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Electrical injuries: hospitalisations and deaths

2014–15 and 2015–16



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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian modification
METeOR	Metadata Online Registry
MLOS	mean length of stay
NCIS	National Coronial Information System
NHMD	National Hospital Morbidity Database
NISU	National Injury Surveillance Unit
NMD	National Mortality Database
NMDS	national minimum data set
WHO	World Health Organization

Summary

This report provides an overview of cases admitted to hospital with an electrical injury or a fatal electrical injury in Australia between 1 July 2014 and 30 June 2016.

Hospitalised cases with any electrical injury

In the 2-year period, almost 1,100 hospitalised cases were identified as having an electrical injury involving exposure to an electric current or lightning.

Close to half (46%) of those were aged 25–44 (487 cases), with similar proportions reported for both males (46%) and females (44%).

The highest age-specific rates were 5.7 cases per 100,000 young men aged 15–24, and 1.7 cases per 100,000 young women aged 25–44.

A total of 103 male and 9 female cases (11% of cases) hospitalised with any electrical injury during 2014–15 to 2015–16 were due to *Exposure to electric transmission lines*. A further 5% were *Victims of lightning* (58 cases).

Exposure to other specified electric current—such as contact with cords and switches or electric current from domestic appliances or machinery—was the most frequently reported cause (73%). The remaining cases were due to *Exposure to unspecified electric current* (84 cases) or *Other external causes* (39 cases), including 9 cases due to an act of intentional self-harm by electrocution.

Nearly half (47%) of all electrical injury cases requiring hospitalisation occurred while the person was working for income (497 cases), and 14% occurred while the person was doing unpaid work, including household maintenance (150 cases). About one-third (32%) of electrical injury cases had no activity specified at the time of injury.

Overall, electrical injuries accounted for 2,425 admitted patient care days for the 2-year period, and patients stayed an average of 2 days. Of hospitalised cases with any electrical injury, 8 (about 1%) died before being discharged, including 2 *Victims of lightning*.

Fatal electrical injuries

During the 2-year period, 55 deaths involving electrical injury were found in the National Mortality Database—50 males and 5 females.

Of these deaths, 8 (15%) were *Victims of lightning*, all of them males. A total of 17 deaths were due to *Intentional self-harm by other specified means including electrocution* (31%), while 18 deaths were due to *Exposure to other specified electric current* (33%).

Supplementary analysis of the National Coronial Information System found that 2 deaths due to lightning and 7 deaths due to electrocution by electric current occurred while the person was working for an income. All work-related deaths in the 2-year period were males.

Lightning deaths most often occurred:

- in a recreational area, cultural area, or public building (2 fatalities or 25%)
- in the countryside (2 fatalities; 25%)
- or on farms or other place of primary production (2 fatalities; 25%).

In contrast, 73% of deaths due to electrocution by electric current occurred in the home, including 13 unintentional deaths, and 14 deaths associated with intentional self-harm.

1 Introduction

This report presents an analysis of hospitalisations and deaths in Australia involving an electrical injury for the 2-year period, 1 July 2014 to 30 June 2016.

The last Australian Institute of Health and Welfare (AIHW) report on electrical injuries and deaths was published more than a decade ago (Pointer & Harrison 2007). That report found that over a 2-year period (2002–03 to 2003–04), 1,493 electrical injury cases required hospitalisation. Of those, 77 were due to a lightning strike.

That report also looked at the National Mortality Database (NMD) and the National Coronial Information System (NCIS) for deaths due to electrical injury between 2001 and 2004. For that 4-year period, 162 deaths were identified, 7 of which were due to lightning strike.

Electrical injuries can occur anywhere, inside or outside of homes and other buildings. They might occur following contact with electrical switches or wiring, domestic appliances, and electric transmission lines, or as the result of a lightning strike.

Electrical injuries can affect the person's cardiovascular and neurological systems, resulting in rhythm disturbances of the heart, respiratory arrest, or a traumatic brain injury. They might also result in burns to the body, ocular damage, and blunt trauma (from being thrown by the passage of the electrical surge) (Jensen & Vincent 2017).

High voltage electrical exposure and the 'no-let-go' phenomenon (muscle contraction causing the victim to grab the source of electrical current) tend to result in more serious and sustained symptoms, including pain, muscle weakness, and loss of sensation (Foris & Huecker 2017; Rådman et al. 2015).

Medical care for electrical injuries is usually only sought in more serious cases, where severe burns or loss of consciousness is involved. As a result, the figures presented in this report and elsewhere are likely to underestimate electrical injury in Australia.

The incidence of injury and death due to electrical causes is relatively small compared with other causes of injury, but given the preventable nature of these incidents, further reductions should be possible.

Methods and data sources

This report uses data from the AIHW National Hospital Morbidity Database (NHMD), the NMD, and the NCIS, covering the 2-year period from 1 July 2014 to 30 June 2016, to provide information on injuries and deaths associated with electricity in Australia. It also provides trends data from the NHMD and NMD over the 17 years from 1 July 1999 to 30 June 2016.

These 3 data sets and how they were analysed are described in more detail in this section. As the numbers of injuries and deaths due to some causes of electrical injuries are relatively small for single years, 2 years of data have been combined.

This report only includes injury cases of people who were admitted to a hospital or who died. It does not include electrical injury cases treated in an emergency department but not admitted to hospital, presentations to general practitioners, or other non-hospital-based treatment facilities.

Important information about the terminology used in this report are summarised in boxes 1.1–1.3, while further information on data and methods is provided in Appendix A.

National Hospital Morbidity Database

The NHMD is an AIHW data set that contains information on episodes of admitted patient care in public and private hospitals in Australia. As well as administrative data, the NHMD contains diagnoses, procedural, and external causes of morbidity and mortality codes, using international standard classification systems.

In 2014–15, episodes of admitted patient care were coded according to the 8th edition of the *International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian modification* (ICD-10-AM) (NCCC 2013). The 9th edition was introduced for episodes of admitted patient care from 2015–16 (ACCD 2014).

Selection criteria for electrical injury cases

Records in the NHMD were included as electrical injury cases if:

- the episode of admitted patient care was between 1 July 2014 to 30 June 2016
- they had 1 of the following ICD-10-AM Chapter 20 *Injury, poisoning and certain other consequences of external causes* codes in any external cause field:
 - *Exposure to electric transmission lines* (W85)
 - *Exposure to other specified electric current* (W86)
 - *Exposure to unspecified electric current* (W87)
 - *Victim of lightning* (X33)
- they had 1 of the following ICD-10-AM Chapter 19 *Injury, poisoning and certain other consequences of external causes* diagnoses codes in any diagnosis field:
 - *Effects of lightning* (T75.0)
 - *Effects of electric current* (T75.4) (See Box 1.1 for definitions and exclusions.)
- they had a principal diagnosis in the ICD-10-AM range of S00–T75 or T79, but excluding any with Z50 *Care involving use of rehabilitation procedures* appearing in any additional diagnosis field
- the mode of admission was not a transfer from another acute hospital (to reduce multiple counting of cases).

In addition to counts and other basic descriptive statistics, this report presents crude (age-specific) and age-standardised rates for electrical injury cases. Information about the calculation and use of rates can be found in Appendix A.

National Morbidity Database

The AIHW NMD comprises cause-of-death unit record file data, which are provided to the AIHW by the Registries of Births, Deaths and Marriages and the NCIS, and coded by the Australian Bureau of Statistics (ABS).

Information on the underlying cause of death and multiple causes of death is coded by the ABS according to the World Health Organization's (WHO) ICD-10 (WHO 2016).

Selection criteria for NMD records

Deaths were considered to be due to electrical causes and included in this report if:

- the death occurred between 1 July 2014 and 30 June 2016 and had been registered by 31 December 2016
- the underlying cause of death or at least 1 multiple cause of death was:
 - *Exposure to electric transmission lines (W85)*
 - *Exposure to other specified electric current (W86)*
 - *Exposure to unspecified electric current (W87)*
 - *Victim of lightning (X33)*
 - *Effects of lightning (T75.0)*
 - *Effects of electric current (T75.4).*

National Coronial Information System

The NCIS is a data repository containing information about deaths reported to a coroner in Australia and New Zealand. The data contained in the NCIS are sourced from the coronial brief created as part of the investigation done by a coroner into the death of an individual. The investigation aims to determine the identity of the deceased and the cause of death, and, where appropriate, to make recommendations to prevent similar deaths from occurring.

The NCIS database contains both coded and non-coded data, as well as searchable legal, medical, and scientific reports, such as the coroners finding, post-mortem report, toxicology report, and police summary of death report.

Selection criteria for NCIS records

Deaths associated with electrical injury were selected using a comprehensive search strategy (see Appendix C for details). Records were included as electrical injury deaths if the:

- case status was closed
- death occurred in Australia between 1 July 2014 and 30 June 2016
- cause of death was identified as being due to:
 - electrocution due to exposure to electric current as the mechanism
 - lightning strike due to exposure to (effect of) weather, natural disaster, or other force of nature as the mechanism and lightning as the object or mechanism.

No coronial records were found for 'taser' in this 2-year period.

Structure of this report

This report focuses on hospitalised electrical injury cases, and deaths associated with electrical injury, which occurred in Australia between 1 July 2014 and 30 June 2016.

The report is arranged as follows:

- Chapter 2 provides an overview of hospitalised cases with an electrical injury and electrical injury deaths.
- Chapter 3 presents an analysis of hospitalised injury cases with an electrical injury from the NHMD.
- Chapter 4 presents information on deaths associated with electrical injury from the NMD and NCIS.

- Appendix A provides summary information on the NHMD, NMD, and NCIS, notes on the presentation of data, the population estimates used to calculate population rates, analysis methods, and information on data quality.
- Appendix B consists of tables underpinning the figures presented in this report.

Box 1.1: Selecting cases with an electrical injury

Due to ICD-10 coding rules, not all cases involving an electrical injury will have an external cause code specific to exposure to electrical current or lightning (W85, W86, W87, or X33) recorded in an external cause field.

For instance, where a transport crash or a fall was also involved, the relevant external cause code from the transport block (V00–V99) or falls block (W00–W19) will be recorded.

Similarly, where an act of intentional self-harm or assault using electric current was involved, external cause codes that help identify the role of human intent are used. For example, external cause codes for intentional self-harm are in the range X60–X84. But this type of case record would have 1 of 2 diagnoses codes related to electrical injury (T75.0 and T75.4) recorded in a diagnoses field. These external cause and diagnosis codes are described in more detail in this box.

For this report, an electrical injury case is defined by the presence of 1 or more of the following 6 ICD-10 codes in a single hospital admission or routine deaths record.

The external cause codes associated with electrical injury are:

- *W85 Exposure to electric transmission lines*—cases in this external cause category have been exposed to high voltage electric transmission and distribution lines that supply power to homes and businesses; these lines may be located overhead or underground
- *W86 Exposure to other specified electric current*—cases in this category include contact with connectors or cords and electric current from domestic appliances, live wiring or machinery, plugs, sockets, and switches
- *W87 Exposure to unspecified electric current*—this causal category includes exposure to electric current from an unspecified source, as well as burns or other injury from electric current not otherwise specified, electric shock not otherwise specified, and electrocution not otherwise specified
- *X33 Victim of lightning*—this causal category excludes fire caused by lightning (X00–X09), and injury from fall of a tree or other object caused by lightning (W20).

The diagnosis codes associated with an electrical injury are:

- *T75.0 Effects of lightning*—cases with this diagnosis might have been struck by or shocked by lightning
- *T75.4 Effects of electric current*—this diagnosis includes electrocution or a shock from electric current.

Box 1.2: Summary of terms relating to hospitalised injury

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

Separation is the episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer, or death), or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation).

Separation also means the process by which an admitted patient completes an episode of care by being discharged, dying, transferring to another hospital, or changing type of care.

The **principal diagnosis** is the diagnosis established after study to be chiefly responsible for occasioning the patient's episode of admitted patient care.

An **additional diagnosis** is a condition or complaint either coexisting with the principal diagnosis, or arising during the patient's episode of admitted patient care.

An **external cause** is defined as the environmental event, circumstance or condition that was the cause of injury or poisoning. Whenever a patient has a principal or additional diagnosis of an injury, an external cause code should be recorded. External cause codes include information on whether the injury was unintentional (accidental) or intentional. More than 1 external cause can be recorded for the same episode of care.

Injury cases are estimated as the number of injury separations, less those records where the patient was transferred from another hospital. These transfers from other hospitals are omitted to reduce over-counting of cases.

Calculating length of stay: The mean length of stay (MLOS) is the average number of days each patient stays in hospital in acute care. This was calculated by dividing the total number of patient days for a reporting period (including hospital transfers) by the estimated number of cases for the same period. Patient days are the number of full and partial days a patient spends in hospital. One patient-day is counted for same-day patients (admitted and discharged from hospital on the same day).

Box 1.3: Summary of terms related to electrical injury deaths

A **multiple cause of death** is a code representing a disease, condition, or external cause recorded on the death certificate. For injury deaths, the **underlying cause of death** is a code representing the external cause of the injury that initiated the train of morbid events leading directly to a person's death according to information available to the coder.

The diseases or conditions recorded on the death certificate consist of:

- the cause that led directly to the death (the underlying cause of death)
- the causes that gave rise to the underlying cause of death
- the causes that contributed to the death, but were not related to the disease or condition causing it.

Mortality coding is according to the ICD-10, which includes a chapter for injury, and another for external causes of injuries and other conditions. Rules that form part of the ICD-10 determine which cause should be coded as the underlying cause of death.

2 Overview of electrical injuries

In 2014–15 to 2015–16, almost 1,100 hospitalised cases were identified as having an electrical injury, as defined in Box 1.1 (Table 2.1). About three-quarters (76%) of these were males (806 cases).

These electrical injury cases accounted for a very small percentage (0.1%) of all hospitalised injury cases in the 2-year period, and this this proportion was the same for both male and female cases.

A total of 55 people died with electrical injury as the underlying cause of death—50 males and 5 females.

Table 2.1: Key indicators of electrical injuries, 2014–15 to 2015–16

Indicators	Males	Females	Persons
Hospitalised cases with any electrical injury^(a)	806	259	1,065
Cases with an electrical injury cause code	771	255	1,026
Cases with other external cause codes	35	4	39
Percentage of all injury cases	0.1	0.1	0.1
Fatal electrical injuries^(b)	50	5	55

(a) Hospitalised cases with any electrical injury (ICD-10-AM external cause codes W85, W86, W87, or X33, or diagnoses codes T75.0 or T75.4) are the focus of Chapter 3.

(b) Fatalities due to electrocution by electric current or lightning are the focus of Chapter 4. The information provided in this chapter is also supplemented by the NCIS.

Sources: AIHW National Hospital Morbidity Database & National Mortality Database.

3 Hospitalised cases with any electrical injury

This chapter provides an analysis of cases in the NHMD where an electrical injury was identified as either the primary cause of hospitalisation (ICD-10-AM codes W85, W86, W87, and X33), or the record contained a diagnosis code related to an electrical injury (T75.0 or T75.4). Topics covered in this chapter include age and sex, principal diagnosis, external cause, place of occurrence, type of activity at time of injury, and length of hospital stay.

Age, sex, and trend over time

An analysis of electrical injury cases by age and sex shows the largest portion (46%) of electrical injury cases occurring among those aged 25–44, with similar proportions reported for males (46%) and females (44%) (Table 3.1).

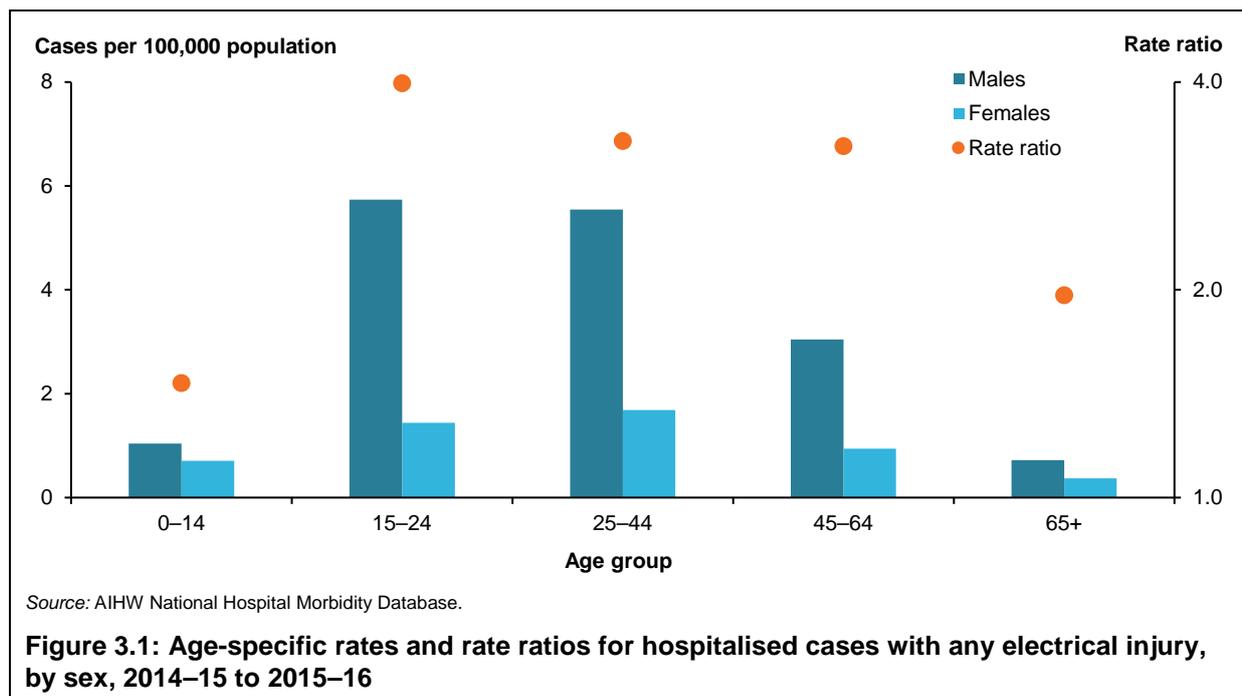
Table 3.1: Hospitalised cases with any electrical injury, by age group and sex, 2014–15 to 2015–16

Age group	Males		Females		Persons	
	Number	%	Number	%	Number	%
0–14	48	6.0	31	12.0	79	7.4
15–24	185	23.0	44	17.0	229	21.5
25–44	373	46.3	114	44.0	487	45.7
45–64	176	21.8	56	21.6	232	21.8
65+	24	3.0	14	5.4	38	3.6
All ages	806	100	259	100	1,065	100

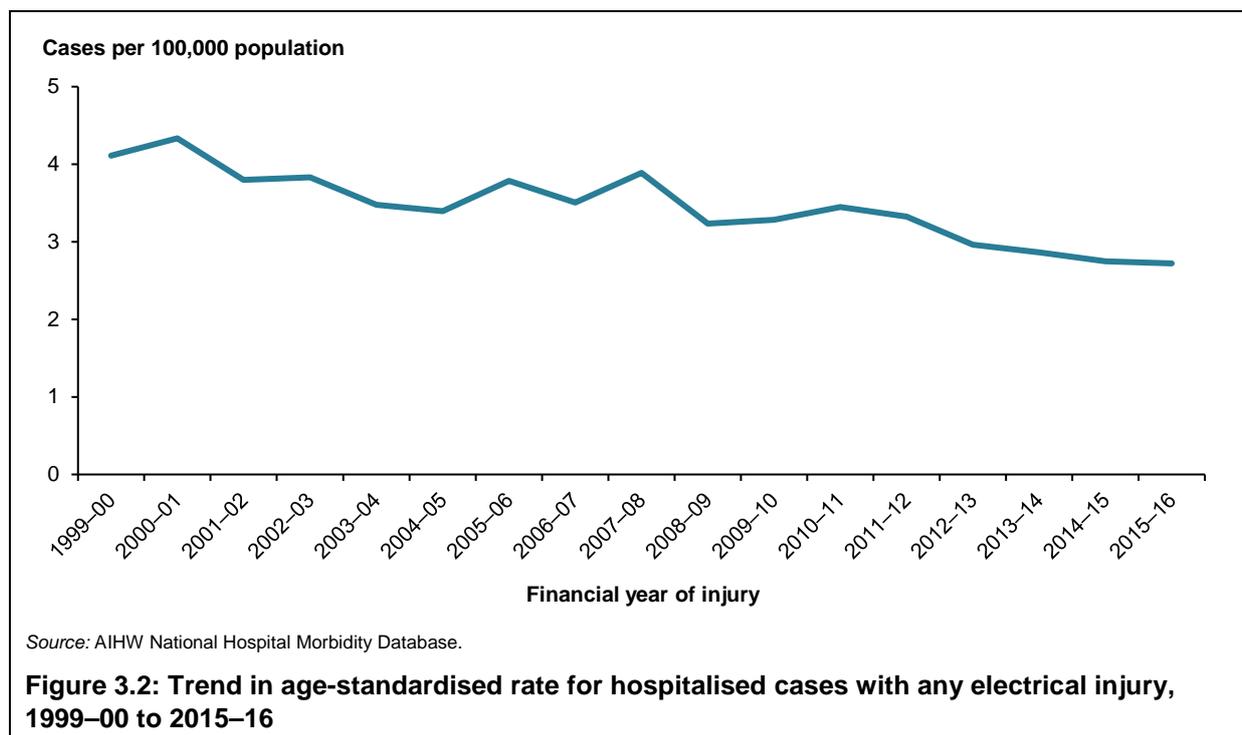
Source: AIHW National Hospital Morbidity Database.

The age-specific rate of hospitalised electrical injury was highest for males aged 15–24, at 5.7 cases per 100,000 population, followed by 5.5 cases for males aged 25–44 (Figure 3.1). The highest rate for females was 1.7 cases per 100,000 in the 25–44 age group.

The male to female rate ratio was highest for cases aged 15–24, with 4 male cases to every 1 female case. The lowest rate ratio was 1.5:1 for boys and girls aged 0–14.



The age-standardised rate for hospitalised electrical injury has generally declined over the past 17 years from 4.1 cases per 100,000 population in 1999–00 to 2.7 cases in both 2014–15 and 2015–16 (Figure 3.2).



Principal diagnosis

Principal diagnoses for injuries due to an electrical cause can:

- have specific ICD-10-AM codes, such as T75.0 *Effects of lightning* or T75.4 *Effects of electric current*
- be assigned to another diagnosis group, such as *Burns* (codes in the range T20–T31)
- be assigned another diagnoses code from Chapter 19 *Injury, poisoning and other certain consequences of external causes* (NCCC 2013).

A diagnosis of *Effects of lightning* may include shock by lightning or struck by lightning not otherwise specified, while a diagnosis of *Effects of electric current* includes electrocution and shock.

Table 3.2 provides the numbers and percentage of principal diagnoses, by sex, according to these categories of diagnoses.

Almost two-thirds (62%) of hospitalised cases with any electrical injury sustained between 2014–15 and 2015–16 had a principal diagnosis of *Effects of electric current*. *Burns* was the next most common principal diagnosis (25%), while a principal diagnosis of *Effects of lightning* accounted for just 3% of electrical injury cases overall. The proportional distribution of principal diagnoses was similar for males and females.

Cases with a principal diagnosis other than *Effects of electric current* or *Effects of lightning*, or *Burns* included *Injuries to the wrist and hand* (29 cases), *Injuries to the shoulder and upper arm* (22 cases) and *Injuries to the head* (17 cases).

The nature of injuries for these *Other diagnoses* cases included 21 fractures, 3 dislocations, 13 intracranial injuries, 10 superficial injuries, 9 soft tissue injuries, and 8 open wounds.

Table 3.2: Principal diagnosis for hospitalised cases with any electrical injury, by sex, 2014–15 to 2015–16

Principal diagnosis	Males		Females		Persons	
	Number	%	Number	%	Number	%
Effects of electric current	489	60.7	169	65.3	658	61.8
Effects of lightning	21	2.6	6	2.3	27	2.5
Burns	211	26.2	59	22.8	270	25.4
Other diagnoses	85	10.5	25	9.7	110	10.3
All electrical injury cases	806	100	259	100	1,065	100

Source: AIHW National Hospital Morbidity Database.

Table 3.3 shows the majority (70%) of the 270 hospitalised burn injury cases sustained a burn to the wrist and hand. A burn to the head and neck (11%) was the next most common type of burn associated with an electrical injury. A burn to the ankle and foot (17 cases), and to the shoulder and upper limb (14 cases) each contributed 6% to burns associated with a hospitalised electrical injury.

Males (12%) had a higher proportion of burns to the head and neck than females (5%), while females (78%) had a higher proportion of burns to the wrist and hand than males (67%).

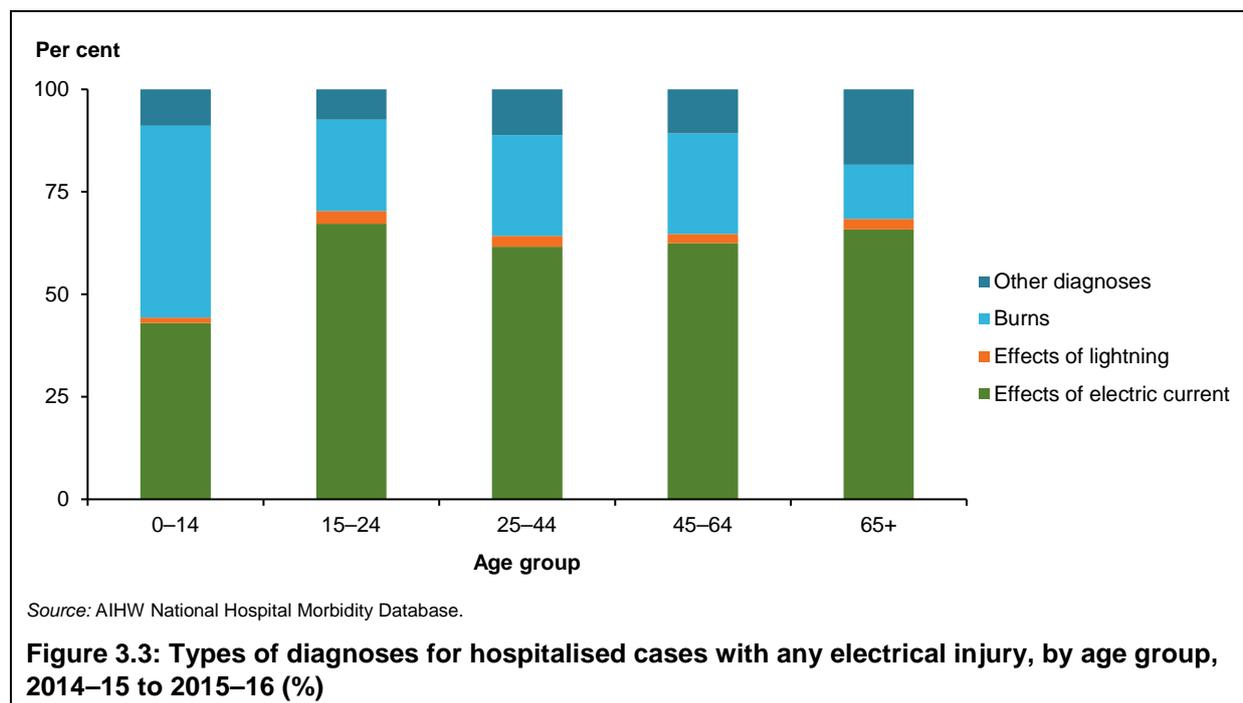
Table 3.3: Principal diagnosis for electrical burns, by sex, 2014–15 to 2015–16

ICD-10-AM Burn injury code	Males		Females		Persons	
	Number	%	Number	%	Number	%
T20 Burn of head and neck	26	12.3	3	5.1	29	10.7
T21 Burn of trunk	8	3.8	3	5.1	11	4.1
T22 Burn of shoulder and upper limb, except wrist and hand	14	6.6	1	1.7	15	5.6
T23 Burn of wrist and hand	142	67.3	46	78.0	188	69.6
T24 Burn of hip and lower limb, except ankle and foot	6	2.8	2	3.4	8	3.0
T25 Burn of ankle and foot	13	6.2	4	6.8	17	6.3
T26 Burn of eye and adnexa	2	0.9	0	0.0	2	0.7
All electrical burn cases	211	100	59	100	270	100

Source: AIHW National Hospital Morbidity Database.

Figure 3.3 shows that principal diagnoses for hospitalised cases with any electrical injury varied according to age. Children aged 0–14 suffered the *Effects of electrical current* (43%) and *Burns* (47%) in almost equal proportions.

About three-quarters (76%) of electrical burn injuries among children aged 0–14 involved a burn to the wrist and hand (28 cases). In contrast, the proportion of burn diagnoses was much smaller (13%) among cases aged 65 or older. *Other diagnoses* accounted for a larger proportion of cases involving an electrical injury among those aged 65 or older (18%) compared with each of the other age groups.



Source: AIHW National Hospital Morbidity Database.

Figure 3.3: Types of diagnoses for hospitalised cases with any electrical injury, by age group, 2014–15 to 2015–16 (%)

External cause

During 2014–15 to 2015–16, a total of 112 people (11%) of cases hospitalised with any electrical injury were due to *Exposure to electric transmission lines* (Table 3.4). The proportion of injuries for this cause was much higher for males (13%, or 103 cases) than females (4%, or 9 cases).

A further 58 cases (5%) were *Victims of lightning*. The most frequently reported causal category was *Exposure to other specified electric current*, such as contact with cords and switches, or electric current from domestic appliances or machinery, at 73%, with a higher proportion of females (85%) than males (69%).

A further 8% of hospitalised cases with any electrical injury were due to *Exposure to unspecified electric current*.

The proportion of *Victim of lightning* cases was the same for males and females (just under 6% each), and 4% were due to *Other external causes*.

Table 3.4: External cause for hospitalised cases with any electrical injury, by sex, 2014–15 to 2015–16

ICD-10-AM External cause category	Males		Females		Persons	
	Number	%	Number	%	Number	%
Exposure to electric transmission lines	103	12.8	9	3.5	112	10.5
Exposure to other specified electric current	553	68.6	219	84.6	772	72.5
Exposure to unspecified electric current	71	8.8	13	5	84	7.9
Victim of lightning	44	5.5	14	5.4	58	5.4
Other external causes	35	4.3	4	1.5	39	3.7
All external causes	806	100	259	100	1,065	100

Source: AIHW National Hospital Morbidity Database.

Of the 39 injury cases involving an electrical injury, but where the person was hospitalised primarily due to *Other external causes*, the majority (69%) were due to unintentional injuries such as:

- a *Fall* (15 cases)
- *Contact with machinery* (6 cases)
- *Transport-related crashes* (4 cases).

Of these cases 9 (23%) were due to an act of intentional self-harm, including 5 cases due to *Intentional self-harm by other specified means including electrocution*.

Another 2 cases were recorded as being due to *Other specified events, undetermined intent*.

Box 3.1: Hospitalised *Victims of lightning*, 2014–15 to 2015–16

During 2014–15 to 2015–16, 58 hospitalised cases had lightning as the external cause of injury, with three-quarters (76%) of these being male. Of the 44 male lightning victims, half (50%) were aged 25–44, while 43%, or 6 of the 14 female victims, were in that age group.

At the time these victims were struck by lightning:

- 2 in 5 (40%) had no specific type of activity recorded
- 2 in 5 (41%) were either working for income (16 cases), or doing unpaid work (8 cases)
- 4 (7%) were struck while playing sport.

In and around the home was the most frequently (30% or 16 cases) identified place where lightning injuries occurred. Other frequent places included farms (7% or 4 cases), and large areas near water including beaches (9% or 5 cases), while 18 (31%) cases had no specified place reported.

About 1 in 3 (36% or 21 cases) lightning victims were discharged home on the same day as admission. Another 3 cases (5%) were transferred to another acute hospital, and 2 cases (3%) died. The remaining 32 cases were discharged home 1–11 days after admission—the majority (81% or 26 cases) of these being after 1 day.

Place of occurrence

During 2014–15 and 2015–16, about one-third (36%) of patients hospitalised with an electrical injury had no recorded type of place where the injury occurred recorded (Table 3.5).

Of all cases, one-third (33%) occurred in the *Home*, and these were more common for females (53%) than males (27%). Another 10% occurred in an *Industrial or construction area*, with a higher proportion for males (12%) than females (3%). *Trade and service areas* (8%) rounded out the top 3 type of places where electrical injuries occurred, while *Farm* accounted for 2% of cases (19 males and 3 females).

Table 3.5: Type of place where electrical injuries occurred, 2014–15 to 2015–16

Type of place	Males		Females		Persons	
	Number	%	Number	%	Number	%
Home	216	26.8	138	53.3	354	33.2
Residential institution	7	0.9	7	2.7	14	1.3
School, other institution & public administration area	21	2.6	12	4.6	33	3.1
Sports and athletics area	1	0.1	2	0.8	3	0.3
Street and highway	9	1.1	2	0.8	11	1.0
Trade and service area	57	7.1	25	9.7	82	7.7
Industrial and construction area	99	12.3	7	2.7	106	10.0
Farm	19	2.4	3	1.2	22	2.1
Other specified place of occurrence	49	6.1	13	5.0	62	5.8
Unspecified place of occurrence	328	40.7	50	19.3	378	35.5
All places	806	100	259	100	1,065	100

Source: AIHW National Hospital Morbidity Database.

Type of activity

About one-third (32%) of hospitalised cases with any electrical injury had no activity specified at the time of their injury (Table 3.6).

The most frequently specified activity for people requiring hospitalisation for an electrical injury was *While working for income* (47%). This was followed by *While engaged in other types of work* (14%), which generally includes household maintenance tasks or similar duties where payment is not expected.

Combined, these cases accounted for about 3 in 5 (61%) patients hospitalised due to an electrical injury in 2014–15 and 2015–16, an increase from the 53% of cases sustained while working either for income or unpaid work in 2002–03 to 2003–04 (Pointer & Harrison 2007).

About 2% of cases who sustained an electrical injury during 2014–15 and 2015–16 were engaged in a sport or leisure activity at the time of injury.

A greater proportion of males (54%) than females (23%) sustained an electrical injury *While working for income*. In contrast, being injured *While engaged in other types of work* was more common for females (22%) than for males (12%).

Table 3.6: Type of activity being undertaken when electrical injury occurred, by sex, 2014–15 to 2015–16

Activity	Males		Females		Persons	
	Number	%	Number	%	Number	%
While engaged in sports	5	0.6	1	0.4	6	0.6
While engaged in leisure	8	1.0	5	1.9	13	1.2
While working for income	437	54.2	60	23.2	497	46.7
While engaged in other types of work	93	11.5	57	22.0	150	14.1
While resting, sleeping, eating, etc.	8	1.0	16	6.2	24	2.3
Other specified activity	23	2.9	15	5.8	38	3.6
Unspecified activity	232	28.8	105	40.6	337	31.7
All activities	806	100	259	100	1,065	100

Source: AIHW National Hospital Morbidity Database.

Electrical injuries sustained while working for income

The majority (70%) of electrical injuries sustained *While working for income* were due to *Exposure to other specified electric current* (Table 3.7).

About 3% of cases injured *While working for income* were a *Victim of lightning*. With the exception of *Exposure to electric transmission lines*, the distribution of external causes of electrical injury while working were relatively similar for males and females.

Table 3.7: External cause for any electrical injury sustained during paid work, by sex, 2014–15 to 2015–16

External cause	Males		Females		Persons	
	Number	%	Number	%	Number	%
Exposure to electric transmission lines	67	15.3	1	1.7	68	13.7
Exposure to other specified electric current	295	67.5	53	88.3	348	70.0
Exposure to unspecified electric current	46	10.5	4	6.7	50	10.1
Victim of lightning	15	3.4	1	1.7	16	3.2
Other external causes	14	3.2	1	1.7	15	3.0
All external causes	437	100	60	100	497	100

Source: AIHW National Hospital Morbidity Database.

During 2014–15 to 2015–16, just over one-quarter (26%) of cases that occurred *While working for income* had no specific employment sector recorded (Table 3.8).

Where an employment sector was specified, the greatest number of electrical injuries occurred in the *Construction* sector (81 cases or 16%), followed by *Manufacturing* (28 cases or 6%), and *Health services* (22 cases or 4%).

Table 3.8: Type of employment sectors where a work-related electrical injury occurred, 2014–15 to 2015–16

Employment sector	Number	%
Agriculture, forestry, and fishing	14	2.8
Mining	11	2.2
Manufacturing	28	5.6
Construction	81	16.3
Wholesale and retail trade	12	2.4
Transport and storage	16	3.2
Government administration and defence	6	1.2
Health services	22	4.4
Other specified sector	178	35.8
Unspecified	129	26.0
All sectors	497	100

Source: AIHW National Hospital Morbidity Database.

More than half (52%) of people who sustained an electrical injury in the workplace were aged 25–44 (259 cases). People aged 15–24 were the second most injured age group (26% or 129 cases).

Effects of electrical current (65% or 323 cases) was the most common principal diagnosis for these work-related cases, while 121 *Burns* cases accounted for nearly one-quarter (24%) of them. About 10% (46 cases) had some other type of principal diagnosis recorded.

Length of stay in hospital

During 2014–15 to 2015–16, electrical injuries accounted for 2,425 admitted patient care days, and patients had a mean length of stay (MLOS) of 2 days (Table 3.9).

The longest MLOS, 5 days, was associated with injuries sustained following *Exposure to electric transmission lines*, and this differed markedly between males (6 days) and females (1 day).

Table 3.9: Length of stay in hospital for patients with any electrical injury, by external cause and sex, 2014–15 to 2015–16

External cause	Males			Females			Persons		
	Cases	Total patient days	MLOS (days)	Cases	Total patient days	MLOS (days)	Cases	Total patient days	MLOS (days)
Exposure to electric transmission lines	103	601	5.8	9	9	1.0	112	610	5.4
Exposure to other specified electric current	553	1,178	2.1	219	296	1.4	772	1,474	1.9
Exposure to unspecified electric current	71	103	1.5	13	20	1.5	84	123	1.5
Victim of lightning	44	56	1.3	14	29	2.1	58	85	1.5
Other external causes	35	116	3.3	4	17	4.3	39	133	3.4
All causes	806	2,054	2.5	259	371	1.4	1,065	2,425	2.3

Source: AIHW National Hospital Morbidity Database.

About 1% (8) of hospitalised cases with any electrical injury died before being discharged, including 2 *Victims of Lightning*.

4 Fatal electrical injuries

This chapter provides an overview of electrical deaths during the 2-year period from 1 July 2014 to 30 June 2016.

Electrical deaths in this chapter include those due to electrocution by electric current and lightning strike. Information was obtained from:

- the cause-of-death unit record file produced by the ABS and held in the AIHW NMD
- supplementary information from the NCIS, which includes information on additional aspects of cases that is not available from the ABS-sourced deaths data.

When inspected for this project, records of 40 deaths involving electrocution by electric current were found in the NCIS, compared with 47 of that type in the NMD (see Appendix C for search criteria for the NCIS). The same number of deaths due to lightning were found in the NMD and the NCIS.

Topics covered in this chapter include age and sex, underlying cause of death, place where the fatal electrical injury occurred, and type of activity being undertaken at time of death.

Age, sex, and trend over time

During 2014–15 to 2015–16, 55 deaths attributable to an electrical injury were identified in the NMD. The overwhelming majority (91%) of these were males (50 fatalities compared with 5 female fatalities).

Fatal electrical injury was uncommon among the 2 youngest age groups, with 1 death among children aged 14 or younger, and 5 among those aged 15–24 (Table 4.1). Of the 5 female deaths, 3 were among women aged 65 or older.

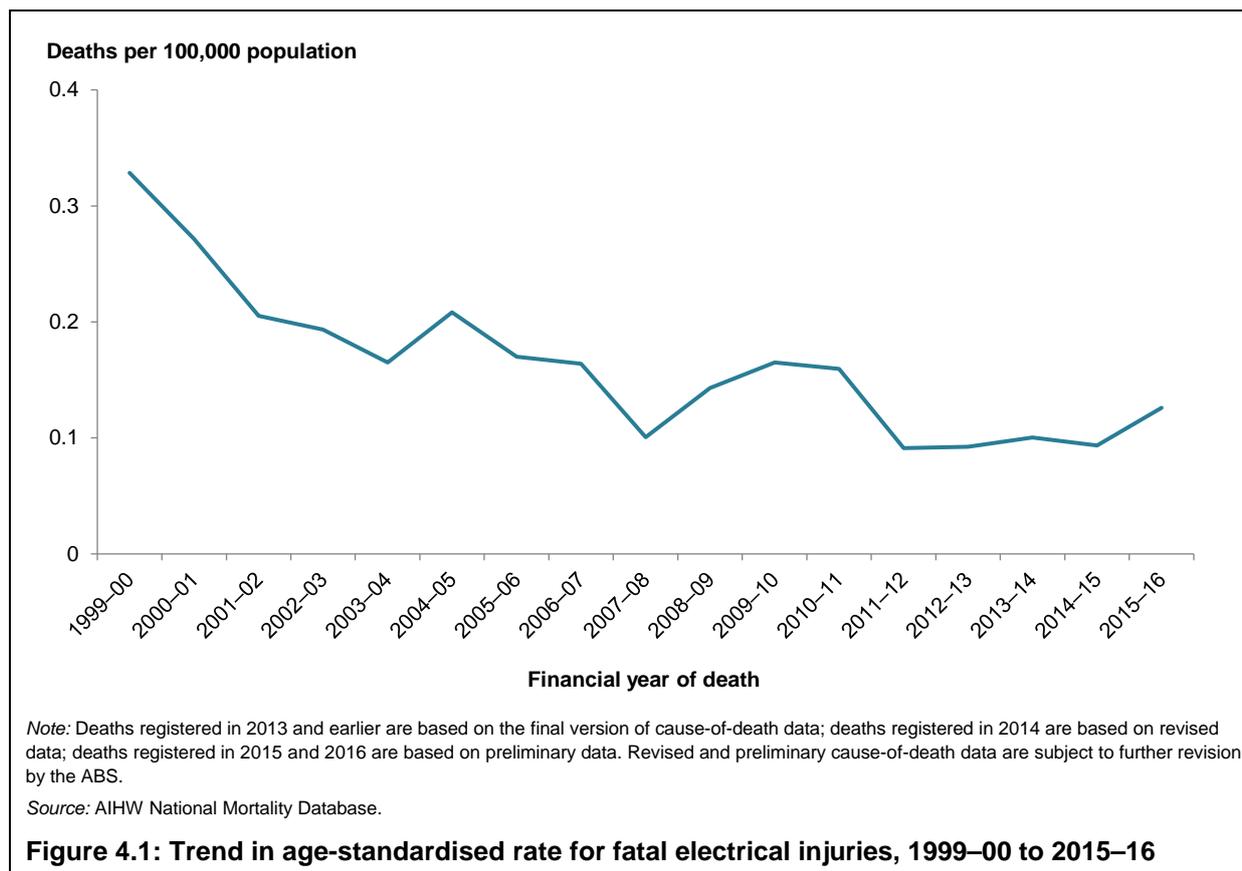
Table 4.1: Fatal electrical injuries, by age group, 2014–15 to 2015–16

Age group	Number	%
0–14	1	1.8
15–24	5	9.1
25–44	15	27.3
45–64	19	34.5
65+	15	27.3
All ages	55	100

Note: Deaths registered in 2014 are based on a revised version of cause-of-death data; deaths registered in 2015 and 2016 are based on preliminary data. These cause-of-death data are subject to further revision by the ABS.

Source: AIHW National Mortality Database.

The population-based rate of electrical cause of death has declined overall during the past 17 years—from about 0.3 deaths per 100,000 population per year to about 0.1 (Figure 4.1). The year-to-year fluctuations in the rate are at least partly due to the relatively small annual number of deaths from this cause.



Underlying cause of death

Table 4.2 presents the underlying cause of death recorded in the NMD for fatal electrical injuries that occurred between 2014-15 and 2015-16.

One-third (33%) of deaths were due to *Exposure to other specified electric current* (18 fatalities), while a similar number were due to *Intentional self-harm by other specified means including electrocution* (31% or 17 fatalities).

Victim of Lightning (15% or 8 fatalities) was the third most frequent underlying cause of death associated with a fatal electrical injury during this period.

These underlying causes of death can be categorised into the 2 main causal categories of:

- lightning (all *Victim of lightning* underlying cause of death)
- electrocution by electric current (all other underlying causes of death shown in Table 4.2).

For convenience, the remainder of this report describes deaths according to these 2 main categories.

Table 4.2: Underlying cause of death for fatal electrical injuries, 2014–15 to 2015–16

Underlying cause of death	Number	%
Exposure to electric transmission lines	5	9.1
Exposure to other specified electric current	18	32.7
Exposure to unspecified electric current	5	9.1
Victim of lightning	8	14.5
Intentional self-harm by other specified means including electrocution	17	30.9
Other specified events, undetermined intent	2	3.6
All causes	55	100

Note: Deaths registered in 2014 are based on a revised version of cause-of-death data; deaths registered in 2015 and 2016 are based on preliminary data. These cause-of-death data are subject to further revision by the ABS.

Source: AIHW National Mortality Database.

Deaths due to lightning

In the 17 years to 2015–16, a total of 26 deaths due to lightning were recorded in the NMD, an average of 1.5 per year (data not shown). The most common number of deaths per year was 1 (in 7 out of 17 years), followed by 2 cases (4 out of 17 years). The largest number was 5 deaths, in 2014–15. No deaths due to lightning were recorded for 2005–06, 2009–10, and 2011–12.

During 2014–15 and 2015–16, all lightning deaths were male, ranging in age 15–58.

Supplementary information obtained from the NCIS for place of occurrence found that in 2014–15 and 2015–16, lightning was responsible for 2 deaths each in a recreational area, cultural area, or public building such as a public park, in the countryside, particularly near large bodies of water, and on farms or other place of primary production (Table 4.3). Other places where a person was fatally struck by lightning included around the home, and on educational premises.

Table 4.3: Type of place where fatal lightning strike occurred, 2014–15 to 2015–16

Type of place	Number	%
Recreational area, cultural area, or public building	2	25.0
Countryside	2	25.0
Farms or other place of primary production	2	25.0
Home	1	12.5
School, educational area	1	12.5
All places	8	100

Source: National Coronial Information System.

NCIS records showed death due to a lightning strike most often occurred while the person was participating in sport and exercise during leisure time (3 deaths or 38%) (Table 4.4).

While undertaking paid work or while doing a vital personal activity were the next most frequent types of activities being undertaken when the person was fatally injured by lightning, with 2 deaths recorded for each activity.

Table 4.4: Type of activity being undertaken at time of fatal lightning strike, 2014–15 to 2015–16

Type of activity	Number	%
Sport and exercise during leisure time	3	37.5
Paid work	2	25.0
Vital personal activity ^(a)	2	25.0
Travelling not elsewhere classified	1	12.5
All activities	8	100

(a) Vital personal activity includes while resting, eating, sleeping, and so forth.

Source: National Coronial Information System.

Deaths due to electrocution by electric current

Of the 55 electrical injury deaths identified in the NMD for 2014–15 and 2015–16, 47 (85%) were due to electrocution by electric current. These included 42 males (89%) and 5 females (11%), aged 14–91.

Not all coronial investigations for deaths due to electrocution by electric current had been closed by the relevant jurisdictional coroner at the time of preparing this report. As a result, the remainder of this chapter focuses on the supplementary information available from the NCIS for 40 of the 47 deaths identified in the NMD.

The majority (73%) of the 40 NCIS records for deaths due to electrocution by electric current occurred in the home (Table 4.5). These included 13 unintentional deaths and 14 deaths associated with intentional self-harm.

A further 4 deaths (10%) due to electrocution occurred on farms or other place of primary production, and all of those were unintentional. Other places where a fatal electrocution occurred included commercial, industrial, and recreational spaces.

Table 4.5: Type of place where fatal electrocution by electric current occurred, 2014–15 to 2015–16

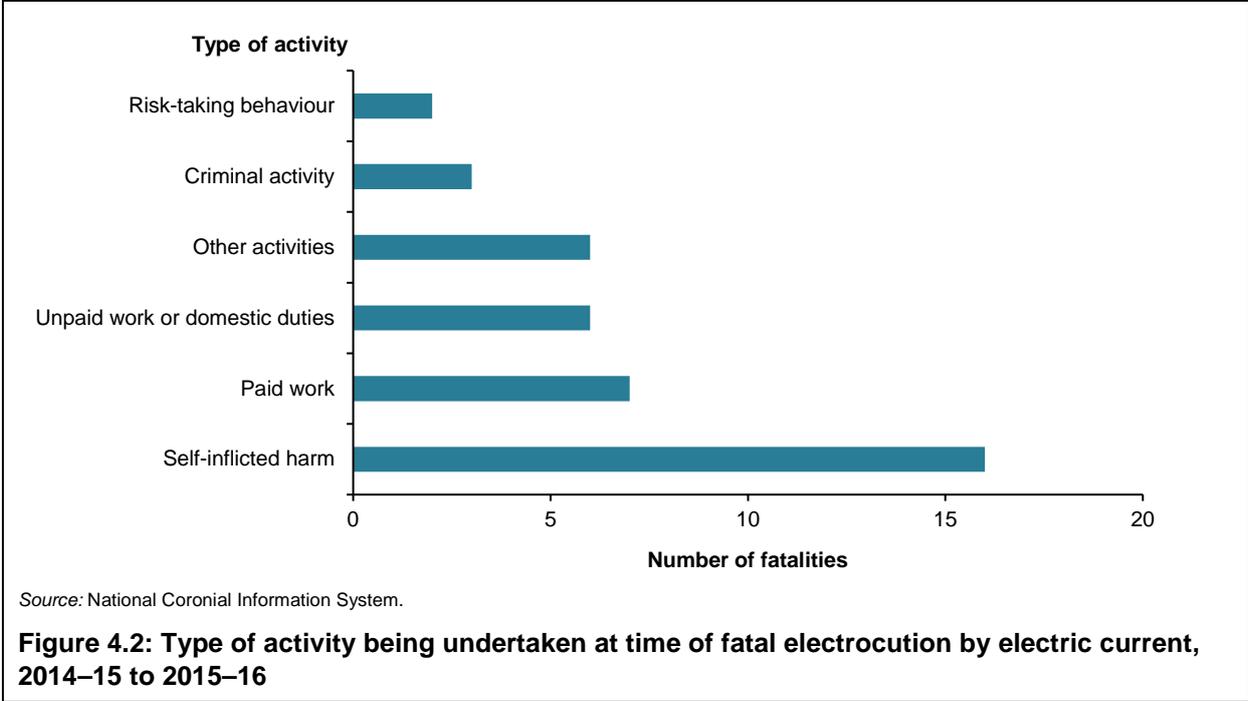
Type of place	Number	%
Home	29	72.5
Farms or other place of primary production	4	10.0
Industrial or construction area	2	5.0
Commercial area (non-recreational)	2	5.0
Recreational area, cultural area, or public building	1	2.5
Other specified areas	2	5.0
All places	40	100

Source: National Coronial Information System.

Figure 4.2 shows the type of activity the person was engaged in when fatally electrocuted, as recorded in the NCIS.

The most frequently recorded activity was an act of self-inflicted harm, with 16 deaths or 40% of the 40 deaths due to electrocution. The second most frequently recorded activity for when fatal electrocution occurred was while in paid work (7 deaths or 18%).

A further 6 deaths (15%) occurred while the person was carrying out unpaid work or domestic duties, while 3 (8%) were involved in a criminal activity, and 2 (5%) were involved in risk-taking behaviour. The remaining 15% of fatalities occurred while the person was undertaking some other type of activity, such as a vital personal activity.



Work-related fatal electrocutions

All 7 work-related deaths due to electrocution by electric current that occurred during 2014–15 and 2015–16 were males. An equivalent number of work-related fatal electrocutions were due to exposure to a high-tension overhead power line or electrical transmission line in or around building, with 2 deaths recorded in the NCIS for each of these objects. The age range for the work-related deaths due to electrocution by electric current was 21–48.

The most common place for these work-related deaths to occur was on a farm or other place of primary production (3 deaths). Other places where work-related deaths due to electrocution occurred were the home and commercial areas (2 deaths each).

Safe Work Australia estimates contact with electricity contributes to about 4% of workplace deaths annually in Australia, with 5 workplace electrical deaths reported in 2014, 8 in 2015, and 7 in 2016 (Safe Work Australia 2017).

Appendix A: Data issues

Data sources

National Hospital Morbidity Database

The NHMD is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. The data supplied are based on the National minimum data set (NMDS) for Admitted patient care, and include demographic, administrative, and length-of-stay data, as well as data on the diagnoses of the patients, the procedures they underwent in hospital, and external causes of injury and poisoning.

The purpose of the NMDS for Admitted patient care is to collect information about care provided to admitted patients in Australian hospitals. The scope of the NMDS is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, free-standing day hospital facilities, and alcohol and drug treatment centres in Australia.

Hospitals operated by the Australian Defence Force, corrections authorities, and in Australia's offshore territories are not in scope, but some are included.

The data set includes records for admitted patient separations between 1 July 2014 and 30 June 2016.

A complete data quality statement for the NHMD is available online at <http://meteor.aihw.gov.au>

National Mortality Database

The NMD comprises cause-of-death unit record file data, which are provided to the AIHW by the Registries of Births, Deaths and Marriages and the NCIS, and are coded by the ABS.

Data are presented according to the financial year in which each death occurred, rather than the calendar year in which the death was registered.

The codes are from the WHO ICD-10 (WHO 2016). The external cause codes are from Chapter 20 *External causes of morbidity and mortality*, and the injury codes are from Chapter 19 *Injury, poisoning and certain other consequences of external causes*. Additional information about the NMD, including links to data quality statements from the ABS, can be found at www.aihw.gov.au/about-our-data/our-data-collections/national-mortality-database

National Coronial Information System

The NCIS is an internet accessible data storage and retrieval system for Australian and New Zealand coronial cases. It enables coroners, their staff, public sector agencies, researchers, and other agencies to access coronial data to inform death and injury prevention activities.

It contains data about deaths reported to an Australian coroner from July 2000 (or January 2001 in the case of Queensland data), and to a New Zealand coroner from July 2007 (closed cases only), and is an initiative of the Australasian Coroners Society.

The NCIS is managed by the Victorian Department of Justice and Regulation on behalf of a Board of Management, and is based at the Coronial Services Centre in Southbank, Victoria.

The data entered into the NCIS are collected from source material, such as the police report of death, autopsy reports, toxicology reports, and coronial findings from 9 jurisdictions, including the 8 Australian states and territories and New Zealand.

The Victorian Department of Justice and Regulation advise that the quality and consistency of these documents might vary between and within each jurisdiction. There are also differences between jurisdictions as to legislation governing the reporting of a death to a coroner, which can affect the type, quality, and quantity of the information collected and reported by each jurisdiction. These differences will have an impact on the information available in the NCIS.

Population data and rates

Population data were obtained from the ABS in March 2017 (ABS 2016). Incidence rates have been calculated as cases per 100,000 population of the estimated resident population of Australia.

Annual rates to 31 December were manually calculated by adding the estimated resident population 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).

Estimating incident hospitalised cases

Adjusting for multiple counting

Each record in the NHMD refers to a single episode of care in a hospital. Some injuries result in more than 1 episode in hospital, so the same injury for the same person might have more than 1 NHMD record.

This can occur when:

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

The NHMD does not include information designed to enable the set of records belonging to an injury case to be recognised as such. So, there is potential for some incident injury cases to be counted more than once, which exists when a single incident injury case results in 2 or more NHMD records being generated, all of which satisfy the selection criteria being used.

Information in the NHMD enables this problem to be reduced, though not eliminated. The approach used for this report makes use of the 'Mode of admission' variable, which indicates whether the current episode began with inward transfer from another acute care hospital. Episodes of this type (inward transfers) are likely to have been preceded by another episode that also met the case selection criteria for injury cases, so are omitted from estimated case counts in this report.

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

Adjusting for changes to rehabilitation coding

A change in coding practice for ICD-10-AM code Z50 *Care involving the use of rehabilitation procedures* has necessitated a change to the standard record inclusion criteria for NISU reports of hospital admitted injury cases.

The change applies to episodes that ended on 1 July 2015, or later. For details of the change see Box 4.2 in *Admitted patient care 2015–16: Australian hospital statistics* (AIHW 2017).

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

To minimise the effect of the coding change on the estimation of injury occurrence and trends, a change to the case estimation method used by NISU was required.

Records with Z50 either as principal diagnosis or as additional diagnosis are now omitted by NISU, both before and after the coding change. The change to data before 2015–16 amounts to an adjustment of less than 0.1% of records. Where injury trends are presented by principal diagnosis for years before 2015–16, data will not be directly comparable for previous reporting periods.

Suppression of small cell counts in data tables

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

The AIHW is committed to reporting that maximises the value of information released for users, while being statistically reliable, and meeting these legislative requirements.

Data (cells) in tables might be suppressed to maintain the privacy or confidentiality of a person or organisation, or because a proportion or other measure related to a small number of events, so might not be reliable.

Errors, inconsistencies and uncertainties

Due to rounding, the sum of the percentages in tables might not equal 100%.

Appendix B: Additional tables

The data included in these additional tables underpin the figures presented throughout this report.

Table B1: Age-specific rates and rate ratios for hospitalised cases with any electrical injury, by sex, 2014–15 to 2015–16

Age group	Males		Females		Rate ratio
	Number	Rate	Number	Rate	
0–14	48	1.0	31	0.7	1.5
15–24	185	5.7	44	1.4	4.0
25–44	373	5.5	114	1.7	3.3
45–64	176	3.0	56	0.9	3.2
65+	24	0.7	14	0.4	2.0
All ages	806	3.4	259	1.1	3.1

Source: AIHW National Hospital Morbidity Database.

Table B2: Trend in age-standardised rate for hospitalised cases with any electrical injury, 1999–00 to 2015–16

Financial year of injury	Number of cases	Age-standardised rate (per 100,000)
1999–00	652	4.1
2000–01	695	4.3
2001–02	619	3.8
2002–03	626	3.8
2003–04	575	3.5
2004–05	565	3.4
2005–06	638	3.8
2006–07	596	3.5
2007–08	676	3.9
2008–09	579	3.2
2009–10	597	3.3
2010–11	634	3.4
2011–12	615	3.3
2012–13	550	3.0
2013–14	547	2.9
2014–15	533	2.7
2015–16	532	2.7

Source: AIHW National Hospital Morbidity Database.

Table B3: Types of diagnoses for hospitalised cases with any electrical injury, by age group, 2014–15 to 2015–16

Age group	Effects of electric current		Effects of lightning		Burns		Other diagnoses		All diagnoses	
	Number	%	Number	%	Number	%	Number	%	Number	%
0–14	34	43.0	1	1.3	37	46.8	7	8.9	79	100
15–24	154	67.2	7	3.1	51	22.3	17	7.4	229	100
25–44	300	61.6	13	2.7	120	24.6	54	11.1	487	100
45–64	145	62.5	5	2.2	57	24.6	25	10.8	232	100
65+	25	65.8	1	2.6	5	13.2	7	18.4	38	100
All ages	658	61.8	27	2.5	270	25.4	110	10.3	1,065	100

Source: AIHW National Hospital Morbidity Database.

Table B4: Trend in age-standardised rate for fatal electrical injuries, 1999–00 to 2015–16

Financial year of death	Number of deaths	Age-standardised rate (per 100,000)
1999–00	62	0.33
2000–01	52	0.27
2001–02	40	0.21
2002–03	38	0.19
2003–04	33	0.17
2004–05	42	0.21
2005–06	35	0.17
2006–07	35	0.16
2007–08	22	0.10
2008–09	31	0.14
2009–10	37	0.17
2010–11	37	0.16
2011–12	21	0.09
2012–13	22	0.09
2013–14	24	0.10
2014–15	23	0.09
2015–16	32	0.13

Note: Deaths registered in 2013 and earlier are based on the final version of cause-of-death data; deaths registered in 2014 are based on revised data; deaths registered in 2015 and 2016 are based on preliminary data. Revised and preliminary cause-of-death data are subject to further revision by the ABS.

Source: AIHW National Mortality Database.

Table B5: Type of activity being undertaken at time of fatal electrocution by electric current, 2014–15 to 2015–16

Type of activity	Number	%
Self-inflicted harm	16	40.0
Paid work	7	17.5
Unpaid work or domestic duties	6	15.0
Other activities	6	15.0
Criminal activity	3	7.5
Risk-taking behaviour	2	5.0
All electrocution deaths	40	100

Source: National Coronial Information System.

Appendix C: NCIS Selection criteria

Multiple methods are available for searching case records in the NCIS, including Find Case, Query Design, Coroners' Screen, External Codes Search, and Drug Search. Following a training session from staff at the NCIS, the authors of this report chose Query Design as the most appropriate method for searching for cases related to electrical injury and lightning.

Three primary strategies were used in the Query Design. These included a search of:

- coded data for Mechanism of injury fields
- coded data for Object or substance producing injury fields
- electronic reports (coroner's findings, autopsy reports, police reports, and toxicology) for keywords included in text (see next section 'Search strategies').

Search strategies

An initial pool of case records based on the following criteria was the starting point:

- case status—closed
- case jurisdiction—Australia
- date search criteria—date notified equal to or greater than start date 1 July 2004 and equal to or less than end 30 June 2016
- case type—death was due to external causes.

In addition to these criteria, searches were done for case records using the coded data field searches and keyword terms for the 2 external causes—electrocution by electric current and lightning—listed separately in the next subsections.

Case exclusions were then made based on:

- the absence of mention of electrocution or lightning in the coded data (mechanism of injury and/or object or substance producing injury fields)
- supporting police, toxicology, autopsy or coroner's findings electronic records lacking sufficient evidence to determine that the injury was related to electric current or lightning.

Deaths due to electrocution by electric current

The following searches for electrocution by electric current case records were conducted between 24 October and 7 November 2017.

Search using Mechanism of injury

- Level 1: Other mechanism of injury
 - Level 2: Exposure to electricity, radiation
 - Level 3: Exposure to electric current.

Search using Object or substance producing injury

- Category 1: Other object/substance
 - Category 2: Public use item
 - Description: High-tension overhead power line (excludes: electrical transmission line in or around building).

- Category 1: Other object/substance
 - Category 2: Public use item
 - Description: Telephone pole, stobie pole (includes pole holding telephone lines, power lines, or streetlights).
- Category 1: Other object/substance
 - Category 2: Public use item
 - Description: Other specified public use item.
- Category 1: Other object/substance
 - Category 2: Law enforcement equipment
 - Description: Other specified law enforcement equipment, taser.

Report search: keywords

The key words used for the searches were:

- electricity
- electrocution
- electric current
- electric shock
- taser.

Deaths due to lightning

The following searches for lightning case records were conducted between 17 and 20 October 2017.

Search using Mechanism of injury

- Level 1: Exposure to (effect of) weather, natural disaster, or other force of nature
 - Level 2: Exposure to (effect of) other specified weather, natural disaster, or other force of nature
 - Level 3: Exposure to lightning.
- Level 1: Exposure to (effect of) weather, natural disaster, or other force of nature
 - Level 2: Other specified exposure to (effect of) weather, natural disaster or other force of nature.

Search using Object or substance producing injury

- Category 1: Other object/substance
 - Category 2: Weather, natural disasters
 - Description: Lightning.

Report search: keywords

The key words used for the searches were:

- lightning
- electrostatic discharge
- thunderstorm.

Cautionary advice on searching NCIS

These searches found 40 case records for inclusion as fatal electrical injuries due to electrocution, and 8 case records for deaths due to effects of lightning where death occurred between 1 July 2014 and 30 June 2016.

An application of these same search strategies on other occasions might find additional coronial cases for this 2-year period, as results are influenced by the date the case was closed in NCIS.

Specifically, coronial cases closed between 17 October and 7 November 2017 might not have been included in the search results, and coronial cases closed on or after 8 November 2017 would not have been in the search results, so could not have been included in this report.

Glossary

Definitions in this Glossary contain, where applicable, an identification number from the Metadata Online Registry (METeOR). METeOR is Australia's central repository for health, community services and housing assistance metadata, or data about data.

It provides definitions for data for health-related and community services-related topics, and specifications for related NMDs, such as the Admitted patient care NMD, that form the basis of this report.

METeOR can be viewed at www.meteor.aihw.gov.au. For more information on the terms used in this report, see definitions in the *National health data dictionary, version 16.2* (AIHW 2015).

activity when injured: The type of activity being undertaken by a person at the time of injury. METeOR identifier: 641383.

additional diagnosis: A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care. METeOR identifier: 641014.

admission: The process whereby the hospital accepts responsibility for the patient's care and/or treatment. Admission follows a clinical decision based on specified criteria that a patient requires same-day or overnight care or treatment. An admission may be formal or statistical. METeOR identifier: 327206.

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

cause of death: From information reported on the medical certificate of cause of death, each death is classified by the underlying cause of death according to rules and conventions of the International Classification of Diseases and Related Health Problems, 10th revision. The underlying cause is defined as the disease that initiated the train of events leading directly to death. Deaths from injury or poisoning are classified according to the circumstances of the fatal injury, rather than to the nature of the injury. See also **underlying cause of death**.

external cause: The environmental event, circumstance or condition as the cause of injury, poisoning and other adverse effect. METeOR identifier: 641415.

fatality: Death caused by an unintentional (accident) or intentional (for example, self-harm or assault) injury event.

International Classification of Diseases and Related Health Problems (ICD): The World Health Organization's (WHO) internationally accepted classification of diseases and related health conditions. The 10th revision, Australian modification (ICD-10-AM) is currently in use in Australian hospitals for admitted patients, while the ICD-10 is used for routine deaths data.

length of stay: The length of stay of a patient, excluding leave days, measured in days. Formula: The length of stay is the separation date minus admission date minus total leave days. The calculation includes admission and separation dates. METeOR identifier: 269982.

mode of admission: The mechanism by which a person begins an episode of care, as represented by a code. METeOR identifier: 269976.

multiple cause of death: A code representing any disease, condition, or external cause recorded on the death certificate or other source of information used when coding causes of death.

principal diagnosis: The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care, or an attendance at the health-care establishment. METeOR identifier: 640978.

separation: The process by which an episode of care for an admitted patient ceases. A separation may be formal or statistical. Formal separation is the administrative process by which a hospital records the cessation of treatment, and/or care, and/or accommodation of a patient. Statistical separation is the administrative process by which a hospital records the cessation of an episode of care for a patient within the 1 hospital stay. METeOR identifier: 327268.

underlying cause of death: The condition, disease, or injury initiating the sequence of events leading directly to death; that is, the primary or main cause of death. METeOR identifier: 307931.

vital personal activity: This type of activity includes; for example, resting, sleeping, eating, bathing, walking, and moving around.

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Related publication

The following AIHW publication relating to electrical injury and death might also be of interest:

- Pointer S & Harrison JE 2007. Electrical injury and death. AIHW National Injury Surveillance Unit briefing no. 9. Cat. no. INJCAT 99. Canberra: AIHW.



A total of 1,065 people hospitalised between 1 July 2014 and 30 June 2016 had sustained an electrical injury, and 55 people died as a result of electrocution or lightning strike. Almost half of people hospitalised with an electrical injury occurred while the person was in paid work (497 cases or 47%), and a further 150 people sustained an electrical injury while doing unpaid work (14%).

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