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Contents

Summary

This 19th report in the *Spinal cord injury, Australia* series presents national statistics on spinal cord injury (SCI) using data from case registrations to the Australian Spinal Cord Injury Register (ASCIR) for 2017–18.

A total of 187 newly incident cases of traumatic SCI due to external causes were reported for 2017–18 among people aged 15 or over. Of these cases, 176 resulted in a persisting traumatic SCI; 2 died; 8 had no long-term neurological injury; and 1 was still to be discharged at the time of data compilation.

In 2017–18, the age-standardised incidence rate of persisting traumatic SCI was estimated to be 8.6 cases per million population aged 15 and over. The age-specific rate was highest for ages 55–64 (11.2 cases per million population), followed by 10.1 cases per million for ages 65–74.

The incidence rates of persisting traumatic SCI for males were higher across all age groups than those for females.

The median duration of initial care was longest for the most severe type of persisting traumatic SCI on admission—*Complete tetraplegia* (see Glossary). *Complete tetraplegia* is a neurological injury to the cervical spine, with no motor or sensory function preserved at the lowest sacral segments S4–S5. For the 2017–18 year, the median duration of initial care for cases of complete cervical injury dropped by about 22% from the previous year (250 days in 2016–17 to 194 for 2017–18).

Causes of spinal cord injury

In 2017–18, 86 cases (46%) of traumatic SCI were the result of a land transport crash, while 67 cases (36%) were the result of a fall.

Overall, unprotected land transport users, such as motorcyclists or quad bike riders, accounted for nearly 1 in 3 cases (54 cases, 29%) of total traumatic SCI in this reporting period. Those who had a high fall from over 1 metre (40 cases, 21%) accounted for the second most common cause of traumatic SCI.

The leading cause of traumatic SCI for males was a land transport crash as an unprotected land transport user (49 cases; 33%), while for females it was a high fall (12 cases; 32%).

About a quarter of the reported cases of traumatic SCI for 2017–18 occurred while the person was engaged in sports or leisure activities (43 cases, 23%, almost all males), while 20 cases occurred while the person was working for income (11%). In a large number of reported cases, the activity at the time of injury was either not described or not specified (111 cases, 59%).

1 Introduction

Spinal cord injury (SCI) from traumatic causes imposes a heavy physical, psychological and economic burden on the injured people, their families and society, because it often results in a high level of long-term disability and morbidity and an increased mortality risk. Hence, there is interest in national statistics on the incidence of traumatic SCI to understand the nature of people injured, the causes of the injuries, and the care provided to them.

This report describes cases of traumatic SCI sustained between 1 July 2017 and 30 June 2018 which required admission to a specialist spinal unit in Australia. It uses data from the Australian Spinal Cord Injury Register (ASCIR).

Australian Spinal Cord Injury Register

The ASCIR was established in 1995 by the National Injury Surveillance Unit (NISU), a collaborating centre of the Australian Institute of Health and Welfare (AIHW) and Australian hospital spinal units specialising in acute management and rehabilitation of persons with an SCI.

Definitions relating to SCI can be found in the Glossary.

Each year newly incident cases of SCI from both traumatic and non-traumatic causes are added to the register, including Australian residents transferred to an Australian spinal unit after incurring a spinal injury overseas, and overseas visitors who sustained an injury while in Australia. This number underestimates the total number of incident (new) cases of SCI in Australia, as it does not include people who:

- did not consent to be included in the register
- were released from hospital without the need for inpatient rehabilitation
- were admitted to another rehabilitation unit that does not provide data to the ASCIR
- died before admission to a spinal unit occurred.

The data quality statement in Appendix A provides more information on the scope, operation and management of the ASCIR. In particular, Appendix A discusses the reduction in the number of reported SCI cases for 2017–18, resulting from a number of factors, including an apparent increase in the number of people declining to consent to inclusion in the register, and disruptions to the data-collection processes, and the COVID-19 pandemic.

Annual reports on the incidence of traumatic SCI have been produced from the ASCIR since its inception. Early reports, based on data from the period 1995–96 to 1998–99, were published in the *Australian Injury Prevention Bulletin*. Subsequent reports have been published in the AIHW Injury Research and Statistics Series *Spinal cord injury, Australia*, and this is the 19th report of that type.

While a very small number of people under the age of 15 have been included in the ASCIR since its inception, children with SCI are generally treated in specialist paediatric hospitals, and are not reported to the register. For this reason, cases occurring in children under the age of 15 are not in scope for this report.

Estimated incidence of traumatic SCI

Based on data reported to the ASCIR for 2015–16, the estimated incidence of persisting traumatic SCI in Australia, for people aged 15 and over and who were discharged alive, was 12.1 cases per million population (AIHW: Tovell 2019). Population modelling using ASCIR data, supplementary data from the National Hospital Morbidity Database and data from Victoria's single paediatric trauma hospital, suggest that, at 30 June 2011, the estimated rate of traumatic SCI for all ages in Australia was between 21 and 32 cases per million population (New et al. 2015).

A study of the worldwide incidence of traumatic SCI estimated a global rate of 23 cases per million population in 2007—nearly 180,000 new traumatic SCI cases each year (Lee et al. 2014). The incidence rate for Australia based on ASCIR data at a similar period, 2007–08, was 15.0 cases per million population aged 15 and over (AIHW: Norton 2010). The study by Lee and others (2014) noted that estimated rates varied by geographical region; for example, 40 cases per million population for North America compared with 16 per million for Western Europe. An international comparison conducted for the World Health Organization found country-specific rates that ranged from 13 cases per million for the Netherlands to 53 per million in Canada (Bickenbach et al. 2013). Caution needs to be applied to these estimates, however, as inclusion criteria may differ (for example, concerning age, or cases where death occurs soon after injury), as may the types and quality of data sources on which they are based. For example, few countries have national compulsory registers. This caution applies to the data reported for Australia as the ASCIR does not have complete population coverage.

Mortality, life expectancy and estimated costs for traumatic SCI

People who acquire SCI and survive the early period with neurological deficits are likely to have a persisting condition. The level and extent of a neurological deficit are usually measured by the International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) American Spinal Injury Association (ASIA) Impairment Scale, which is the classification measure used in the ASCIR and in this report (see Glossary). The international standards were most recently revised in 2019 (ASIA 2019).

Describing types of neurological impairment for SCI

Spinal cord injuries are generally classified by the neurological level and extent of injury (Bertz et al. 2019).

The neurological level of SCI is the lowest level (that is, the one furthest from the head) that has full neurological function, both motor and sensory.

The neurological level of injury refers to loss of function at 1 of the **cervica**l (C1–C8), **thoracic** (T1–T12), **lumbar** (L1–L5), or **sacral** (S1–S5) segments of the spine. From the top of the body, the cervical spine is the highest part of the spine and includes the neck. The sacral segments are the lowest and include the sacrum and coccyx. Injuries to the sacrum and coccyx are the least common type of SCI, therefore for reporting purposes these cases are combined with lumbar cases and reported as one group: **lumbosacral**.

An injury to the spinal cord at the cervical level results in the reduction or loss of motor and/or sensory function in the arms as well as in the trunk, legs and pelvic organs. This type of impairment is referred to as **tetraplegia** (sometimes also called 'quadriplegia'). An injury to the thoracic, lumbar or sacral levels of the spinal cord may result in a reduction or

loss of motor and/or sensory functions of the trunk, legs and pelvic organs. This type of impairment is referred to as **paraplegia**.

Extent of injury is reported as **complete** or **incomplete**. This refers to the preservation of sensory and motor functioning at different levels of the spine. **Complete** injury is the term used when there is no sensory and motor function in the lowest sacral segments (S4–S5). **Incomplete** injury is the term used when there is some sensory and/or motor function below the neurological level of injury that includes the lowest sacral segments S4–S5.

A complete injury of the spinal cord at a high cervical neurological level is considered the most severe type of SCI.

Spinal cord injuries may result in a temporary or persisting deficit. For the purposes of this report, cases are designated as **persisting traumatic** or **persisting non-traumatic** SCI, based either on a finding of an ASIA Impairment Scale grade of A, B, C or D, 90 days after injury, or on discharge from rehabilitation (ASIA 2003; Birtz et al. 2019); or when the presence of deficit on discharge was reported by the spinal unit.

Neurological level of injury at time of discharge is the measure used to describe the clinical characteristics of persisting traumatic SCI in Chapter 3. Neurological injury at time of admission is the measure used when describing external causes of traumatic SCI in Chapter 4.

Mortality, life expectancy and estimated costs of traumatic SCI

Middleton and others (2012) studied the mortality and life expectancy of people in New South Wales who acquired SCI in the 50 years from 1955 to 2006. Early mortality varied with level of injury: 8.2% of persons with tetraplegia (injury to the cervical segments C1–C8) and 4.1% of persons with paraplegia (injury to the lower spinal segments of thorax, lumbar and sacrum) died within 12 months of injury. Mortality in the first year declined over time. Comparing the period 1975–1984 with 1995–2006, mortality in the first year declined from 9.1% to 6.6% for all tetraplegia cases, while for all paraplegia cases it decreased from 4.1% to 2.8%. For those with complete high injury (C1–C4), first-year mortality dropped from 32% to 14%.

Mortality after the first year remained higher for people with SCI than for the general population. For those with tetraplegia who survived the first year, the subsequent mortality rate was twice that of the general population, with a standardised mortality ratio (SMR) of 2.2 (Middleton et al. 2012). Mortality after the first year for survivors with paraplegia was also higher than for the general population, though to a smaller extent (an SMR of 1.7).

Access Economics' analysis of the estimated cost of traumatic SCI in Australia, undertaken in 2009, remains the most comprehensive study to date. Total economic costs for tetraplegia amounted to $1.3 billion, while those for paraplegia were close to $690 million (Access Economics 2009). Individual lifetime costs were estimated to be $9.5 million per case of tetraplegia and $5 million per case of paraplegia. With medical advances and the positive trend in survival beyond 12 months, lifetime costs will become more significant as people live longer with SCI.

Structure of this report

The primary focus of this report is traumatic SCI that occurred between 1 July 2017 and 30 June 2018. It also includes information on trends in the period 1995–96 to 2017–18. However, in Appendix A there is important information on the apparent reduction in reported SCI cases for the 2017–18 year, which has an effect on reported trends in this report.

The report is arranged as follows:

- **Chapter 2** presents an overview of all newly incident traumatic SCI cases that occurred in 2017–18.
- **Chapter 3** provides an analysis of newly incident cases of persisting traumatic SCI. This chapter includes all cases aged 15 and over who were discharged alive.
- **Chapter 4** provides information on external causes of injury and factors associated with the SCI event for all 2017–18 traumatic cases.
- **Appendix A** provides summary information on the ASCIR and information on data quality.
- **Appendix B** provides information on the estimates used to calculate population rates; use of confidence intervals; and methods used to assign mechanism of injury and remoteness area.
- **Appendix C** provides summary information for non-traumatic SCI cases admitted to a participating spinal unit during 2017–18, and complications of medical care SCI cases that occurred during 2017–18.

Additional information underpinning data in charts can be found in the supplementary tables accompanying this report. Information regarding other terminology and classifications used in this report can be found in the Glossary.

2 Traumatic spinal cord injury case registrations in 2017–18

This chapter provides an overview of traumatic SCI incident cases where the injury event occurred between 1 July 2017 and 30 June 2018, and the case was reported by 17 November 2020. The late closing date for the data for this reporting year was a result of various staff changes in the NISU and several spinal units, as mentioned previously.

For the period 2017–18, a total of 187 incident cases were reported to the ASCIR by participating spinal units (Table 2.1).

Table 2.1: Discharge status of traumatic SCI cases aged 15 and over with onset in 2017–18, by residency status

	Australian residents		Non-residents		Total	
	Number	%	Number	%	Number	%
At discharge from spinal unit:						
Persisting deficit	175	94.1	1	100.0	176	94.1
No ongoing neurological deficit	8	4.3	0	0.0	8	4.3
Died on ward	2	1.1	0	0.0	2	1.1
Total[(a)(b)]	**186**	**100.0**	**1**	**100.0**	**187**	**100.0**

(a) Percentages may not equal 100, due to rounding.

(b) One Australian resident injured in 2017–18 was still an admitted patient in the spinal unit at the time data for this report was collated and has been included in the totals.

Source: AIHW ASCIR.

Chapter 3 of this report focuses on the demographic, social and clinical characteristics of the 176 people (175 Australians and 1 non-resident) with onset of traumatic SCI during 2017–18 who were discharged alive with a persisting traumatic SCI. This total includes 2 Australian residents who were transferred to an Australian spinal unit after incurring a spinal injury overseas.

Chapter 4 focuses on the external causes of injury and other factors related to the injury event for all 187 traumatic SCI cases with onset in 2017–18, irrespective of survival to discharge or persistence of deficit. This total also includes the non-Australian resident who was admitted to and discharged from a spinal unit in Australia, and the 2 patients who died while still in a spinal unit. Both patients who died during admission were men who incurred their SCI as the result of a fall, 1 a high fall, 1 a low fall. The neurological level of injury at admission in these cases was C1 and T7, and both were complete.

3 Persisting traumatic spinal cord injury

This chapter examines the characteristics of the 176 cases of persisting traumatic SCI sustained during 2017–18. It also presents summary information on new cases reported each year from 1995–96 to 2016–17.

Records in the ASCIR that met all the following criteria were included as persisting traumatic SCI cases:

- date of injury was in the reference year, ending 30 June
- aged 15 or older at onset
- reported to have a spinal cord deficit at discharge
- discharged alive.

Incidence rates were calculated using the estimated resident population of Australia aged 15 or older, as provided by the Australian Bureau of Statistics (ABS) (see 'Population denominators' in Appendix B). Direct age-standardisation was employed using the Australian population in 2001 as the reference (ABS 2003).

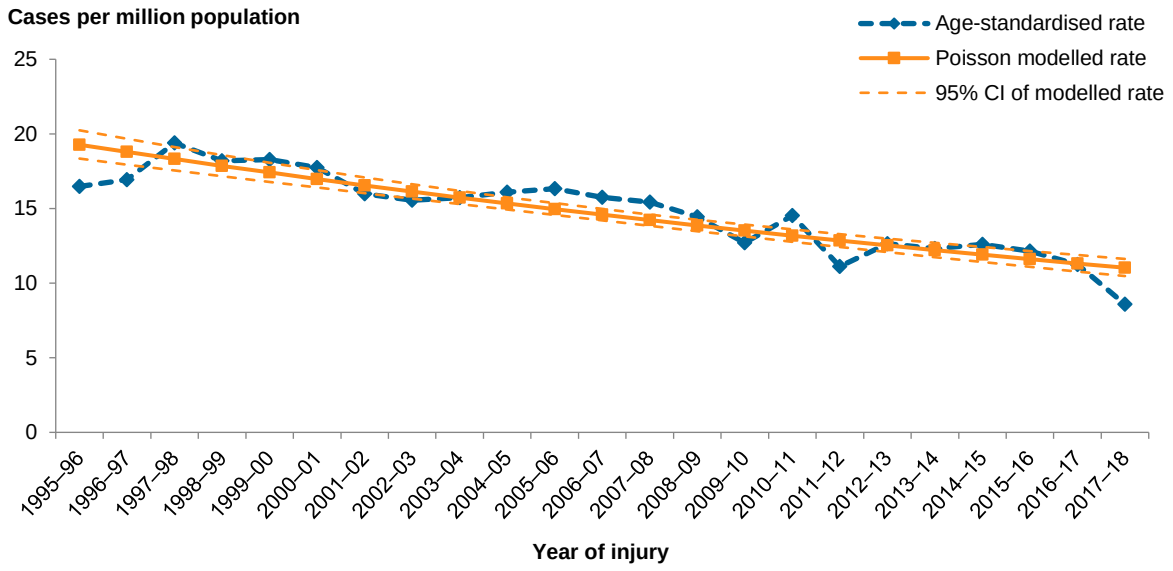
Trends of persisting traumatic SCI, 1995–96 to 2017–18

Incidence rates

In 2017–18, the age-standardised incidence rate of persisting traumatic SCI for people aged 15 and over was 8.6 cases per million population.

Poisson regression based on the annual incidence rates, presented as a trend with 95% confidence intervals (CIs), is shown in Figure 3.1 (see 'Use of confidence intervals' in Appendix B). According to this, the incidence rate of persisting SCI at age 15 and over has declined since 1995–96 by an average of 2.5% per year (95% CI –2.9% to –2.1%). This decline, however, should be interpreted with some caution as discussed further below.

Figure 3.1: Trends in rates of persisting traumatic SCI cases aged 15 and over, by year of injury, 1995–96 to 2017–18

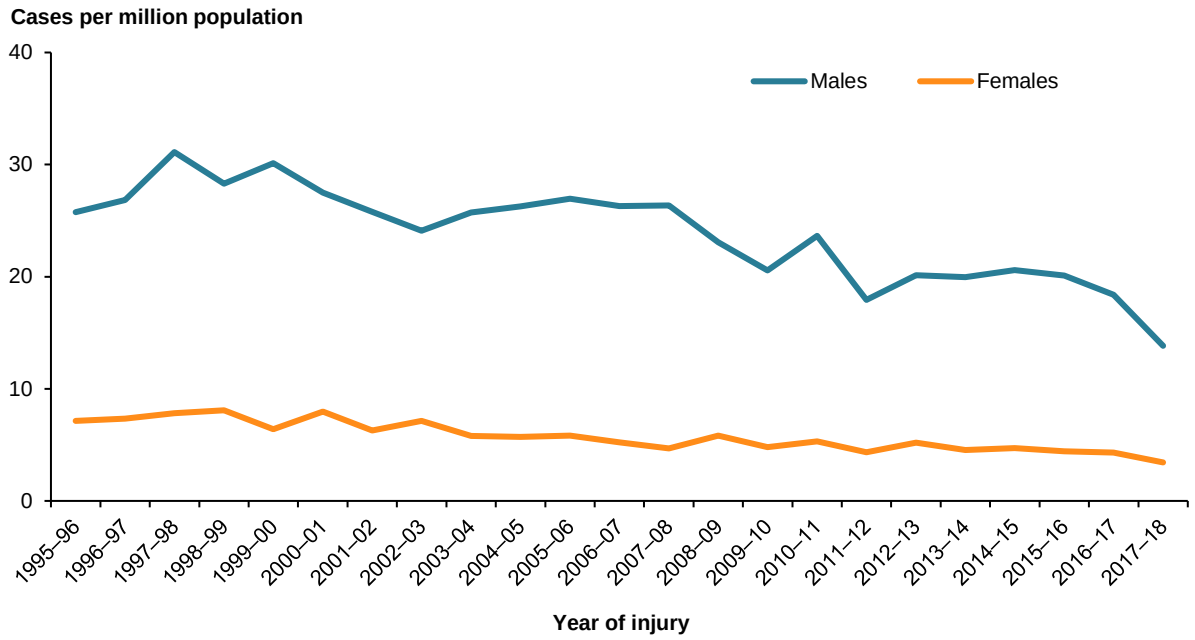


Source: AIHW ASCIR.

The trend in incidence rates, by sex, is shown in Figure 3.2. Across the 23 years of the ASCIR data, the age-standardised rate of persisting traumatic SCI for males aged 15 and over has been consistently higher than for females aged 15 and over. The rate for females has shown little variation over this time, while there has been a decrease in the rate for males. The drop seen in the rate of injury for males in 2009–10 and 2011–12 was influenced by known under-reporting of cases to the ASCIR for those years (see Appendix A). The drop evident in the rate of injury for males in 2017–18 is also discussed in Appendix A. Two spinal units returned a nearly 50% reduction in registrations for the 2017–18 year, 1 for unknown reasons and 1 because anecdotally, there had been an increase in the number of people either withholding consent to be included in the ASCIR or whose consent process was incomplete. While there was a period of inconsistent returns from the spinal units, and an apparent increase in the number of people who declined consent to their inclusion in the register, these may not account for the total drop in numbers. As a result, the trends shown in this chapter need to be interpreted cautiously, until these matters are explored further with the unit directors.

The highest rate of persisting traumatic SCI observed for males during this 23-year period was 31.1 cases per million in 1997–98, while the highest rate for females was 8.1 in the following year, 1998–99.

Figure 3.2: Trends in age-standardised rates of persisting traumatic SCI cases aged 15 and over, by sex, by year of injury, 1995–96 to 2017–18



Source: AIHW ASCIR.

Median duration of initial care for persisting traumatic SCI

This section provides information on the median duration of initial care (DIC—see Glossary) for persisting traumatic SCI cases. The median DIC has been used as the summary measure because it is not greatly affected by outlier values. The data are presented by neurological level (cervical, thoracic, or lumbosacral); extent of lesion (complete or incomplete); and year of injury. Level and extent of lesion are as assessed on admission to a participating spinal unit.

Cases with a *Complete injury* on admission have consistently had the longest median DIC (Table 3.1). This was also true in 2017–18. Cases admitted with *Complete tetraplegia* had the longest recorded stays, with median DIC ranging between 194 and 261 days (or between 27 and 37 weeks). However, in this reporting year the median DIC for cases of complete cervical injury dropped by about 22% (250 days in 2016–17, compared with 194 for 2017–18), while the median DIC for cases with complete lumbosacral injury rose by more than 100% (67 days in 2016–17, compared with 149 days in 2017–18).

Cases with *Complete paraplegia* at the thoracic level had the next longest stay on average, ranging between 131 and 179 days (or roughly between 19 and 26 weeks). The least severe neurological impairment—*Incomplete paraplegia* at the lumbosacral level—had the shortest median DIC, with a median of less than 90 days (or 13 weeks) reported in most years. However, as fewer than 10 cases a year have been reported for *Complete paraplegia* at the lumbosacral level since 1999–00, the median DIC for this type of case should be interpreted cautiously.

Table 3.1: Median duration of initial care (days) for persisting traumatic SCI cases aged 15 and over, by year of injury, by neurological impairment at admission, 1995–96 to 2017–18

Year of injury	Tetraplegia		Paraplegia				Proportion included (%)[a]
	Cervical		Thoracic		Lumbosacral		
	Complete	Incomplete	Complete	Incomplete	Complete	Incomplete	
1995–96	261	88	144	134	83	49	89
1996–97	220	104	148	102	97	67	86
1997–98	204	68	143	92	125	69	94
1998–99	245	89	157	84	111	61	90
1999–00	232	80	149	70	106	79	91
2000–01	254	95	136	121	145	67	88
2001–02	224	98	155	106	104	54	91
2002–03	201	95	142	103	112	54	92
2003–04	238	62	138	104	131	61	88
2004–05	227	103	145	111	179	52	87
2005–06	252	139	143	111	104	97	89
2006–07	220	124	161	128	123	74	91
2007–08	228	113	146	104	108	88	93
2008–09	247	143	151	132	106	88	93
2009–10	261	174	164	127	133	54	87
2010–11	227	128	165	115	88	60	85
2011–12	235	123	134	146	117	117	90
2012–13	197	110	135	111	80	99	86
2013–14	239	111	168	114	89	56	88
2014–15	216	140	179	119	70	101	90
2015–16	212	106	131	143	70	67	90
2016–17	250	146	149	116	67	65	88
2017–18	194	160	146	116	149	72	90

(a) This proportion is calculated as the number of new cases for which DIC could be calculated (see Glossary), divided by the total number of new persisting traumatic SCI cases.

Note: Shading indicates median DIC has been calculated on fewer than 10 cases and therefore should be interpreted cautiously.

Source: AIHW ASCIR.

Demographic and social characteristics of persisting traumatic SCI in 2017–18

The remainder of this chapter focuses only on the newly incident cases of persisting traumatic SCI among people aged 15 and over with an injury date between 1 July 2017 and 30 June 2018 who were discharged alive (176 cases).

Age and sex distribution

The age-specific rates of new cases of persisting traumatic SCI by sex are presented in Table 3.2. There has been a notable drop in the reported numbers of those aged 45–54 years, from 40 in 2016–17 to 19 in 2017–18, and in the numbers of those aged 65 and over, from 47 in 2016–17 to 32 in 2017–18.

Table 3.2: Comparison of age-specific rates of persisting traumatic SCI cases aged 15 and over, by age group, by sex, 2016–17 and 2017–18

	Males		Females	
	2016–17	2017–18	2016–17	2017–18
Age-group	Age-specific rate	Age-specific rate	Age-specific rate	Age-specific rate
15–24	20.3	13.4	3.9	4.5
25–34	16.0	16.8	5.5	3.2
35–44	16.1	14.6	2.5	1.8
45–54	21.2	8.9	4.3	3.1
55–64	15.3	17.1	4.9	5.5
65–74	17.3	16.8	4.6	3.6
75+	22.8	9.6	5.5	3.2

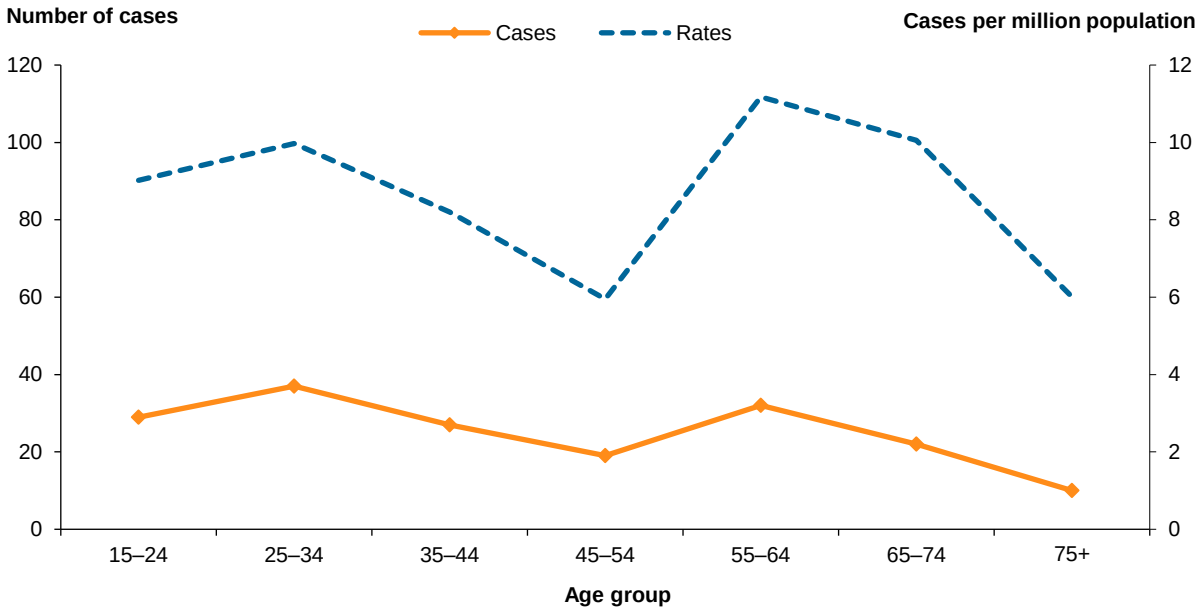
Note: Age-specific rate is number of cases per million population.

Source: AIHW ASCIR.

Consistent with most recorded years, the majority (80%) of cases of persisting traumatic SCI reported to the ASCIR for 2017–18 were male (140 cases). A total of 36 female cases (20%) were included in the register for the same period. The highest number of new SCI cases was seen among those aged 25–34 (37 cases, or 21%). Cases aged 55–64 were the next most common, with 32 cases or 18% (Figure 3.3).

While the age-specific rate was again highest for those aged 55–64 and over (11.2 cases per million population), the age-specific rate for 2 groups, those aged 25–34 and those aged 65–74, followed closely, with 10.0 cases per million and 10.1 cases per million, respectively (Figure 3.3). The rate for those aged 45–54 dropped sharply from 12.6 cases per million in 2016–17 to 6.0 cases per million in 2017–18, and for those aged more than 75, there was a similar sharp drop in the age-specific rate, from 13.0 cases per million in 2016–17, to 6.0 cases per million in 2017–18 (AIHW 2020). As mentioned previously, these rates need to be viewed with caution, because of the reduced number of cases registered overall in 2017–18.

Figure 3.3: Case numbers and age-specific rates of persisting traumatic SCI cases aged 15 and over, by age group, 2017–18

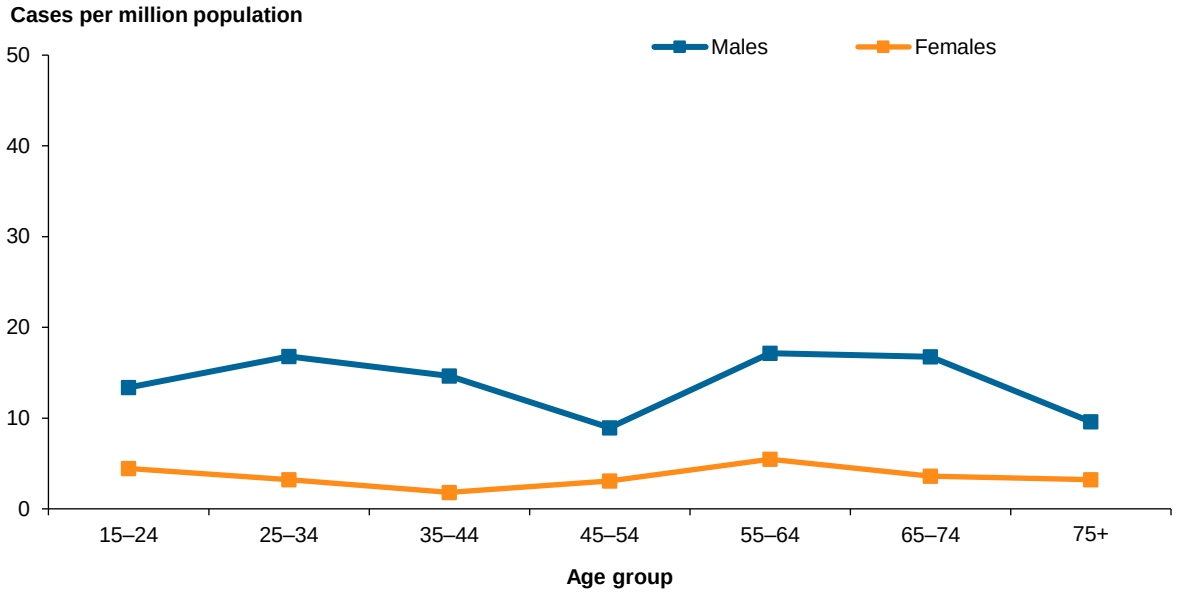


Note: Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Source: AIHW ASCIR.

The pattern of incidence rates for persisting traumatic SCI cases for people aged 15 and over remains consistent with previous years, in that the rates for males were higher across all age groups than those for females (Figure 3.4). However, the pattern of incidence rates by age for males and females has changed significantly from the previous year.

Figure 3.4: Age-specific rates of persisting traumatic SCI cases aged 15 and over, by age group, by sex, 2017–18



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

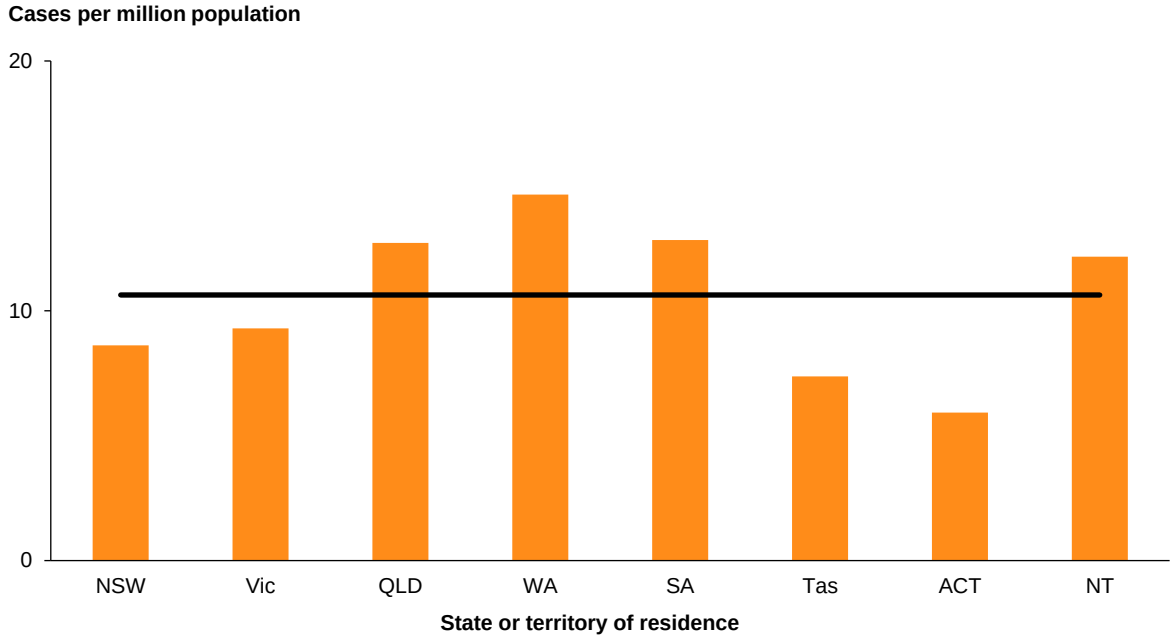
Source: AIHW ASCIR.

State or territory of usual residence

Age-standardised incidence rates of persisting traumatic SCI, by state and territory of usual residence, are presented in Figure 3.5. Due to the small number of cases in some jurisdictions, rates were based on the aggregated state or territory case counts for the 3-year period 2015–16 to 2017–18.

Despite that, the rates are based on low numbers of cases (fewer than 10 cases each) for the less populous jurisdictions of Tasmania and the 2 territories. Rates based on such small numbers should be expected to fluctuate considerably from year to year. The 3-year rate for residents of the Australian Capital Territory was the lowest (5.9 cases per million), while the rate for residents of Western Australia was the highest (14.6 cases per million). The 3-year rates of persisting traumatic SCI for Queensland, Western Australia, South Australia and the Northern Territory were higher than the national rate, which was 10.6 cases per million.

Figure 3.5: Age-standardised 3-year rates of persisting traumatic SCI cases aged 15 and over, by state or territory of usual residence, 2015–16 to 2017–18



Notes

1. The 3-year national rate is shown as the solid horizontal line. The 3-year national rate includes non-Australian residents injured in Australia.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

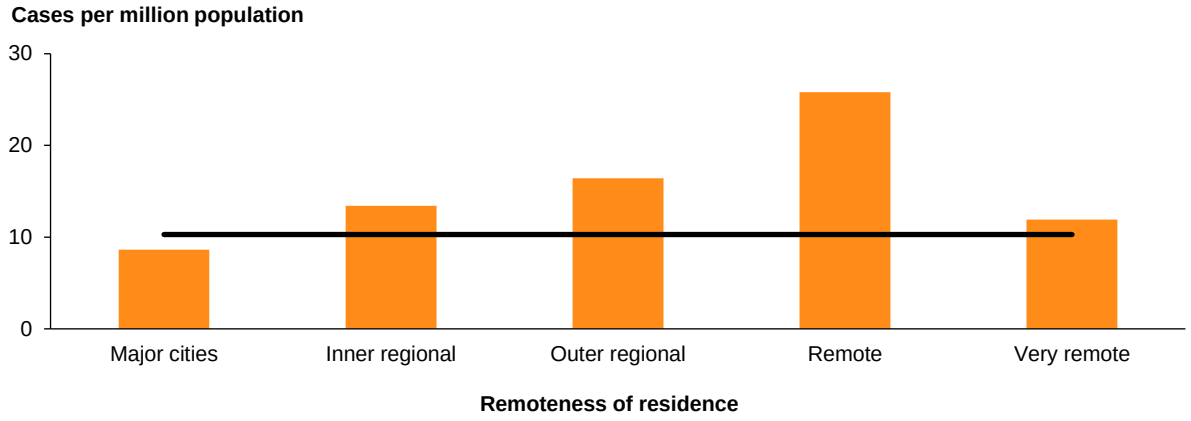
Source: AIHW ASCIR.

Remoteness of residence

Three-year incidence rates were calculated for cases grouped according to remoteness of usual residence for the period 2015–16 to 2017–18 (Figure 3.6) (see 'Assignment to remoteness area' in Appendix B).

As is clear from the figure, the highest 3-year rate of persistent SCI occurs among residents of *Remote areas* (25.8 cases per million), and the lowest 3-year rate occurs among residents of *Major cities* (8.6 cases per million). However, caution should be used in interpreting the rates for residents of *Outer regional* and more remote areas, because case numbers are fewer than 100.

Figure 3.6: Age-standardised 3-year rates of persisting traumatic SCI cases aged 15 and over, by remoteness of residence, 2015–16 to 2017–18



Notes:

1. The overall 3-year national rate is shown as the solid horizontal line. The 3-year national rate includes non-Australian residents injured in Australia and Australian residents with insufficient details to determine remoteness area.
2. Data underpinning this figure can be found in the accompanying supplementary spreadsheets.

Source: AIHW ASCIR.

Socioeconomic characteristics

The domestic living arrangements of people with persisting traumatic SCI may have a significant effect on their recovery from injury. People who are in relationships—married, de-facto or shared living—perhaps may anticipate support from their partners; people who live alone may find it more taxing to manage their changed domestic arrangements. There are policy implications from these data. As a result, this report has traditionally included information on the marital status of people included in each year's data. However, information on marital status is often not reported at all, and so these data need to be interpreted with caution.

Overall, more than half of the people who sustained a persisting traumatic SCI in 2017–18 were married or in a de-facto relationship at the time of injury (Table 3.3). Never married (57 cases, 32.4%) was the next most commonly reported marital status for people injured during this period.

Table 3.3: Marital status at onset of persisting traumatic SCI, 2017–18

Marital status	Number	%
Never married	57	32.4
Widowed/Divorced/Separated	17	9.7
Married (including de facto)	90	51.1
Not reported	12	6.8
Total[(a)]	**176**	**100.0**

(a) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Overall, 62% of cases were employed at the time of injury (Table 3.4). Note that this does not mean they were necessarily working at the time of their injury, just that they had a job at the time of injury. Those reported as being pensioners (31 cases, 18%) included those receiving age or disability pensions, as well as those described as retired.

Table 3.4: Employment status at onset of persisting traumatic SCI, 2017–18

Employment status	Number	%
Employed	109	61.9
Pensioner	31	17.6
Unemployed	11	6.3
Not available for employment	14	8.0
Not reported	11	6.3
Total[(a)]	**176**	**100.0**

(a) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

The highest level of education completed at time of injury was poorly reported for 2017–18, as has been the case in previous years. Education level was not reported in 40% of all cases with a persisting traumatic SCI registered with the ASCIR for this period (Table 3.5). Among the 106 cases who did have a highest education level reported, 48 people (27%) had a post-school qualification—27 had completed tertiary or postgraduate education (15%) and 21 had completed a trade qualification or an apprenticeship (12%). Another 17 (10%) had been awarded a diploma or a certificate or other post school study.

Table 3.5: Highest educational level attained at onset of persisting traumatic SCI, 2017–18

Education level	Number	%
Tertiary/postgraduate	27	15.3
Trade qualification/apprenticeship	21	11.9
Diploma or certificate/other post school study	17	9.7
Highest available secondary school level	19	10.8
Did not complete secondary school	19	10.8
Still at school/higher education	3	1.7
Not reported	70	39.8
Total[(a)]	**176**	**100.0**

(a) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Clinical characteristics of persisting traumatic SCI in 2017–18

Information on the neurological level of SCI, extent of injury to the cord, and the degree of impairment is routinely reported by spinal units during the initial hospitalisation for the SCI, and at discharge from rehabilitation. These clinical characteristics provide an indirect indication of the degree of support required by people with an SCI at discharge from hospital.

The neurological level of SCI is the lowest level (that is, the 1 furthest from the head) that has preservation of full neurological function, both motor and sensory. Further information on neurological level of SCI and how it is assessed is provided in the Glossary.

The period of admitted hospital care for people with persisting traumatic SCI is often prolonged. It is not uncommon for people injured in 1 reporting period not to be discharged until the following reporting period, and sometimes even later. For example, 1 case whose injury is included in this report (2017–18) was still in a rehabilitation unit in August 2020, the date of the case registration with the ASCIR. At the time of writing, no further information was available on this patient's status.

Neurological level of injury at discharge

Neurological level of persisting traumatic SCI at discharge is not always known or can be missing in the records. Of the 176 cases of persisting traumatic SCI, in 161 cases information on neurological level had been provided on discharge. In 15 cases the neurological level of persisting traumatic SCI discharge status was missing or unknown. The 2017–18 data unusually do include several cases of people who were discharged directly from the acute hospital, for whom admission data are available but whose neurological impairment was not collected at that discharge.

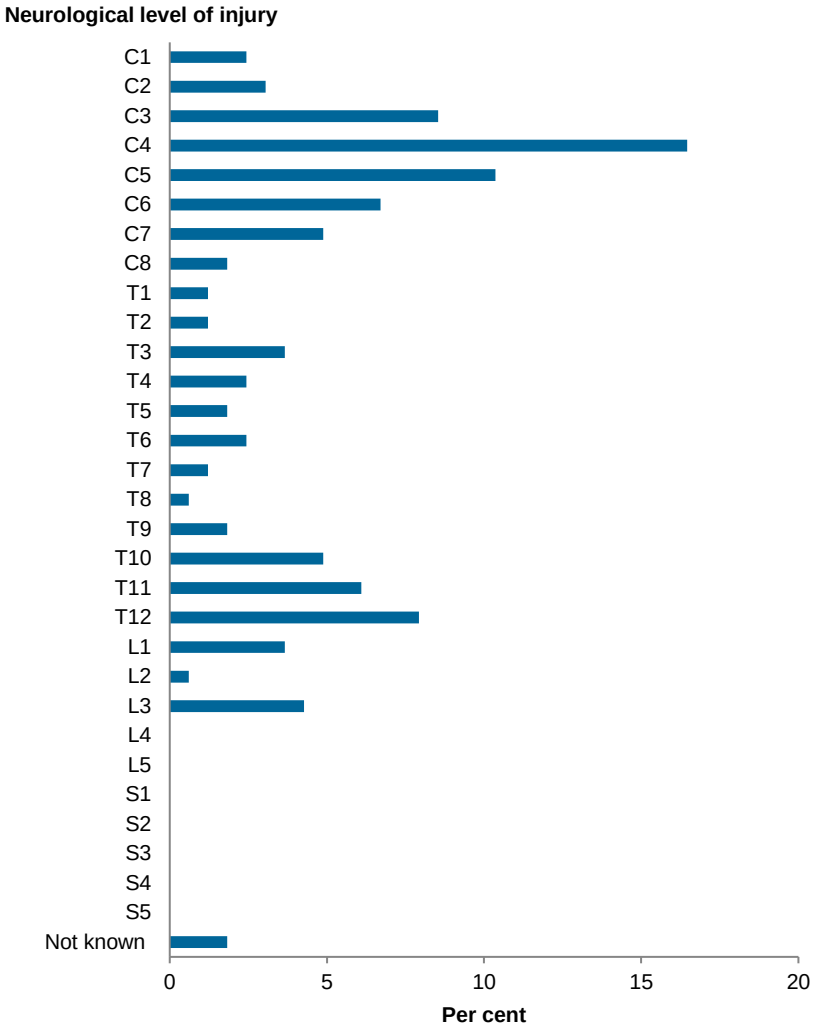
The distribution of neurological level of persisting traumatic SCI at discharge is presented in Figure 3.7. Of the 161 cases, just over half (55%) had a neurological injury at 1 of the cervical segments, C1–C8 (89 cases). The impairment resulting from this neurological level is referred to as *Tetraplegia*.

The most common neurological level of injury was C4, which accounted for 27 cases or 30% of cervical cases and 17% of the 161 cases with an identified level of injury. A further 17 cases had a neurological level of injury at C5 (19% of cervical cases and 11% of the total known cases).

Of the 161 known cases, 36% had a neurological level of injury at a thoracic segment (T1–T12) (58 cases), and of these, an injury at T11 was most common (17% of thoracic cases and 6% of known cases).

Fewer than 10% of the 161 cases with an identified level of injury had an injury at a lumbar segment (L1–L5) (14 cases). There were no injuries recorded at a sacral segment (S1–S5). The impairment resulting from injury at the thoracic or lumbosacral neurological levels is referred to as *Paraplegia*.

Figure 3.7: Neurological level of injury at discharge for persisting traumatic SCI cases aged 15 and over, 2017–18



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

Source: AIHW ASCIR.

Neurological impairment at discharge

For all persisting traumatic SCI cases reported to the ASCIR for 2017–18, the most frequently reported neurological impairment at discharge was *Incomplete tetraplegia* (69 cases, 43%; Table 3.6). Cases in this category had been assessed as having a cervical-level injury, and an ASIA Impairment Scale grade of either B (some sensory but no motor function preserved), C or D (some motor function preserved).

The next most common impairment at discharge was *Incomplete paraplegia* at the thoracic level (32 cases, 20%). Cases in this category had been assessed as having a neurological level of injury between T1 and T12, with an ASIA Impairment Scale grade of either B (some sensory but no motor function preserved), C or D (some motor function preserved).

All except 3 of the 14 cases involving the lumbosacral region were discharged with *Incomplete paraplegia*.

Table 3.6: Neurological impairment at discharge for persisting traumatic SCI cases aged 15 and over, 2017–18

Neurological impairment	Number	Proportion of cases (%)
Tetraplegia		
Cervical	89	55.3
Complete tetraplegia	*20*	*22.5*
Incomplete tetraplegia	*69*	*77.5*
Paraplegia		
Thoracic	58	36.0
Complete paraplegia	*26*	*44.8*
Incomplete paraplegia	*32*	*55.2*
Lumbosacral	14	8.7
Complete paraplegia	*3*	*21.4*
Incomplete paraplegia	*11*	*78.6*
Total	**161**	**100.0**

Note: In 15 cases the neurological level of persisting traumatic SCI discharge status was missing or unknown and are not included in this table.

Source: AIHW ASCIR.

Length of stay in spinal unit

Table 3.7 presents the median length of stay (LOS—see Glossary) in a spinal unit for persisting traumatic SCI cases in 2017–18, by neurological impairment at discharge. The 5th and 95th percentiles are also provided, to give an indication of the patterns of variation in LOS between types of impairment.

Cases with a *Complete injury* had a longer median LOS in a spinal unit than cases with an *Incomplete injury*, irrespective of spinal level impairment.

Overall, those with *Complete tetraplegia* had the longest median LOS at 192 days (between 27 and 28 weeks), while those with *Incomplete paraplegia* at the lumbosacral level had the shortest median LOS at 91 days (exactly 13 weeks).

Table 3.7: Length of stay in a spinal unit for persisting traumatic SCI cases aged 15 and over, by neurological impairment at discharge, 2017–18

Neurological impairment at discharge	Number of cases	Median LOS (days)	5th percentile (days)	95th percentile (days)
Tetraplegia				
Cervical	89	161	38	392
Complete tetraplegia	*20*	*192*	*141*	*435*
Incomplete tetraplegia	*69*	*149*	*30*	*370*
Paraplegia				
Thoracic	58	116	17	239
Complete paraplegia	*26*	*138*	*95*	*238*
Incomplete paraplegia	*32*	*102*	*17*	*239*
Lumbosacral	14	91	48	177
Complete paraplegia	*3*	*95*	*50*	*99*
Incomplete paraplegia	*11*	*91*	*48*	*177*

Note: In 15 cases the neurological level of persisting traumatic SCI discharge status was missing or unknown and are not included in this table.

Source: AIHW ASCIR.

4 External causes of spinal cord injury in 2017–18

In addition to recording information on the incidence of traumatic SCI, the ASCIR records information about the event which resulted in injury: the mechanism, the role of human intent, the type of place where the injury occurred, and the type of activity the person was involved in at the time of injury. Information about the factors associated with occurrence of traumatic SCI is important for injury prevention.

This chapter includes all 187 cases of traumatic SCI with onset in 2017–18 that were treated in participating spinal units and had been reported to the ASCIR by November 2020. This includes the 176 cases of persisting traumatic SCI that are the subject of Chapter 3; the 8 cases in which a person admitted to a spinal unit had no neurological deficit at discharge (that is, had an ASIA Impairment Scale of E); the 2 cases who died while in a spinal unit; and the 1 case that had not yet been discharged at the time of data compilation (see Table 2.1).

Mechanism of injury

In keeping with previous reports, traumatic SCI resulting from *Transport-related crashes* is categorised into 2 main groups: cases resulting from a *Land transport crash* or cases resulting from *Other transport crashes* (including water, air or rail). Because of the large number of cases and the diversity of types of land transport vehicles involved, *Land transport crash* cases are further divided into 2 groups:

- *Motor vehicle occupants* include drivers, passengers and unspecified occupants of sedans, station wagons, 4WD vehicles, buses, vans, trucks, semi-trailers and other similar vehicles in which the person is usually afforded some impact protection in the event of a traffic crash (for example, seatbelts and crumple zones).
- *Unprotected land transport users* include users of motorcycles, quad-bikes and bicycles, as well as pedestrians. (This term, commonly used in road safety statistics, refers to the greater vulnerability to injury, in a crash, of road users who are not restrained occupants of a car or other large motor vehicle.)

Cases resulting from *Other transport crashes* (including water, air or rail) are included in the *Other and unspecified causes* category. *Other transport crashes* may include farm machinery such as tractors or heavy machinery such as excavators.

SCI cases resulting from a *Fall* may be classified as resulting from either a *Low fall* (a fall on the same level or from a height of less than 1 metre), or from a *High fall* (a fall from a height of 1 metre or more). Occasionally details regarding the height of the fall are missing from the record. These cases are traditionally recorded as a *Low fall* in the ASCIR.

Water-related SCI cases are grouped using a search of descriptive injury text for terms related to events such as diving into shallow water; being dumped in the surf by a wave, or falling while water-skiing; or while scuba diving.

There are generally sufficient cases reported each year to include additional external cause categories for SCI resulting from *Heavy falling objects*, *Horse-related* and *Football.* However, for the 2017–18 year, there were very few cases reported in any of these categories (a total of only 5 cases, compared with 22 in the previous year).

More detailed information on how cases are assigned to a mechanism of injury category is included in Appendix B.

In 2017–18, the most common cause of total traumatic SCI cases in 2017–18 was a *Land transport crash* (86 cases, 46%), followed by a *Fall* of some kind (67 cases, 36%) (Table 4.1). The leading cause of injury for males for this reporting period was a *Land transport crash* as an *Unprotected land transport user* (49 cases, 33% of cases for males), while a *High fall* was the most common cause for females (12 cases, 32% of cases for females). In 2016–17, a *Low fall* was the most common cause for females (16 cases, 36% of cases for females) and for males it was a *Land transport crash* as an *Unprotected land transport user* (49 cases, 27% of cases for males). These 2 causes combined, *Land transport crash* and *Fall*, accounted for more than 80% of all newly incident traumatic SCI cases in 2017–18. In 2016–17, this figure was 78% of the total; in 2015–16, it was 90% of the total.

Characteristics of the cases due to each of the mechanisms shown in Table 4.1 are presented in the following subsections. The method for grouping cases by mechanism is described in Appendix B.

Table 4.1: Mechanism of injury of all traumatic SCI cases aged 15 and over, by sex, 2017–18

	Males		Females		Total	
Mechanism of injury	**Number**	**%**	**Number**	**%**	**Number**	**%**
Land transport crash						
Motor vehicle occupant	25	16.7	7	18.9	32	17.1
Unprotected land transport user	49	32.7	5	13.5	54	28.9
Fall						
Low fall (same level or <1 metre)[(a)]	19	12.7	8	21.6	27	14.4
High fall (≥1 metre)	28	18.7	12	32.4	40	21.4
Water-related	12	8.0	2	5.4	14	7.5
Heavy falling object	2	1.3	0	0.0	2	1.1
Horse-related	0	0.0	1	2.7	1	0.5
Football	2	1.3	0	0.0	2	1.1
Other and unspecified causes	13	8.7	2	5.4	15	8.0
Total[(b)]	**150**	**100.0**	**37**	**100.0**	**187**	**100.0**

(a) Includes falls from unspecified heights.

(b) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Table 4.2 shows mechanism of injury for SCI cases in 2017–18 by age group. *Land transport crashes* as a *Motor vehicle occupant* was the leading cause of traumatic SCI for cases aged 15–24 (9 cases, 33% of cases for this age group), while in the 25–64 year age group, *Land transport crashes* as an *Unprotected land transport user* was the leading cause (39 cases, 33% of cases for this age group).

A *Low fall* or fall from an unspecified height (14 cases, 38% of cases for this age group) was the leading cause of traumatic SCI among cases aged 65 and over.

Table 4.2: Mechanism of injury of all traumatic SCI cases aged 15 and over, by age group, 2017–18

	15–24 years		25–64 years		65+ years		All ages	
Mechanism of injury	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Land transport crash								
Motor vehicle occupant	9	33.3	18	15.4	4	10.8	32	17.1
Unprotected land transport user	7	25.9	39	33.3	6	16.2	54	28.9
Fall								
Low fall (same level or <1 metre)[(a)]	0	0.0	13	11.1	14	37.8	27	14.4
High fall (≥1 metre)	3	11.1	26	22.2	10	27.0	40	21.4
Water-related	5	18.5	7	6.0	1	2.7	14	7.5
Heavy falling object	0	0.0	1	0.9	0	0.0	2	1.1
Horse-related	1	3.7	0	0.0	0	0.0	1	0.5
Football	0	0.0	2	1.7	0	0.0	2	1.1
Other and unspecified causes	2	7.4	11	9.4	2	5.4	15	8.0
Total[(b)]	**27**	**100.0**	**117**	**100.0**	**37**	**100.0**	**187**	**100.0**

(a) Includes falls from unspecified heights.

(b) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Just over half (105 cases, 56%) of the total traumatic SCI cases in 2017–18 had a neurological injury to the cervical spine, or *Tetraplegia*, when admitted to the spinal unit (Table 4.3). Nearly one-quarter (24 cases, 23%) of *Tetraplegia* cases were due to crashes involving *Unprotected land transport users*, followed by a similar number (23 cases, 22%) due to *Low falls*.

Of the 61 neurological injuries sustained at the thoracic level, the leading cause involved *Unprotected land transport users* (23 cases, 38%), followed by *High fall* cases (13 cases, 21%).

Of the 20 lumbosacral-level cases, around one-third (7 cases, 35%) were the result of crashes involving *Unprotected land transport users*.

Table 4.3: Mechanism of injury for all traumatic SCI cases aged 15 and over, by neurological level of injury at admission, 2017–18

	Tetraplegia		Paraplegia					
	Cervical		Thoracic		Lumbosacral		Total	
Mechanism of injury	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Land transport crash								
Motor vehicle occupant	15	14.3	12	19.7	4	20.0	32	17.1
Unprotected land transport user	24	22.9	23	37.7	7	35.0	54	28.9
Fall								
Low fall (same level or <1 metre)[(a)]	23	21.9	3	4.9	1	5.0	27	14.4
High fall (≥1 metre)	22	21.0	13	21.3	5	25.0	40	21.4
Water-related	14	13.3	0	0.0	0	0.0	14	7.5
Heavy falling object	0	0.0	1	1.6	1	5.0	2	1.1
Horse-related	0	0.0	1	1.6	0	0.0	1	0.5
Football	2	1.9	0	0.0	0	0.0	2	1.1
Other and unspecified causes	5	4.8	8	13.1	2	10.0	15	8.0
Total[(b)]	**105**	**100.0**	**61**	**100.0**	**20**	**100.0**	**187**	**100.0**

(a) Includes falls from unspecified heights.

(b) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Land transport crashes

The mean age at onset for traumatic SCI resulting from a *Land transport crash* in 2017–18 was similar for both *Motor vehicle occupants* and *Unprotected land transport users,* at 40 and 43 years respectively (data not shown). The age range for injured *Motor vehicle occupants* was 16 to 79 years, while for injured *Unprotected land transport users* it was 17 to 82 years (data not shown).

As shown in Table 4.1, almost half of all traumatic SCI cases (86 cases, 46%) reported to the ASCIR for 2017–18 were as a result of a *Land transport crash*. In over one-third of male cases (26 cases, 35%) the males were motorcycle drivers at the time of their injury (Table 4.4). For females, 5 cases (42%) of the 12 female cases were motor vehicle passengers at the time of their injury.

Table 4.4: Land transport user types for all traumatic SCI cases aged 15 and over, by sex, 2017–18

	Males		Females		Total	
Land transport user type	**Number**	**%**	**Number**	**%**	**Number**	**%**
Motor vehicle driver	20	27.0	5	41.7	25	29.1
Motor vehicle passenger	5	6.8	2	16.7	7	8.1
Motorcycle driver	26	35.1	3	25.0	29	33.7
Motorcycle passenger	2	2.7	1	8.3	3	3.5
Pedal cyclist or pedal cycle passenger	15	20.3	1	8.3	16	18.6
Quad-bike rider	6	8.1	0	0.0	6	7.0
Total[(a)]	**74**	**100.0**	**12**	**100.0**	**86**	**100.0**

(a) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Motor vehicle occupants

Information on the use of seatbelts and the circumstances surrounding *Land transport crashes*—including rollovers, ejection, and impact with another vehicle or roadside hazard—is not always available to the staff who complete the case registration forms for the ASCIR.

Of the 32 *Motor vehicle occupants* who sustained a traumatic SCI in 2017–18, 19% (6 cases) stated they were wearing a seatbelt at the time of the crash, while 25% (8 cases) stated they were not. Information on the use of seatbelts was not available in 50% of cases (16 cases).

The most common type of crash event for *Motor vehicle occupants* was an impact with a roadside hazard (11 cases). Five people reported they had been ejected from the vehicle in which they had been travelling. Relatively few injured *Motor vehicle occupants* stated that the injury event included impact with another motor vehicle (5 cases; 16%), while over half (21 cases, 66%) stated there was no other motor vehicle involved. These types of events are not mutually exclusive and more than 1 event might have been reported for the same person.

Nearly half (15 cases, 47%) of *Motor vehicle occupants* recorded a neurological injury at the cervical level on admission (Table 4.3). Ten (66.6%) of these 15 cases were discharged with *Incomplete tetraplegia*. A further 12 cases recorded a thoracic-level injury on admission, and of these, *Complete paraplegia* was the most common impairment at discharge (8 cases).

Unprotected land transport users

Of the 54 *Unprotected land transport user* SCI cases, 49 cases (91%) were male (Table 4.1). Twenty-nine motorcycle drivers (54% of *Unprotected land transport user* SCI cases) accounted for more than one-third of total *Land transport crash* cases in 2017–18 (Table 4.4). Motorcyclists (drivers and passengers combined) represent 59% of the *Unprotected land transport users* who sustained a traumatic SCI in 2017–18. Sixteen pedal cyclists accounted for a further 30%. The remaining cases (6) were quad-bike riders.

Types of crash events that resulted in a traumatic SCI for *Unprotected land transport users* differed by user group. For instance, the most common confirmed crash event for motorcyclists was impact with a roadside hazard (12 cases; 38% of motorcyclists), followed by impact with a motor vehicle (4 cases). Five pedal cyclists were involved in an impact with a motor vehicle and 4 involved impact with a roadside hazard. Among the injured quad-bike riders, 2 experienced a rollover event and 2 fell from the quad-bikes, as described in the registration record of 4 of the 6 quad-bike cases. Only 6 of the 32 motorcyclist cases were reported to have occurred at ‘high speed’, or at a speed of at least 60 kilometres per hour.

A traumatic SCI at the cervical level was most frequent for pedal cyclists (12 of 16 cases) and quad-bike riders (3 of 6 cases), while thoracic-level injuries were most numerous for motorcycle drivers (15 of 29 cases).

Of the 54 *Unprotected land transport user* cases, 29 cases (54%) were injured on public roads and the remaining cases were in a variety of places: public recreation areas, racetracks, farms and bushland.

Falls

The mean age at onset for traumatic SCI due to a *Low fall* was 64 years, and cases ranged in age from 30 to 88 years. Traumatic SCI cases involving a *High fall* tended to be younger, with a mean age at onset of 48, and an age range of 21 to 80 years.

Just over one-third of traumatic SCI cases (67 cases, 36%) in 2017–18 were attributed to a fall of some kind. There were fewer cases of traumatic SCI resulting from a *Low fall* (27 cases) than those resulting from a *High fall* (40 cases). There were 8 *High fall* cases that involved stairs (20.0% of *High fall* cases), 6 cases that involved falling off a ladder (15.0% of *High fall* cases), and a further 4 cases (10.0% of *High fall* cases) that involved either falling off or through a roof. Historically, falls in which the height was unknown have been classified as a *Low fall*, and consequently precise numbers of those falls in which the height is unknown are not recorded separately.

The places where injuries occurred were diverse—63% (17 cases) of the *Low fall* cases occurred in or around the home, compared with 30% (12 cases) of the *High fall* cases. In 26% (7 cases) of the *Low fall* cases and in 38% (15 cases) of the *High fall* cases, the place of injury was not specified.

Water-related

The mean age at onset for *Water-related* SCI in 2017–18 was 37 years, and the age range was 18 to 73 years.

Of the 14 traumatic SCI cases reported for 2017–18 that were a result of a *Water-related* event, 86% were males (12 cases). Seven (50%) of the *Water-related* SCI cases involved the person diving or jumping into water, including into pools and shallow surf. Three cases (21%) occurred when the person was surfing or body surfing. Other *Water-related* events for this period involved jumping from a wharf or jumping into a shallow lake (1 case each), or being found unconscious or immobile in the water (2 cases).

All of the 14 *Water-related* SCI cases were admitted to a spinal unit with a neurological injury to the cervical-level spine, or *Tetraplegia* (Table 4.3). Seven of these 14 cases were discharged with *Incomplete tetraplegia.*

Other specified causes and other unspecified causes

In the 2017–18 period, there were relatively few reported cases of traumatic SCI resulting from *Heavy falling objects* (2), *Horse-related* (1)*, or Football* (2, both rugby-related)—a total of 5 cases from these categories. In the previous reporting year, 2016–17, there were 6 cases of SCI resulting from *Heavy falling objects*, 8 from *Horse-related events*, and 8 from *Football*—a total of 22 cases. The decrease in reported football-related SCIs may relate to the decrease in overall reported SCI cases, as mentioned elsewhere in this report.

A total of 15 other cases (13 males and 2 females) of traumatic SCI were reported for 2017–18 with a mechanism of injury other than those described above. This residual category, *Other and unspecified causes*, accounted for 8.0% of traumatic SCI cases overall. Causes of traumatic SCI in this category included air-transport crashes (3 cases), and assaults, with and without weapons (6 cases).

On the basis of the relatively low numbers for these specified and unspecified SCI causes for 2017–18, no further analysis is presented in these categories.

Activity at time of injury

The classification system for reporting type of activity when injury occurred is based on that used in the the *International statistical classification of diseases and related health problems, 10th revision, Australian modification* (ICD-10-AM) (ACCD, 2016). It includes the categories: *While engaged in sports or leisure; While working for income; While engaged in other types of work* (such as unpaid home maintenance)*; While resting, sleeping, eating or engaging in other vital activities* (hereafter referred to as *While engaged in a personal activity*); or *While engaged in other or unspecified activity*.

The types of activity being undertaken at the time of injury, together with the mechanism of injury, are shown in Table 4.5.

Table 4.5: Traumatic SCI cases aged 15 and over, by mechanism of injury, by type of activity, 2017–18

	Sports and leisure		Working for income[a]		Other type of work		Personal activity		Other and unspecified activity		Total	
Mechanism of injury	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Land transport crash												
Motor vehicle occupant	0	0.0	4	20.0	0	0.0	0	0.0	28	25.2	32	17.1
Unprotected land transport user	15	34.9	4	20.0	0	0.0	0	0.0	35	31.5	54	28.9
Fall		0.0										
Low fall (same level or <1 metre)[b]	1	2.3	0	0.0	4	40.0	2	66.7	20	18.0	27	14.4
High fall (≥1 metre)	9	20.9	5	25.0	4	40.0	1	33.3	21	18.9	40	21.4
Water-related	13	30.2	0	0.0	0	0.0	0	0.0	1	0.9	14	7.5
Heavy falling object	1	2.3	0	0.0	1	10.0	0	0.0	0	0.0	2	1.1
Horse-related	1	2.3	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5
Football	2	4.7	0	0.0	0	0.0	0	0.0	0	0.0	2	1.1
Other and unspecified causes	1	2.3	7	35.0	1	10.0	0	0.0	6	5.4	15	8.0
Total[c]	**43**	**100.0**	**20**	**100.0**	**10**	**100.0**	**3**	**100.0**	**111**	**100.0**	**187**	**100.0**

(a) Includes travel to and from work.

(b) Includes falls from unspecified heights.

(c) Percentages may not equal 100, due to rounding.

Source: AIHW ASCIR.

Engaged in sports or leisure activities

Nearly a quarter (43 cases, 23%) of the 187 traumatic SCI cases reported to ASCIR for 2017–18 occurred while the person was *Engaged in sports or leisure activities*. *Unprotected land transport users* accounted for the largest proportion (15 cases, 35%) of cases injured during a sport or leisure activity, including 11 motorcyclists, 4 pedal cyclists, and 1 quad-bike rider. *Water-related* SCI cases were next most common (13 cases, 30%), followed by *High falls* (9 cases, 21%). The *Football* cases (2) and the single *Horse-related* case are included in this activity category.

Other sporting activities during which SCI occurred included riding dirt bikes (6 cases), mountain biking (4 cases), skiing, playing rugby and surfing. Young men aged 25–34 (13 cases) accounted for nearly one-third (30%) of cases in this activity group.

While working for income, and while engaged in other types of work

In previous reports, *While working for income* was the next most numerous specified activity being undertaken when a traumatic SCI occurred, after *Engaged in sports and leisure activities*, and this is again the case in 2017–18 (20 cases, 11%). After working for income, the next most common specified activity was *While engaged in other types of work* (10 cases, 5.3%).

Of the 20 cases who were injured *While working for income*, 18 were males, 9 of whom were aged 25–34 years. A fall of some kind accounted for 25% of work-related cases (5), all were *High falls,* all from a height estimated to be 3 metres or more.

The highest proportion of cases injured *While working for income* resulted from *Land transport crashes*, with 4 cases each for *Motor vehicle occupants* and *Unprotected land transport users* (8 cases; 40%). These included a person travelling to work, a truck driver, and 2 quad-bike riders.

The places where these work-related SCI cases occurred included construction sites, public roads, public recreation areas, a factory, a warehouse, and a farm.

Eight of the 10 people who sustained a traumatic SCI while engaged in work other than for income were male (80%). Their average age was 66 years. There were 8 cases of fall, 4 each for *High fall* and *Low fall*.

While engaged in a personal activity

Two females and 1 male made up the 2% of 2017–18 traumatic SCI cases that occurred *While engaged in a personal activity* (such as eating, sleeping or self-care). All 3 were the result of a fall, 2 *Low falls* and 1 *High fall.*

The 2 *Low falls* resulted from falling in the bathroom and tripping over on the way to the bathroom. The *High fall* case resulted from falling from a campervan bed. All 3 cases in this activity group occurred in the home (including the campervan which was designated as a mobile home).

Other or unspecified activity

There were 111 cases that had *Other or unspecified activity* recorded as activity at the time of injury. Of these cases, *Land transport crashes* accounted for 63 cases (58%)—including 28 *Motor vehicle occupants* cases and 35 *Unprotected land transport users* cases (Table 4.5). A further 41 cases were the result of a fall, including 20 *Low falls* cases and 21 *High falls* cases.

The great majority (102 cases, 92%) of traumatic SCI cases in this activity group were due to unintentional events.

Appendix A: Data issues

2017–18 data issues

There are some inconsistencies in the data reported for this year, 2017–18, when compared with previous years, in particular a drop in the number and type of cases reported. Comparison of the patterns of 2017–18 cases with patterns of earlier years' cases must be interpreted cautiously. The following observations should be noted:

- Follow-up with spinal units for 2017–18 case registrations began in 2019. There was a major pause in activity because of the COVID-19 pandemic and the absence of the Australian Spinal Cord Injury Register (ASCIR) Manager. Follow-up resumed in August 2020. Follow-up was halted in November 2020, in order to process the data and produce the 2017–18 annual report. At last inquiry, 1 registered case admitted in 2017–18 was still in-unit.
- The total number of newly incident cases of traumatic spinal cord injury (SCI) reported by November 2020 to the ASCIR for the 2017–18 year was 187. This base count is about 18% lower than the number reported for the 2016–17 year (n = 230), and 25% lower than the mean number reported in the previous 4 years (n = 24/year).
- The change in reported traumatic SCI has differed markedly between participating spinal units, ranging from a small increase to a decrease of 50%. The reductions have not been random, being greatest for certain age groups and certain types of cases.
- In the case of one service, this reduction in numbers was reported to be the result of a noticeable increase in the number of people who either did not consent to their data being added to the ASCIR, or perhaps whose consent process was not followed up by unit staff. We know that 13 patients of one of the other participating spinal units did not consent to inclusion in the ASCIR, and are not included in this report. We do not know the numbers of non-consenting patients for the other units.
- This report includes about 12 records of people who were admitted to the acute ward with a diagnosed SCI but who were discharged directly from that ward without the usual SCI-related discharge data being collected, as it is on discharge from rehabilitation (for example, level and degree of neurological impairment). Further, there are 8 cases in which incomplete dates of birth have been provided.

Data quality statement

This data quality statement provides information relevant to interpretation of the ASCIR.

Summary of key data quality issues

- The Australian Institute of Health and Welfare (AIHW) NISU compiles the ASCIR using data provided by participating spinal units in hospitals in Australia.
- While it has always been assumed that the ASCIR collects a large proportion of adult cases of SCI resulting from trauma, there has been no formal testing of this assumption.
- The ASCIR database changes over time, adding new records and improving the quality of existing records as new information becomes available. Reported information on the ASCIR records may therefore change from year to year.
- The series of annual reports based on the ASCIR are published by the AIHW and concentrate only on those cases of persisting traumatic spinal cord injury in adults over the age of 15 years.
- There are some inconsistencies in the data published in the 2017–18 report.

Description

The ASCIR is an opt-in national register of incident cases of SCI which occur in Australia and overseas to Australian residents, as well as those which are incurred by overseas residents if they are treated in a spinal unit in Australia. The ASCIR has operated as a cooperative venture of the directors of the participating spinal units in Australia and the AIHW through the AIHW NISU, since 1995. The ASCIR is part of the NISU work program, which is managed and operated at Flinders University. The ASCIR is based on the national register originally established in 1986 by Mr John Walsh, AM.

The ASCIR is managed by a board of directors comprising the directors of the spinal units; the director of the NISU; and invited specialists in epidemiology, paediatric rehabilitation and other fields of relevance.

The registration process begins in the spinal unit after patient stabilisation. The director at each participating spinal unit is responsible for data collection and patient consent arrangements in their own units. The registration process and reporting to the NISU differs between spinal units: some spinal units use a 2-phase registration and reporting process, on admission and on discharge, while others may register and report at the time of discharge only.

Institutional environment

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* (the AIHW Act) to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent, corporate Commonwealth entity established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The AIHW also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The AIHW works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections, to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national data sets based on data from each jurisdiction; to analyse these data sets; and to disseminate information and statistics.

The AIHW Act, in conjunction with compliance with the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality. For further information, see the AIHW website www.aihw.gov.au.

The AIHW is the Data Custodian for the ASCIR data, through the NISU. The Data Custodian ensures that the analysis and dissemination of the data are in accord with purposes approved by the AIHW Ethics Committee, as well as security provisions required by Section 29 of the AIHW Act. The NISU is responsible for the security, proper operation, access to and use of the ASCIR data. The Director, Professor James Harrison, is responsible to the AIHW for ensuring that the operation of the ASCIR and the use of ASCIR data comply with AIHW policies and procedures.

Timeliness

The reference period for this report is 2017–18.

The main focus for reporting is incident cases of persisting traumatic SCI. 'Persisting' cases are those in which the ASIA Impairment Scale is A to D at 90 days after injury, or at discharge from rehabilitation. Long periods in rehabilitation are not unusual. Finalising register data, particularly for cases that arise late in the reference year, requires follow-up for a period after the end of the reference year.

The date of closure for case registrations for 2017–18 data was 17 November 2020. This late closing date for registrations resulted from staff changes in both the NISU and several spinal units. Data corrections from spinal units up to November 2020 are included in this report.

Accessibility

The AIHW provides the published annual epidemiological *Spinal cord injury, Australia* series based on the ASCIR. These products may be accessed on the AIHW website www.aihw.gov.au.

Additional data requests can also be made on an ad hoc basis, facilitated through the AIHW.

Aggregated jurisdictional data may be released with the permission of the AIHW Data Custodian and the relevant spinal unit director(s). Aggregated national data may be released with the permission of the AIHW Data Custodian.

Interpretability

The annual publications include a glossary and an appendix on data issues, as well as inclusion and exclusion criteria for each chapter or subsection.

Further information on the ASCIR is available, on request, by email nisu@flinders.edu.au.

Relevance

The ASCIR contains records of newly incident adult cases of SCI which occur, in Australia and overseas, to Australian residents (who received treatment in an Australian spinal unit) between 1995–96 and 2017–18. Cases for 2018–19 onwards are currently being registered.

The scope of the ASCIR includes patients who are admitted to 1 of the 7 specialised spinal units in Australia chiefly responsible for care and rehabilitation of people with this condition. The following spinal units, all based in public hospitals, contribute data to the ASCIR:

- New South Wales State Spinal Cord Injury Services at:
  - Prince of Wales Hospitals (Sydney)
  - Royal North Shore Hospital (Sydney)
  - Royal Rehab (Sydney)
- Queensland Spinal Cord Injuries Service, Princess Alexandra Hospital (Brisbane)
- South Australian Spinal Cord Injury Service, Hampstead Rehabilitation Unit (Adelaide)
- Victorian Spinal Cord Service, Austin Health (Melbourne)
- Western Australian State Rehabilitation Service, Fiona Stanley Hospital (Perth).

The ASCIR keeps a record of patient demographic information; assessment of level of SCI at admission; a description of the event that led to the SCI; details of clinical status at discharge; and any complications during the course of treatment and rehabilitation.

Accuracy

The participating spinal units are primarily responsible for the quality of the data they provide. However, the NISU undertakes extensive validations on receipt of data. Data are checked for valid values, logical consistency and historical consistency. Potential errors and gaps in data are queried with the relevant spinal unit, and corrections and resubmissions may be made in response to these queries. Despite these processes, values of some variables remain unspecified, because information may not have been volunteered or recorded. The number of records for which data on tabulated variables were not available is generally stated in tables and footnotes. The NISU does not adjust data to account for possible data errors or missing or incorrect values, except as stated in reports.

Ideally, all cases would be added to the ASCIR during the initial period of hospitalisation following injury. However, in practice there has often been a substantial time lag between a patient's admission and the start of the case registration process. Each spinal unit has a different system for completing and compiling case registrations before submission to the NISU, and delays at different stages of the process occur from time to time.

The ASCIR is continuously updated. Sometimes information comes to hand after the closure of a reporting period. Closure of a reporting period usually occurs following an audit/review period extending for at least 1 year, and often longer, after the reporting period ends. This allows for sometimes long periods of admitted patient care. As a result, analysis of data from the register over longer periods of time will reflect these changes to data for cases that occurred in earlier years, and will not necessarily match the results of analyses in previous reports.

The current system does not capture detailed information on the period from injury to admission to a spinal unit, and does not obtain follow-up data after discharge from a spinal unit.

While a very small number of people under the age of 15 have been included in the ASCIR since its inception, children with SCI are generally treated in specialist paediatric hospitals, and are not reported to the register. For this reason, cases occurring in children under the age of 15 are not in scope for this report.

Known contributing factors in underestimation include that the person:

- did not consent to be included in the register
- was released from hospital without the need for admitted patient rehabilitation
- was admitted to another rehabilitation unit that does not provide data to the ASCIR
- died before admission to a specialist spinal unit occurred.

Coherence

The ASCIR includes data for each year from 1995–96 to 2017–18.

Although the ASCIR is a valuable source of information on the incidence of SCI care characteristics and trends, the data have limitations which may contribute to under-estimation of the actual numbers of newly incident SCI cases in any given year. Notably, the system does not include cases that are treated at units which do not participate in the ASCIR. This includes paediatric cases and some others.

Extensive checking of the ASCIR records was undertaken in 2014 and 2015. This revealed some errors and inconsistencies, mostly mistakes in transcription from paper records. In most instances, these were capable of correction on the basis of stored registration forms, or by consultation with the submitting spinal unit.

In addition, it was found that the assignment of external causes of traumatic SCI on the basis of short-text descriptions in submitted registration data was not always consistent. A revised method was implemented, based more directly on the available text and aligned more closely with the ICD-10-AM and the previous version of the classification (ICD-9-CM). The main effect of this is that, in reports covering cases occurring in 2008–09 and later, *Land transport* cases have not been sub-divided into traffic and non-traffic cases, as available text was not sufficient to make this distinction reliably in many cases. In reports covering cases from 2011–12 and later, cases of SCI resulting from complications of medical care have been reported with non-traumatic cases in an appendix. Formerly, some such cases were reported as non-traumatic while others, reported as traumatic, were included in the body of the annual reports. This change makes clearer how complications of care cases are now handled and better aligns ASCIR statistical reports with other AIHW reports on injury.

The case definition of ‘traumatic spinal cord injury’ has been changed slightly for new case registrations reported for 2011–12 onwards.

According to ICD-10-AM, some complications of surgical and medical care are codable to disease-specific chapters of the classification, while the remainder are codable to a section of the injury chapter T80–T88 *Complications of surgical and medical care, not elsewhere classified.*

By longstanding convention, AIHW reports on injury generally do not include cases coded to T80–T88. This is because T80–T88 includes a poorly defined part of all complications of medical care cases, and because circumstances of occurrence differ greatly between these cases and other injuries which occur in the community rather than the special circumstances of clinical care.

Beginning with the data year 2011–12, this practice has been applied to the reporting of ASCIR data. The effect is that small numbers of cases (2 to 5 in most years), which would previously have been reported in the *Other and unspecified causes* category of the 'External causes' chapter in the annual Spinal cord injury, Australia series, are now included in an appendix with non-traumatic cases. In 2017–18, there were 2 cases of SCI occurring as a result of chiropractic manipulation.

Time series presentations may be affected by changes in admission practices and/or in reporting of cases to the ASCIR. This applies particularly to the least severe cases, namely those that were admitted to 1 of the participating spinal units but were later found to have no ongoing neurological injury (that is, an ASIA Impairment Scale grade of E). Such cases were more numerous in the decade from 1995–96 than more recently.

Funding for the ASCIR was not provided in 2008–09 and 2009–10. During this period, case registration and compilation slowed considerably. When funding was reinstated, some spinal units experienced difficulties in retrospectively achieving full case registration.

For the financial year of injury 2011–12, fewer cases from 1 spinal unit were registered than usual. In most years, this unit contributes an average of 20% of newly incident cases, but for 2011–12, it contributed only 13%.

Further information on the ASCIR dataset is available on request by email to nisu@flinders.edu.au.

Appendix B: Technical notes

Population denominators

Australia, states and territory population data were obtained from the Australian Bureau of Statistics (ABS) in March 2019 (ABS 2018). Australian Statistical Geography Standard (ASGS) population-based data for calculating remoteness rates were supplied by the AIHW (2018, pers. comm., 21 November).

Incidence rates have been calculated as cases per million of the estimated resident population (ERP) of Australia.

Annual rates to 31 December were calculated by adding the ERPs for the first and second year and dividing by 2.

Direct standardisation was employed, taking the Australian population in 2001 as the standard (ABS 2003).

This report adopts the ABS definition of *Place of usual residence* as:

> *…that place where each person has lived or intends to live for six months or more from the reference date for data collection* (ABS 2012).

As with Australian Census data, place of residence at the time of injury for the ASCIR is self-reported, and some visitors to Australia might have reported an address in Australia as their place of residence, rather than applying this technical distinction. This might have resulted in some non-residents being assigned *Australian resident* status in this report.

Since 2014–15 the rate of persisting traumatic SCI in the *Spinal cord injury, Australia* series has been calculated using both resident and non-resident SCI cases. This change has made little difference to the annual rates, as shown in Table B1 below.

Table B1: Comparison of annual rate of persisting traumatic SCI for Australian residents only, and for Australian residents and non-residents of Australia

	Australian residents only		Australian residents and non-residents	
Year of injury	Number of cases	Age-standardised rate per million population	Number of cases	Age-standardised rate per million population
1995–96	238	16.1	244	16.5
1996–97	243	16.5	249	16.9
1997–98	279	18.7	289	19.4
1998–99	264	17.7	272	18.2
1999–00	268	17.8	275	18.3
2000–01	258	17.0	270	17.8
2001–02	231	15.0	246	16.0
2002–03	236	15.1	243	15.5
2003–04	242	15.3	249	15.7
2004–05	244	15.2	258	16.1
2005–06	254	15.6	265	16.3
2006–07	255	15.4	260	15.7
2007–08	255	15.0	262	15.4
2008–09	238	13.9	248	14.4
2009–10	219	12.4	224	12.7
2010–11	256	14.3	260	14.5
2011–12	202	11.0	204	11.1
2012–13	229	12.3	234	12.6
2013–14	230	12.0	235	12.3
2014–15	246	12.4	250	12.6
2015–16	239	12.0	242	12.1
2016–17	221	11.1	223	11.2
2017–18	175	8.5	176	8.6

Source: AIHW ASCIR.

Use of confidence intervals

The ASCIR is designed to register new cases of SCI at ages 15 and over, so sampling errors do not apply to these data. However, the time period used to group the cases (a financial year) is arbitrary. Use of another period (for example, January to December) would result in different rates.

Where case numbers are small, the effect of chance variation on rates can be large. Confidence intervals (95%, based on a Poisson assumption about the number of cases in a time period) have been placed around rates in Figure 3.1 as a guide to the size of this variation. Chance variation alone would be expected to lead to a rate outside the interval only once in 20 occasions.

Assignment to reported mechanism of injury

Cases were assigned to 1 of the following mechanism of injury categories:

- *Land transport crashes*
  - *Motor vehicle occupants*
  - *Unprotected land transport users*
- *Falls*
  - *Low falls* (same level or <1 metre) (includes falls from an unspecified height)
  - *High falls* (≥ 1 metre)
- *Water-related*
- *Heavy falling object*
- *Horse-related*
- *Football.*

The method for allocating cases to mechanism of injury categories shown in Table B2 was a 3-step process:

- Step 1: Draft allocation to *Land transport crashes*, *Falls* or *Horse-related* SCI on the basis of the numeric code values in the 'Main External Cause A' data field.
- Step 2: Draft allocation to the next 3 categories on the basis of the presence of keywords or phrases in the 'Description of the traumatic SCI event' data field.
- Step 3: Cases were reviewed for errors and inconsistencies, and re-assigned if these were found. If a case met criteria for more than 1 row, then it was assigned to the 1 occurring highest in the table.

Table B2: Assignment to reported mechanism of injury

Reported mechanism of injury	Assignment according to the ASCIR field 'Main external cause A' numeric code or content of the ASCIR field 'Description of the traumatic SCI event'
Motor vehicle occupants	1. Motor vehicle: driver 2. Motor vehicle: passenger (includes unspecified occupants)
Unprotected land transport users	3. Motorcycle: driver 4. Motorcycle: passenger (includes unspecified occupants) 5. Pedal cyclist or pedal cycle passenger (includes unspecified occupants) 6. Pedestrian 7. Other or unspecified transport-related circumstance, if record also contains reference to quad-bike, go-kart or other similar land transport vehicle
Low falls (same level or <1 metre)	9. Fall: low (on same level, or <1 metre drop) (also includes fall from an unspecified height)
High falls (≥1 metre)	10. Fall: high (drop of 1 metre or more)
Water-related	Records searched for mention of: dive, diving, swim, surf, pool, shallow, water-skiing, wakeboarding, snorkelling, jet-ski
Heavy falling object	Records searched for mention of heavy object falling onto or striking the person. Types of objects include logs, trees and parts of trees, machinery, parts of buildings and hay (stacks or bales).
Horse-related	8. Horse-related (fall from, struck or bitten by)
Football	Records searched for mention of: football, AFL, rugby, soccer
Other and unspecified causes	Any remaining records not assigned to a mechanism above

Assignment to remoteness area

The ABS Remoteness Structure is a measurement commonly used in Australian health data and provides a classification system which gives an indication of road distances people may have to travel to their nearest service centres. The Remoteness Structure was developed by the Australian Government in 1997 and its methodology was updated in 2011 (ABS 2013b). The classification of remoteness areas (RA) remains the same, however, and includes:

- *Major cities of Australia*
- *Inner regional Australia*
- *Outer regional Australia*
- *Remote Australia*
- *Very remote Australia.*

In this report, remoteness for place of residence and place of injury was assigned using 2 interactive map look-up tools.

The first step involved converting postcodes recorded in the ASCIR to an RA using Table 3 in the Postcode 2012 to Remoteness Area 2011 Data Cube (ABS 2013a) for cases with an injury date between 1 January 2012 and 31 December 2014, or 2015 Postcode to Remoteness Area 2011 Data Cube (ABS 2016, pers. comm., 22 June) for cases with an injury date on or after 1 January 2015.

Where a postcode had more than 1 RA assigned, and 95% or more of the postcode area was in 1 RA, then cases were assigned to that RA. Otherwise, the street address or location recorded in the ASCIR was used to search the Department of Health DoctorConnect website https://beta.health.gov.au/resources/apps-and-tools/health-workforce-locator/health-workforce-locator#hwc-map and the case was assigned to an RA on that basis.

Appendix C: Other SCI cases

Two types of SCI cases reported to the ASCIR are not included in the main part of this report. They are cases caused by a disease ('non-traumatic SCI') and cases in which the onset of SCI was a complication of medical care for a disease. These cases are summarised here.

Non-traumatic SCI cases often have a gradual onset. Accordingly, these non-traumatic SCI cases are reported according to year of admission. Cases that are a complication of medical care usually have a well-defined date of onset, which allows the cases to be reported according to the year of occurrence.

Non-traumatic cases

A total of 131 non-traumatic SCI cases were admitted to a participating spinal unit between 1 July 2017 and 30 June 2018 and consented to being included in the ASCIR. Males accounted for 60.3% of these—79 cases, compared with 52 for females.

The mean age at admission for non-traumatic SCI cases was 58, and admitted patients ranged in age from 19 to 89.

Three non-traumatic patients died during their admission. The median LOS for these 131 discharged patients was 103 days (5th percentile, 19 days; 95th percentile, 279 days).

Three-quarters (98 cases; 75%) of non-traumatic SCI cases had a mode of separation to a private home (previous, new or unknown home). Thirteen people were transferred to *Another acute hospital*, while 13 were discharged to a *Nursing home* and 3 to *Another type of health care accommodation*. One was recorded as discharged *Left against medical advice*.

Complication of medical care cases

Cases included here arose in the course of surgery (most commonly decompressive) or following other medical care (for example, an adverse medication effect or chiropractic treatment), where the record states that the onset of paralysis was post-intervention.

Five male and 8 female cases with a date of SCI onset between 1 July 2017 and 30 June 2018 were reported to the ASCIR as meeting the criteria for a complication of medical care case.

Acknowledgments

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This report was written by James Harrison, Denzil O'Brien and Sophie Pointer, at the AIHW NISU at Flinders University, with assistance from Amanda Tovell and Stacey Wendt.

Abbreviations

ABS	Australian Bureau of Statistics
ASCIR	Australian Spinal Cord Injury Register
AIHW	Australian Institute of Health and Welfare
ASIA	American Spinal Injury Association
CI	confidence interval
DIC	duration of initial care
ERP	estimated resident population
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification
ISNCSCI	International Standards for Neurological Classification of Spinal Cord Injury
LOS	length of stay
NISU	National Injury Surveillance Unit
pers. comm.	personal communication
RA	remoteness area
SCI	spinal cord injury
SMR	standardised mortality ratio

Symbols

≥	equal to or greater than
<	less than

Glossary

ASIA Impairment Scale: The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) (revised 2011) uses the American Spinal Injury Association Impairment Scale, also known as the ASIA Impairment Scale or AIS, to classify spinal injuries using a combination of measurements of motor and sensory function (ASIA 2003; ASIA 2019. This scale is a modification of an earlier classification system known as the Frankel Scale, which was commonly used between 1969 and 1992 (Frankel et al. 1969). To avoid confusion with the more widely known Abbreviated Injury Scale (AIS) classification system, this report has adopted the term 'ASIA Impairment Scale'. The following ASIA Impairment Scale categories are used to grade the degree of impairment:

> ***A = Complete****. No sensory or motor function is preserved in the sacral segments S4-5.*
>
> ***B = Sensory Incomplete****. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-5 (light touch or pin prick at S4-5 or deep anal pressure) AND no motor function is preserved more than three levels below the motor level on either side of the body.*
>
> ***C = Motor Incomplete****. Motor function is preserved at the most caudal sacral segments for voluntary anal contraction (VAC) OR the patient meets the criteria for sensory incomplete status (sensory function preserved at the most caudal sacral segments S4-5 by LT, PP or DAP), and has some sparing of motor function more than three levels below the ipsilateral motor level on either side of the body. (This includes key or non-key muscle functions to determine motor incomplete status.) For AIS C – less than half of key muscle functions below the single NLI have a muscle grade ≥ 3.*
>
> ***D = Motor Incomplete****. Motor incomplete status as defined above, with at least half (half or more) of key muscle functions below the single NLI having a muscle grade ≥ 3.*
>
> ***E = Normal****. If sensation and motor function as tested with the ISNCSCI are graded as normal in all segments, and the patient had prior deficits, then the AIS grade is E. Someone without an initial SCI does not receive an AIS grade* (ASIA 2019).

complete injury: An SCI case with a complete injury is assessed as an ASIA Impairment Scale grade of A.

complication of medical care: A spinal cord injury in circumstances in which the injury was due to medical or surgical intervention.

duration of initial care (DIC): The period from the date of injury to the date of discharge from a participating spinal unit to a person's previous home, or to a new home, nursing home or other accommodation. This period includes retrieval of the person from the scene of the injurious event; stabilisation; and all acute care and rehabilitation as an admitted patient. Part of the care, but usually not all, is provided in a spinal unit.

extent of SCI: The extent of neurological damage, which is either 'complete' or 'incomplete'. If partial preservation of sensory and/or motor functions is found below the neurological level and includes the lowest sacral segment, the injury is defined as 'incomplete'. The term 'complete injury' is used when there is an absence of sensory and motor function in the lowest sacral segment (see **ASIA Impairment Scale**).

incident case of SCI: A person who suffers a temporary or permanent (persisting) spinal cord injury, as defined by the US Centers for Disease Control, during a reporting period.

incomplete injury: An SCI case with an incomplete injury is assessed as an ASIA Impairment Scale grade of B, C or D.

neurological level of SCI: The most caudal segment of the spinal cord with normal sensory and motor function on both sides of the body (that is, the level furthest from the head that has full function—see **ASIA Impairment Scale**). Neurological level of SCI is often described according to the region of the spine injured (cervical, thoracic, lumbar or sacral). These regions include the:

- **cervical** spine, consisting of segments C1–C8
- **thoracic** spine, consisting of segments T1–T12
- **lumbar** spine, consisting of segments L1–L5
- **sacral** spine, consisting of segments S1–S5 ('**lumbosacral**' is the combined region consisting of segments L1–L5 and S1–S5).

length of stay (LOS): The index commonly used in hospital and health reports. Measured in number of days between admission to and discharge from the spinal unit.

non-traumatic SCI: A lesion of neural elements in the spinal canal (spinal cord and cauda equina) resulting in temporary or permanent sensory deficit, motor deficit, or bladder/bowel dysfunction (Thurman et al. 1995), in circumstances in which the cause of injury was disease.

paraplegia: An impairment or loss of motor and/or sensory function in the thoracic, lumbar or sacral (but not cervical) segments of the spinal cord, due to damage of neural elements within the spinal canal. Paraplegia can be complete or incomplete (see **ASIA Impairment Scale**).

persisting spinal cord injury: An ASIA Impairment Scale grade of A, B, C or D either 90 days after injury, or at discharge from rehabilitation, or a deficit on discharge was advised by the spinal unit.

protected land transport user: An occupant of a car, truck, or most other motor vehicles in which they are afforded some protection, for example, by seat belts in the event of a crash.

tetraplegia: An impairment or loss of motor and/or sensory function in the cervical segments of the spinal cord due to damage of neural elements within the spinal canal. Before 1992, 'quadriplegia' was the term commonly used to describe a spinal cord injury at the cervical level (ASIA 1992). Tetraplegia can be complete or incomplete (see **ASIA Impairment Scale**).

traumatic spinal cord injury: An acute, traumatic lesion of neural elements in the spinal canal (spinal cord and cauda equina) resulting in temporary or permanent sensory deficit, motor deficit, or bladder/bowel dysfunction (Thurman et al. 1995), in circumstances in which the cause of injury was external to the person (for instance, a road crash, falling, or diving into shallow water).

unprotected land transport user: A pedestrian, pedal cyclist, motorcycle rider or a quad-bike rider.

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Related publications

This report, *Spinal cord injury, Australia 2017–18*, is part of an annual series. Earlier editions and any published subsequently can be downloaded without cost from the AIHW website http://www.aihw.gov.au.

A total of 187 newly incident cases of traumatic spinal cord injury (SCI) due to external causes were reported to the Australian Spinal Cord Injury Register for 2017–18. The majority (80%) of these were males. Land transport crashes (46%) and falls (36%) were most often reported as the cause of traumatic SCI.

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