting time less than or equal to the maximum waiting time stated in the Australasian Triage Scale definition. Triage categories and respective clinically appropriate waiting times are as follows (for further details see AIHW METEOR):

Category	Clinically appropriate waiting time
1	Resuscitation: immediate (within seconds)
2	Emergency: within 10 minutes
3	Urgent: within 30 minutes
4	Semi-urgent: within 60 minutes
5	Non-urgent: within 120 minutes

For this report, a patient with a triage category of Resuscitation was considered to be seen on time if the waiting time to commencement of clinical care was less than or equal to 2 minutes.

Quality of data on ED waiting times

For 2020–21, about 870 head injury cases that should have been included in the calculation of waiting times statistics were excluded, as they did not have a valid commencement of clinical care time recorded.

The criteria used to determine the proportion of *Resuscitation* patients seen on time varies between jurisdictions, therefore, the proportions of *Resuscitation* patients seen on time presented in this report may differ from those reported by individual jurisdictions.

Proportion of presentations ending in admission

The proportion of presentations ending in admission is determined as the proportion of all emergency presentations with an episode end status of Admitted to this hospital (either short-stay unit, hospital-in-the-home, or non-emergency department hospital ward).

Admission to hospital from emergency departments

Admission to hospital from emergency departments (for patients who were subsequently admitted) is calculated using the emergency department length of stay for presentations with an episode end status of *Admitted to this hospital (either short-stay unit, hospital-in-the-home, or non-emergency department hospital ward)*.

Age and sex of patient

All states and territories supplied the date of birth of the patient, from which the age of the patient at the date of presentation was calculated. For 32 records, the age of the patient could not be calculated, as date of birth was missing. For 46 records, the sex of the patient was reported as either *Intersex or indeterminate* or *Not stated/inadequately described*.

Definitions and classifications

If not otherwise indicated, data elements were defined according to their definitions in the AIHW's Metadata Online Registry (METEOR), and summarised in the Glossary.

In particular, data element definitions for the Non-admitted patient emergency department care National Minimum Data Set (NMDS) are available online at: METEOR website.

ICD-10-AM principal diagnosis Short List inclusions

Table 1 describes the inclusion for each major principal diagnosis category and the relevant ICD-10-AM codes.

Table 1: List of ICD-10-AM codes and their descriptions

FROSTBITE		
BURNS OF EYE AND INTERNAL ORGANS		
BURNS		
EFFECTS OF FOREIGN BODY ENTERING THROUGH NATURAL ORIFICE		
INJURIES INVOLVING MULTIPLE BODY REGIONS		
Category	ICD-10AM code	Description
INJURIES TO THE HEAD		
	S00	Superficial injury of head
	S01	Open wound of head

	S02	Fracture of skull and facial bones
	S03	Dislocation, sprain and strain of joints and ligaments of head
	S04	Injury of cranial nerves
	S05	Injury of eye and orbit
	S06	Intracranial injury
	S07	Crushing injury of head
	S08	Traumatic amputation of part of head
	S09	Other and unspecified injuries of head
	T00.0	Superficial injuries involving head with neck
	T01.0	Open wounds involving head with neck
	T02.0	Fractures involving head with neck
	T03.0	Dislocations, sprains and strains involving head with neck
	T04.0	Crushing injuries involving head with neck
	T06.0	Injuries of brain and cranial nerves with injuries of nerves and spinal cord at neck level
	T15	Foreign body on external eye
	T16	Foreign body in ear
	T20	Burn of head and neck
	T26	Burn of eye and adnexa
	T33.0	Superficial frostbite of head
	T34.0	Frostbite with tissue necrosis of head

Technical notes

Deaths data sources

The deaths data in this report come from the Australian Institute of Health and Welfare's (AIHW) National Mortality Database (NMD) and the National Coronial Information System (NCIS).

National Mortality Database

The National Mortality Database (NMD) holds records for deaths in Australia from 1964. The database comprises information about causes of death and other characteristics of the person, such as sex, age at death, area of usual residence and Indigenous status.

The Cause of Death Unit Record Files are provided to the AIHW by the Registries of Births, Deaths and Marriages in each state and territory and the National Coronial Information System (managed by the Victorian Department of Justice). The cause of death data are compiled and coded by the Australian Bureau of Statistics (ABS) to the International Statistical Classification of Diseases and Related Health Problems (ICD) and maintained at the AIHW in the NMD. Registration of deaths is the responsibility of the Registry of Births, Deaths and Marriages in each state and territory. The data quality statements underpinning the AIHW NMD can be found on the following ABS internet pages:

- ABS quality declaration summary for Deaths, Australia
- ABS quality declaration summary for Causes of death, Australia

For more information on mortality coding refer to Causes of Death, Australia methodology (ABS 2021).

This document relates to data for 2011–12 to 2020–21, published in 2023.

> **Box 1: Key terms and concepts**
>
> An **external cause** is the environmental event or condition that caused the injury, for example a transport accident of a particular type.
>
> The **underlying cause of death (UCoD)** code represents the disease or injury that initiated the train of morbid events leading to a person's death, according to information available to the coder. If a death was due to an injury, the ICD-10 requires that the external cause be entered as the UCoD.
>
> **Multiple causes of death (MCoD)** codes represent all the morbid conditions, diseases and injuries which are listed on the death certificate. They include all the factors in the morbid train of events leading to death: the underlying cause, the immediate cause, any intervening causes, and any conditions that contributed. This is especially helpful for chronic conditions, which often involve more than one illness.
>
> Coding is according to the ICD-10 (WHO 2019), which includes a chapter for injuries and another for external causes.

Injury deaths

Most injury deaths are certified by a coroner. For these deaths, the ABS seeks additional information from the NCIS required to code external causes.

Some injury deaths (and most other deaths) are certified by a doctor. For these, ABS coders rely on information about the causes of death that the doctor records on the death certificate. In this report, the most common cause of injury in doctor-certified deaths is 'fall'.

Deaths that are referred to a coroner can take time to be fully investigated, which can influence what information is available to assign a cause of death code during the ABS coding process. Each year, some coroner cases are coded by the ABS before the coronial proceedings are finalised. Coroner cases that have not been closed or had all information made available can impact on data quality as less specific ICD-10 codes often need to be applied. At the time of coding 2021 data there was a higher proportion of open coroner cases at preliminary coding than seen in previous years (67.2% in 2021 versus a 5-year average for 2015-2019 of 56.2%). This is reflected in the 2021 dataset by a higher rate of deaths due to 'other ill-defined and unspecified causes of mortality' (R99).

Changes in death registrations over time

The ABS introduced several changes for deaths registered in 2007 and subsequent years (ABS 2009), with the potential to affect injury death statistics.

The most important change was to make 3 data releases for deaths registered in each calendar year:

- preliminary (released a little over one year after the end of the registration year)
- revised (1 year after the preliminary release) and
- final (2 years after the preliminary release).

Further changes were implemented for deaths registered in 2008 and later:

- For both open and closed coroner cases, more time has been spent investigating Part II of the Medical Certificate of Death when information in Part I is not sufficient to allow assignment of a specific UCoD code.
- Increased resources and time have been spent investigating coroners' reports to identify specific causes of death. This involves making increased use of police reports, toxicology and autopsy reports, and coroners' findings, to minimise the use of non-specific causes and intents (ABS 2010, 2011b, 2012).
- In the 2019 reference year, there were an additional 2,812 death registrations for Victoria. This issue impacts both the Victorian and national mortality data when reporting by reference year, where 2017, 2018 and 2019 deaths are included. For more detail please refer to Technical note: Victorian additional registrations and time series adjustments in Causes of death, Australia, 2019 (ABS Cat. No. 3303.0).

This issue does not impact on analyses based on year of occurrence of death, which this report is based. Data in this report have not been adjusted for Victorian additional death registrations in 2019.

Data releases used in this report

In this report, deaths registered in 2019 or earlier are based on the final ABS release of cause of death data; deaths registered in 2020 are based on the revised release; and deaths registered in 2021 are based on the preliminary release. Since the preliminary and revised versions are subject to further revision, future reports based on later releases might show different results for the affected years. For further information surrounding the revisions process, see the ABS Causes of Death, Australia, 2021 methodology page.

Inclusion criteria

Deaths data are commonly recorded according to the calendar year in which the death was registered. However, in this report data are presented according to the financial year in which each death occurred, because:

- presenting data by year of occurrence is more meaningful than by year of registration, because some cases are registered much later than when the death occurred (sometimes years later)
- reporting by financial year aligns with AIHW reports on injury morbidity, enabling deaths and hospitalisations to be presented for the same period.

The following inclusion criteria were used where both of the below resulted in inclusion:

- the multiple cause of death (MCoD) was an external cause code in the range V01–Y36; and
- a multiple cause of death (MCoD) code for a head injury in the range S00–S09, T00.0, T01.0, T02.0, T03.0, T04.0, T06.0, T35.2, T15–T16, T20, T26.

The code range V01–Y36 includes all unintentional (accidental) deaths, intentional self-harm (suicide), homicides, and deaths where intent remained undetermined. The codes provide information around the circumstances of the death, such as details of a transport accident, drowning, asphyxiation, effects of radiation, heat, pressure, deprivation, and maltreatment.

The code range S00–S09, T00.0, T01.0, T02.0, T03.0, T04.0, T06.0, T35.2, T15–T16, T20, T26 includes head injuries (such as fractures, superficial injuries, dislocation, burns and lacerations). The codes also provide information about the single or multiple body regions affected.

> **Box 2: Multiple causes of death (MCoD)**
>
> Box 1 provides standard definitions of the terms underlying cause of death (UCoD) code and multiple causes of death (MCoD) codes.
>
> In this report, MCoD codes relate to causes that contributed to death and may or may not have been related to the underlying cause.
>
> An elderly person might suffer a heart attack that results in a fall, and subsequently a skull fracture. A combination of factors might lead to death. In this case, the record would most likely show an UCoD code for acute myocardial infarction (I21), an MCoD code for an external cause of fall (W00–W19), and another MCoD code for skull fracture (S02).
>
> This case would be included in this report, because the first example meets the criterion for inclusion.

ICD-10 External cause inclusions

The Appendix tables below specify the ICD-10 codes used for each cause category, and describe the inclusions for each major external cause category and the relevant ICD-10-AM codes.

Indigenous status

The AIHW uses 'First Nations people' to refer to Aboriginal and/or Torres Strait Islander people in this report. The term 'non-Indigenous Australians' is used where the NMD explicitly records the persons Indigenous status as non-Indigenous.

First Nations deaths data are reported for 5 jurisdictions—New South Wales, Queensland, Western Australia, South Australia, and the Northern Territory. Other jurisdictions have a small number of First Nations deaths, and identification of First Nations deaths in their registration system is relatively poor, making the data less reliable.

AIHW considers the quality of First Nations identification in deaths data for the 5 jurisdictions to be adequate from 1998 onwards. Data by Indigenous status for this report are for these 5 jurisdictions combined. Deaths data for these 5 should not be assumed to represent the experience in other jurisdictions. Data for these 5 jurisdictions over-represent First Nations populations in less urbanised (more remote) locations.

Since 2015, the Queensland Registry of Births, Deaths and Marriages used both medical certificate information and death registration form information to derive Indigenous status. This approach has been used in South Australia, Western Australia, Tasmania, the Northern Territory, and the Australian Capital Territory since 2007. If either source indicates that the deceased was a First Nations person, they are recorded as such. In New South Wales and Victoria, only information from the death registration form is used (ABS 2020).

Analysis and presentation of data

The sum of the counts of death by cause may be greater than the total number of injury deaths because some deaths have multiple causes.

Crude/age-specific rates are calculated per 100,000 estimated resident population.

Age-standardised rates are calculated per 100,000 population.

Persons totals include deaths for which sex was not reported.

All age totals include deaths where age is not reported.

Data may be suppressed to maintain the privacy or confidentiality of a person, or because a proportion, rate (numerator or denominator) or other measure is related to a small number of events and may therefore not be reliable. Data may also be suppressed to avoid attribute disclosure. The abbreviation 'n.p.' (not published) has been used in tables to denote these suppressions. The suppressed information remains in the totals.

Population data and the calculation of rates

General population

Rates were calculated using, as the denominator, the estimated resident population as at 31 December in the relevant year (for example, 31 December 2018 for 2018–19 data). The final release was used where possible.

Directly age-standardised rates were calculated using the Australian population in 2001 as the standard (ABS 2011a). Age-standardised rates were derived by 5-year age group up to 85+. For counts under 20, age-standardised rates tend to be unstable and so are not presented.

The COVID-19 pandemic and resulting Australian Government closure of the international border from 20 March 2020 caused significant disruptions to the usual Australian population trends. The ERP for 30 June 2020, used in this report reflects these disruptions.

First Nations population

Rates of injury death of First Nations people were calculated using data from 5 jurisdictions (New South Wales, Queensland, Western Australia, South Australia, and the Northern Territory). Data were selected based on place of usual residence.

The assessments of the quality of identification of Indigenous status are affected by restrictions that jurisdictions place on what is included in the data. The assessments are subject to review, and some recent AIHW reports include New South Wales data from 1999 onwards (AIHW 2014).

Rates were calculated using, as the denominator, an estimate of the First Nations population as at December 31 in the relevant year (for example, 31 December 2019 for 2019–20 deaths) using the projected First Nations population, series B (ABS 2019). Rates were not presented for counts under 5 due to unstable rates.

Since estimates of resident First Nations 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 2019 is calculated by adding estimates for 30 June 2019 and 30 June 2020 and dividing by 2).

Directly age-standardised rates were calculated using the Australian population in 2001 as the standard (ABS 2011a). Age-standardised rates were derived by 5-year age group up to 65+. Age-standardised rates were not presented for counts under 20 due to unstable rates.

For non-Indigenous Australians, population denominators were derived by subtracting the estimated First Nations population from the total Australian estimated resident population (of the states and territories eligible for inclusion), as at 31 December of the relevant year.

Current standard practice in AIHW reports is to omit cases where Indigenous status was not stated or unknown.

Rates and change in rates

Estimated trends in age-standardised rates were reported as average annual percentage changes.

Errors in deaths data

The data presented in this report are subject to 2 types of statistical error—non-random and random (a third type of statistical error, sampling error, does not apply in this report, because none of the data sources used involved probability sampling).

Non-random error

Some level of non-random error is to be expected in administrative data collections, such as the NMD on which this report relies. For example, non-random error could occur if the approach to assigning cause codes to deaths were to differ systematically between jurisdictions, or over time. Systems are in place to encourage uniform data collection, and coding and scrutiny of data during analysis include checking for patterns that might reflect non-random error. But some error remains.

Random error

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

Some of the topics for which results are reported compare groups that vary widely in case count, largely due to differences in population size (for example, the population of New South Wales is more than 30 times as large as the Northern Territory population, and the population of *Major cities* is nearly 90 times that of *Very remote* areas). In this situation, year-to-year changes in counts or rates for the smaller-population groups might be subject to large random variation. Such fluctuations could potentially be misinterpreted as meaningful rises or falls.

Geographical classification

Australian Statistical Geography Standard

The ABS's Australian Geography Standard (ASGS) Remoteness Structure 2016 (ABS 2016a) is a hierarchical classification system of geographical regions and consists of interrelated structures. The ASGS provides a common framework of statistical geography, and enables the production of statistics that are comparable and can be spatially integrated.

The structure has seven hierarchical levels listed here from smallest to largest:

- Mesh Blocks
- Statistical Area Level 1 (SA1)
- Statistical Area Level 2 (SA2)
- Statistical Area Level 3 (SA3)
- Statistical Area Level 4 (SA4)
- Greater Capital City Statistical Areas
- State and Territory.

Each level directly aggregates to the level above. For example, SA1s are aggregates of Mesh Blocks, and themselves aggregate to SA2s. At each level, the units collectively cover all of Australia.

Remoteness

Australia can be divided into several regions, based on the distance from urban centres. This is considered to predict the range and types of services available. These regions are known as remoteness areas and are defined using the ABS's ASGS Remoteness Structure 2016 (ABS 2016b). The ASGS Remoteness Structure 2016 categorises geographical areas in Australia into remoteness areas as described at www.abs.gov.au.

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 follows:

- *Major cities* (for example, Sydney, Geelong, Gold Coast)
- *Inner regional* (for example, Hobart, Ballarat, Coffs Harbour)
- *Outer regional* (for example, Darwin, Cairns, Coonabarabran)
- *Remote* (for example, Alice Springs, Broome, Strahan)
- *Very remote* (for example, Coober Pedy, Longreach, Exmouth).

Data on geographical location of the place of usual residence of the person who died is recorded in the NMD. These data are the state or territory of residence and SA2. Each death is allocated to a remoteness area according to the SA2.

Further information

For more information on the NMD see Deaths data at AIHW

The data quality statements underpinning the NMD can be found in the following ABS publications:

- Australian Bureau of Statistics (2021), Deaths, Australia methodology
- Australian Bureau of Statistics (2021), Causes of Death, Australia methodology

National Coronial Information System (NCIS)

The NCIS is a data collection which contains information on deaths reported to a coroner in each jurisdiction in Australia and New Zealand. The information contained in the NCIS varies based on the level of detail in the coronial investigation; therefore, the comprehensiveness of the data changes on a case by case basis (NCIS 2022a).

A reportable death is one that is investigated by a coroner, these deaths are generally unexpected or explained. The ABS reported in 2017 that 11.9% of deaths are reportable. Most injury deaths are reportable; with the exception of falls which are commonly doctor certified (NCIS 2022b).

Data used in this report

Deaths data are commonly recorded according to the calendar year and month in which the death occurred.

Until the investigation is completed by the coroner and the coding of all relevant fields is completed by the court, the *case status* remains *open* in the NCIS. When the investigation and relevant coding is complete, the court changes the *case status* to closed. At the time of preparing this report, cases from 1 July 2020 to 31 June 2021 were used. Any open cases are excluded from the analysis in this report.

Where the NCIS have reported that a death is due to "intentional self-harm", the term "suicide" has been substituted to align with broader injury reporting terminology.

> **Box 3: NCIS key terms and concepts**
>
> **Case type:** Indication of the classification of death; can be 'Death due to natural causes', 'Death due to external causes', 'Body not recovered' or 'Unlikely to be known' (NCIS 2020).
>
> **Case status:** The current status of the coroners' case; can be 'open' or closed' (NCIS 2020).
>
> **Incident activity details:** The type of activity being undertaken by the person when injured, or when they died (if a natural cause death) (NCIS 2020).
>
> **Intent:** The role of human purpose in the event resulting in death as determined at the completion of the coronial investigation (NCIS 2020).
>
> **Mechanism of injury:** The means, environmental event, condition or circumstance in which injury was sustained, including poisoning and adverse effect. The way in which the injury resulting in death was sustained (NCIS 2020).
>
> **Object or substance producing injury:** coded field which identified the objects, substances and phenomena which produced the injury causing death (NCIS 2020).
>
> **Location – Death:** The specific location (place) where the death occurred (NCIS 2020).
>
> **Location – Incident:** The specific location (place) where the deceased was situated when injured/where the incident occurred or was started (NCIS 2020).

Inclusion criteria for the NCIS

Cases were included where:

- the case status was closed
- the case type was due to external cause(s)
- the ICD-10 cause of death variables for a head injury were in the range S00–S09, T00.0, T01.0, T02.0, T03.0, T04.0, T06.0, T35.2, T15–T16, T20, T26
- head-related terminology within the open-text cause of death (COD) fields included 'head', 'skull', 'cranium', 'face', 'scalp', 'brain', 'nose', 'traumatic asphyxia', 'hypoxi', or 'cerebral'. These were further filtered to remove non-injury related deaths by excluding cases with underlying ICD-10 codes including E05.0,G20,G35,G71.1,G80.0,G93.1, and I69.4.
- the date of death was between 1 July 2020 and 31 June 2021, inclusive.
- the death occurred in an Australian state or territory.

Text analysis of COD fields

There are six medical cause of death open-text fields provided in the NCIS. Determining the most common terms used in head-injury deaths in the NCIS required the aggregation of all COD fields. Stop words (e.g. and, to, so, for) were removed, as were common words contributing little to the determination of cause of death (e.g. treated, consequence, sustained, history). Leading and trailing spaces were also removed. Each unique search term was counted once per record, regardless of the number of times it appeared in the aggregated cause of death fields.

Related words were transformed to the word root. Words such as 'fractures' or 'fractured' were substituted with the root 'fracture', to ensure complete coverage of a term. Words such as 'boy' and 'man', or 'lady' and 'woman' were substituted with 'male' and 'female' for continuity with the rest of the report. Alternative spellings were streamlined (e.g. haemorrhage and hemorrhage) and small identifiable spelling errors were also corrected (e.g. haemmorrhage).

All haemorrhage and haematoma terms (where the term began with subdural, intracranial, subarachnoid, intracerebral, intracranial, intra cerebral, epidural, extradural, intraparenchymal etc. and ended with haemorrhage or haematoma) were grouped under the umbrella term "intracranial bleeds". Additionally, the terms "motor vehicle" and "motorcycle vehicle" were grouped under the umbrella term "motor vehicle".

Limitations in NCIS data

Case status

Only cases that are closed in the NCIS following coronial investigation are included in this report. It is possible cases of relevance were still under coronial investigation at the time of writing and are excluded from this report.

Quality assessment of closed cases

The NCIS Unit conducts a quality assessment of the coding associated with closed cases. While every effort is made to quality review closed cases in a timely manner, there may be a delay between the case being closed and the completion of the quality review. It cannot be guaranteed that all cases included in this report have been quality assessed.

Primary and secondary mechanism of injury contribution

In the NCIS database, each eligible case is allocated at least one mechanism that explains the means, environmental event, condition or circumstance in which injury was sustained. The first code is known as the primary mechanism of injury. Any secondary code for mechanism of injury is considered to have a secondary contribution to death. For this report, only the primary mechanism of injury was considered for analysis.

The mechanism of injury follows a hierarchical coding structure, including three potential levels of increasing specificity. Level 1 encompasses a broad description of the mechanism. For the purposes of this report, Level 1 codes were referred to as the 'primary mechanism'. Level 3 codes were referred to as the 'specific mechanism'.

Primary and secondary object contribution

In the NCIS database, each eligible case is allocated at least one object or substance producing injury code. The first code is known as the primary object or substance producing injury. Any secondary code object or substance producing injury code is considered to have a secondary contribution to death. For this report, only the primary object was considered for analysis.

Cause of death

The NCIS database uses both ICD-10 and medical cause of death data. ICD-10 coding uses the Tenth Revision, and is prepared annually by the ABS for integration into the database. Around 1.2% of cases used in this report do not have any ICD-10 code recorded.

Medical cause of death is determined by the investigating forensic pathologist. The medical cause of death open-text fields are not subject to standardised terminology or review, which may influence the identification of cases due to misspellings, or alternative descriptions not considered within the scope of this report.

Presentation of the NCIS data

Data are presented as counts. Persons totals include deaths for which sex was not reported. All age totals include deaths where age is not reported. A value of 0 indicates that no deaths were identified. To ensure data are appropriately de-identified, values between 1–4 were suppressed. The suppressed information remains in the totals.

Further information

For more information on the NCIS see NCIS about the data.

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Data

Related material

The following list includes AIHW publications from recent years that include information on head injury. See Injury reports for any older publications that may exist.

Resources

Related topics

- Hospitals
- Children & youth
- Men & women