

# ELECTROCUTION RELATED DEATHS

Unintentional electrocution deaths:

- most are males
- most occur in the home
- more than half occur during paid work
- an average of 20 deaths per year in Australia (between 2001 and 2008)

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## General Summary

Regulations and safety campaigns have been progressively implemented aimed at minimising unintentional deaths from electrocution, whether in the workplace or at home<sup>1</sup>.

Between 1st July 2000<sup>2</sup> and 31st October 2011, there were 321 electrocution deaths reported to Australian coroners as identified and closed on the NCIS database. Almost two-thirds (62.0%) of these deaths were unintentional. Additional NCIS database searches indicate that there are at least an additional 39 electrocution deaths still under coronial investigation.

Whilst an average of 20 people died each year nationally due to unintentional electrocution (between 2001 and 2008, being years where most cases have been closed), this is less than levels of a few decades ago<sup>3</sup>. Despite this, it is likely that most of these deaths are still preventable.

Major findings in relation to *unintentional electrocution deaths* include:

- The highest proportion occurred in the 30-39 age group (22.1%)
- Ninety-six percent involved males
- New South Wales had the highest frequency (n=55 over the entire period of reporting) yet the Northern Territory and Tasmania had the highest estimated rates between 2001-2008 (0.66 and 0.29 per 100,000 persons, respectively)
- The most common objects involved included overhead power lines (22.1%), electrical appliances (16.6%) and direct contact with electrical wires (11.6%)
- The most frequent location was the home, and more than half (54.3%) occurred while the deceased was engaged in paid work. Almost two-thirds of unintentional incidents involving overhead power lines occurred during paid work (63.6%).

1 Examples: *NSW Electricity (Consumer Safety) Regulation 2006* and the “*Look Up and Live*” campaign (Various jurisdictions)

2 1st January 2001 for Queensland data

3 An average of 74 unintentional electrocution deaths occurred in Australia each year from 1980 through to 1989 (NISU. *Injury Deaths Australia 1979-1998*. Online query dataset. Accessed in August 2011 from <http://www.nisu.finders.edu.au>)



# Statistics about all electrocution deaths (unintentional and intentional)

Intent was determined on completion of the coroner's investigation (Table 1). While slightly over one-third of cases involved intentional self-harm, further discussion of these deaths is beyond the scope of this fact-sheet.

Table 1: National deaths involving electrocution, by Intent (n=321)

Intent	Total	Percentage (%)
Unintentional	199	62.0
Intentional Self-Harm	111	34.6
Undetermined / Unlikely to be known / Other	11	3.4
<b>TOTAL</b>	<b>321</b>	<b>100</b>

Over three quarters of all unintentional electrocution deaths occurred in persons aged between 20-59 years (75.9%) and very few involved females.

Table 2: National unintentional electrocution deaths (July 2000 – October 2011), by Age Group of deceased

Age Group (years)	Total	Percentage (%)
0-9	6	3.0
10-19	17	8.5
20-29	41	20.6
30-39	44	22.1
40-49	35	17.6
50-59	31	15.6
60-69	15	7.5
70+	9	4.5
Unknown	1	<1
<b>TOTAL</b>	<b>199</b>	<b>100</b>

Table 3: National unintentional electrocution deaths (July 2000 – October 2011), by Gender of deceased

Gender	Total	Percentage (%)
Male	191	96.0
Female	8	4.0

There was a notably higher frequency of unintentional electrocution deaths in 2001 compared to any of the other years. In 2001, there were more electrocution deaths that occurred while the person was undertaking domestic duties (n=10) or paid work (n=18) than the average number of incidents per year between 2001-2008 for these activities (averages of 4 and 12 per annum, respectively<sup>4</sup>)

<sup>4</sup> Calculation of averages and rates was performed using 2001-2008 data since the proportion of cases closed between 2009 and 2011 are lower than previous years, which could lead to an underestimate in these years.

Table 4: National unintentional electrocution deaths (July 2000 – October 2011), by Year of Notification<sup>5</sup>

Year of notification	Total
2000*	13
2001	35
2002	21
2003	18
2004	20
2005	23
2006	18
2007	15
2008	12
2009*	12
2010/11*	12
<b>TOTAL</b>	<b>199</b>

New South Wales has the highest frequency of unintentional electrocution deaths, but the observed rates based upon population were highest in the Northern Territory and Tasmania. The south-eastern mainland states/territories of Australia (Victoria, New South Wales and the Australian Capital Territory) were the only jurisdictions with rates of unintentional electrocution deaths below the national average of 0.10 per 100,000 persons.

5 Data for year 2000 is from July 2000 through to end of year (for all states except Queensland). Data for 2009 and 2010/11 is likely to be an underestimate since a higher proportion of deaths from these years are awaiting coronial findings/closure

Table 5: National unintentional electrocution deaths (July 2000 – October 2011), by Jurisdiction

Jurisdiction	Total
NSW/ACT	58
QLD	48
WA	32
VIC	18
SA	17
NT	15
TAS	11
<b>TOTAL</b>	<b>199</b>

Table 6: Unintentional electrocution deaths per 100,000 persons, by Jurisdiction during 2001-2008 (n=162)<sup>6</sup>

Jurisdiction	Frequency (2001-2008)	Average (per annum)	Rate per 100,000 persons
NT	10	1.3	0.66
TAS	11	1.4	0.29
WA	28	3.5	0.18
QLD	41	5.1	0.14
SA	13	1.6	0.11
NSW/ACT	48	6.0	0.09
VIC	11	1.4	0.03
<b>TOTAL</b>	<b>162</b>	<b>20.3</b>	<b>0.10</b>

The most common object involved in unintentional electrocutions were overhead power lines (n=44, or 22.1%), and the majority of unintentional electrocutions occurred in the home (n=96 or 48.2%). The most common activity being undertaken when unintentionally electrocuted was paid work (54.3%), whilst almost a quarter (23.6%) of unintentional electrocutions occurred while the deceased was undertaking domestic duties (Figure 1).

6 Calculation of averages and rates was performed using 2001-2008 data since the proportion of cases closed between 2009 and 2011 are lower than previous years, which could lead to an underestimate in these years.

Table 7: National unintentional electrocution deaths (July 2000 – October 2011), by Object

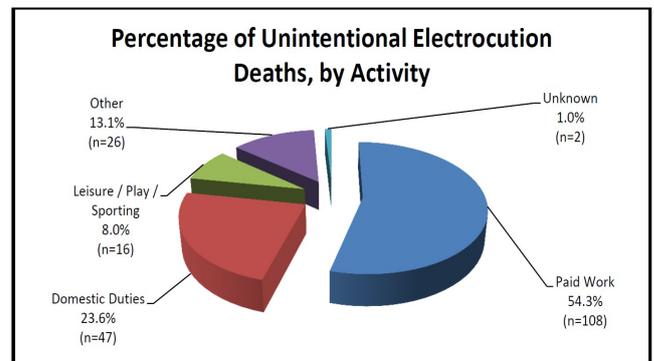
Object	Total
High-tension Overhead Power Line	44
Appliance (including the cord of a household appliance)	33
Contact with wires (including stripped electrical cords)	23
Machine / Tool	23
Electrical Transmission Line in or around building	20
Electrical fixture / Light	15
Generator / Pump / Motor / Transformer / Power station / Battery	10
Mains power source	9
Fixed house fitting (including copper pipes and bathtubs)	6
Electrified fence	≤ 5
Train	≤ 5
Telephone pole / Stobie pole	≤ 5
Unspecified / Other	7
<b>TOTAL</b>	<b>199</b>

Table 8: National unintentional electrocution deaths (July 2000 – October 2011), by Incident Location<sup>7</sup>

Location of Fatal Incident	Total
Home (including farmhouse)	96
Industrial or Construction area	29
Commercial area	25
Farm or other place of primary production	19
Transport area – public roadway	11
Countryside	6
Other place of occurrence	13
<b>TOTAL</b>	<b>199</b>

<sup>7</sup> 'Commercial area' includes: Café/Restaurant, Shop, Office Building, Motel/Hotel, Commercial Garage. 'Other' includes medical service areas, other non-roadway transport areas, residential institutions, schools and recreational areas.

Figure 1: Activity at the time of unintentional electrocution incident (July 2000 – October 2011)



Note: Of 39 additional cases on the NCIS database at the time of data extraction, 5 are currently coded as unintentional from the 7 cases with information available. At least 2 of these 5 possible unintentional deaths appeared to be electrocutions in a work setting.

## Coronial recommendations on unintentional electrocution

Coroners investigating unintentional electrocution deaths made recommendations in twenty-one cases of the 199 identified. Eight cases had recommendations made towards specific workplaces (or amendments to particular legislation or regulations governing the electrical industry) surrounding a review of their electrical safety systems and are not reproduced below. Five cases had recommendations made to the Department of Housing, WorkCover and WorkSafe. Three recommendations were also made in relation to advertising promotion or provision of Residual Current Devices (RCD's), commonly known as "safety switches". Other recommendations with broad applicability and relevance to public safety are provided below.



## Case 1

*The deceased was located in the garage of their residence where they received an electrocution whilst attempting to repair a microwave recently purchased from a second-hand retail outlet.*

“That consideration also be given to making compulsory the attachment of a warning notice to all second-hand electrical equipment/appliances disposed of through [second-hand retail outlets].”

## Case 2

*Whilst working in a roof cavity, a licenced plumber came into contact with an electrified copper pipe whilst installing a solar hot water system.*

“I adopt the recommendation ... that the [state electrical safety branch] should liaise with the [state’s] Master Plumbers and Mechanical Contractors Association, the [state’s] Master Builders Association and the [state’s] Housing Industry Association with a view to notifying their members of the potentially fatal risk of electrocution while working on or about sites that could involve live electrical power in water pipes and hot water systems and particularly to recommend the universal use of bonding strip (insulated jumper leads) when working on any metal piping.”

## Case 3

*The deceased, who was a building and maintenance manager, received a fatal electrical injury whilst working on an air conditioning unit in their workplace. It appears that the deceased utilised a proximity volt-tester at the time of death since this device was discovered near the deceased’s head.*

1. The Department of Fair Trading should review the adequacy of the precautions attached to the sale of proximity voltage testers (“volt sticks”) in light of their inherent unreliability and potentially fatal consequences.
2. Specifically, all information sheets/brochures provided with volt sticks should: a) contain a

recommendation that the instrument be used by qualified tradesmen only; b) stipulate a recommended procedure that the functioning of the instrument is tested twice to confirm that it “indicates” when the power is turned on and that there is no “indication” when the power is disconnected; and c) contain the warning that for safe operation it is not sufficient to assume that failure of the instrument to “indicate” means that a circuit has been correctly isolated. The procedure above (i.e. double testing) must be followed every time. Additionally, after ascertaining that a live condition exists, the reading should be confirmed by another type of test device before commencing any work that could involve fatal contact with live electrical parts.

3. Additionally, the volt stick itself should have a warning in large type to the effect, ‘*Danger, test before use*’.

## Case 4

*In the capacity of a ‘trainee’ tradesperson, the deceased received a fatal electrical injury upon touching the “live” metal prongs of a plug under a workbench.*

“The Department of Industries and Business commence an awareness program notifying all [state] employers and residents that electrical installations must be installed, maintained and repaired by competent licensed electricians.”

## Cases 5 and 6

*The deceased person had entered an ornamental pond at home whilst clearing it from weeds and been electrocuted by the pond’s electric pump which had fallen into the pond. Another person was subsequently fatally electrocuted whilst trying to help the first deceased person. It was later found that the pump motor was not effectively earthed.*

“That a safety message is produced by the electricity industry of the dangers associated with electrical appliances. Appliances near water should



be expanded to cover unusual situations such as ponds, dams, creeks and the like.”

“Greater emphasis should be placed on the formation of electrical maintenance of appliances, including the installation of safety switches and the necessity to utilise qualified persons to perform electrical work.”

### **Case 7**

*The deceased received a fatal electrical injury when operating the hot water tap of the bathtub. It was later found that the mains electricity supply neutral conductor had become disconnected, which formed a “live” circuit between the deceased, the hot water tap, the waste pipe of the metallic bath and the ground.*

“To prevent further deaths of a like nature occurring in the future, I recommend that occupiers of residences be informed by public notice that the neutral connection at the mains box should be checked on a regular basis, particularly in areas subjected to high winds and close to beaches, but with the clear indication there may be deterioration over time due to expansion and contraction.”

### **Case 8**

*Whilst installing new lights, the deceased crawled into the ceiling space and received a fatal electrical injury when making contact with exposed terminals of an electrical junction box.*

“I think it appropriate and timely to once again remind the community that only appropriately licensed electricians, authorised under the *Electrical Industry Safety & Administration Act 1971*, carry out electrical installation and/or repair work and that the fullest safety procedures and protocols be identified and followed at all times.”

### **Cases 9 and 10**

*Whilst working, two employees were loading irrigation pipes onto a utility (“ute”) when one of the irrigation pipes made contact with an overhead power line, resulting in both employees receiving fatal electrical injuries.*

“I recommend that any conductive object, plant or machine capable of contacting energised conductors due to extension or inadvertent movement is not stored, stacked or kept underneath energised conductors. Infrastructure or installation owners and / or easement controllers should ensure such separation. Irrigation pipes and electric power lines must never come into contact with one another. I further recommend the on-going awareness campaign implemented by [the power supply company].”

### **Case 11**

*The deceased was yachting with family members when the mast of the yacht made contact with an overhead power line, which resulted in a fatal electrocution.*

“I recommend that [the power supply company] take steps immediately [to] survey all its power lines over navigable waters. Any lines which are [found] to be dangerously low should be immediately raised and there should be a program put in place [to] ensure that all lines are of a minimum clearance over full supply level.”

### **Case 12**

*In the capacity of paid work, the deceased made direct contact with electrical wiring whilst performing electrical work in the roof space of a commercial building.*

“I recommend that when electrical work is to be performed in areas such as roof spaces above [a building] where the extent and quality of previous electrical work is not well known, electricians should either:

- work at a time when the power can be turned off so that they are neither carrying out live work nor carrying out work in close proximity to exposed live parts, or



- if it is considered necessary to work while the power is on, that an electrician never work alone, that the area is well lit, that a work plan has been prepared to ensure that the work can be conducted safely and that written approval of the installation owner or operator has been obtained for the live work. Any such work plan should specifically identify danger points such as exposed junctions and known earthed conductors.”

“I further recommend that in respect of the wiring being worked on, that there must be adequate isolation, testing and securing of the isolation. Danger tags should always be used, prominently displayed and applied so that the power is not turned on by a person unaware of the work being performed by the electrician.”

“I further recommend that if an electrician is working in a roof space above a [building] and becomes aware that there are a number of exposed junctions, whether or not those junctions originally complied with *Australian Standards*, there be a requirement that the situation be addressed and that prior to any further electrical work taking place, junction boxes should be installed.”

## Tips for living and working safely with electricity

A range of resources is readily available with respect to living and working safely with electricity:

Australian Government Comcare:

[http://www.comcare.gov.au/forms\\_\\_and\\_publications/fact\\_sheets/electrical\\_safety](http://www.comcare.gov.au/forms__and_publications/fact_sheets/electrical_safety)

Energex Australia:

<http://www.energex.com.au/safety>

[http://www.energex.com.au/\\_\\_data/assets/pdf\\_file/0012/32124/Look-up-and-live-8047.pdf](http://www.energex.com.au/__data/assets/pdf_file/0012/32124/Look-up-and-live-8047.pdf)

“Electricity Dangers” (courtesy of Energy Australia):

<http://www.childsafetyaustralia.com.au/children/electricity/electricity.htm>

Energy Safe Victoria:

<http://www.esv.vic.gov.au/>

<http://www.esv.vic.gov.au/For-Consumers/Gas-and-electricity-outdoors/Electricity/Look-Up-and-Live> (“Look Up and Live” Campaign)

Queensland Government:

<http://www.justice.qld.gov.au/fair-and-safe-work/electrical-safety>

SafeWork South Australia:

[http://www.safework.sa.gov.au/show\\_page.jsp?id=2770](http://www.safework.sa.gov.au/show_page.jsp?id=2770)

## Research Reports

Driscoll TR, Mitchell RJ, Hendrie AL, Healey SH, Mandryk JA, Hull BP. Unintentional fatal injuries arising from unpaid work at home. *Inj Prev* 2003 Mar; 9(1):15-9.

Byard RW, Hanson KA, Gilbert JD, James RA, Nadeau J, Blackbourne B, Krous HF. Death due to electrocution in childhood and early adolescence. *J Paediatr Child Health* 2003 Jan-Feb; 39(1):46-8.

Wick R, Gilbert JD, Simpson E, Byard RW. Fatal electrocution in adults--a 30-year study. *Med Sci Law* 2006 Apr; 46(2):166-72.

Fatovich DM. Electrocution in Western Australia, 1976-1990. *Med J Aust* 1992 Dec 7-21; 157(11-12):762-4.



## Methods and limitations

Data is available on the NCIS database from 1st July 2000 (Queensland data available from 1st January 2001). Data for the purposes of this report was extracted during November 2011, and only closed cases on the NCIS database were included.

NOTE: Deaths related to lightning strikes have been excluded from this analysis.

Searches for incidents involving electrocution on the NCIS database involved keyword searches of the causes of death assigned by coroners using the following terms: "electrocution", "electric", "electricity", "voltage", "electrocuted" or "electrical". Searches also included cases classified within the NCIS database under the category of "Other Mechanism of Injury \ Exposure to Electricity, Radiation \ Exposure to Electric Current".

The proportion of open cases on the NCIS may impact the data set, especially in more recent years. The percentage of closed cases for each calendar year at the time of data extraction is as follows:

Year	% closed
2001	96.3
2002	96.5
2003	96.1
2004	94.7
2005	97.2
2006	94.0
2007	91.2
2008	87.2
2009	82.7
2010	69.7
2011	23.8

## National Coroners Information System (NCIS)

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### The NCIS

The National Coroners Information System (NCIS) is managed by the Victorian Institute of Forensic Medicine (VIFM) on behalf of the NCIS Board of Management.

NCIS is funded by each State and Territory Justice/ Attorney-General's Department and the following Government agencies:

- Australian Department of Health and Ageing
- Australian Institute of Criminology
- Safe Work Australia
- Australian Competition and Consumer Commission
- Australian Department of Infrastructure and Transport

Data is provided by each of the Coronial Offices around Australia, the Australian Bureau of Statistics (ABS) and Safe Work Australia.