

NSW Child Death Review Team

Annual Report

2010

October 2011

NSW Child Death Review Team 2010 Annual Report Errata

Errata notice

Errors in the NSW Child Death Review Team 2010 Annual Report have been identified.

Suicide

In Table 64 on page 93 of the report in Section '8.4 Suicide', the rows for Female and Male are incorrectly labelled. Text correctly states that males are twice as likely to suicide as females.

Below is the corrected Table 64 as it should appear with the row labels.

Table 64: Gender of children who died due to suicide, deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Male	19 (7.2)	23 (8.7)	13 (4.9)	8 (3.0)	10 (3.7)	12 (4.4)	13 (4.7)	12 (4.3)	9 (3.2)	13 (4.6)	6 (2.1)	9 (3.2)	7 (2.5)	14 (4.9)	9 (3.2)
Female	6 (2.3)	10 (3.8)	2 (0.8)	13 (4.8)	8 (3.0)	5 (1.8)	6 (2.2)	6 (2.2)	7 (2.5)	6 (2.1)	2 (0.7)	4 (1.4)	5 (1.8)	4 (1.4)	5 (1.9)
Children	25 (4.9)	33 (6.4)	15 (2.9)	21 (4.0)	18 (3.4)	17 (3.2)	19 (3.5)	18 (3.3)	16 (2.9)	19 (3.5)	8 (1.5)	13 (2.3)	12 (2.2)	18 (3.2)	14 (2.5)

Aboriginal and Torres Strait Islander status

There is an error in the report relating to the numbers (and Crude Mortality Rate) of deaths of Aboriginal and Torres Strait Islander children. The error principally relates to a change in values coded as 'missing' in the child death register in 2007. This resulted in fields that contained the missing values prior to 2007 being interpreted as a positive indicator of Indigenous status.

On page 17, the text should state:

- Using birth and death registration only, the register reports the deaths of 749 Aboriginal and Torres Strait Islander children between 1996 and 2010.
- Using birth and death registration, police reports of the death to the Coroner, Coronial records, the Midwives Data Collection and other determinations made by the Team, the register reports the deaths of 874 Aboriginal and Torres Strait Islander children.

Table 2 on page 18 of the report should appear as follows:

Table 2: Aboriginal and Torres Strait Islander status - all deaths of children registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	788 (52.1)	720 (47.4)	671 (44)	758 (49.5)	696 (45.2)	677 (43.7)	590 (38.2)	596 (38.7)	570 (37.2)	620 (40.4)	566 (36.8)	539 (34.9)	562 (36.3)	546 (35.1)	537 (34.4)
Aboriginal or Torres Strait Islander	44 (80.1)	51 (89.8)	49 (83.6)	55 (91.3)	57 (92.2)	38 (60.1)	48 (74.4)	49 (74.7)	46 (69.2)	50 (74.3)	64 (91.4)	59 (84.2)	52 (74.2)	34 (48.3)	53 (74.9)
Total	832 (53.1)	771 (48.9)	720 (45.5)	813 (51.1)	753 (47.1)	715 (44.3)	638 (39.6)	645 (40.2)	616 (38.5)	670 (41.8)	630 (39.1)	598 (37)	614 (37.8)	580 (35.7)	590 (36.1)

On page 19 of the report, text should state that there is a non-significant decline in mortality rates for Aboriginal and Torres Strait Islander children over the 15 years from 1996 to 2010, as demonstrated in Table 2 above.

Table 27 on page 40 of the report should appear as follows:

Table 27: Aboriginal and Torres Strait Islander status of children who died due to conditions arising in the perinatal period - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	233 (2.8)	213 (2.5)	173 (2.1)	236 (2.8)	224 (2.7)	228 (2.8)	176 (2.1)	186 (2.2)	173 (2.1)	243 (2.9)	221 (2.6)	173 (2.0)	198 (2.2)	192 (2.2)	166 (1.8)
Aboriginal or Torres Strait Islander	14 (5.7)	22 (7.8)	15 (5.0)	15 (4.9)	22 (7.4)	16 (5.1)	12 (3.6)	13 (4.0)	10 (2.8)	15 (4.8)	19 (5.4)	26 (7.0)	16 (4.0)	8 (1.9)	20 (4.5)
Total	247 (2.9)	235 (2.7)	188 (2.2)	251 (2.9)	246 (2.8)	244 (2.9)	188 (2.2)	199 (2.3)	183 (2.1)	258 (3.0)	240 (2.7)	199 (2.2)	213 (2.2)	200 (2.2)	186 (1.9)

Text on page 39 of the report should state that Table 27 shows that the mortality rate for Aboriginal and Torres Strait Islander children due to perinatal conditions has been higher than that for non-Indigenous children in every year for the past 15 years, except for 2009. The decline in child mortality rates from 1996 to 2010 is not significant.

Table 30 on page 44 of the report should appear as follows:

Table 30: Aboriginal and Torres Strait Islander status of children who died due to congenital malformations or chromosomal abnormalities - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	113 (7.5)	114 (7.5)	100 (6.6)	116 (7.6)	95 (6.2)	101 (6.5)	74 (4.8)	84 (5.5)	100 (6.5)	88 (5.7)	67 (4.4)	88 (5.7)	102 (6.6)	110 (7.1)	111 (7.1)
Aboriginal or Torres Strait Islander	6 (10.9)	3 -	5 (8.5)	10 (16.6)	9 (14.6)	4 (6.3)	8 (12.4)	2 -	7 (10.5)	7 (10.4)	8 (11.4)	4 (5.7)	10 (14.3)	5 (7.1)	9 (12.7)
Total	119 (7.6)	117 (7.4)	105 (6.6)	126 (7.9)	104 (6.5)	105 (6.5)	82 (5.1)	86 (5.4)	107 (6.7)	95 (5.9)	75 (4.7)	92 (5.7)	112 (6.9)	115 (7.1)	120 (7.3)

Text on page 43 should state that the mortality rate for Aboriginal and Torres Strait Islander children due to congenital malformations or chromosomal abnormalities has been higher than that for non-Indigenous children in most years of the past 15 years. The overall mortality rate has shown little or no change.

Table 33 on page 47 of the report should appear as follows:

Table 33: Aboriginal and Torres Strait Islander status of children who died due to cancers and tumours - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	55 (3.6)	54 (3.6)	63 (4.1)	64 (4.2)	52 (3.4)	58 (3.7)	47 (3.0)	52 (3.4)	51 (3.3)	37 (2.4)	29 (1.9)	45 (2.9)	32 (2.1)	31 (2.0)	43 (2.8)
Aboriginal or Torres Strait Islander	2 -	1 -	3 -	0 -	0 -	1 -	1 -	1 -	3 -	2 -	2 -	2 -	1 -	1 -	1 -
Total	57 (3.6)	55 (3.5)	66 (4.2)	64 (4.0)	52 (3.2)	59 (3.7)	48 (3.0)	53 (3.3)	54 (3.4)	39 (2.4)	31 (1.9)	47 (2.9)	33 (2.0)	32 (2.0)	44 (2.7)

Text on page 47 of the report should state that the small number of deaths due to cancers and tumours among Aboriginal and Torres Strait Islander children shows no reliable trend over the 15 years from 1996 to 2010, as shown in table 33.

Table 36 on page 50 of the report should appear as follows:

Table 36: Aboriginal and Torres Strait Islander status of children who died due to diseases of the nervous system - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	46 (3.0)	39 (2.6)	43 (2.8)	32 (2.1)	38 (2.5)	36 (2.3)	38 (2.5)	46 (3.0)	46 (3.0)	29 (1.9)	36 (2.3)	16 (1.0)	26 (1.7)	30 (1.9)	25 (1.6)
Aboriginal or Torres Strait Islander	1 -	0 -	2 -	2 -	1 -	0 -	6 (9.3)	1 -	2 -	1 -	3 -	1 -	1 -	2 -	3 -
Total	47 (3.0)	39 (2.5)	45 (2.8)	34 (2.1)	39 (2.4)	36 (2.2)	44 (2.7)	47 (2.9)	48 (3.0)	30 (1.9)	39 (2.4)	17 (1.1)	27 (1.7)	32 (2.0)	28 (1.7)

Text on page 50 of the report should state that the mortality rate for Aboriginal children due to diseases of the nervous system was approximately the same as for non-Indigenous children, as shown in table 36.

Table 40 on page 54 of the report should appear as follows:

Table 40: Aboriginal and Torres Strait Islander status of children who died due to diseases of the circulatory system - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	27 (1.7)	17 (1.1)	21 (1.4)	23 (1.5)	21 (1.4)	28 (1.8)	19 (1.2)	9 (0.6)	15 (1.0)	18 (1.2)	18 (1.2)	18 (1.2)	17 (1.1)	14 (0.9)	17 (1.1)
Aboriginal or Torres Strait Islander	0 -	0 -	2 -	0 -	1 -	1 -	2 -	1 -	3 -	1 -	1 -	3 -	0 -	0 -	1 -
Total	27 (1.7)	17 (1.1)	23 (1.5)	23 (1.4)	22 (1.4)	29 (1.8)	21 (1.3)	10 (0.6)	18 (1.1)	19 (1.2)	19 (1.2)	21 (1.3)	17 (1.0)	14 (0.9)	18 (1.1)

Text on page 54 correctly states that the mortality rate for Aboriginal children due to diseases of the circulatory system was close to that for non-Indigenous children, and the difference was not significant.

Table 43 on page 57 of the report should appear as follows:

Table 43: Aboriginal and Torres Strait Islander status of children who died due to endocrine, nutritional or metabolic diseases - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	9 (0.6)	10 (0.7)	17 (1.1)	25 (1.6)	11 (0.7)	12 (0.8)	18 (1.2)	14 (0.9)	9 (0.6)	15 (1.0)	8 (0.5)	10 (0.6)	19 (1.2)	21 (1.3)	14 (0.9)
Aboriginal or Torres Strait Islander	0 -	0 -	0 -	0 -	0 -	0 -	0 -	0 -	0 -	0 -	1 -	2 -	0 -	0 -	0 -
Total	9 (0.6)	10 (0.6)	17 (1.1)	25 (1.6)	11 (0.7)	12 (0.7)	18 (1.1)	14 (0.9)	9 (0.6)	15 (0.9)	9 (0.6)	12 (0.7)	19 (1.2)	21 (1.3)	14 (0.9)

Text on page 57 correctly states that the mortality rate for Aboriginal children due to endocrine, nutritional or metabolic diseases was close to that for non-Indigenous children, and the difference was not significant, as shown in Table 43.

Table 46 on page 59 of the report should appear as follows:

Table 46: Aboriginal and Torres Strait Islander status of children who died due to respiratory diseases – deaths registered 1996-2010 – number (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	22 (1.5)	20 (1.3)	23 (1.5)	21 (1.4)	11 (0.7)	14 (0.9)	14 (0.9)	10 (0.6)	12 (0.8)	7 (0.5)	10 (0.6)	13 (0.8)	16 (1.0)	9 (0.6)	14 (0.9)
Aboriginal or Torres Strait Islander	3 -	3 -	2 -	2 -	3 -	0 -	1 -	4 -	4 -	0 -	1 -	2 -	5 (7.1)	0 -	1 -
Total	25 (1.6)	23 (1.5)	25 (1.6)	23 (1.4)	14 (0.9)	14 (0.9)	15 (0.9)	14 (0.9)	16 (1)	7 (0.4)	11 (0.7)	15 (0.9)	21 (1.3)	9 (0.6)	15 (0.9)

Text on page 59 should state that for the 15 years from 1996, and as shown in table 46, the mortality rate for Aboriginal and Torres Strait Islander children due to respiratory diseases has been highly variable, but has been higher than that for non-Indigenous children, except for those years when no Indigenous children died from respiratory diseases.

Table 49 on page 62 of the report should appear as follows:

Table 49: Aboriginal and Torres Strait Islander status of children who died due to infectious or parasitic diseases - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	13 (0.9)	15 (1.0)	14 (0.9)	11 (0.7)	12 (0.8)	11 (0.7)	12 (0.8)	10 (0.6)	8 (0.5)	6 (0.4)	18 (1.2)	13 (0.8)	9 (0.6)	6 (0.4)	10 (0.6)
Aboriginal or Torres Strait Islander	1 -	2 -	2 -	0 -	0 -	1 -	1 -	4 (6.1)	0 -	3 -	1 -	1 -	0 -	1 -	0 -
Total	14 (0.9)	17 (1.1)	16 (1.0)	11 (0.7)	12 (0.7)	12 (0.7)	13 (0.8)	14 (0.9)	8 (0.5)	9 (0.6)	19 (1.2)	14 (0.9)	9 (0.6)	7 (0.4)	10 (0.6)

Text on page 62 correctly states that in 2010, no Aboriginal or Torres Strait Islander children had an underlying cause of death of infectious or parasitic disease. As illustrated in table 49, for the 15 years from 1996, the mortality rate of Aboriginal and Torres Strait Islander children from infectious or parasitic diseases has been highly variable, but has been comparable to that of non-Indigenous children in recent years.

Table 72 on page 103 of the report should appear as follows:

Table 72: Aboriginal and Torres Strait Islander status of children who died due to fatal assault - deaths registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Not Aboriginal or Torres Strait Islander	11 (0.7)	12 (0.8)	15 (1.0)	12 (0.8)	15 (1.0)	13 (0.8)	7 (0.5)	18 (1.2)	9 (0.6)	11 (0.7)	11 (0.7)	7 (0.5)	12 (0.8)	6 (0.4)	9 (0.6)
Aboriginal or Torres Strait Islander	2 -	0 -	2 -	3 -	1 -	2 -	1 -	2 -	0 -	2 -	0 -	1 -	1 -	1 -	5 (7.1)
Total	13 (0.8)	12 (0.8)	17 (1.1)	15 (0.9)	16 (1)	15 (0.9)	8 (0.5)	20 (1.2)	9 (0.6)	13 (0.8)	11 (0.7)	8 (0.5)	13 (0.8)	7 (0.4)	14 (0.9)

Text on page 102 correctly states that Table 72 shows the rate of assault deaths of Aboriginal children has been higher than that of non-Aboriginal children since 1996, but the two have shown some evidence of converging over the 15 year period. The sharp rise in 2010 reflects relatively high number of deaths of Aboriginal children this year.

Yours sincerely



Bruce Barbour
Convenor, NSW Child Death Review Team
NSW Ombudsman

NSW Child Death Review Team
Annual Report
2010

October 2011

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Foreword

This is the fifteenth annual report of the NSW Child Death Review Team, and the first since I became Convenor of the Team, and responsibility for support and assistance for the work of the Team was transferred to my office.

The death of a child is a profound loss, first and foremost to family and friends, and to our whole community. The work of reviewing child deaths has one core purpose: to prevent, to the degree possible, other children dying. It is a significant responsibility as well as a great opportunity to make a difference.

On behalf of the Team, I wish to thank the NSW Commission for Children and Young People for supporting the work of the Team since 1999. Over that time, much has been gained in our knowledge of child deaths and preventative strategies.

The transfer of the Team to my office has presented significant challenges over the past two years, and I am pleased that at the time of writing, I am very optimistic that these issues will soon be fully resolved. The Team is now fully constituted, and we have a number of new members who will bring high level expertise in child health and wellbeing, and research and data analysis. Enhanced membership, along with increased funding, provides a great opportunity to consolidate the Team's previous work, and to look afresh at how we can move this important work forward in the future.

The resources and expertise of my office will also be of great benefit to the Team. My office has extensive understanding of the range of relevant government services, from human services and health to transport and local government. We already have extensive experience in reviewing deaths, through my responsibilities for reviewing 'reviewable' child deaths and the deaths of people with disabilities in care. Importantly, this work was a major impetus for transferring the Team. Justice James Wood's vision in recommending this significant change following his Inquiry into child protection services in NSW was to ensure that scrutiny and reporting of reviewable child deaths would be *'enhanced through an integrated function that examines all child deaths in NSW to enable the making of more systemic recommendations to prevent child deaths.'*

In moving forward, the Team's immediate focus will be to develop a clear work plan and determine its immediate and long term priorities. Decisions will also need to be made about the best way to report on the Team's work and to engage others in driving prevention strategies.

In this context, it is critical for the Team to be fully aware of the organisations and individuals who use the report, how they use the information it provides, and what would be useful for them. To this end, the report includes details of a survey that will assist the Team in decisions about its future work. I would encourage all who read this report to complete the survey.

This report is different in style and format to previous Team reports. Because of delays and other issues I have detailed in the report, the report has been drafted with less direct input from the Team than would otherwise be the case. It is in some ways, an 'interim' report that will be used as the basis for further discussion and decisions by the Team. It is nonetheless a complete and informative document that I trust will promote understanding of child deaths in NSW.

Finally, on behalf of the Team, I wish to convey my sincere condolences to the families and friends of the children and young people who died, and whose deaths are considered in this report. It is our foremost responsibility that in reviewing these deaths, we learn from them and use that knowledge to make a difference to the lives of others.



Bruce Barbour

Convenor, Child Death Review Team
NSW Ombudsman

NSW Child Death Review Team

At the time of writing this report, the NSW Child Death Review Team was in the process of being constituted. Team-related persons at this time were:

Mr Bruce Barbour

Convenor
NSW Ombudsman

Ms Megan Mitchell

Commissioner, NSW Commission for Children and Young People

Ms Helen Freeland

A/Deputy Chief Executive, Operations, Community Services

Ms Anne Marie Dwyer

Executive Director, Prevention and Pathways, Ageing, Disability and Home Care

Ms Robyn Bale

Director, Student Achievement and Community Partnerships, Department of Education and Communities

Detective Superintendent Peter Cotter

Commander Homicide, NSW Police Force

Mr Maurice Taylor

Coordinator, Coronial Information and Support Unit, State Coroner's Office

Mr Marcel Savary

Courts Policy Manager, Department of Attorney General and Justice

Professor Ngiare Brown

Medical Officer, Australian Indigenous Doctors Association

Dr Jonathan Gillis

National Medical Director, Organ and Tissue Authority

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Paediatric Pathologist, Sydney Children's Hospital

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Acknowledgements

The Child Death Review Team would like to thank NSW state government and other agencies that provided data for this report. In particular, thanks to the NSW Registry of Births, Deaths and Marriages; the State Coroner's Office; the Department of Family and Community Services, in particular Community Services; NSW Health; the Department of Education and Communities; and the NSW Police Force.

The Team would also like to acknowledge the National Centre for Health Information Research and Training for cause of death coding and reporting advice.

Thanks also to Dr Jonathan Gillis, who provided regular consulting as an expert adviser, and to Dr Bronwyn Gould for her expert advice and reviews.

Finally, the Team appreciates the contribution of information from agencies and child death review committees in other states and territories.

Tell us what you think of this report...

The Team is keen to find out who uses this report, and to hear what people who read the report think about how it is written, what information it provides, and how it could be improved.

Please visit:

<https://www.surveymonkey.com/s/JFC9Q9D>

to complete a short survey.

Your views would be much appreciated.

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Executive Summary

This is the fifteenth report of the NSW Child Death Review Team (the Team), and the first since the NSW Ombudsman became Convenor of the Team and responsibility for support and assistance for the Team transferred to his office from the NSW Commission for Children and Young People. The transfer took place in late February 2011.

The report provides information on 589 children and young people whose deaths were registered in NSW in 2010.

Cause of death

Information was available on cause of death for 542 of the children who died, and reporting of cause is based on this figure. Cause of death is reported primarily on underlying cause of death, which is the disease or injury that initiated the train of events leading to death.

Of the 542 children, the large majority (445, 82%) died from natural causes. The deaths of 97 children (18%) were related to external injury.

Child deaths registered in 2010 – all causes

Demographic and individual characteristics of the children

- ▶ Of the 589 children whose deaths were registered in 2010, more boys (361, 61%) died than girls (228, 39%).
- ▶ The majority of children who died were very young. Most were infants less than one year of age (364, 62%), and almost three-quarters of the children who died were under five years of age.
- ▶ Aboriginal and Torres Strait Islander children were over-represented in child deaths. The deaths of these children accounted for 10 per cent of all child deaths registered in 2010. Fifty one children who died were Aboriginal and eight were Torres Strait Islander children.
- ▶ Most of the children who died lived in major cities (61%), although the Crude Mortality Rate (CMR) - or deaths per 100,000 of the relevant population - was highest in remote areas.

15 year trends

Over the fifteen years from 1996, the mortality rate for all children has fallen by about 36 per cent. Rates for males and females have exhibited similar declines.

The findings related to gender, age and over-representation of Aboriginal and Torres Strait Islander children are consistent with previous years.

Leading causes of death

Three leading causes of death

The leading cause of death for children in NSW in 2010 was conditions originating in the perinatal period, which are conditions that arise during pregnancy or up to 28 days after birth (184 children, 34%).

The second leading cause of death was congenital malformations and chromosomal abnormalities (117 children, 22%).

Taken together, the two leading causes of death accounted for over half of all child deaths registered in 2010. This is consistent with the Team's previous findings.

The third most common cause of death in children was injuries. Injuries tend to peak between the ages of one and three years.

The leading causes of death for Aboriginal and Torres Strait Islander children were mostly the same as those for all children, but with generally higher crude mortality rates.

Three leading causes of death by age

Leading causes of death vary by age. Because most children who die are infants, the leading causes of death for children aged under one year reflect those for all child deaths, as above.

- ▶ For children aged between one and four years, the leading cause of death was injury-related, followed by neoplasms (cancers and tumours), and then congenital malformations and chromosomal abnormalities.
- ▶ The two leading causes of death for children aged five to nine years and 10 – 14 years were cancers and tumours followed by injury related deaths. For the five to nine year age group, the third leading cause was diseases of the circulatory system. For the older age group, the third leading cause was diseases of the nervous system.
- ▶ For those aged over fifteen years, the most common cause of death was injury, followed by cancers and tumours and then diseases of the circulatory system.

15 year trends

Since 1996, deaths from conditions arising in the perinatal period have decreased to some degree, but deaths from congenital malformations and chromosomal abnormalities have not.

The decline of injury related deaths over the years from 1996 to 2010 has, since 2008, resulted in external cause deaths falling from the second most common cause of death to the third.

Multiple causes of death

In addition to underlying cause of deaths, information about contributing and direct causes of death are important for a more complete understanding of what led to a death, and the co-contribution of diseases to mortality.

The most salient relationships to emerge from considering multiple causes of death for children whose deaths were registered in 2010 are that deaths from conditions arising in the perinatal period and congenital malformations and chromosomal abnormalities are often recorded together, with congenital or chromosomal causes tending to be recorded as the underlying cause of death when this occurs.

The majority of deaths with an underlying external cause of death included at least one contributory cause relating to injury or poisoning.

About one third of deaths having an underlying cause of diseases of the nervous system include a contributory cause of disease of the respiratory system. Respiratory conditions are common in children with long term nervous system disabilities such as cerebral palsy or muscular dystrophy. Respiratory conditions were also common in cases where the underlying cause of death was infectious and parasitic diseases, endocrine, nutritional and metabolic diseases or diseases of the circulatory system.

Deaths of infants and Sudden Unexpected Death in Infancy (SUDI)

Fifty infant deaths (14% of infant deaths) were Sudden Unexpected Death in Infancy (SUDI). SUDI is not a cause of death, but a classification to enable the consideration of deaths of otherwise normal babies who, for unknown reasons, do not survive. SUDI includes Sudden Infant Death Syndrome.

Demographic and individual characteristics of the children

Of the 50 SUDI deaths registered in 2010:

- ▶ Ten infants were neonates aged less than 28 days. Since 1996, neonatal SUDI deaths have comprised approximately 15 per cent of all SUDI in NSW.
- ▶ Two thirds (33) of the infants were male.
- ▶ Nine of the infants were Aboriginal, and two were Torres Strait Islander children.
- ▶ Seventeen of the infants who died suddenly and unexpectedly had been the subject of a report of risk of harm or report of risk of significant harm to Community Services prior to their death. Seven of these infants were the subject of a report before they were born.

Cause of death

Coronial information on cause of death was available for 24 of the 50 infants. In 14 cases, the cause of death was identified. Eight infants died due to an illness, abnormality or disease that was not recognised as life threatening prior to the infant's death. Six infants died due to unintentional suffocation.

The cause of death for 10 infants remained unexplained after autopsy. In all ten cases, the cause of death has been classified as Sudden Infant Death Syndrome.

Risk factors

At least one or more modifiable risk factors for SUDI were present for almost all (94%) of the infants who died suddenly and unexpectedly in NSW in 2010. These factors included inappropriate bedding, being placed in a prone or side sleep position, and being exposed to tobacco smoke. In addition to the modifiable risk factors, many of the infants were born prematurely and almost half had experienced recent illness.

15 year trends

There has been a decline in SUDI over the past 14 years, however, there has been no significant change in the rate of SUDI since 2004.

Preventative messages

Key messages, particularly directed to modifiable risk factors associated with infant sleep, are to sleep babies on their back in a safe sleeping environment, on their own and with no loose bedding or objects; and to avoid exposure to tobacco smoke before and after birth.

Vigilance by maternity and early childhood care providers about the risk factors for SUDI, including infant illness, is also critical.

Deaths from drowning

In NSW in 2010, the drowning deaths of 14 children were registered in NSW. Drowning was the equal second most frequent external cause of death for children.

Demographic and individual characteristics of the children

Males were more likely to drown than females (11 of the 14 children). Most of the children (nine) were aged between one and four years.

Circumstances of drowning

Of the 14 children who drowned in NSW:

- ▶ Six children drowned in private swimming pools. In all six swimming pool drowning deaths, pool gates and/or fencing were faulty, and the child accessed the pool unsupervised. The common compliance failure for all six pools was the gate latch mechanism.
- ▶ Five children drowned in natural bodies of water, and one child drowned in a dam. Three of the children were under four years of age, all of whom entered the water unobserved by their carers. One teenager drowned while undertaking recreational activities, and for two of the children, the specific circumstances are not known. There was no evidence of risk taking behaviour on the part of the older children.
- ▶ Two children drowned in bathtubs. Both the children who died were very young – one child was an infant just under a year old, and the other just over. Both children were unsupervised by an adult at the time.

15 year trends

Since 1996, there has been a continued decrease in drowning deaths of children.

Preventative messages

Critical messages for drowning prevention are the provision by carers of age appropriate levels of supervision; ensuring that baths and containers of water are not accessible to small children; and provision of effective child resistant safety barriers or safe play areas to keep children away from water hazards.

In regard to swimming pools, the NSW Government is considering recommendations of the Team and from two Coronial inquests into child drowning deaths regarding measures to promote compliance with safety standards.

Transport deaths

Thirty-five children died in 32 transport incidents. Transport fatalities remain the leading external cause of death for children and young people in NSW.

Demographic and individual characteristics of the children

Transport deaths occurred across all age groups. Notably however, over half of all those who died were young people aged between 15 and 17 years. More males (21) than females (14) died. All pedestrians who died were boys.

Circumstances of transport deaths

Of the 35 children:

- The majority (19) were passengers in vehicles. Passenger deaths have consistently been the single largest grouping of transport fatalities.
- Eight young people were driving a vehicle; six were driving a motor vehicle, one a watercraft and one a motorcycle. One child was riding a bicycle.
- Seven children who died were pedestrians.

Motor vehicle crashes

In relation to vehicle crashes, police identified a range of contributing factors that are largely preventable. These included dangerous or reckless driving (13 crashes); speed (10 crashes); absence of, or inappropriate, child restraints (five crashes); and driver drug and /or alcohol use (three, and possibly four, crashes). Eight crashes occurred while it was raining, or the road was wet. In most of these crashes (six) young people were driving. In a number of crashes, more than one contributory factor was present.

Pedestrian deaths

Five pedestrian deaths occurred in traffic. Three were young people, and all had consumed alcohol prior to the incident. Two children, in two separate incidents, ran onto the road.

Two children died in low-speed vehicle run-over incidents, where the driver was unaware of the child being near the vehicle.

Other transport incidents

One child in the 10 to 14 age group died riding a bicycle. The child was not wearing a helmet. One young person died in an off-road motorbike crash.

15 year trends

Overall, there has been a decline in the rate of transport deaths since 1996. This has been predominantly in relation to pedestrian deaths.

Preventative messages

Prevention of transport fatalities is captured by the NSW Centre for Road Safety slogan '*safer road, safer vehicles, safer people*'. Many transport fatalities involving children are preventable – through safer driving behaviour, ensuring children are restrained appropriately in vehicles, closely supervising young children around vehicles and traffic, and educating older children to avoid risk taking behaviour as both pedestrians and drivers.

Other unintentional injury related deaths

Fifteen children died as a result of other unintentional injury related deaths. The children died in house fires (four), unintentional poisoning (four), from injuries acquired during sporting activities (three), following medical procedures (two), and from a fall or crush injury (two).

Demographic and individual characteristics

Deaths due to other unintentional injuries occurred across all age groups, however most deaths occurred in the 15 to 17 year age group (six), and the one to four year age group (five).

Almost all of the children who died as a result of other unintentional injuries were male (12). Four children were Aboriginal.

15 year trends

While historical trends are difficult to determine due to the heterogeneous nature of these deaths, child deaths resulting from falls, fires and poisoning have shown a decline in frequency over the past fifteen years.

Preventative measures

While risk and protective factors for the range of unintentional injuries above differ, active supervision of young children is the most commonly promoted prevention message. For older children and young people, prevention messages are targeted to raising awareness of risk factors and strategies to negotiate potential risk.

Suicide

The deaths of 14 young people registered in NSW in 2010 were the result of suicide.

Demographic and individual characteristics

The age of the young people who died as a result of suicide ranged from 14 to 17. The majority (10) were young people aged 16 and 17 years.

Just under two thirds (nine) of the young people who died as a result of suicide were male. This is consistent with previous years. Two young people, both male, were Aboriginal.

Half (seven) of the young people who died as a result of suicide had a child protection history.

Stated or expressed intent

More than half (9) of the young people who died as a result of suicide had at some time previously stated their intent to suicide, most often to a friend or family member.

Risk factors associated with suicide

There is a range of interacting risk factors which have been associated with suicidal behaviour. Of the 14 young people whose suicide deaths were registered in 2010, identified risk factors included:

- Mental health problems for 11 young people. Depression was the most commonly identified mental illness.
- Previously attempted suicide in the case of three young people. A further seven young people had expressed suicidal ideation and/or previously self harmed.
- Evidence of a history of substance misuse in relation to eight young people, most commonly cannabis and alcohol. Two young people had a history of chronic substance misuse.
- Social isolation and exclusion was an issue for four young people, and a number of the young people were experiencing, or had experienced one or more personal crises.

Precipitating events

Possible precipitating events were identified for nine of the 14 young people who died as a result of suicide. For almost all of these young people (seven) the possible precipitating event was an argument with someone they were close to. Other events included experiences which may have left the young person feeling vulnerable or embarrassed.

15 year trends

An interval analysis of the 15 year period from 1996 shows a significant decline in the rate of deaths due to suicide. There is no difference between males and females in this trend. Males were about twice as likely to commit suicide as females.

Preventative measures

Risk factors associated with suicide can be mitigated by the presence of protective factors. This includes things such as positive sense of self and sense of control, supportive relationships and access to support services.

In its last Annual Report, the Team directed three recommendations to NSW Health in relation to the NSW Suicide Prevention Strategy. NSW Health supported all three recommendations and advised the Team of a range of strategies in place to meet them.

Fatal assault

The deaths of 13 children and young people registered in NSW in 2010 were the result of fatal assault. All fatal assault deaths of children and young people are separately reviewable by the NSW Ombudsman.

Demographic and individual characteristics

In 2010, males – predominantly teenagers - were over three times more likely to die of assault than females (11 of the 13 deaths). Fatal assaults occurred most commonly among young people aged 15 to 17 years (eight children) and among young children, aged less than five years (three children). These findings are consistent with previous years.

Aboriginal children were over-represented in deaths resulting from assault. Three of the four Aboriginal children who were fatally assaulted were over 16 years of age.

Circumstances of fatal assault

Generally, most child homicides are committed by family members, usually a parent or step-parent. Over three-quarters of children who died as a result of abuse in NSW between 2003 and 2009 died in family homicides.

In 2010, however, this was not the case. The majority of fatal assault deaths (seven of the 13) were teenagers allegedly killed by peers. Four children died in familial homicides. All four were allegedly killed by a parent or step-parent. One child died following an alleged attack by an acquaintance, reportedly in the context of a psychotic episode. One young person was killed in an incident involving unknown assailants.

Offender characteristics and precipitating factors

Peer-related assault

At the time of writing, 11 alleged offenders had been charged in relation to five peer-related fatal assaults. The alleged offenders were either teenagers or in their early to mid 20's.

All 11 alleged offenders were previously known to police, and eight of the 11 alleged offenders had a child protection history. For five, this history related to earlier childhood and behavioural issues. One young person was in statutory care at the time of the incident, and another had exited care in the weeks prior.

Three alleged offenders had a known history of substance misuse.

Family homicide

Two of the children who died in family homicides in 2010 died in the apparent context of maternal mental illness and psychosis. In a third case, the alleged offender had a history of mental illness and long-term substance abuse, and had recently experienced family breakdown.

In a fourth family homicide, the alleged offender had a history of being a perpetrator of domestic violence in a previous relationship. In the weeks prior to the child's death, the child had been the subject of a report of risk of significant harm to Community Services relating to physical harm.

15 year trends

Annual rates of fatal assault have fluctuated considerably since 1996. The increase in deaths for the 2010 year is exclusively in relation to the deaths of teenagers in peer-related incidents, which were unusually high.

Factors associated with fatal assault and preventative measures

Developing strategies to prevent the fatal abuse of children is complex. In regard to family homicides, it is difficult to point to any particular family type or circumstance or combination of factors where risk is likely to escalate to fatal abuse. The Ombudsman has made a range of recommendations since 2004 related to child deaths, including those due to fatal assault, particularly in the context of child protection concerns.

The high number of fatal assault involving peers in 2010 will be the subject of further detailed consideration by the Ombudsman.

Chapter 1. Introduction

This is the fifteenth report of the NSW Child Death Review Team (the Team), and the first since the NSW Ombudsman became Convenor of the Team and responsibility for support and assistance for the Team transferred to his office from the NSW Commission for Children and Young People. The transfer took place in late February 2011.

This report was therefore produced during a transitional period for the Team.

The report provides information on 589 children and young people whose deaths were registered in NSW in 2010.

1.1 The purpose of the Team

The NSW Child Death Review Team is established under Part 7A of the *Commission for Children and Young People Act 1998*. The purpose of the Team is to prevent and reduce the deaths of children in NSW.

The Team consists of the NSW Ombudsman, who is Convenor of the Team; the Commissioner for Children and Young People; representatives of NSW government agencies; experts in health care, research methodology, child development or child protection, or persons who are likely to make a valuable contribution to the Team; and two members who are Aboriginal.

The functions of the Team are to:

- ▶ Maintain a register of child deaths in NSW.
- ▶ Classify deaths in the register according to cause, demographic criteria and other relevant factors, and to identify trends and patterns in relation to those deaths.
- ▶ Undertake research that aims to help prevent or reduce the likelihood of child deaths, and to identify areas requiring further research.
- ▶ Make recommendations as to legislation, policies, practices and services for implementation by government and non-government agencies and the community to prevent or reduce the likelihood of child deaths.

Child Death Review Teams with similar roles and functions operate in most States and Territories across Australia, and also internationally.

1.2 History of the Team

The NSW Child Death Review Team was originally established in 1993, within the NSW Child Protection Council.

In 1999, administrative support for the team moved to the newly established Commission for Children and Young People. The Commissioner became the Convenor of the Team.

In 2003, responsibility for the review of certain child deaths was transferred to the NSW Ombudsman, under the *Community Services (Complaints, Reviews and Monitoring) Act 1993*. 'Reviewable' deaths under this Act included children who died as a result of abuse or neglect, or in suspicious circumstances; children who died while in care or in detention; and children, or siblings of children, who had been the subject of a report of risk of harm to Community Services in the three years prior to their death. The *Commission for Children and Young People Act* was subsequently amended to exclude the Team from undertaking a review of a reviewable death, although the Team could include reviewable deaths in research, and with the approval of the Minister, conduct research about reviewable deaths.

In 2008, and in response to the deaths of two children in circumstances of abuse and neglect, the NSW government commissioned a special commission of inquiry into child protection services in NSW. The inquiry was headed by Justice James Wood, and its terms of reference included consideration of the adequacy of the statutory framework for child protection oversight agencies. This included child death reviews.

In his final report, released in November 2008, Justice Wood recommended that the role of reviewing the deaths of children or siblings of children who had previously been the subject of a report to Community Services should be undertaken by

Community Services, rather than the Ombudsman. He further recommended that the NSW Child Death Review Team (CDRT) should be convened, chaired and supported by the Ombudsman. Justice Wood noted:

It is evident to the Inquiry that in considering reviewable deaths it is critical to examine and compare the contexts in which the deaths occur. This can be enhanced through an integrated function that examines all child deaths in NSW to enable the making of more systemic recommendations to prevent child deaths.¹

In April 2009, the NSW Parliament assented to legislative changes that would bring these recommendations into effect.

1.3 Transfer of the Team to the NSW Ombudsman's office and issues arising

The transfer of the Team to the Ombudsman's office took almost two years from the time of Parliament's assent. The legislation to effect the transfer was proclaimed in February 2011.

Initially, delays in the transfer were due to negotiations around funding levels for the Team, and problems relating to the legislative amendments to support the transfer. Funding issues were resolved in 2010. The legislative issues have been documented in detail elsewhere, and at the time of writing, remain largely unresolved.²

Following the transfer, further issues arose for the Team. The Ombudsman's office identified that the Team was not constituted as required by the *Commission for Children and Young People Act*. The terms of the majority of independent and agency members had lapsed either months or years previously, effectively rendering these positions vacant under the Act. Some members had not been properly appointed under the terms stipulated by the Act. In addition, the Team had not been operating with enough members to meet the minimum requirement for a Team and quorum.

The Ombudsman attempted to resolve these issues promptly, however this was complicated by the change of government in NSW, as Team nominations and appointments are the responsibility of Ministers.

In July 2011, and given ongoing delays in securing a properly constituted Team, the Ombudsman sought advice from the Solicitor General in relation to the legal basis for reporting to Parliament in the absence of a 'Team'. While noting that the composition of the Team should be brought into conformity with the relevant sections of the Act as soon as possible, the Solicitor General's advice indicated that a report could be prepared and tabled.

In this context, this report has been drafted with less direct input from the Team than would otherwise be the case. However, individual 'members' were appointed as 'expert advisers' under the *Commission for Children and Young People Act*, and assisted with reviews and were consulted on key aspects of the report.

Team membership issues were subsequently resolved in September 2011, and at the time of writing, the Team is now fully constituted.

1.4 The 2010 CDRT annual report

The 2010 annual report differs in format and content from previous reports prepared while the team was situated within the Commission for Children and Young People.

Team reports for deaths in 2007 to 2009 took a particular approach to classifying and reporting cause of death, and were primarily descriptive in both tabulation and commentary, with some tabulations being largely raw data.

The approach was significantly different to how the Ombudsman's office had approached cause of death classification and reporting in relation to reviewable child and disability deaths. In this context, we sought expert advice from the National Centre for Health Information Research and Training at the Queensland University of Technology (NCHIRT). NCHIRT are recognised experts in cause of death coding and mortality reporting.

1 Hon James Wood AO QC 2008, Special Commission of Inquiry into Child Protection Services in NSW, State of NSW, Sydney

2 NSW Ombudsman 2010, *Unresolved issues in the transfer of the NSW Child Death Review Team to the Office of the NSW Ombudsman*, NSW Ombudsman, Sydney

National Centre for Health Information Research and Training review

We asked NCHIRT to provide advice about best practice in mortality reporting, particularly in the context of national and international guidelines for reporting and presentation of mortality data, and the practice of child death review teams across Australia and internationally.

The purpose of the review was not to find fault or challenge the previous work of the Team, but to ensure that in moving forward with this work, NSW could draw on the most up to date methods available. While NSW and Victoria have had established review teams for over a decade, most other states and territories have relatively new models. A critical issue being discussed at a national level is how to ensure compatibility of data and reporting amongst review teams to allow for comparison and consistency in prevention messages across Australia. Internationally, child death review and the World Health Organisation's classification and rules for mortality statistics have seen marked changes and development over the past decade. It is important to be aware of ongoing research in the field and to apply this knowledge in NSW.

NCHIRT provided a review and appraisal of the Team's *Annual Report 2009*, and recommendations regarding the format of future annual reports. These recommendations have guided the preparation of this report.

The report is summarised at appendix 1.

NCHIRT identified a number of areas for improvement, noting that the *Annual Report 2009* contained limited information about underlying causes of death and leading causes of death and a lack of separation of underlying causes of death from intervening and contributory causes of death, resulting in a duplication of counting across causes. NCHIRT also identified that reporting against a broad age grouping of 1 – 17 limited the ability to identify and examine developmental and age specific causes of death.

NCHIRT's subsequent recommendations were:

- ▶ Inclusion of an underlying cause of death chapter and a leading causes of death chapter in the report.
- ▶ Cessation of the presentation of aggregated counts of underlying and multiple cause data in tables, and of counting numbers of deaths in multiple sections (which results from aggregation of underlying and multiple cause data).
- ▶ Reporting of death data according to the underlying cause of death to which it pertains, and reporting of multiple cause data for each underlying cause only in the chapter where the underlying cause is presented.
- ▶ Clarification of the rationale for the choice of causes of death reported.
- ▶ Presentation of specific age groups compatible with other CDRTs (under 1 year, 1 – 4 years, 5 – 9 years, 10 – 14 years, and 15 – 17 years).
- ▶ More focus on the steps towards prevention beyond the initial description of the problem.

To the degree possible, this report has taken account of these recommendations. The Team's status at the time has meant that NCHIRT's review recommendations have yet to be fully considered by the Team.

Report structure and approach

The methodology used in this report is detailed in appendix 2. Definitions of cause of death are at appendix 3, and other definitions at appendix 4.

Percentages in the report have been rounded, so may not add to 100.

Report coding and tabulation

The data in this report is coded and tabulated according to the International Statistical Classification of Diseases and Related Health Problems (ICD) system. The ICD is the international standard health classification published by the World Health Organization (WHO) for coding diseases for statistical aggregation and reporting purposes.³

The report presents information by the classification chapters of the (ICD) system, 10th revision, as modified for Australia (ICD -10 - AM).

3 World Health Organisation 2007, International Statistical Classification of Diseases and related health problems, 10th revision accessed <http://apps.who.int/classifications/apps/icd/icd10online/>

The sources for coding of cause of death are medical certificates of cause of death and in the case of deaths that are examinable by the Coroner, coronial certification of cause of death.

- Underlying cause of death is defined by the World Health Organisation as the 'disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury'.
- Direct cause of death is the final condition or event that actually produces a death (for example, cardiac arrest or respiratory failure).
- Intervening causes of death are other conditions that may have given rise to the immediate cause of death.
- Contributory causes of death are conditions or events that were present during the sequence leading to death, but may not have been necessary influences.

To illustrate, a child might die as a result of cancer. Cancer would be the underlying cause; pneumonia might be the direct cause (as it is in many cases) and intervening causes might be exposure to toxins.

This report focuses primarily on underlying cause of death, as the single most essential element to understanding causes of death. Historically, and from national and international perspectives, the concept of underlying cause of death is considered the most critical factor for public health reporting purposes in annual mortality statistics.⁴ *Chapters 2* (All causes) and *3* (Leading causes) report underlying cause of death.

Multiple cause data is an important concept for a more complete understanding of the chain of events leading to death, and the co-contribution of diseases to mortality.⁵ However, reporting of multiple causes should retain links between the underlying cause and other causes, to enable a complete understanding of the chain of events from the underlying condition to the direct cause of death. *Chapter 4* in this report considers multiple causes of death.

Chapter 5 of the report provide information about the deaths of children who were usually resident in NSW but died outside of the state.

Chapter 6 focuses on diseases and morbid conditions (natural causes of death), with a particular examination of the eight leading natural causes of death for children in NSW.

Chapter 7 details information about the deaths of infants, including an examination of Sudden Unexpected Deaths of Infants. In NSW, as in other States and internationally, the majority of child deaths occur in infancy.

Chapter 8 focuses on external cause deaths (injury related deaths). These deaths are of particular concern to the Team, given the potential for prevention. The chapter includes specific examination of child deaths resulting from transport incidents, drowning, assault and suicide; the major external causes of death that have previously been areas of focus in the Team's reporting.

Socio economic status

As noted, methodology used in this report is detailed in appendix 2. Of particular note however, is the measurement of socioeconomic status.

Over the years, the Team has adopted a number of different approaches to measuring and reporting socioeconomic status. In this report we have used the Index of Relative Social Disadvantage (IRSD)⁶ one of the Socioeconomic Indices for Areas (SEIFA). There is, however, a level of inaccuracy in assigning a socioeconomic status to an individual or family using the average for the area of residence, as socioeconomic status may vary widely within these areas. For this reason, only the broadest categories of high and low are used. For more detailed discussion, see appendix 2.

The Team recognises the importance of deriving as accurate a measure of socioeconomic status as possible, and examination of the range of approaches and suitability for child death reviews will be a priority focus.

4 National Centre for Health Information, Research and Training 2011, *Review and recommendations for the annual reporting of child deaths in NSW*, unpublished, NSW Ombudsman

5 Ibid.

6 Australian Bureau of Statistics 2006, *2039.0 An Introduction to Socioeconomic Indexes for Areas (SEIFA)*. Canberra: ABS.

1.5 Future plans

As noted above, this report was prepared in a short period of time in an environment of change for the Team.

As at September 2011, the Team is properly constituted, with the inclusion of additional experts in principal areas of health care, research methodology and child protection. Combined with the opportunities provided by the integration of the Team's work with the reviewable death work of the Ombudsman, the next year provides a significant opportunity for renewed focus and direction.

The recommendations of the NCHIRT review, and effective approaches to reporting cause of death and subsequent prevention messages, will be the subject of full consideration by the Team.

Development of a research agenda and further enhancement of annual and special reporting will be well supported by the resources of the Ombudsman's office.

Previous areas of work that were interrupted by the period of uncertainty prior to the transfer will be reviewed, including the pursuit of recommendations relating to infection prevention strategies for meningococcal disease and pneumonia, defining chronic conditions, geographic analysis of child mortality, examining the deaths of 'vulnerable and non-vulnerable' children, and capturing psychosocial and socioeconomic circumstances for children who die and their families.

The Team will also have a keen interest in the work of the Australian and New Zealand Child Death Review and Prevention Group. The group is comprised of a range of agencies involved in child death review throughout Australian and New Zealand. In addition to ongoing work to develop a national agenda in relation to child death review and prevention, the group is currently considering issues related to preventable infant mortality.

Chapter 2. Deaths from all causes

The deaths of 589 children were registered in NSW in 2010.

For 47 of the 589 children, insufficient information was available at the time of writing to report on the cause of their death. Thirty two of these children were under the age of one year and the circumstances of their death are included in Chapter 7.

This chapter considers these deaths for all causes of death. The analysis considers variations associated with gender, age and Aboriginal and Torres Strait Islander status. Subsequent chapters provide more detailed information about specific causes of death.

For this chapter, only the underlying cause of death is used in the descriptive analyses. The Crude Mortality Rate is the number of deaths per 100,000 person-years⁷ in the relevant population except for perinatal deaths, where the Infant Mortality Rate (IMR) of deaths per 1000 live births is used.

Appendix 2 describes the methods used in this report, and appendix 3 provides definitions.

2.1 Demographic and individual characteristics

Table 1: Key demographic and individual characteristics – all deaths of children registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	589	100	36.0	33.1 - 39.0	
Gender					
Female	228	39	28.6	25.0 - 32.5	
Male	361	61	43.1	38.7 - 47.7	1.5
Age					
Infants (less than 1 year)	364	62	377 (IMR 3.92)*	338 - 418	
1-4 years	72	12	19.7	15.4 - 24.8	0.05
5-9 years	34	6	7.7	5.3 - 10.8	0.02
10-14 years	42	7	9.3	6.7 - 12.6	0.02
15-17 years	77	13	27	21.6 - 34.2	0.07
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	530	90	33.8	31.0 - 36.9	
Aboriginal and Torres Strait Islander	59	10	83.4	63.5 - 108	2.5
Remoteness					
Major cities	364	61	30.6	27.6 - 33.9	
Inner regional	142	27	42.9	36.1 - 50.6	1.4
Outer regional	66	11	64.2	49.7 - 81.8	2.1
Remote	8	1	107.2	46.2 - 211	3.5
Very remote	1	0.2	98.4	2.5 - 548	3.2
Socioeconomic status[#]					
High	254	43	27.3	24.1 - 30.9	
Low	335	57	38.0	34.1 - 42.4	1.4

*IMR (Infant Mortality Rate) is defined as infant death per 1000 live births

Socioeconomic status is based on the Index of Relative Social Disadvantage (IRSD)

⁷ See Appendix 2 (Methods) for a complete description of Crude Mortality Rate.

Age

Figures 1 and 2 show that over half of all child deaths registered in 2010 occurred within the first year of life and almost three-quarters of the children who died were under five years of age. The incident rate ratios for all older age groups compared to the under one year group for 1996 to 2010 (referred to below as 'historical analysis') are comparable to those in Table 1. The distribution of age of death for children under one year of age shows most deaths occurred in the first month of life.

Figure 1: Age distribution (years) of children who died – deaths registered in 2010

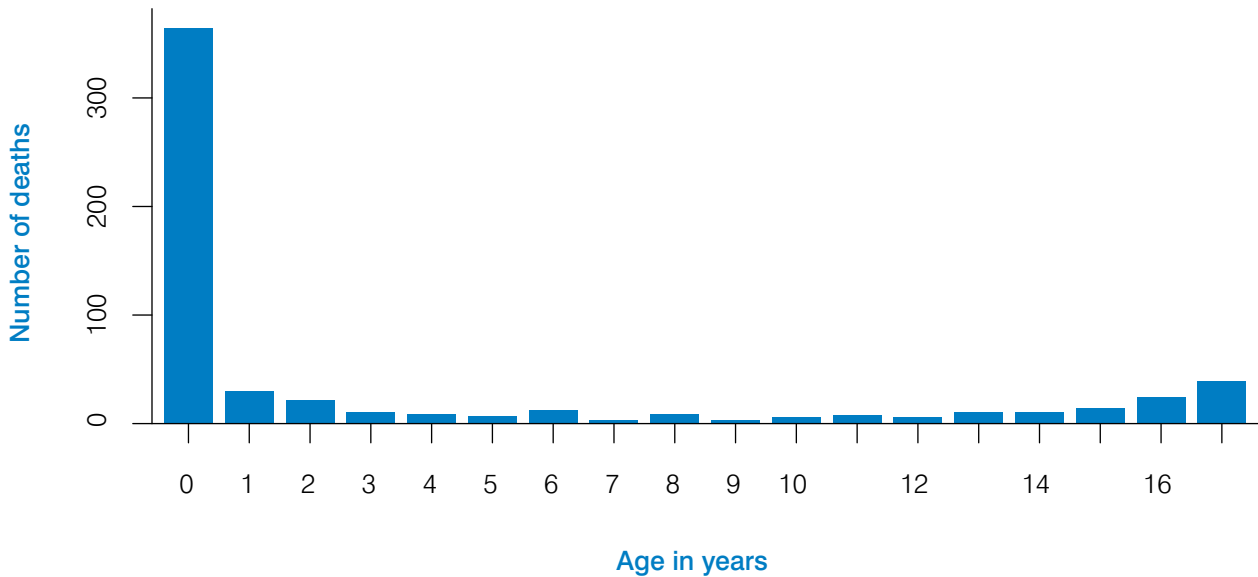
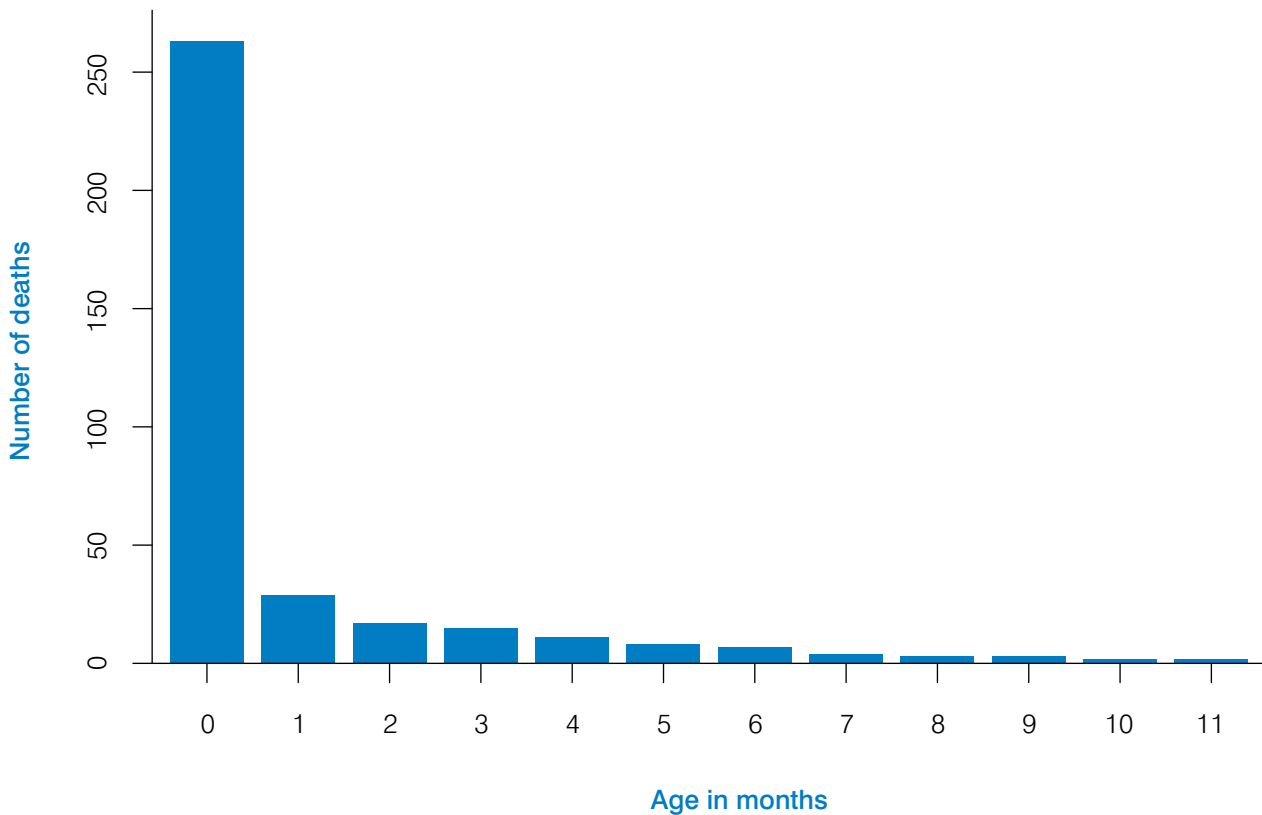


Figure 2: Age distribution (months) of children aged less than one year who died – deaths registered in 2010



Gender

The mortality rate for males was about half again that of females.

Aboriginal and Torres Strait Islander status

Collection of reliable data relating to Aboriginal and Torres Strait Islander identity is recognised as a significant issue that affects policy development, planning and service improvement across health, education, community service and other areas.⁸

In regard to child deaths in NSW, over time, the Team has adopted different approaches to identifying Indigenous status in its annual reports. To some extent, this is the result of the multiple criteria that can be used to identify a child's Aboriginal or Torres Strait Islander status, including whether the child's mother or father is Aboriginal or Torres Strait Islander, residence in a particular community, adoption of Aboriginal or Torres Strait Islander cultural practices and self-reporting of identity. Inclusion of some or all of these criteria affect the decision to record an individual's status as Aboriginal or Torres Strait Islander.⁹

In 2005 and 2006, the Team reported Aboriginal and Torres Strait Islander identity as indicated by birth and death registrations, police reports of a death to the Coroner and identification of a family as Aboriginal or Torres Strait Islander by expert advisers.¹⁰ In recent years, the Team has identified individual children as Aboriginal or Torres Strait Islander where the child has been:

*identified as either Aboriginal or Torres Strait Islander on their NSW Births Deaths and Marriages death certificate or a child or their parent/s who have been identified as Aboriginal or Torres Strait Islander on the NSW Births Deaths and Marriages birth certificate.*¹¹

The Team has noted that the use of different criteria has led to different estimates of death for Aboriginal and Torres Strait Islander children within Team publications.¹² For example,

- Using birth and death registration only, the register reports the deaths of 1,518 Aboriginal and Torres Strait Islander children between 1996 and 2010.
- Using birth and death registration, police reports of the death to the Coroner, Coronial records, the Midwives Data Collection and other determinations made by the Team, the register reports the deaths of 1,719 Aboriginal and Torres Strait Islander children.

In considering preventative strategies, particularly in the context of the notable over-representation of Aboriginal and Torres Strait Islander children in child deaths, reliable information about Aboriginal or Torres Strait Islander identity is a critical consideration for the Team.

In undertaking reviews of deaths registered in 2010, the Ombudsman's office identified six children who were Aboriginal who were not recorded as such in birth and death records. The Ombudsman's office has direct access to the NSW Police COPS database and Community Services KIDS client database, which often hold information that can support Aboriginal or Torres Strait Islander identity. NSW Health and other agency records were also used to assess child and family background. The children were identified as Aboriginal or Torres Strait Islander through a number of records, which were corroborative.

The difference is reflected in Table 2. Drawing on birth and death registration alone, the deaths of 53 Aboriginal and Torres Strait Islander children were registered in NSW in 2010. Drawing on all sources, including police, coronial, health and community service records, the deaths of 59 children were registered.

Using the more comprehensive figure, Aboriginal and Torres Strait Islander children whose deaths were registered in 2010 were approximately 2.5 times more likely to die in NSW than non-Indigenous children.

In chapters below relating to specific cause of death, the analysis is based on the more comprehensive identification.

8 Australian Institute of Health and Welfare 2010, *National best practice guidelines for collecting Indigenous status in health data sets*, AIHW cat no IHW 29, AIHW Canberra

9 Australian Institute of Health and Welfare, 2010, op. cit.

10 NSW Child Death Review Team 2006, *Annual Report 2005*, page 12, Commission for Children and Young People, Sydney

11 NSW Child Death Review Team, *Annual Report 2008* (p. 267), *2009* (p 381) and *2010* (p 372), Commission for Children and Young People, Sydney

12 NSW Child Death Review Team 2010, *Annual Report 2009*, p 372, Commission for Children and Young People, Sydney

Table 2: Aboriginal and Torres Strait Islander status – all deaths of children registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2010*
Aboriginal and Torres Strait Islander	163 (302)	164 (294)	145 (252)	163 (275)	95 (156)	83 (133)	111 (175)	86 (134)	65 (99.9)	107 (162)	72 (108)	56 (82.5)	52 (75.7)	33 (47.4)	53 (74.9)	59 (83.4)
Non-aboriginal	718 (47.5)	611 (40.2)	575 (37.7)	653 (42.6)	662 (43)	634 (40.9)	532 (34.4)	566 (36.7)	554 (36.1)	567 (36.9)	570 (36.9)	507 (32.8)	566 (36.5)	542 (34.8)	536 (34.2)	530 (33.8)
Percent Aboriginal and Torres Strait Islander	23	27	25	25	14	13	21	15	12	19	13	11	9	6	10	10

*The identification of Aboriginal and Torres Strait Islander status in this column includes sources additional to birth and death registration.

Child protection history

In NSW, 105 of the 589 children whose deaths were registered in 2010 had a child protection history. This means that they had been the subject of a report of risk of harm or significant risk of harm to Community Services within the three years prior to their death (101 children), or the subject of report of risk to a Child Wellbeing Unit (four children).

An additional 38 children did not have a child protection history themselves, but had a sibling who did. Thirty six children had a sibling who had been the subject of a report of risk of harm or significant risk of harm to Community Services within the three years prior to their death, and two children had a sibling who was the subject of report of risk to a Child Wellbeing Unit.

In January 2010, a new system for the delivery of child protection services was introduced in NSW. The aim is to make child protection a shared responsibility across government agencies and between government and non-government agencies.

Among other strategies, the statutory reporting threshold – that is, the reports or risk that will warrant intervention by Community Services – has been raised to ‘risk of significant harm’. New intake and referral pathways have been or are being implemented, including Child Wellbeing Units that have been established within the Departments of Family and Community Services, Education, Health, and the NSW Police Force. The Units assist their agencies to identify child protection concerns that constitute risk of significant harm, and to respond to children and families where risk is below that threshold.

In its *Annual Report 2008*, the Team reported that children, or siblings of children, who had been the subject of a report of risk of harm to Community Services within the three years prior to their death had an overall lower likelihood of death than those children who had not, except when considering external (injury related) deaths.¹³ The Team found that these children were nearly twice as likely to suicide, twice as likely to drown, more than seven times more likely to die as a result of fatal assault, and had nearly two-and-a-half times the likelihood of sudden unexpected death in infancy.

In relation to children whose deaths were registered in 2010, and noting that the numbers are small, children who had a child protection history were:

- 4.9 times more likely to suicide
- 2.6 times more likely to die suddenly and unexpectedly in infancy
- 2.1 times more likely to die as a result of fatal assault

In relation to transport incidents, there was little difference. The one external cause where children with a child protection history were slightly less likely to die was drowning.

13 NSW Child Death Review Team 2009 Annual Report 2008. Commission for Children and Young People, p 221.

2.2 Trends in child deaths since 1996

Tables 3 to 5 show the number of deaths and mortality rate for children in NSW since 1996. Over the fifteen years, the mortality rate for all children has fallen by about 36 per cent. Rates for males and females have exhibited similar declines. Mortality rates for Aboriginal and Torres Strait Islander children have also fallen by about 25 per cent, as demonstrated by Table 2 above, but the smaller numbers of deaths make comparisons less likely to be reliable. These rates are presented as crude mortality rates due to the difficulty of accurately estimating the population of Aboriginal and Torres Strait Islander children in any given year.

Table 3: Deaths of children from all causes – deaths registered 1996-2010

	Population	Deaths	Crude Mortality Rate	Directly Standardised Mortality Rate ¹⁴	95% Lower Confidence Limit	95% Upper Confidence Limit
1996	1569780	879	56	56.1	52.34	59.91
1997	1580259	773	48.92	49.04	45.56	52.57
1998	1587065	719	45.3	45.42	42.06	48.83
1999	1595912	814	51.01	51.17	47.69	54.85
2000	1605516	755	47.03	47.18	43.83	50.67
2001	1616104	715	44.24	44.33	41.09	47.74
2002	1613603	639	39.6	39.67	36.58	42.84
2003	1605813	646	40.23	40.24	37.1	43.42
2004	1604074	618	38.53	38.63	35.62	41.8
2005	1606119	672	41.84	41.96	38.81	45.27
2006	1603990	636	39.65	39.5	36.42	42.66
2007	1601505	563	35.15	34.87	31.98	37.83
2008	1624425	610	37.55	37.65	34.64	40.7
2009	1624450	574	35.34	35.28	32.42	38.31
2010	1636854	589	35.98	35.98	33.07	38.97

Table 4: Deaths of female children from all causes – deaths registered 1996 to 2010

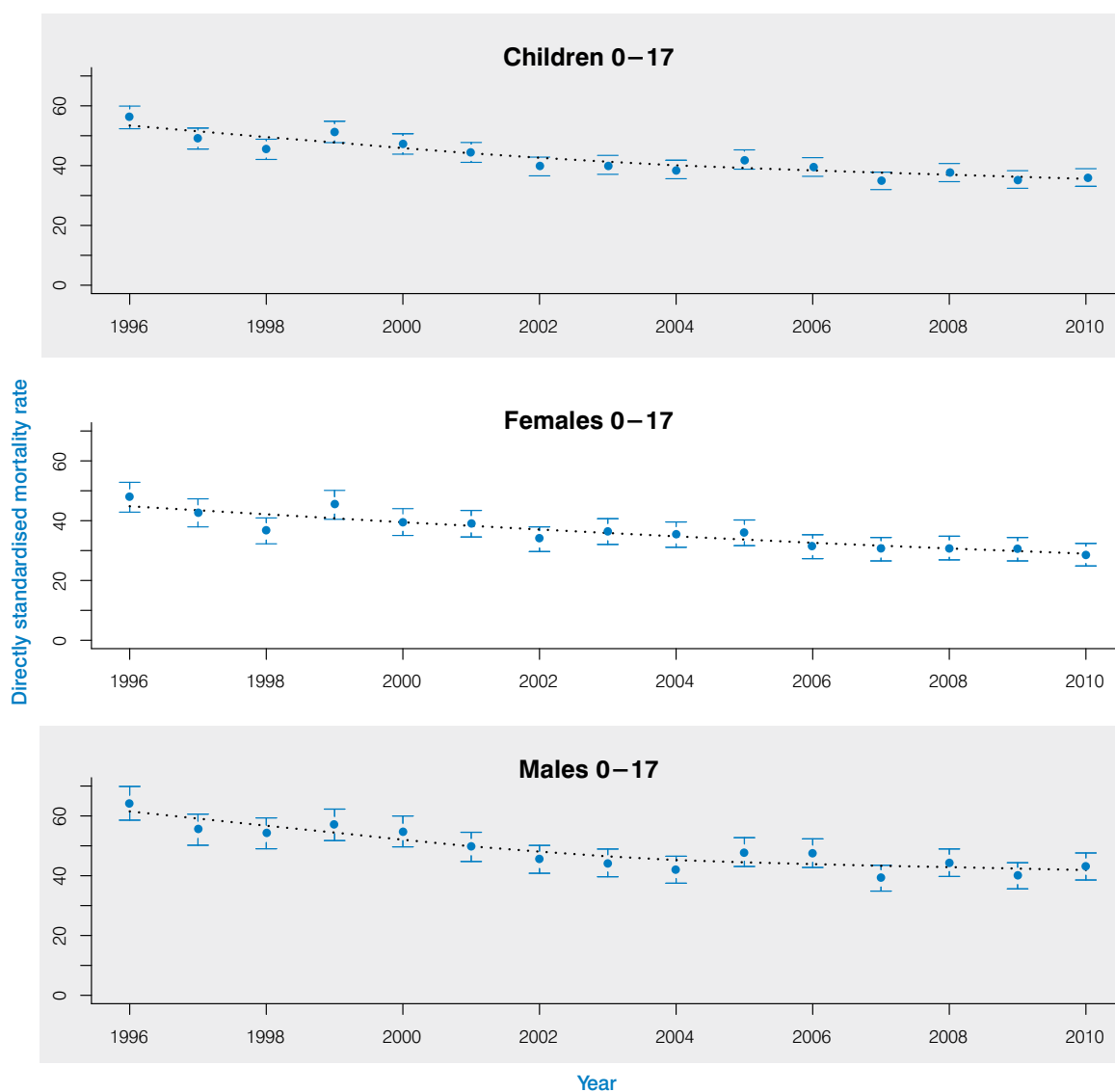
	Population	Deaths	Crude Mortality Rate	Directly Standardised Mortality Rate	95% Lower Confidence Limit	95% Upper Confidence Limit
1996	765527	365	47.68	47.77	42.85	52.83
1997	770673	326	42.3	42.42	37.92	47.3
1998	773856	281	36.31	36.41	32.26	40.92
1999	778348	350	44.97	45.11	40.46	50.12
2000	782682	307	39.22	39.34	35.05	44.02
2001	787589	305	38.73	38.81	34.54	43.43
2002	785944	265	33.72	33.75	29.67	37.94
2003	781435	283	36.22	36.17	32.05	40.66
2004	781052	274	35.08	35.14	31.1	39.57
2005	781876	280	35.81	35.89	31.65	40.23
2006	780156	245	31.4	31.23	27.3	35.29
2007	778941	239	30.68	30.39	26.53	34.37
2008	791682	242	30.57	30.66	26.89	34.8
2009	791691	241	30.44	30.39	26.53	34.37
2010	798315	228	28.56	28.56	24.85	32.39

¹⁴ The Directly Standardised Mortality Rate is adjusted for differences in the composition of the population over time to allow comparisons between years. For a more complete explanation see Appendix 2 Methods

Table 5: Deaths of male children from all causes – deaths registered 1996 to 2010

	Population	Deaths	Crude Mortality Rate	Directly Standardised Mortality Rate	95% Lower Confidence Limit	95% Upper Confidence Limit
1996	765527	514	63.91	64.03	58.59	69.86
1997	770673	447	55.21	55.35	50.2	60.61
1998	773856	438	53.86	54	49.03	59.35
1999	778348	464	56.75	56.93	51.75	62.28
2000	782682	448	54.45	54.64	49.67	59.99
2001	787589	410	49.49	49.57	44.76	54.53
2002	785944	374	45.19	45.3	40.82	50.15
2003	781435	363	44.03	44.12	39.66	48.93
2004	781052	344	41.8	41.94	37.49	46.51
2005	781876	392	47.56	47.72	43.09	52.73
2006	780156	391	47.46	47.36	42.77	52.33
2007	778941	324	39.39	39.12	34.86	43.5
2008	791682	368	44.19	44.3	39.74	48.95
2009	791691	333	39.99	39.92	35.61	44.35
2010	798315	361	43.05	43.05	38.57	47.61

Figure 3: Trends in child deaths by gender – deaths registered 1996 to 2010



Chapter 3. Leading causes of death

This chapter reports on the leading causes of death for children whose deaths were registered in 2010. It considers leading causes of death and variations by gender, age, Aboriginal and Torres Strait Islander status, remoteness and socioeconomic status.

Leading causes of death were broadly classified by the 22 ICD-10 chapters.

Table 6 lists the 10 leading causes of death for all children, by ICD-10 chapter. The leading cause of death for children whose deaths were registered in NSW in 2010 was conditions originating in the perinatal period. Unlike the Australian Bureau of Statistics (ABS), child deaths subject to review by the Team do not include deaths that occur *in utero*, or infants who are stillborn.¹⁵

The second leading cause of death was congenital malformations and chromosomal abnormalities. Many deaths of children due to this cause occurred shortly after birth, either from influences during pregnancy and parturition, or from abnormal development.

Taken together, the two leading causes of death accounted for over half of all child deaths registered in 2010. This is consistent with the Team's previous findings, and is comparable with the findings of other child death review agencies in other states.¹⁶

The underlying causal factors in these deaths are primarily present at or before birth. In most cases, prevention of such deaths is seen as a medical issue, and advances in areas such as delaying premature birth¹⁷ and providing intensive care to premature babies¹⁸ have reduced the rate of deaths from perinatal conditions (see *Deaths from perinatal conditions section 6.1*).

The third most common cause of death in children was injuries. Injuries tend to peak between the ages of one and three years, as the child acquires mobility and ventures into situations that may be dangerous. The rate of deaths from injuries drops sharply in the early school years, however it rises again among young people as they initiate age-restricted activities such as motor vehicle driving and recreational drug and alcohol use.

The decline of injury related deaths over the years from 1996 to 2010 has resulted in external cause deaths falling in 2008 from the second most common cause of death to the third (Figure 4). Deaths from perinatal conditions have also decreased somewhat, but deaths resulting from malformations or chromosomal abnormalities have not.

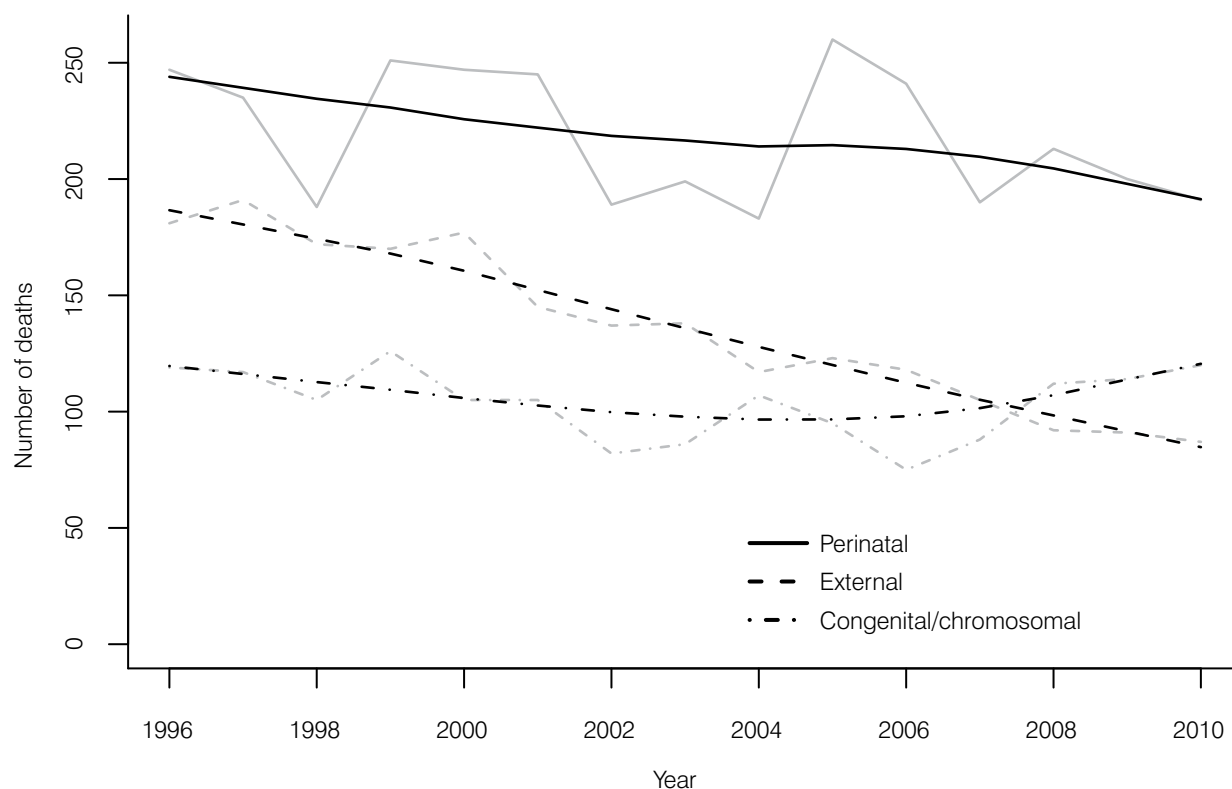
15 Australian Bureau of Statistics 2011, 3304.0 *Perinatal deaths*, Australia, 2009. Canberra; ABS.

16 Commission for Children and Young People and Child Guardian Queensland 2010, *Annual Report: Deaths of children and young people, Queensland, 2009–10*, p 43 and South Australia Child Death and Serious Injury Review Committee 2010, *Annual Report 2009–2010*, p 25

17 Goldenberg, R.L. & Rouse, D.J. 1998), Prevention of premature birth. *New England Journal of Medicine*, 339(5): 313-320.

18 Boxwell, G. (Ed.) 2010, *Neonatal intensive care nursing*. New York: Routledge.

Figure 4: Three leading causes of child deaths – deaths registered 1996 to 2010



Neoplasms (cancers) contribute substantially to death in children, with different types of cancer contributing to the mortality rate at different ages (see *Deaths from neoplasms* section 6.3).

The remaining causes of death are less frequent, vary more from year to year, and have more complex antecedents.

Table 6: Ten leading causes of child deaths – deaths registered in 2010

Leading causes of death (all children) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	184	11.2
Congenital malformations or chromosomal abnormalities	117	7.2
External causes of morbidity and mortality	97	5.9
Neoplasms	44	2.7
Diseases of the nervous system	25	1.5
Diseases of the circulatory system	18	1.1
Endocrine, nutritional and metabolic diseases	14	0.9
Symptoms, signs, abnormal findings not elsewhere classified	13	0.8
Diseases of the respiratory system	12	0.7
Infectious and parasitic diseases	8	0.5

3.1 Leading causes of death by gender

Deaths from perinatal conditions are more common in males. This could be attributable to the greater susceptibility of male infants to infections and conditions related to prematurity and development.¹⁹ In contrast, there is little difference between males and females in the number of congenital malformations or chromosomal abnormalities, or neoplasms. Deaths from infectious diseases, external causes and injury/poisoning are about twice as common in males. It is thought that the increased rate of death due to injury among males may be a result of differences in behaviour between males and females as well as the socialisation of gender.²⁰

Table 7: Ten leading causes of death for female children – deaths registered in 2010

Leading causes of death (females) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	70	8.8
Congenital malformations or chromosomal abnormalities	58	7.3
Injury and external causes of morbidity and mortality	30	3.8
Neoplasms	22	2.8
Diseases of the nervous system	9	1.1
Diseases of the circulatory system	7	0.9
Endocrine, nutritional and metabolic diseases	5	0.6
Diseases of the respiratory system	5	0.6
Infectious and parasitic diseases	3	0.4
Symptoms, signs, abnormal findings not elsewhere classified	3	0.4

Table 8: Ten leading causes of death for male children – deaths registered in 2010

Leading causes of death (males) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	114	13.6
Injury and external causes of morbidity and mortality	67	8.0
Congenital malformations or chromosomal abnormalities	59	7.0
Neoplasms	22	2.6
Diseases of the nervous system	16	1.9
Diseases of the circulatory system	11	1.3
Symptoms, signs, abnormal findings not elsewhere classified	10	1.2
Endocrine, nutritional and metabolic diseases	9	1.1
Diseases of the respiratory system	7	0.8
Infectious and parasitic diseases	5	0.6

19 Australian Institute of Health and Welfare 2009, *A Picture of Australia's Children 2009*, p 13, AIHW Canberra

20 Australian Bureau of Statistics 2005, *Australian Social Trends 2005*, <http://www.abs.gov.au/ausstats/abs>

3.2 Leading causes of death by age

As the Team's trends analyses have previously shown, the large majority of deaths of children occur during the first five years of life. This is followed by the smallest number of deaths in the next five years, and a steadily increasing number of deaths with increasing age, a trend that continues during the late teenage years and early twenties.²¹ This distribution was reflected in deaths registered in 2010, as shown in tables 9 to 14.

In each age category, more males died than females, with the largest relative difference in the 15-17 year old category. However, the gender difference in the 0-four age range was influenced by the large number of deaths due to neoplasms and congenital malformations or chromosomal abnormalities, for which there is little or no gender difference.

Examining the distribution of deaths by the underlying cause recorded, and as noted above, perinatal influences and congenital malformations or chromosomal abnormalities accounted for most deaths. This is consistent with the breakdown by age, with very young children being most at risk of dying. The sections on perinatal influences and congenital malformations or chromosomal abnormalities further examine this relationship.

The third largest category of death, external causes (injury related deaths) include the smaller number of deaths that will be reviewed in the last section of this report. Of the three most common categories, injury related deaths are the category with the greatest gender imbalance. About twice as many male children have an underlying cause of death in this category as do female children. This may be a result of differences in behaviour and the type of activities boys and girls tend to pursue.²² Aboriginal and Torres Strait Islander children are also overrepresented in injury deaths. It is thought this could be the result of associated socioeconomic disadvantages, such as lower education and income, which limit the opportunity to gain knowledge about safety and injury prevention.²³

Table 9: Natural, external and ill-defined causes of death by age category – deaths registered in 2010

Category of death	Age category					
	Infants		1-4 years	5-9 years	10-14 years	15-17 years
	Neonate (<28 days)	Post-neonate (28 days to 1 year)				
Natural	252	69	43	23	31	27
External	2	9	20	10	10	46
Unspecified	9	23	9	1	1	4

Perinatal conditions and congenital malformations or chromosomal abnormalities were the underlying cause of death for 280 children registered in 2010. The relatively large number of ill-defined causes of death recorded in the Symptoms/Signs chapter is mostly the result of sudden infant deaths and will be discussed in more detail in the section on Sudden Unexpected Deaths of Infants (SUDI).

21 NSW Child Death Review Team 2008 *Trends in child deaths in NSW 1996 – 2005*, NSW Commission for Children and Young People, Sydney

22 Australian Bureau of Statistics 2005, *Australian Social Trends 2005*, accessed <http://www.abs.gov.au/ausstats/abs>

23 Australian Institute of Health and Welfare 2011, *Young Australians: Their Health and Wellbeing 2011*, p 183, accessed <http://www.aihw.gov.au/publication-detail/?id=10737419261> AIHW Canberra

Table 10: Ten leading causes of death for children under one year of age – deaths registered in 2010

Leading causes of death (under one year of age) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	180	186
Congenital malformations or chromosomal abnormalities	99	102
External causes of morbidity and mortality	11	11.4
Symptoms, signs, abnormal findings not elsewhere classified	10	10.3
Endocrine, nutritional and metabolic diseases	7	7.2
Diseases of the respiratory system	6	6.2
Diseases of the circulatory system	5	5.2
Diseases of the nervous system	5	5.2
Infectious and parasitic diseases	4	4.1
Diseases of the blood and blood-forming organs	2	2.1

The largest single cause of death for one to four year olds was injury related. This reflects the transition from conditions associated with pregnancy and parturition to deaths due to accidents such as drowning and pedestrian fatalities. These accidents are most common between the ages of one and three years.

Table 11: Ten leading causes of death for children one to four years of age – deaths registered in 2010

Leading causes of death (1 to 4 years of age) ICD chapter	Number of deaths	Crude mortality rate
External causes of morbidity and mortality	20	5.5
Neoplasms	10	2.7
Congenital malformations or chromosomal abnormalities	8	2.2
Diseases of the nervous system	8	2.2
Endocrine, nutritional and metabolic diseases	4	1.1
Infectious and parasitic diseases	3	0.8
Diseases of the circulatory system	2	0.6
Certain conditions originating in the perinatal period	2	0.6
Diseases of the respiratory system	2	0.6
Symptoms, signs, abnormal findings not elsewhere classified	2	0.6

The second five years of life is marked by the lowest rate of death in childhood. The leading cause of death for children aged five to nine years was neoplasms (cancers and tumours). Those children who have survived the first five years are more likely to have acquired the immune competence to survive infectious diseases, and the behavioural skills to avoid many of the most common forms of injury to young children. Injury was still, however, the second leading cause of death in 2010 for this age group.

Table 12: Ten leading causes of deaths for children five to nine years of age – deaths registered in 2010

Leading causes of death (5 to 9 years of age) ICD chapter	Number of deaths	Crude mortality rate
Neoplasms	11	2.5
External causes of morbidity and mortality	10	2.3
Diseases of the circulatory system	3	0.7
Congenital malformations or chromosomal abnormalities	3	0.7
Certain conditions originating in the perinatal period	2	0.5
Infectious and parasitic diseases	1	0.2
Injury/poisoning and consequences of external causes	1	0.2
Diseases of the musculoskeletal system	1	0.2
Diseases of the nervous system	1	0.2
Diseases of the respiratory system	1	0.2

Rates of death begin to rise during the third five years of life, particularly in the early teenage years. As for children aged five to nine, those aged ten to fourteen years were also most likely to die as a result of cancers and tumours, followed by injury.

Table 13: Ten leading causes of death for children ten to fourteen years of age – deaths registered in 2010

Leading causes of death (10 to 14 years of age) ICD chapter	Number of deaths	Crude mortality rate
Neoplasms	11	2.4
External causes of morbidity and mortality	10	2.2
Diseases of the nervous system	7	1.6
Congenital malformations or chromosomal abnormalities	5	1.1
Diseases of the circulatory system	3	0.7
Diseases of the respiratory system	3	0.7
Diseases of the genitourinary system	1	0.2
Injury/poisoning and consequences of external causes	1	0.2
Mental and behavioural disorders	1	0.2

For those aged over fifteen years, the most common cause of death was injury, followed by cancers and tumours. This is a common trend which can be linked to the increased independence of young people and the uptake of previously restricted activities such as motor vehicle driving and the use of recreational drugs. This coincides with on-going development of decision making abilities, which can result in risk taking in more dangerous circumstances.²⁴

Table 14: Ten leading causes of death for children 15-17 years of age – deaths registered in 2010

Leading causes of death (15 to 17 years of age) ICD chapter	Number of deaths	Crude mortality rate
External causes of morbidity and mortality	46	16.3
Neoplasms	10	3.6
Diseases of the circulatory system	5	1.8
Diseases of the nervous system	4	1.4
Endocrine, nutritional and metabolic diseases	3	0.8
Congenital malformations or chromosomal abnormalities	2	1.1
Diseases of the blood and blood-forming organs	1	0.7
Diseases of the musculoskeletal system	1	0.4
Mental and behavioural disorders	1	0.4
Symptoms, signs, abnormal findings not elsewhere classified	1	0.4

²⁴ Australian Institute of Health and Welfare 2011, *Young Australians: Their Health and Wellbeing 2011*, p 20, accessed <http://www.aihw.gov.au/publication-detail/?id=10737419261>, AIHW Canberra

3.3 Leading causes of death by Aboriginal and Torres Strait Islander status

People who are Aboriginal or Torres Strait Islander tend to have worse health outcomes and lower life expectancies than non-Indigenous Australians, although this varies considerably with factors such as employment and place of residence.²⁵ Aboriginal and Torres Strait Islander status is not well determined for all individuals, and particularly when numbers are small, it is recognised that comparisons with non-Indigenous children may not be reliable.²⁶

Of the 589 deaths of children registered in 2010, 51 were Aboriginal children and eight were Torres Strait Islander children.

The leading causes of death for Aboriginal and Torres Strait Islander children were mostly the same as those for all children, but with generally higher crude mortality rates, as shown in tables 15 and 16.

All eight Torres Strait Islander children were infants. Six of the infants died as a result of conditions arising in the perinatal period or congenital malformations or chromosomal abnormalities. Two were sudden and unexpected deaths in infancy. The most obvious difference in the leading causes of death for Aboriginal children is the high rate of injury related deaths, about four times that seen among non-Aboriginal children. Apart from this, the small numbers of deaths in a single year do not allow for reliable comparisons among causes.

Table 15: Ten leading causes of death for non-Indigenous children – deaths registered in 2010

Leading causes of death (non-Indigenous children) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	164	10.5
Congenital malformations or chromosomal abnormalities	108	6.9
External causes of morbidity and mortality	82	5.2
Neoplasms	43	2.7
Diseases of the nervous system	22	1.4
Diseases of the circulatory system	17	1.1
Endocrine, nutritional and metabolic diseases	14	0.9
Symptoms, signs, abnormal findings not elsewhere classified	12	0.8
Diseases of the respiratory system	11	0.7
Infectious and parasitic diseases	8	0.5

Table 16: Eight leading causes of death for Aboriginal and Torres Strait Islander children – deaths registered in 2010

Leading causes of death (Aboriginal and Torres Strait Islander children) ICD chapterer	Number of deaths		Crude mortality rate
	Aboriginal children	Torres Strait Islander children	
Certain conditions originating in the perinatal period	15	5	28.3
External causes of morbidity and mortality	15		21.2
Congenital malformations or chromosomal abnormalities	8	1	12.7
Diseases of the nervous system	3		4.2
Diseases of the circulatory system	1		1.4
Neoplasms	1		1.4
Diseases of the respiratory system	1		1.4
Symptoms, signs, abnormal findings not elsewhere classified	1		1.4

25 Australian Institute of Health and Welfare 2003, *National health data dictionary*, accessed meteor. <http://www.aihw.gov.au/content/index.phtml/itemId/357718>, AIHW, Canberra

26 Ibid

3.4 Leading causes of death by remoteness

Tables 17 to 19 illustrate leading causes of death by remoteness, that is, children who died who resided in major cities, in inner regional areas, and in outer regional and remote areas. Although over half of all children whose deaths were registered in 2010 resided in major cities, a substantial number resided in more remote areas.

There are differences. It is apparent that those children living in inner regional areas were more at risk of injury related deaths than those in major cities, with external causes of death being the leading cause, in comparison to the third leading cause for children in major cities. However, in outer regional areas the distribution of types of death became more like that in major cities. The small number of deaths (nine) in remote and very remote areas do not provide a reliable comparison, and have been aggregated with outer regional areas in Table 19.

There are a number of factors that could influence this outcome. Children identified as Aboriginal or Torres Strait Islander were more likely to reside outside major cities, but this effect is unlikely to account for the entire difference due to the small number of deaths of Aboriginal and Torres Strait Islander children. Children living outside major cities may also have less immediate access to hospitals, and thus be less likely to survive a major injury. In addition, the environment outside major cities tends to have greater hazards, such as more unenclosed bodies of water and open roads. These factors will be further examined in the sections on specific types of death to follow.

The Queensland Commission for Children and Young People and Child Guardian, in an analysis of the deaths of children in non-metropolitan areas, found unique risks exist for children in rural areas. These risks were seen to result from a combination of environment and culture, including for example, the presence of dams or farm machinery and practices which allow children to drive all-terrain vehicles on large private properties.²⁷

Table 17: Ten leading causes of death for children residing in major cities – deaths registered in 2010

Leading causes of death (Major cities) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	133	11.4
Congenital malformations or chromosomal abnormalities	75	6.4
External causes of morbidity and mortality	46	4.0
Neoplasms	30	2.6
Diseases of the nervous system	13	1.1
Endocrine, nutritional and metabolic diseases	11	0.9
Diseases of the circulatory system	10	0.9
Symptoms, signs, abnormal findings not elsewhere classified	8	0.7
Diseases of the respiratory system	7	0.6
Infectious and parasitic diseases	6	0.5

²⁷ Queensland Commission for Children and Young People and Child Guardian 2009, *Keeping Country Kids Safe*, discussion paper. CCYPCG, Brisbane

Table 18: Ten leading causes of death for children residing in inner regional areas – deaths registered in 2010

Leading causes of death (Inner regional areas) ICD chapter	Number of deaths	Crude mortality rate
External causes of morbidity and mortality	34	9.9
Certain conditions originating in the perinatal period	27	7.9
Congenital malformations or chromosomal abnormalities	27	7.9
Neoplasms	12	3.5
Diseases of the nervous system	6	1.8
Diseases of the circulatory system	5	1.5
Symptoms, signs, abnormal findings not elsewhere classified	5	1.5
Endocrine, nutritional and metabolic diseases	3	0.9
Diseases of the respiratory system	3	0.9
Diseases of the blood and blood-forming organs	1	0.3

Table 19: Nine leading causes of death for children residing in more remote areas – deaths registered in 2010

Leading causes of death (More remote areas) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	23	19.4
External causes of morbidity and mortality	16	13.5
Congenital malformations or chromosomal abnormalities	15	12.6
Diseases of the nervous system	5	4.2
Diseases of the circulatory system	3	2.5
Neoplasms	2	1.7
Diseases of the respiratory system	2	1.7
Diseases of the digestive system	1	0.8
Infectious and parasitic diseases	1	0.8

Leading causes of death by socioeconomic status

The following tables illustrate leading causes of death by socioeconomic status.

There is a level of inaccuracy in assigning a socioeconomic status to an individual or family using the average for the area of residence, as socioeconomic status may vary widely within these areas. For this reason, only the broadest categories of high and low are used. These categories are calculated using the median split of the Index of Relative Social Disadvantage. This index includes measures such as education and household income that are generally regarded as core elements of the concept of socioeconomic status.

For children whose deaths were registered in 2010, there was little difference between the leading causes of death for children residing in high and low socioeconomic areas, although the overall mortality rate was generally higher for children residing in low socioeconomic areas.

Table 20: Ten leading causes of death for children residing in high socioeconomic areas – deaths registered in 2010

Leading causes of death (High Socioeconomic status) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	83	8.9
Congenital malformations or chromosomal abnormalities	46	5.0
External causes of morbidity and mortality	39	4.2
Neoplasms	19	2.0
Diseases of the nervous system	13	1.4
Diseases of the circulatory system	10	1.1
Symptoms, signs, abnormal findings not elsewhere classified	8	0.9
Endocrine, nutritional and metabolic diseases	7	0.8
Diseases of the respiratory system	5	0.5
Infectious and parasitic diseases	3	0.3

Table 21: Ten leading causes of death for children residing in low socioeconomic areas – deaths registered in 2010

Leading causes of death (Low Socioeconomic status) ICD chapter	Number of deaths	Crude mortality rate
Certain conditions originating in the perinatal period	101	11.5
Congenital malformations or chromosomal abnormalities	71	8.1
External causes of morbidity and mortality	58	6.6
Neoplasms	25	2.8
Diseases of the nervous system	12	1.4
Diseases of the circulatory system	8	0.9
Endocrine, nutritional and metabolic diseases	7	0.8
Diseases of the respiratory system	7	0.8
Infectious and parasitic diseases	5	0.6
Symptoms, signs, abnormal findings not elsewhere classified	5	0.6

Chapter 4. Multiple causes of death

Historically, and from national and international perspectives, the concept of underlying cause of death is considered the most critical factor for public health reporting purposes in annual mortality statistics.²⁸ However, multiple cause data is important for a more complete understanding of the chain of events leading to deaths, and the co-contribution of diseases to mortality.²⁹

An example of the importance of considering multiple cause is death by drowning where epilepsy may have been a contributing factor. Epileptic seizures are known to be an important risk factor for drowning, and the appearance or omission of this factor can have a profound influence on any inference about risk factors, as most drowning deaths are unobserved. Another example is a death in which the direct cause is a respiratory condition, but the underlying cause is dysphagia (swallowing difficulties) in the context of a disability such as cerebral palsy. In such cases, acknowledging the contribution of the chronic disability by a case analysis of the multiple causes of death is the appropriate way to differentiate this from a respiratory death due to an acute condition.

Table 22 provides a cross-tabulation of multiple causes of death for children whose deaths were registered in 2010. The table shows the proportion of times that a contributory cause of death was mentioned for each underlying causes of death, by the International Classification of Diseases chapter. This shows which contributory causes co-occur with which underlying causes.

The most salient relationships to emerge from considering multiple causes of death for children in 2010 are conditions arising in the perinatal period and congenital malformations or chromosomal abnormalities are often recorded together, with congenital or chromosomal causes tending to be recorded as the underlying cause of death when this occurs. Multiple perinatal causes of death were often recorded, with almost three quarters of these deaths having at least one additional perinatal cause of death as a contributory cause. As would be expected, the majority of deaths (three-quarters) with an underlying external cause of death included at least contributory cause relating to injury or poisoning.

About one third of deaths having an underlying cause from the nervous system chapter include a contributory cause from the respiratory chapter. Respiratory conditions are common in children with long term nervous system disabilities such as cerebral palsy or muscular dystrophy. Respiratory conditions were also common in cases where the underlying cause of death was infectious or parasitic disease, disorders of the endocrine or metabolic system, or diseases of the circulatory system.

Effective reporting of multiple causes of death is an area for further development.

28 National Centre for Health Information Research and Training 2011, review and recommendations for the annual reporting of child deaths in NSW. Prepared for the NSW Ombudsman, unpublished.

29 Ibid.

Table 22: Multiple causes of death by ICD chapter for all causes of death (UCoDs by number, MCoDs by proportion of UCoDs) – deaths registered in 2010

Multiple causes of death →	Cases	Infectious/ parasitic	Neoplasm	Blood/blood forming	Endocrine/ metabolic	Mental/ behavioural	Nervous system	Eye/ear	Circulatory	Respiratory	Digestive	Musculo-skeletal	Genitourinary	Perinatal	Congenital/ chromosomal	Symptoms/ signs	Injury/ poisoning	External causes
		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Infectious/parasitic	8	0	0	0	0	0	0.12	0	0	0.25	0	0	0	0.38	0	0.25	0.12	0.12
Neoplasm	44	0.07	0.14	0.09	0.05	0	0.07	0	0.14	0.16	0.07	0	0.05	0.11	0.02	0.11	0.11	0.16
Blood/blood forming	4	0.5	0	0.25	0	0	0	0	0	0.25	0.25	0	0	0.75	0	0.75	0	0.25
Endocrine/metabolic	14	0	0	0	0.14	0	0.29	0	0.21	0.29	0	0	0.07	0.07	0	0.07	0	0
Mental/behavioural	2	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0
Nervous system	25	0.04	0.04	0	0.04	0.08	0.2	0	0.2	0.32	0	0.04	0	0.24	0.08	0.32	0.16	0.04
Circulatory	18	0.06	0.06	0	0.06	0	0.17	0	0.28	0.11	0.06	0	0.06	0.17	0.17	0.11	0.17	0.11
Respiratory	12	0	0	0	0	0	0.33	0	0.33	0.25	0.08	0	0.08	0.08	0	0.17	0.17	0
Digestive	2	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5	0	0
Musculoskeletal	2	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0
Genitourinary	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Perinatal	185	0.01	0.01	2	0.01	0.01	0.03	0	0.03	0.04	0.01	0	0.01	0.71	0.05	0.03	0.04	0.01
Congenital/chromosomal	117	0.03	0	3	0.03	0.01	0.09	0.01	0.11	0.1	0.04	0.02	0.03	0.51	0.33	0.12	0.09	0.02
Symptoms/signs	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
External causes	93	0.01	0.01	0.01	0	0.02	0.04	0	0.09	0.08	0.01	0	0.03	0.39	0.1	0.13	0.56	0.06

Chapter 5. Deaths of children outside NSW

A small number of children normally resident in NSW die in another state and their deaths are registered there.

Since 2008, the Team has collected and reported some information about these deaths. In 2007, the legislation governing the operation of the CDRT was amended to enable any function of the Team to be exercised in relation to this group of children. In order for this provision to be enacted, the legislation also allows for the Convenor of the Team to enter into an agreement or arrangement with a relevant agency in another state or territory to exchange information about child deaths.

At this time, the Team has no formal arrangements in place with other states or territories, and such an arrangement would be dependent on similar provisions for exchange of information being available in the relevant legislation for other state and territory review bodies.

In the absence of such arrangements, and due to privacy and confidentiality laws in other jurisdictions, it is not possible to gather complete information on children who die outside NSW. No state or territory has been able to provide identifying information about the children. This issue is the subject of current discussion for the Australian and New Zealand Child Death Review and Prevention Group. The Group is comprised of various child death review agencies or mechanisms in Australia and New Zealand.

We received information about 33 deaths of children normally residing in NSW that occurred outside NSW in 2009. Information for 2010 was not available. This data was limited to the ACT, Queensland, Victoria and South Australia. Victoria provided provisional data.

From the information provided, the large majority of the children died as a result of perinatal disorders (18), followed by congenital malformations and chromosomal abnormalities (seven). No state reported any deaths due to injury.

Table 23: Deaths of children resident in NSW registered in another state 1996 to 2009

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ACT	8	11	7	9	8	12	11	9	4	7	10	7	9	11
NT	0	0	1	1	0	0	0	0	0	0	0	0	0	0
QLD	4	5	6	17	7	7	14	10	5	9	7	15	6	14
SA	5	3	0	2	1	2	1	2	1	1	1	2	4	1
VIC	0	0	0	1	5	3	2	1	5	4	2	2	9	8
WA	0	1	0	0	0	0	1	0	0	0	0	0	1	0
	17	20	14	30	21	24	29	22	14	21	20	26	29	34

Chapter 6. Natural cause deaths

In 2010, 445 children whose deaths were registered in NSW died from natural causes.

Table 24 shows the leading natural causes of death for these children, and table 25 describes the demographic and individual characteristics of the children. The leading causes may not sum to the totals for chapters, as these causes do not include all deaths.

Sections 6.1 to 6.5 below provide further details of child deaths resulting from conditions originating in the perinatal period, congenital malformations and chromosomal disorders, neoplasms (cancers and tumours), disorders of the central nervous system and infectious and parasitic diseases.

Table 24: Leading natural causes of death – deaths of children registered in 2010

Underlying cause of death	Females	Males	Total	Crude Mortality Rate	95% confidence interval
Perinatal³⁰	71	114	185	2.0	1.7 - 2.3
Prematurity	17	19	36	0.4	0.3 - 0.5
Maternal (placental)	11	12	23	0.3	0.2 - 0.4
Maternal conditions of pregnancy	7	15	22	0.2	0.2 - 0.4
Congenital/chromosomal	58	59	117	7.2	5.9 - 8.6
Circulatory diseases	15	17	32	2.0	1.3 - 2.8
Chromosomal abnormalities	12	5	17	1.0	0.6 - 1.7
Brain disorders/deformities*	9	6	15	0.9	0.5 - 1.5
Musculoskeletal deformities*	5	10	15	0.9	0.5 - 1.5
Neoplasms	22	22	44	2.7	2.0 - 3.6
Central nervous system	12	6	18	1.1	0.4 - 3.6
Lymphatic/blood	4	10	14	0.9	0.1 - 2.6
Ill-defined/multiple site	3	1	4	0.2	0.0 - 1.3
Nervous system	9	16	25	1.5	1.0 - 2.3
Episodic/paroxysmal disorders	2	7	9	0.6	0.6 - 1.0
Atrophies	3	3	6	0.4	0.1 - 0.8
Paralytic disorders	2	3	5	0.3	0.1 - 0.7
Circulatory system	5	11	18	1.1	0.7 - 1.7
Cardiomyopathy/cardiomegaly	3	2	5	0.3	0.1 - 0.7
Pulmonary hypertension	2	1	3	0.2	0.04 - 0.5
Ischaemic heart disease	0	2	2	0.1	0.01 - 0.4
Endocrine, nutritional and metabolic diseases†	5	9	14	0.9	0.5 - 1.4
Symptoms, signs, abnormal findings, not otherwise classified†	3	10	13	0.8	0.4 - 1.4
Respiratory system	5	7	12	0.7	0.4 - 1.3
Acute lower respiratory infection	3	1	4	0.2	0.07 - 0.6
Asthma	1	3	4	0.2	0.07 - 0.6
Pneumonia	1	2	3	0.2	0.04 - 0.5
Infectious/parasitic diseases†	3	5	8	0.5	0.2 - 1.0

* Equal third

† Subcategories were poorly defined and diverse

³⁰ Perinatal CMRs are based per 1000 births in 2009

Table 25: Key demographic and individual characteristics – all deaths of children due to natural causes registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	445	100	27.2	24.7 - 29.9	
Gender					
Female	184	41	23.1	19.8 - 26.6	
Male	261	59	31.1	27.5 - 35.1	1.4
Age					
Infants (less than 1 year)	321	72	332 (IMR 3.5)*	296 - 371	
1-4 years	43	10	11.7	8.5 - 15.8	0.04
5-9 years	23	5	5.2	3.3 - 7.8	0.02
10-14 years	31	7	6.9	4.7 - 9.8	0.02
15-17 years	27	6	9.6	6.3 - 14.0	0.03
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	409	92	26.1	23.9 - 28.8	
Aboriginal and Torres Strait Islander	36	8	50.9	35.6 - 70.5	2.0
Remoteness					
Major cities	295	67	25.3	22.5 - 28.4	
Inner regional	94	21	27.5	22.2 - 33.6	1.1
Outer regional	48	11	43.9	32.4 - 58.2	1.7
Remote	4	1	48.5	13.2 - 124	1.9
Socioeconomic status					
High	199	45	21.4	18.5 - 24.6	
Low	246	55	27.9	24.5 - 31.7	1.3

* IMR (Infant Mortality Rate)

6.1 Deaths from conditions arising during the perinatal period

In 2010, 184 children whose deaths were registered in NSW died as a result of conditions arising in the perinatal period. This was the leading cause of death for children in the state, as it has been consistently since 1996.

The term 'perinatal conditions' is used to refer to conditions that arise during pregnancy, or up to 28 days. It includes conditions such as prematurity; complications of labour, including hypertension and maternal haemorrhage; and disorders associated with fetal growth. It may also include certain respiratory, cardiovascular and infectious diseases associated with the perinatal period, such as aspiration of meconium and respiratory distress of the newborn.

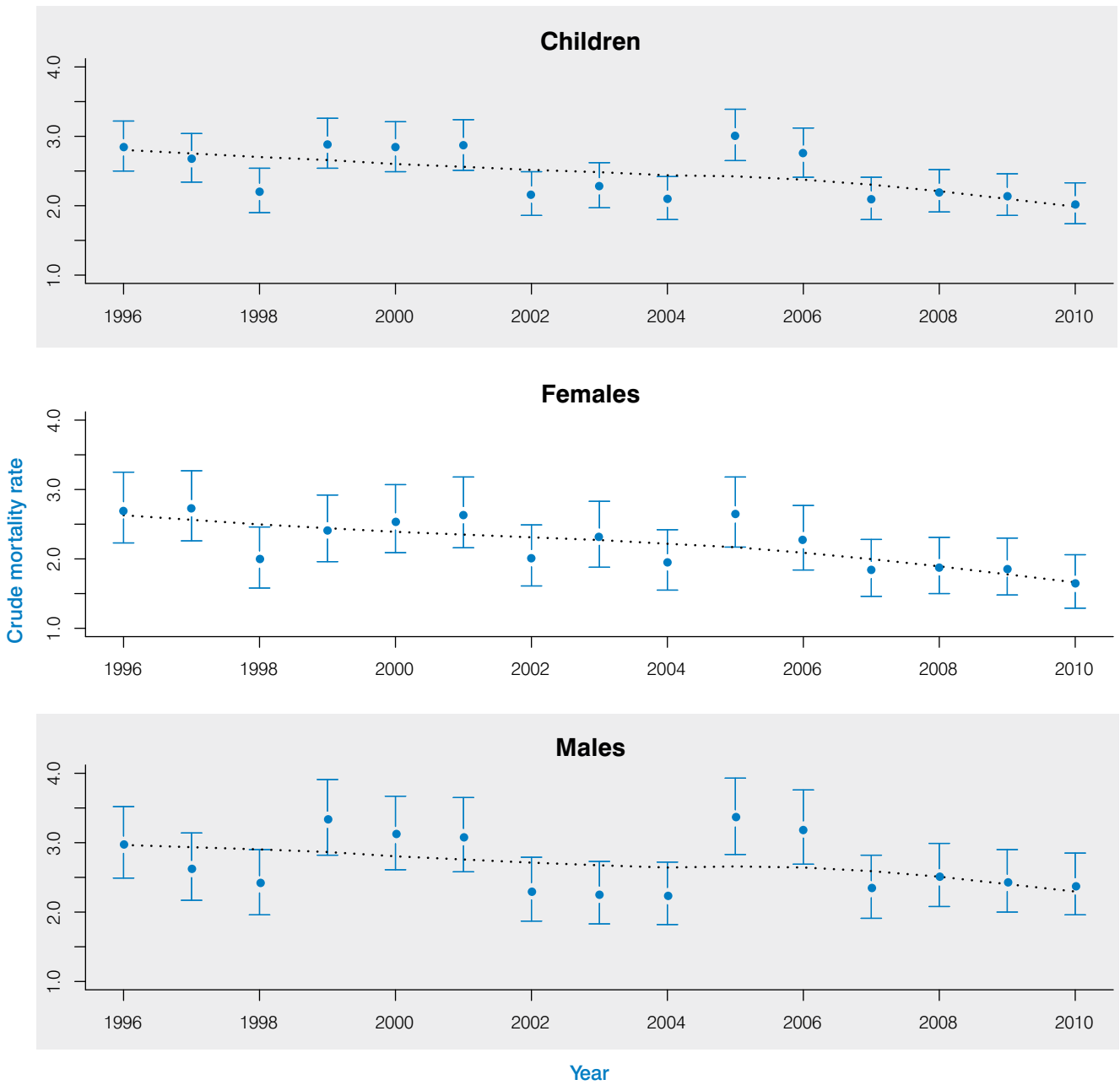
The use of the term 'perinatal condition' does not necessarily mean that the child died in the perinatal period.

In this chapter, and in line with convention, mortality rates are determined per 1000 live births in NSW during the 2009 calendar year.³¹

Figure 5 below, shows the trends in deaths due to conditions arising in the perinatal period for children between 1996 and 2010. Mortality from perinatal conditions varies considerably from year to year. While higher mortality rates are generally found among males, there have been two years in which females have had higher mortality rates (1997 and 2003).

31 Australian Bureau of Statistics 2010, *3301.0 Births, Australia, 2009*. ABS, Canberra.

Figure 5: Trends in deaths of children due to conditions originating in the perinatal period by gender – deaths registered 1996 to 2010



6.1.1 Demographic and individual characteristics

Table 26 provides an overview of the key demographic characteristics of the 184 children who died due to perinatal conditions.

Table 26: Key demographic and individual characteristics – deaths of children due to conditions originating in the perinatal period registered in 2010

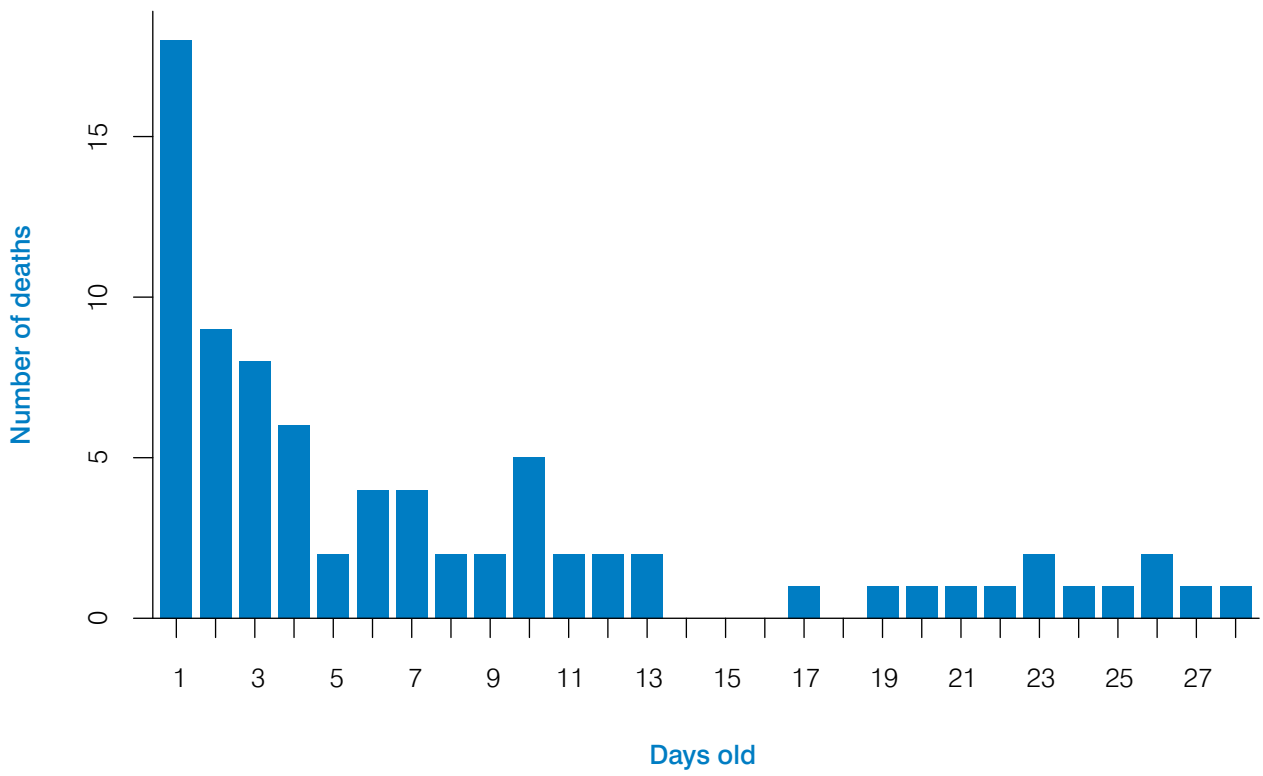
	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	184	100	2.0	1.7 - 2.3	
Gender					
Female	70	38	1.6	1.2 - 2.0	
Male	114	62	2.4	2.0 - 2.9	1.6
Age					
Under 1 day	94	51	1.0	0.8 - 1.3	
Under 1 week	47	25	0.5	0.4 - 0.7	0.5
Under 28 days	30	16	0.3	0.2 - 0.5	0.3
Under 1 year	9	5	0.1	0.04 - 0.2	0.1
1 year and over	4	2	0.04	0.01 - 0.1	0.04
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	164	89	1.9	1.6 - 2.2	
Aboriginal and Torres Strait Islander	20	11	4.8	3.0 - 7.5	2.6
Remoteness					
Major cities	134	73	2.4	2.0 - 2.8	
Inner regional	27	15	1.0	0.7 - 1.5	0.4
Outer regional	22	12	2.5	1.6 - 3.8	1.1
Remote	1	1	1.0	0.02 - 5.5	0.4
Socioeconomic status					
High	83	45	1.7	1.4 - 2.2	
Low	101	55	2.3	1.8 - 2.1	1.3

Age, gender and Aboriginal and Torres Strait Islander status

As noted above, a child who dies as a result of a perinatal condition will not necessarily die in the perinatal period. Among the children who died from conditions arising in the perinatal period, their ages ranged from one day to six years old.

The large majority of children (77%) were less than one week old. A further 30 children were between one week and 28 days old, nine were less than one year old and four children were aged between one and six years. As shown in Figure 6, the rate of deaths declines steeply from birth during the first 28 days of life.

Figure 6: Age of children who died (days) due to conditions originating in the perinatal period, up to 28 days of age



The mortality rate for boys was about one and one half times that of girls. The higher mortality rates of boys were consistent across many of the specific conditions arising in the perinatal period, with the exception of disorders related to length of gestation.

The mortality rate for Aboriginal and Torres Strait Islander children whose deaths were registered in 2010 and were due to perinatal conditions was over three times that of non-Indigenous children. Table 27 shows the Aboriginal and Torres Strait Islander status of children who died due to perinatal conditions from 1996 to 2010. Across the period there has been a consistently higher rate of death due to perinatal conditions for Aboriginal and Torres Strait Islander children than non-Indigenous children, except in 2006. There is also much more variation from year to year for Aboriginal and Torres Strait Islander children.

Table 27: Aboriginal and Torres Strait Islander status of children who died due to conditions originating in the perinatal period – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	14 (4.9)	22 (7.7)	15 (5.1)	15 (3.3)	23 (4.0)	16 (2.6)	11 (4.8)	13 (2.0)	9 (5.4)	15 (2.8)	7 (2.4)	20 (3.9)	11 (4.9)	10 (7.7)	20 (4.8)
Non-Indigenous	232 (2.8)	211 (2.7)	173 (2.8)	235 (2.1)	223 (2.2)	226 (2.1)	176 (2.9)	184 (2.8)	171 (2.0)	245 (2.2)	233 (2.1)	167 (1.9)	198 (2.8)	189 (2.7)	164 (1.9)

No significant differences were seen for remoteness of residence or socioeconomic status in 2010. Sufficiently accurate data on births in the relevant categories for these measures was not available at the time of writing to conduct an historical analysis for 1996 to 2010.

6.1.2 Leading causes of death from conditions originating in the perinatal period

Taken together, maternal placental conditions and maternal conditions of pregnancy are the leading causes of death associated with perinatal conditions. This is followed by fetal prematurity and then neonatal respiratory conditions. A variety of neonatal disorders and diseases account for the remaining deaths. The relative frequencies of the specific causes vary considerably from year to year.

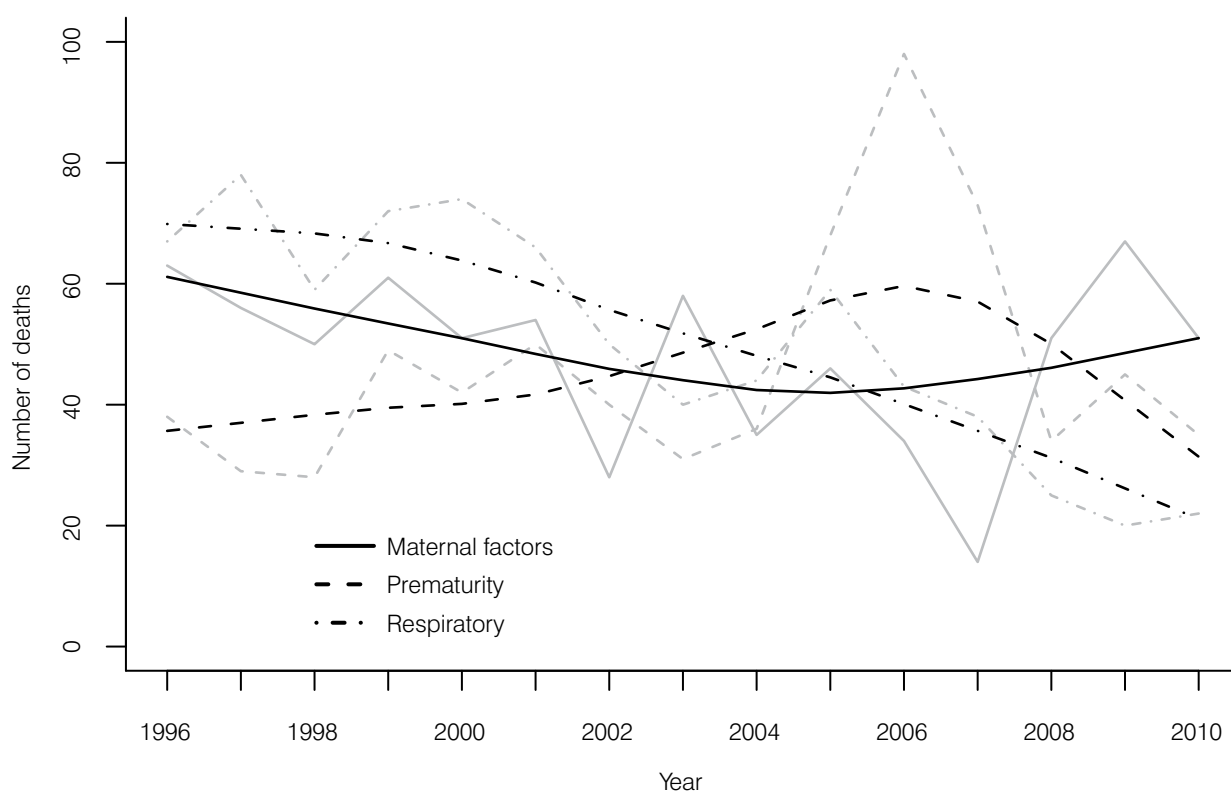
Aboriginal children were over-represented in deaths due to maternal conditions, as well as obstetric complications and respiratory conditions.

Table 28: Leading causes of death from conditions originating in the perinatal period – deaths of children registered in 2010

Underlying cause of death ³²	Females	Males	Total	Crude Mortality Rate	95% Confidence Interval
Fetal prematurity	17	19	36	0.39	0.27 - 0.54
Maternal placental conditions	11	12	23	0.25	0.16 - 0.37
Maternal conditions of pregnancy	7	15	22	0.24	0.15 - 0.36
Neonatal respiratory conditions	8	11	19	0.2	0.12 - 0.32
Neonatal haematological disorders	5	11	16	0.17	0.1 - 0.28
Neonatal infections	6	8	14	0.15	0.08 - 0.25
Neonatal digestive disorders	3	6	9	0.1	0.04 - 0.18
Obstetric complications	3	6	9	0.1	0.04 - 0.18
Neonatal circulatory disorders	1	6	7	0.08	0.03 - 0.16
Other maternal conditions	1	2	3	0.04	0.01 - 0.1

³² Twenty six conditions did not fall into any of the major classes

Figure 7: Three leading causes of death due to conditions originating in the perinatal period – deaths of children registered 1996 to 2010



6.2 Deaths from congenital malformations and chromosomal abnormalities

In NSW, 117 children whose deaths were registered in 2010 died as a result of congenital malformations and chromosomal abnormalities. This is the second leading cause of death for children in NSW.

Congenital malformations and chromosomal abnormalities refer to a range of conditions, including for example, Down Syndrome, congenital hydrocephalus and trisomy 18 (Edwards Syndrome).

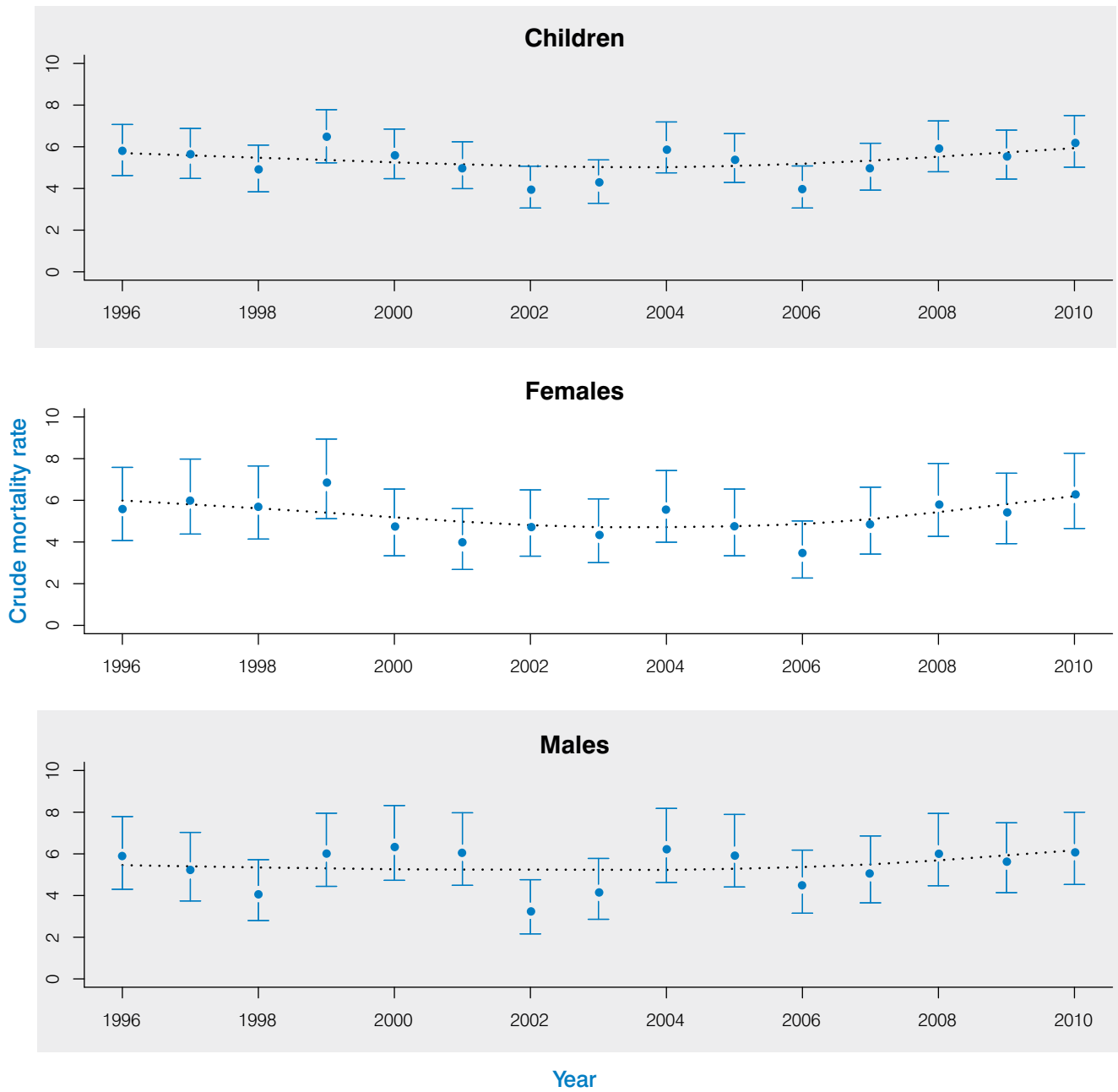
These conditions are present at birth, and have a significant impact on a child's health. The conditions usually require intensive health care and where a child survives, often result in disability.³³ Developments in antenatal care, management of labour, and health care for infants with certain disorders are reducing the impact of some of these conditions.³⁴

As Figure 8 shows, there has been no observable trend in relation to deaths due to congenital malformations and chromosomal abnormalities over the past 15 years.

33 Abeywardana S & Sullivan EA 2008. *Congenital anomalies in Australia 2002–2003*. Birth anomalies series no. 3, p vi

34 Australian Institute of Health and Welfare (2010) *A Picture of Australia's Children 2009*, p 27 AIHW, Canberra

Figure 8: Trends in deaths of children due to congenital malformations or chromosomal abnormalities by gender – deaths registered 1996 to 2010



6.2.1 Demographic and individual characteristics

Table 29 provides an overview of the key demographic characteristics of the 117 children who died due to congenital malformations or chromosomal abnormalities.

Table 29: Key demographic and individual characteristics – deaths of children due to congenital malformations or chromosomal abnormalities, deaths registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	117	100	7.1	5.9 - 8.6	
Gender					
Female	58	50	7.3	5.5 - 9.4	
Male	59	50	7.0	5.4 - 9.1	1.0
Age					
Infants (less than 1 year)	99	85	100 (IMR 1.1)*	83 - 120	
1-4 years	8	7	2.2	0.9 - 4.3	0.02
5-9 years	3	3	0.7	0.1 - 2.0	0.01
10-14 years	4	3	0.9	0.2 - 2.3	0.01
15-17 years	3	3	1.1	0.2 - 3.1	0.01
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	108	92	6.9	5.7 - 8.3	
Aboriginal and Torres Strait Islander	9	8	13	5.8 - 24.0	1.9
Remoteness					
Major cities	75	64	6.4	5.1 - 8.1	
Inner regional	27	23	7.9	5.2 - 11.0	1.2
Outer regional	14	12	13	7.0 - 21.0	2.0
Remote	1	1	12	0.3 - 68	1.9
Socioeconomic status					
High	46	39	5.0	3.6 - 6.6	
Low	71	61	8.1	6.3 - 10.0	1.6

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

The age of children who died as a result of congenital malformations and chromosomal abnormalities varied. However, the large majority of children (99) were less than 12 months old. Historical analysis of deaths resulting from congenital malformations or chromosomal abnormalities found that incident rate ratios for all older age groups were small and the differences from the infant group highly significant.

Of child deaths registered in 2010, there was no difference between boys and girls in relation to deaths due to congenital malformations and chromosomal abnormalities. This is consistent with previous years. As shown in table 30, the mortality rate for Aboriginal and Torres Strait Islander children has almost always been higher than that for non-Indigenous children, but has tended to decrease, while the overall mortality rate has shown little change.

Table 30: Aboriginal and Torres Strait status of children who died due to congenital malformations or chromosomal abnormalities – deaths registered in 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	13 (24.1)	19 (34.1)	17 (29.6)	26 (44)	15 (24.8)	7 (11.3)	16 (25.3)	10 (15.6)	9 (13.8)	8 (12.2)	5 (7.5)	3 (4.4)	9 (13.1)	4 (5.7)	9 (13)
Non-Indigenous	77 (5.1)	69 (4.5)	60 (3.9)	76 (5)	74 (4.8)	74 (4.8)	48 (3.1)	58 (3.8)	85 (5.5)	78 (5.1)	59 (3.8)	77 (5)	87 (5.6)	86 (5.5)	108 (6.9)

There were no significant differences for remoteness of residence or socioeconomic status in 2010.

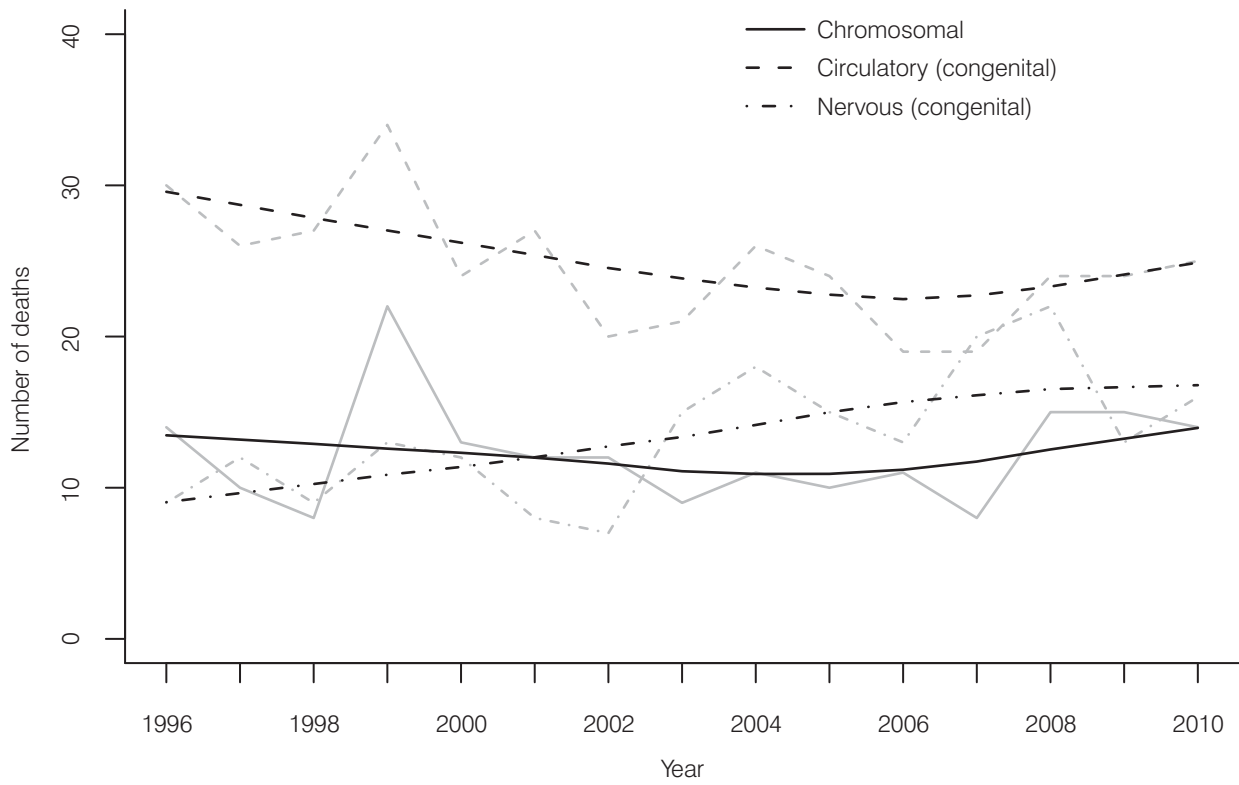
6.2.2 Leading causes of death due to congenital malformations and chromosomal abnormalities

Leading causes were calculated by age group to determine whether different types of deaths from congenital malformations and chromosomal abnormalities became more important at different ages. In Table 31, it can be seen that the number of causes of death declined for the older age groups. Overall, congenital circulatory malformations were most common, except for the oldest age group. Chromosomal abnormalities were the second most common over all age groups, with congenital brain and musculoskeletal malformations equal third.

Table 31: Leading causes of deaths due to congenital malformations or chromosomal abnormalities by age – deaths registered in 2010, number and (crude mortality rate)

Under 1 year	1 to 4 years	5 to 9 years	10 to 14 years	15 to 17 years
Circulatory 25 (25.9)	Circulatory 4 (1.1)	Circulatory 1 (0.2)	Circulatory 2 (0.4)	Chromosomal 2 (0.7)
Musculoskeletal 14 (14.5)	Musculoskeletal 1 (0.3)	Chromosomal 1 (0.2)	Chromosomal 2 (0.2)	Brain 1 (0.4)
Chromosomal 13 (13.5)	Brain 1 (0.3)	Brain 1 (0.2)	Brain 2 (0.2)	-
Brain 11 (11.0)	Respiratory 1 (0.3)	-	-	-

Figure 9: Three leading causes of deaths due to congenital malformations or chromosomal abnormalities – deaths registered 1996 to 2010



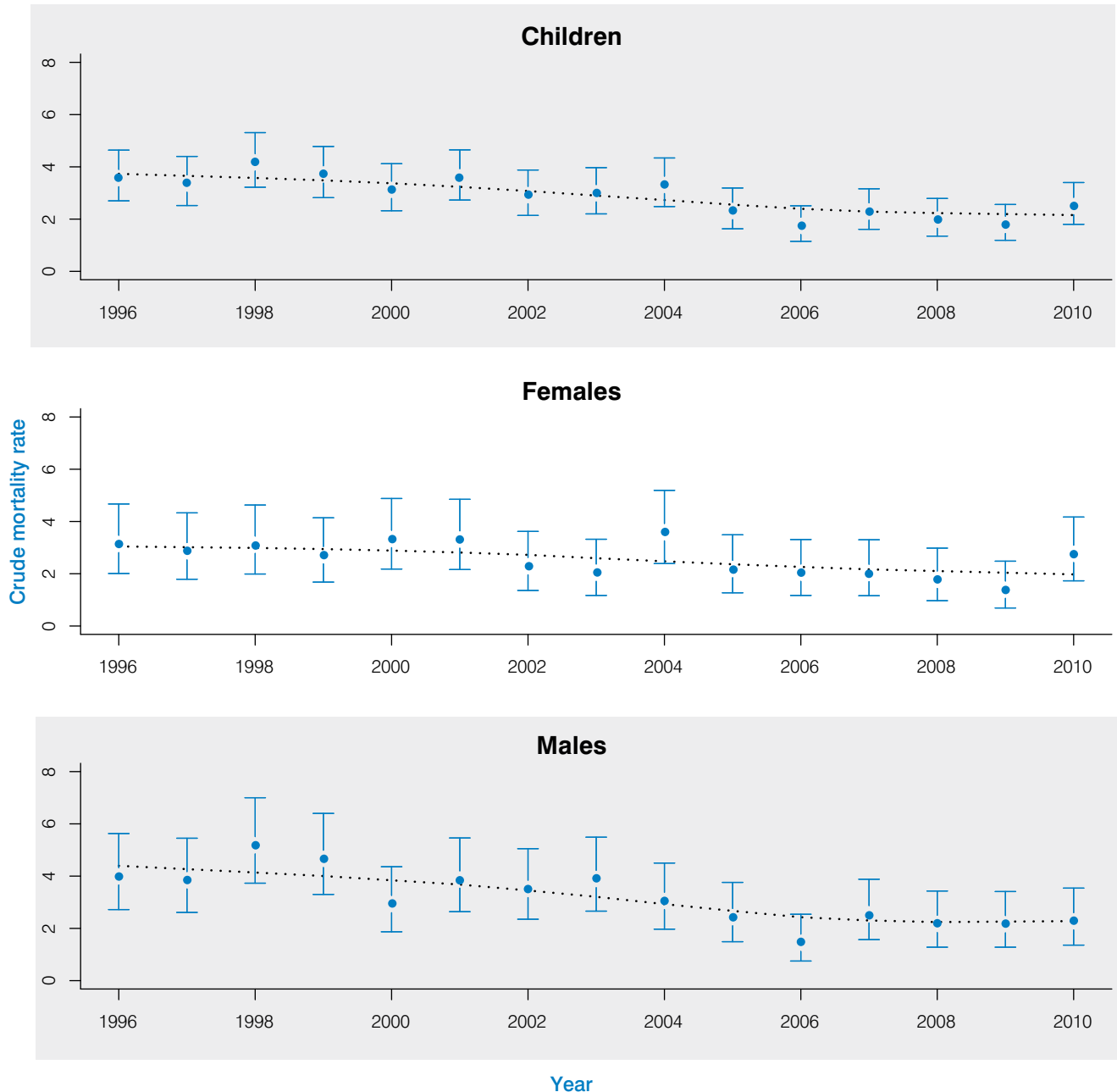
6.3 Deaths from neoplasms (cancers and tumours)

In 2010, 44 children whose deaths were registered in NSW died as a result of cancers and tumours.

Australia-wide, cancer is one of the leading causes of death for children and young people, excluding infants.³⁵

As Figure 10 below shows, child deaths from cancers and tumours have declined in NSW over the past fifteen years for both boys and girls. The decline is largely due to medical advances in relation to both diagnosis and treatment of cancer.³⁶

Figure 10: Trends in deaths of children due to cancers and tumours by gender – deaths registered 1996 to 2010



35 Australian Institute of Health and Welfare (2009) *A Picture of Australia's Children 2009*, p 15, accessed <http://www.aihw.gov.au/publication-detail/?id=6442468252> AIHW Canberra

36 *Ibid*, p 21

6.3.1 Demographic and individual characteristics

Table 32 provides an overview of the main demographic characteristics of children who died as a result of cancer.

Table 32: Key demographic and individual characteristics – deaths due to cancers and tumours registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	44	100	2.7	2.0 - 3.6	
Gender					
Female	22	50	2.8	1.7 - 4.2	
Male	22	50	2.6	1.6 - 4.0	1.0
Age					
Infants (less than 1 year)	2	5	2.1 (IMR 0.02)*	0.3 - 7.5	
1-4 years	10	23	2.7	1.3 - 5.0	1.3
5-9 years	11	25	2.5	1.2 - 4.5	1.2
10-14 years	11	25	2.4	1.2 - 4.4	1.2
15-17 years	10	23	3.6	1.7 - 6.5	1.7
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	43	98	2.8	2.0 - 3.7	0.5
Aboriginal and Torres Strait Islander	1	2	1.4	0.04 - 7.9	
Remoteness					
Major cities	30	66	2.6	1.7 - 3.7	
Inner regional	12	30	3.5	2.0 - 6.1	1.4
Outer regional	2	5	1.8	0.2 - 6.6	0.7
Socioeconomic status					
High	24	45	2.2	1.3 - 3.3	
Low	20	55	2.7	1.7 - 4.1	1.3

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

The age of children who died due to cancer and tumours ranged from 0 to 17 years. Excluding infants, deaths occurred evenly amongst all age groups. There was no difference between boys and girls in 2010.

Two children were Aboriginal. The mortality rate for Aboriginal children was not significantly different from that of non-Indigenous children. This is largely consistent with previous years, apart from the four year period 1996 to 1999, when the mortality rate for Aboriginal and Torres Strait Islander children was notably higher.

Table 33: Aboriginal and Torres Strait Islander status of children who died due to cancers and tumours – deaths registered 1996-2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	11 (20.4)	11 (19.7)	10 (17.4)	7 (11.8)	2 (3.3)	1 (1.6)	7 (11.1)	1 (1.6)	4 (6.1)	9 (13.7)	1 (1.5)	2 (2.9)	1 (1.5)	1 (1.4)	1 (1.4)
Non-Indigenous	45 (3)	42 (2.8)	56 (3.7)	52 (3.4)	48 (3.1)	57 (3.7)	40 (2.6)	47 (3)	49 (3.2)	28 (1.8)	27 (1.7)	35 (2.3)	31 (2)	28 (1.8)	43 (2.8)

No differences were found for remoteness of residence or socioeconomic status in 2010.

6.3.2 Leading causes of death due to cancers and tumours

Table 34, below, shows the leading types of cancer and tumours for children whose deaths were registered in 2010, divided by age group. Overall, cancers of the central nervous system were most common, and all but two of these were of the brain. Cancers of the lymphoma and blood were the second most common. Almost all of these were leukaemia, with acute lymphoblastic leukaemia the most common.

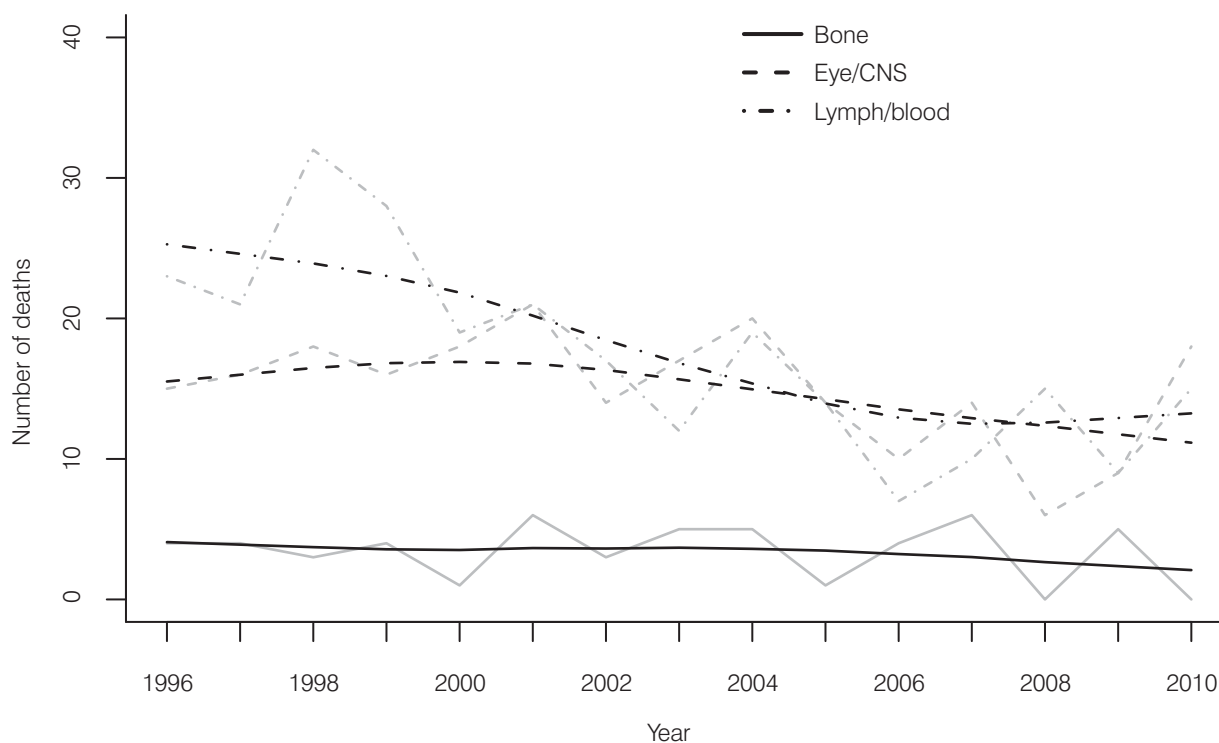
Table 34: Leading cause of deaths due to cancer by age – deaths registered 2010, number and (crude mortality rate)

Under 1 year	1 to 4 years	5 to 9 years	10 to 14 years	15 to 17 years
Lymph/blood 1 (1.0)	Central nervous system 4 (1.1)	Central nervous system 6 (1.4)	Lymph/ blood 6 (0.9)	Central nervous system 4 (1.4)
-	Lymph/blood 3 (0.8)	Lymph/blood 2 (0.5)	Central nervous system 4 (0.2)	Lymph/blood 2 (0.7)
-	Ill-defined, secondary and unspecified sites 2 (0.6)	Ill defined, secondary and unspecified sites 2 (0.5)	-	Digestive 2 (0.7)
-	Mouth/pharynx 1 (0.3)	-	-	Endocrine glands 1 (0.4)

Over the past 15 years, and across all age groups, as Figure 11 shows, the three most common types of cancer deaths have been cancers of the bone and cartilage, cancers of the central nervous system, and cancers of lymph system or blood.

Over the period, cancers of the lymph system or blood have decreased the most, with cancers of the central nervous system decreasing somewhat, and cancers of bone and cartilage decreasing little, if at all.

Figure 11: Three leading causes of deaths due to cancer – deaths registered 1996 to 2010



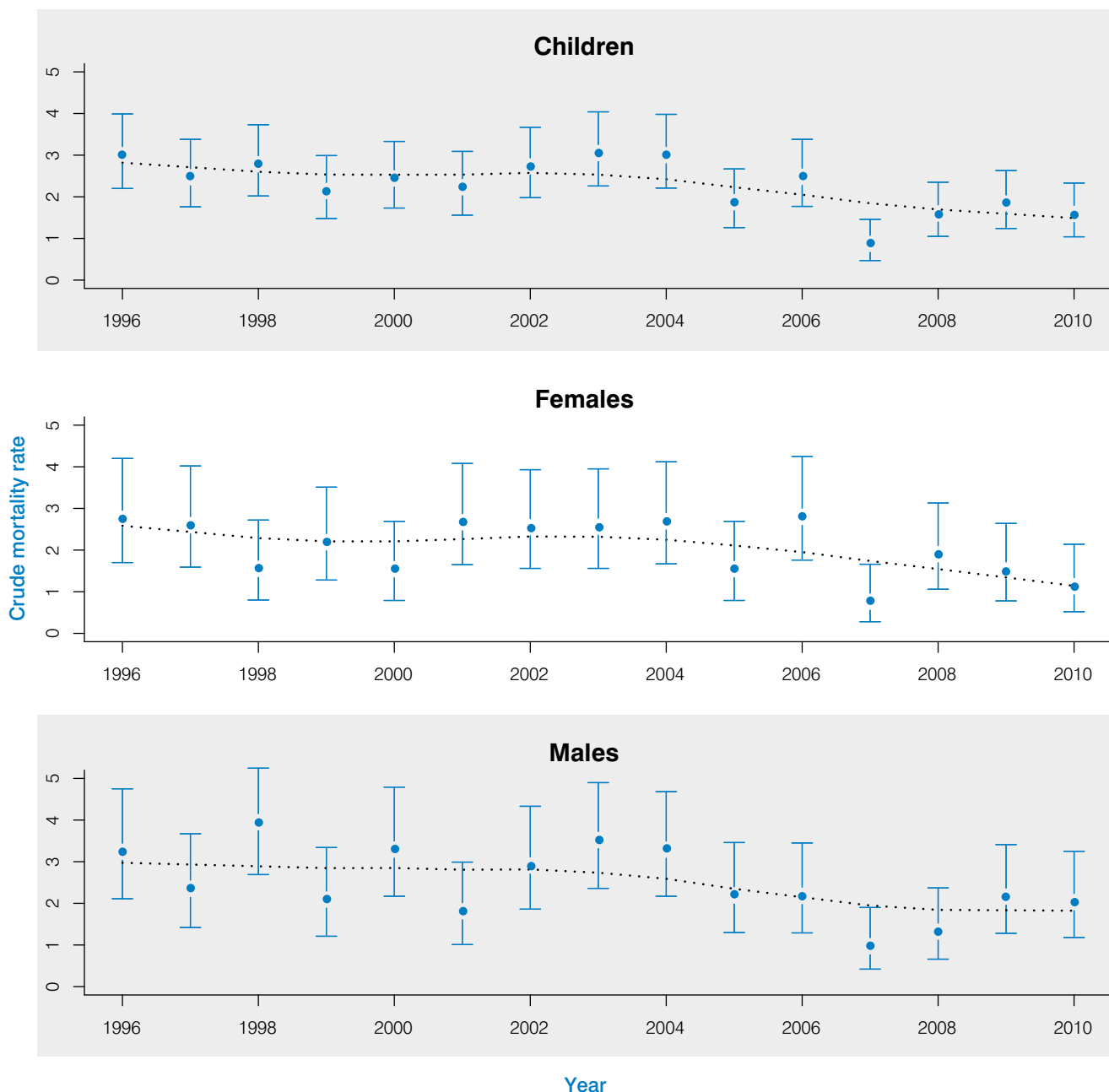
6.4 Deaths from diseases of the nervous system

In 2010, 25 children whose deaths were registered in NSW died as a result of diseases of the nervous system. Excluding infants, this is one of the leading causes of death for children.

Diseases of the nervous system relate to a broad range of disorders such as epilepsy, cerebral palsy and muscular dystrophy, as well as inflammatory and degenerative conditions.

Figure 12 shows there has been a slow decline in deaths due to diseases of the nervous system since 1996.

Figure 12: Trends in deaths of children due to diseases of the nervous system by gender – deaths registered 1996 to 2010



6.4.1 Demographic and individual characteristics

Table 35 gives an overview of the key demographic characteristics of the 25 children who died due to diseases of the nervous system.

Table 35: Key demographic and individual characteristics – deaths of children due to diseases of the nervous system registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	25	100	1.5	1.0 - 2.3	
Gender					
Female	9	36	1.1	0.5 - 2.1	
Male	16	64	1.9	1.1 - 3.1	1.7
Age					
Infants (less than 1 year)	5	20	5.2 (IMR 0.05)*	1.7 - 12	
1-4 years	8	32	2.2	0.9 - 4.3	0.4
5-9 years	1	4	0.2	0.01 - 1.3	0.04
10-14 years	7	28	1.6	0.6 - 3.2	0.3
15-17 years	4	16	1.4	0.4 - 3.6	0.3
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	22	88	1.4	0.9 - 2.1	
Aboriginal and Torres Strait Islander	3	12	4.2	0.9 - 12.0	3.0
Remoteness					
Major cities	13	54	1.1	0.6 - 1.9	
Inner regional	6	25	1.8	0.6 - 3.8	1.6
Outer regional	4	17	3.7	1.0 - 9.4	3.3
Remote	1	4	12	0.3 - 68	11.0
Socioeconomic status					
High	13	52	1.4	0.7 - 2.4	
Low	12	48	1.4	0.7 - 2.4	1.0

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Deaths of children due to diseases of the nervous system occurred in all age groups, and were distributed across the age groups. However, the historical analysis revealed that all of the older age groups had significantly lower mortality rates than the infants.

Boys were somewhat more likely than girls to have diseases of the nervous system as an underlying cause of death, but given the small numbers, this was not statistically significant in 2010.

The mortality rate for Aboriginal children was higher than for non-Indigenous children, as shown in table 36, but the difference was not significant

Table 36: Aboriginal and Torres Strait Islander status of children who died due to diseases of the nervous system – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	8 (14.8)	7 (12.5)	7 (12.2)	9 (15.2)	1 (1.7)	3 (4.8)	11 (17.4)	5 (7.8)	4 (6.1)	3 (4.6)	3 (4.5)	0 (0)	1 (1.5)	3 (4.3)	3 (4.2)
Non-Indigenous	39 (2.6)	32 (2.1)	37 (2.4)	25 (1.6)	38 (2.5)	33 (2.1)	33 (2.1)	44 (2.9)	44 (2.9)	27 (1.8)	37 (2.4)	14 (0.9)	25 (1.6)	27 (1.7)	22 (1.4)

No significant differences in mortality rates were found for remoteness and socioeconomic status in 2010.

6.4.2 Leading causes of death from diseases of the nervous system

Table 37 below, shows the leading causes of death from diseases of the nervous system, divided by age group.

Children in the two youngest age groups most commonly died from atrophic disorders. These were all spinal muscular atrophy excepting one case of Huntington's disease. Common underlying causes of death in the youngest age groups were paralytic nervous disorders, usually cerebral palsy; and episodic/paroxysmal, all of which were epilepsy.

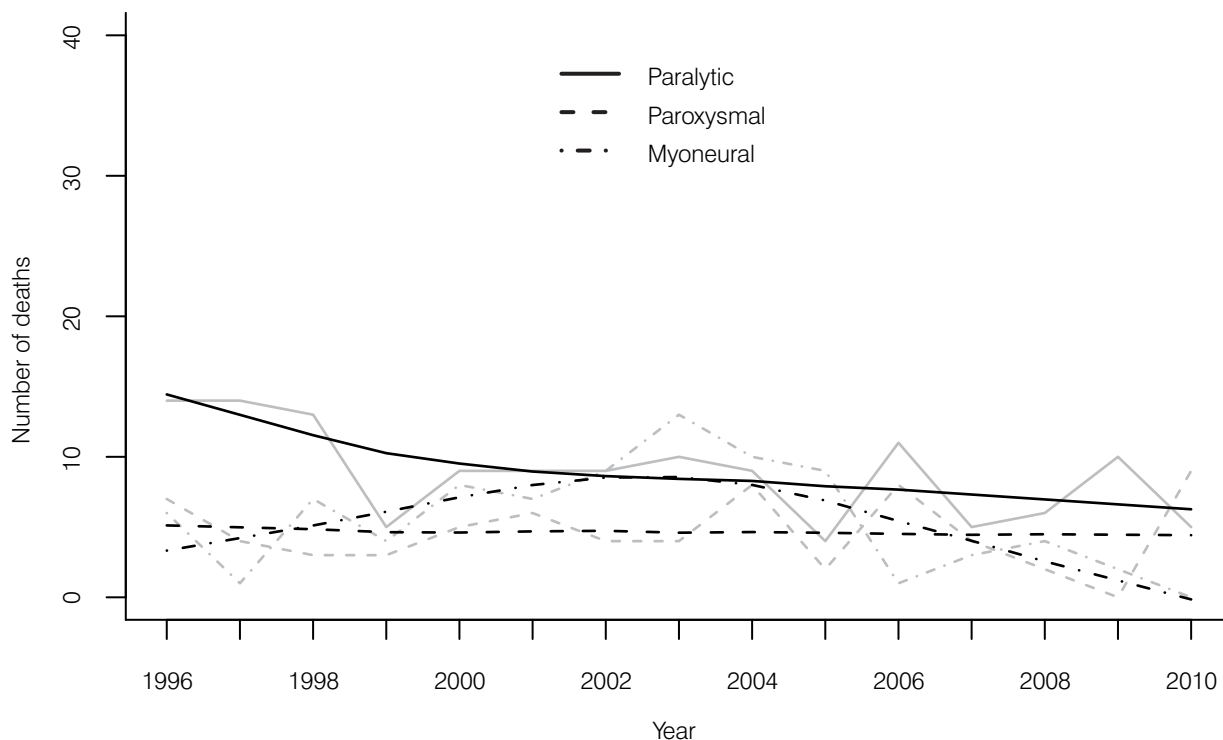
Table 37: Leading causes of deaths due to diseases of the nervous system by age - deaths of children registered 2010, number and (crude mortality rate)

Under 1 year	1 to 4 years	5 to 9 years	10 to 14 years	15 to 17 years
Atrophies 2 (2.1)	Atrophies 3 (0.8)	Degenerative 1 (0.2)	Epilepsy 5 (1.1)	Atrophies 1 (0.4)
Paralytic 1 (1.0)	Paralytic 2 (0.6)	-	Paralytic 1 (0.2)	Paralytic 1 (0.4)
Epilepsy 1 (1.0)	Epilepsy 2 (0.6)	-	Sleep apnoea 1 (0.2)	Degenerative 1 (0.4)
Anoxia 1 (1.0)	-	-	-	Cerebral oedema 1 (0.4)

Over the past 15 years, and across all age groups, as Figure 13 shows, the three most common types of nervous system disorder deaths have been Paralytic, including cerebral palsy; Myoneural, including muscular dystrophies; and Episodic/paroxysmal, including epilepsy.

The occurrence of deaths for all three disorders are highly variable, with little indication of a reliable trend in the past fifteen years.

Figure 13: Three leading causes of deaths due to diseases of the nervous system – deaths registered 1996 to 2010



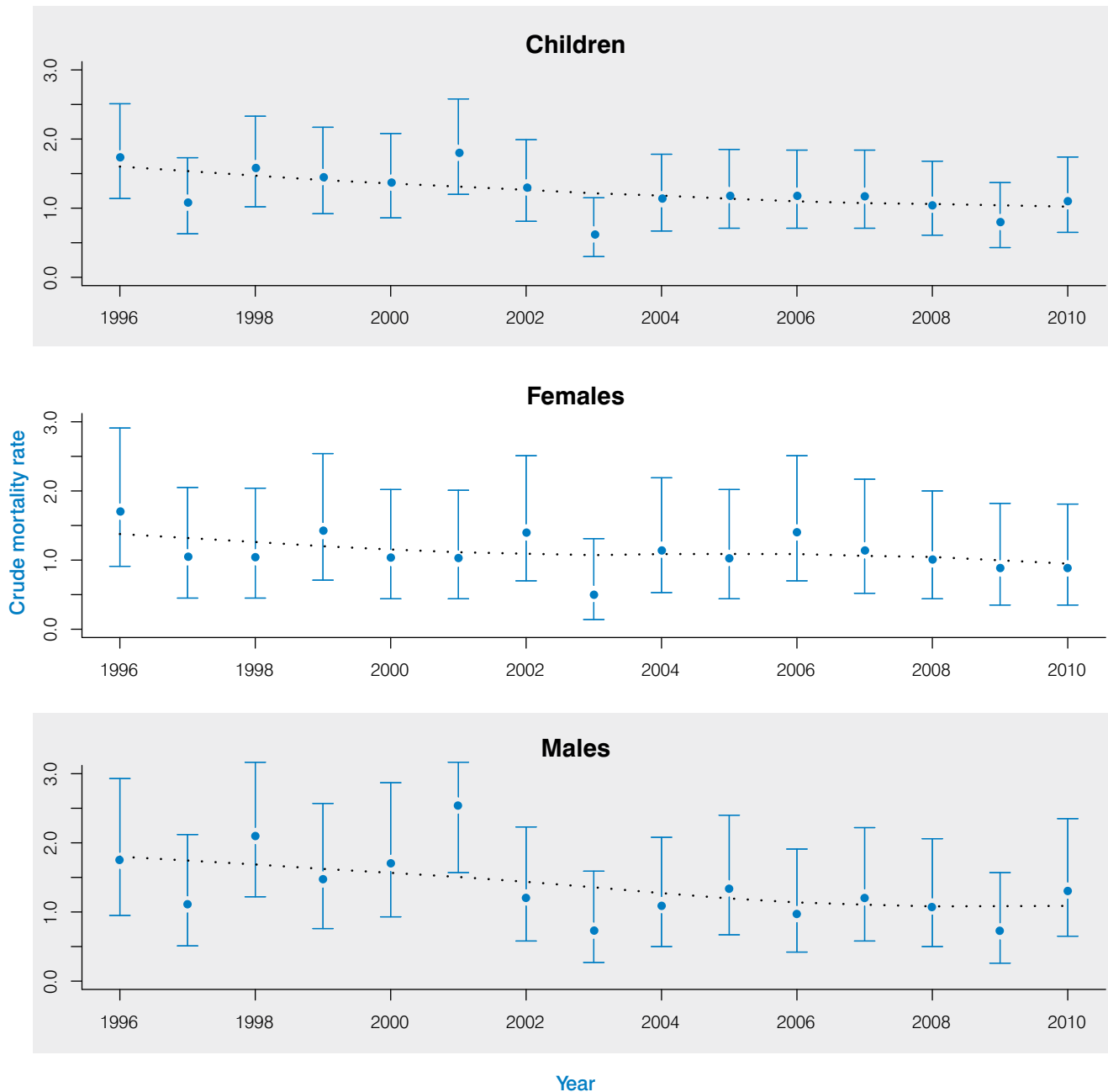
6.5 Deaths from diseases of the circulatory system

In 2010, eighteen children whose deaths were registered in NSW died as a result of disorders of the circulatory system.

Diseases of the circulatory system relate to a broad range of conditions such as cardiac and blood vessel malformations.

Figure 14 shows a significant decline in deaths due to diseases of the circulatory system since 1996.

Figure 14: Trends in deaths of children due to diseases of the circulatory system by gender – deaths registered 1996 to 2010



6.5.1 Demographic and individual characteristics

Table 38 gives an overview of the key demographic characteristics of the 18 children who died due to diseases of the circulatory system.

Table 38: Key demographic and individual characteristics – deaths of children due to diseases of the circulatory system registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	18	100	1.1	0.7 - 1.7	
Gender					
Female	7	39	0.9	0.4 - 1.8	
Male	11	61	1.3	0.7 - 2.4	1.5
Age					
Infants (less than 1 year)	5	28	5.2 (IMR 0.05)*	1.7 - 12	
1-4 years	2	11	0.6	0.1 - 2.0	0.1
5-9 years	3	17	0.7	0.1 - 2.0	0.1
10-14 years	3	17	0.7	0.1 - 2.0	0.1
15-17 years	5	28	1.8	0.6 - 4.1	0.3
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	17	94	1.1	0.6 - 1.6	
Aboriginal and Torres Strait Islander	1	6	1.4	0.04 - 7.9	1.3
Remoteness					
Major cities	10	56	0.8	0.4 - 1.6	
Inner regional	5	28	1.5	0.5 - 3.4	1.7
Outer regional	2	11	1.8	0.2 - 6.6	2.1
Remote	1	6	12.0	0.3 - 68	14.0
Socioeconomic status					
High	10	56	1.1	0.5 - 2.0	
Low	8	44	0.9	0.4 - 1.8	0.8

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Deaths of children due to diseases of the circulatory system occurred in all age groups, and were generally evenly distributed between the age groups except for infants. All older age groups had significantly lower mortality rates than infants in the historical analysis.

Of child deaths registered in 2010, boys were somewhat more likely than girls to have diseases of the circulatory system as an underlying cause of death, but given the small numbers, this was not statistically significant.

Table 39: Gender of children who died due to diseases of the circulatory system – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	13 (1.7)	8 (1.0)	8 (1.0)	11 (1.4)	8 (1.0)	8 (1.0)	11 (1.4)	4 (0.5)	9 (1.2)	8 (1.0)	11 (1.4)	9 (1.1)	8 (1.0)	7 (0.9)	7 (0.9)
Male	14 (1.7)	9 (1.1)	17 (2.1)	12 (1.5)	14 (1.7)	21 (2.5)	10 (1.2)	6 (0.7)	9 (1.1)	11 (1.3)	8 (1.0)	10 (1.2)	9 (1.1)	6 (0.7)	11 (1.3)
Children	27 (1.7)	17 (1.1)	25 (1.6)	23 (1.5)	22 (1.4)	29 (1.8)	21 (1.3)	10 (0.6)	18 (1.1)	19 (1.2)	19 (1.2)	19 (1.2)	17 (1.1)	13 (0.8)	18 (1.1)

The mortality rate for Aboriginal children was close to that for non-Indigenous children, and the difference was not significant.

Table 40: Aboriginal and Torres Strait Islander status of children who died due to diseases of the circulatory system – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	4 (7.4)	2 (3.6)	5 (8.7)	1 (1.7)	1 (1.7)	4 (6.5)	5 (7.9)	1 (1.6)	4 (6.1)	4 (6.1)	1 (1.5)	3 (4.4)	0 (0)	0 (0)	1 (1.4)
Non-Indigenous	23 (1.5)	15 (1)	20 (1.3)	22 (1.4)	21 (1.4)	25 (1.6)	16 (1)	9 (0.6)	14 (0.9)	15 (1)	18 (1.2)	16 (1)	17 (1.1)	13 (0.8)	17 (1.1)

No significant differences in mortality rates were found for remoteness and socioeconomic status in 2010.

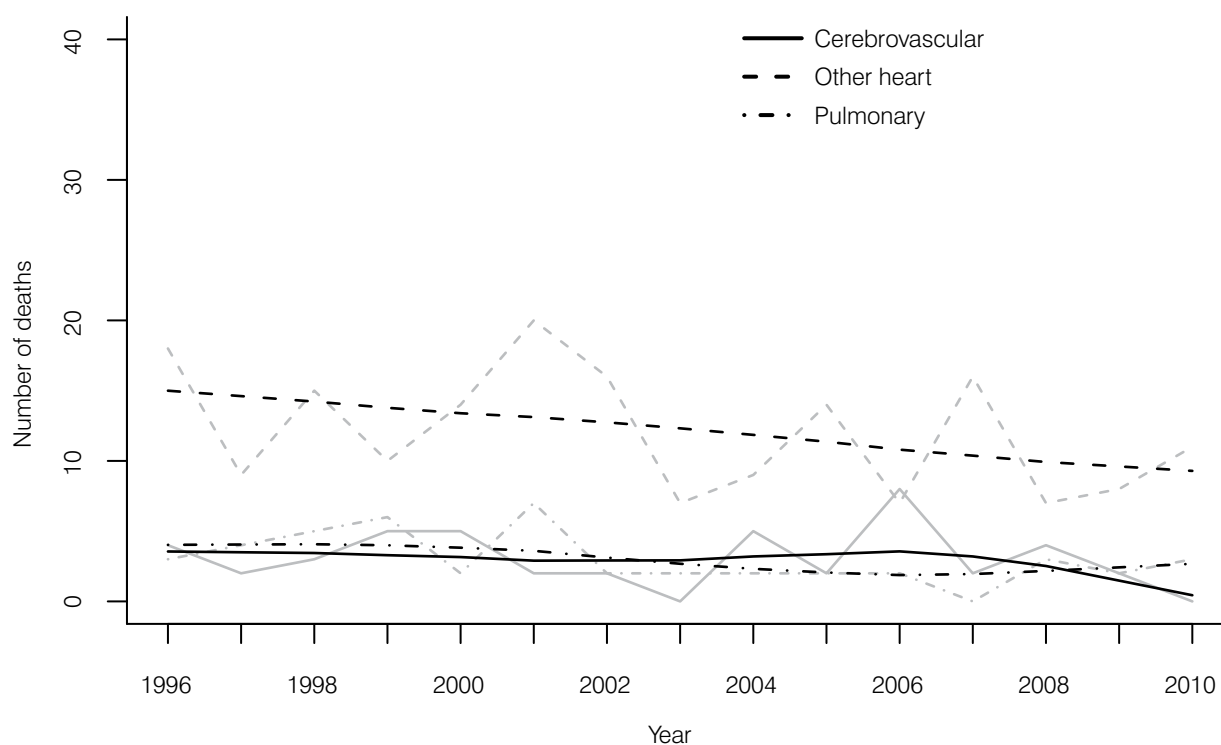
6.5.2 Leading causes of death from diseases of the circulatory system

Deaths from 'Other heart conditions' were the most common type of circulatory system disease for children whose deaths were registered in 2010, including cardiomyopathies, arrhythmias, cardiomegaly and one case each of infective myocarditis and unspecified cardiac arrest. This was followed by pulmonary heart conditions and ischaemic heart conditions. The number of deaths was not sufficient to break down by age group. Over the past 15 years, the three most common types of deaths due to diseases of the circulatory system have been:

- Other heart conditions
- Cerebrovascular diseases
- Pulmonary conditions

The number of deaths for all three types are highly variable. Deaths from pulmonary conditions have declined significantly, those from other heart conditions have declined marginally, and cerebrovascular diseases have shown no change.

Figure 15: Three leading causes of deaths due to diseases of the circulatory system – deaths registered 1996 to 2010



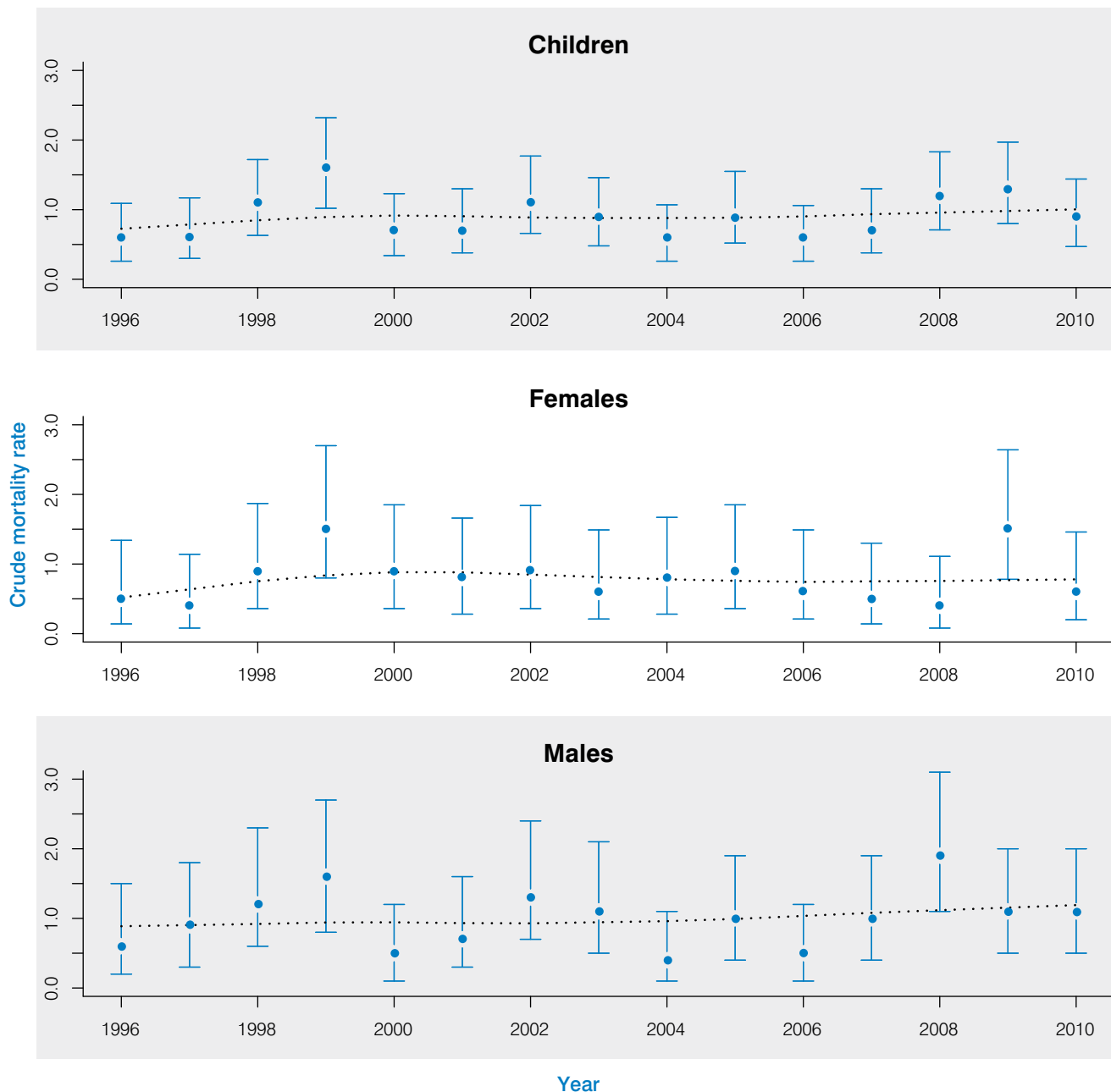
6.6 Deaths from endocrine, nutritional and metabolic diseases

In 2010, fourteen children whose deaths were registered in NSW died as a result of endocrine, nutritional or metabolic disease.

Endocrine, nutritional or metabolic diseases range from lactose intolerance to diabetes. Some of these conditions are easily treated, others produce lifelong disabilities or can be rapidly fatal. This category includes disorders of nutrition, but there were no deaths with these disorders recorded as the underlying cause in 2010.

Two hundred and fifteen deaths with underlying causes of endocrine, nutritional or metabolic disease occurred between 1996 and 2010. Although Figure 16 shows that there has been a slight increase in the yearly number of deaths in this category since 1996, this increase does not approach significance.

Figure 16: Deaths from endocrine, nutritional or metabolic diseases – deaths registered 1996 to 2010



6.6.1 Demographic and individual characteristics

Table 41 gives an overview of the key demographic characteristics of the 14 children who died due to endocrine and metabolic disease.

Table 41: Key demographic and individual characteristics – deaths of children due to endocrine or metabolic disease registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	14	100	0.9	0.5 - 1.4	
Gender					
Female	5	36	0.6	0.2 - 1.5	
Male	9	64	1.1	0.5 - 2.0	1.7
Age					
Infants (less than 1 year)	7	54	7.2 (IMR 0.08)*	2.9 - 15	
1-4 years	4	31	1.1	0.3 - 2.8	0.2
5-9 years	0	0			
10-14 years	0	0			
15-17 years	3	21	1.1	0.2 - 3.1	0.2
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	14	100	0.9	0.5 - 1.7	
Aboriginal and Torres Strait Islander	0	0			
Remoteness					
Major cities	11	79	0.9	0.5 - 1.7	
Inner regional	3	21	0.9	0.2 - 2.6	0.9
Socioeconomic status					
High	7	50	0.8	0.3 - 1.6	
Low	7	50	0.8	0.3 - 1.6	1.1

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Deaths of children due to endocrine or metabolic diseases only occurred in the youngest and oldest age groups, and most were recorded in the youngest age groups. All older age groups had significantly lower mortality rates in the historical analysis. The only death with an underlying cause of diabetes mellitus was recorded in the oldest age group.

Boys were somewhat more likely than girls to have endocrine, nutritional or metabolic diseases as an underlying cause of death, but given the small numbers, this was not statistically significant. No difference was found in the historical analysis.

Table 42: Gender of children who died due to endocrine, nutritional and metabolic diseases – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	4 (0.5)	3 (0.4)	7 (0.9)	12 (1.5)	7 (0.9)	6 (0.8)	7 (0.9)	5 (0.6)	6 (0.8)	7 (0.9)	5 (0.6)	4 (0.5)	3 (0.4)	12 (1.5)	5 (0.6)
Male	5 (0.6)	7 (0.9)	10 (1.2)	13 (1.6)	4 (0.5)	6 (0.7)	11 (1.3)	9 (1.1)	3 (0.4)	8 (1)	4 (0.5)	8 (1)	16 (1.9)	9 (1.1)	9 (1.1)
Children	9 (0.6)	10 (0.6)	17 (1.1)	25 (1.6)	11 (0.7)	12 (0.7)	18 (1.1)	14 (0.9)	9 (0.6)	15 (0.9)	9 (0.6)	12 (0.7)	19 (1.2)	21 (1.3)	14 (0.9)

The mortality rate for Aboriginal children was close to that for non-Indigenous children, and the difference was not significant.

Table 43: Aboriginal and Torres Strait Islander status of children who died due to endocrine, nutritional and metabolic diseases – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	0 (0)	4 (7.2)	3 (5.2)	5 (8.5)	0 (0)	1 (1.6)	2 (3.2)	1 (1.6)	0 (0)	4 (6.1)	1 (1.5)	2 (2.9)	0 (0)	0 (0)	0 (0)
Non-Indigenous	9 (0.6)	6 (0.4)	14 (0.9)	20 (1.3)	11 (0.7)	11 (0.7)	16 (1)	13 (0.8)	9 (0.6)	11 (0.7)	8 (0.5)	10 (0.6)	19 (1.2)	21 (1.3)	14 (0.9)

No significant differences in mortality rates were found for remoteness and socioeconomic status. No effects of remoteness were found in the historical analysis.

6.6.2 Leading causes of death from endocrine and metabolic diseases

All but one death in this category in 2010 were metabolic diseases. This has also been the case over the past fifteen years. The number of deaths was not sufficient to break down by age group.

6.7 Deaths from diseases of the respiratory system

In 2010, 12 children whose deaths were registered in NSW died as a result of diseases of the respiratory system. Respiratory diseases include conditions such as pneumonia and asthma.

6.7.1 Demographic and individual characteristics

Table 44 gives an overview of the key demographic characteristics of the 12 children who died due to diseases of the respiratory system.

Table 44: Key demographic and individual characteristics – deaths of children due to diseases of the respiratory system registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	12	100	0.7	0.4 - 1.3	
Gender					
Female	5	42	0.6	0.2 - 1.5	
Male	7	58	0.8	0.3 - 1.7	1.3
Age					
Infants (less than 1 year)	6	50	6.2 (IMR 0.06)*	2.3 - 14	
1-4 years	2	17	0.6	0.6 - 2.0	0.1
5-9 years	1	8	0.2	0.01 - 1.3	0.04
10-14 years	3	25	0.6	0.1 - 2.0	0.1
15-17 years	0	0			
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	11	92	0.7	0.4 - 1.3	
Aboriginal and Torres Strait Islander	1	8	1.4	0.04 - 7.9	2.0
Remoteness					
Major cities	7	58	0.6	0.2 - 1.2	
Inner regional	3	25	0.9	0.2 - 2.6	1.5
Outer regional	2	17	1.8	0.2 - 6.6	3.1
Socioeconomic status					
High	5	42	0.5	0.2 - 1.3	
Low	7	58	0.8	0.3 - 1.6	1.5

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Deaths of children due to diseases of the respiratory system occurred in all but the oldest age group. Most of the children (8) were less than five years old. In the historical analysis, all older groups had significantly lower mortality rates than infants.

The mortality rate for boys due to respiratory disease has been generally higher than that of girls over the fifteen years.

Table 45: Gender of children who died from diseases of the respiratory system – deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	10 (1.3)	9 (1.2)	8 (1.0)	9 (1.2)	5 (0.6)	5 (0.6)	5 (0.6)	8 (1.0)	7 (0.9)	2 (0.26)	5 (0.6)	5 (0.6)	9 (1.1)	4 (0.5)	5 (0.6)
Male	16 (2.0)	14 (1.7)	17 (2.1)	14 (1.7)	9 (1.1)	11 (1.3)	11 (1.3)	9 (1.1)	9 (1.1)	5 (0.6)	8 (1.0)	10 (1.2)	11 (1.3)	5 (0.6)	7 (0.8)
Children	26 (1.7)	23 (1.5)	25 (1.6)	23 (1.5)	14 (0.9)	16 (1.0)	16 (1.0)	17 (1.1)	16 (1)	7 (0.4)	13 (0.8)	15 (0.9)	20 (1.2)	9 (0.6)	12 (0.7)

For the 15 years from 1996, and as shown in table 46, the mortality rate for Aboriginal and Torres Strait Islander children due to respiratory diseases has been highly variable, but has been markedly higher than for non-Indigenous children, with the exception of 2009.

Table 46: Aboriginal and Torres Strait Islander status of children who died due to respiratory diseases - deaths registered 1996-2010 - number (crude mortality rate)

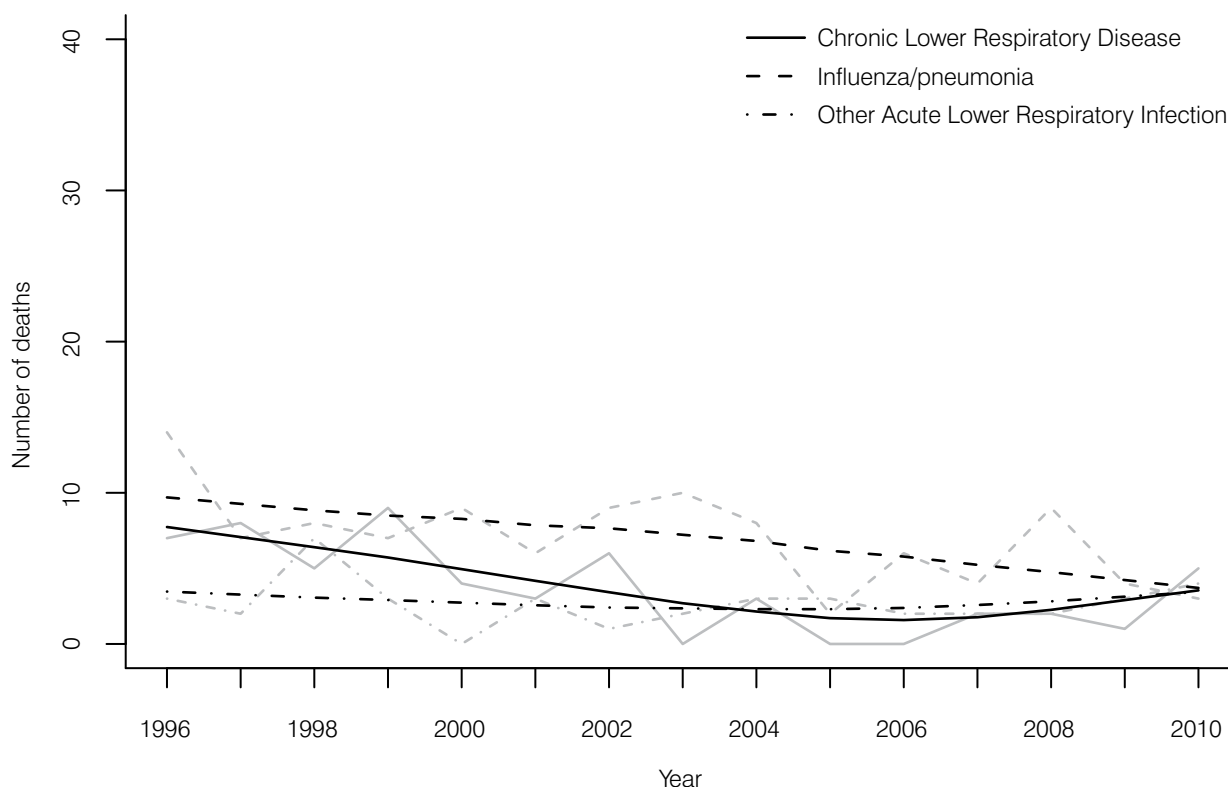
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	4 (7.4)	5 (9)	9 (15.6)	6 (10.2)	5 (8.3)	3 (4.8)	2 (3.2)	7 (10.9)	4 (6.1)	2 (3)	1 (1.5)	2 (2.9)	5 (7.3)	0 (0)	1 (1.4)
Non-Indigenous	22 (1.5)	18 (1.2)	16 (1)	17 (1.1)	9 (0.6)	13 (0.8)	14 (0.9)	10 (0.6)	12 (0.8)	5 (0.3)	12 (0.8)	13 (0.8)	15 (1)	9 (0.6)	11 (0.7)

6.7.2 Leading causes of death due respiratory diseases

The most frequent underlying cause of death due to respiratory diseases for children whose deaths were registered in 2010 was acute lower respiratory infections, including pneumonia. These accounted for almost two thirds of the deaths (seven children). Six of these children were infants between one and 11 months of age, and one child was aged 15 months. The average age of the children was just over six months.

For four children, the underlying cause of death was asthma. These children were aged four, six, eleven and fourteen years. The remaining child was thirteen years old and had an underlying cause of death of chronic obstructive pulmonary disease.

Figure 17: Three leading causes of death due to respiratory diseases – deaths registered 1996-2010



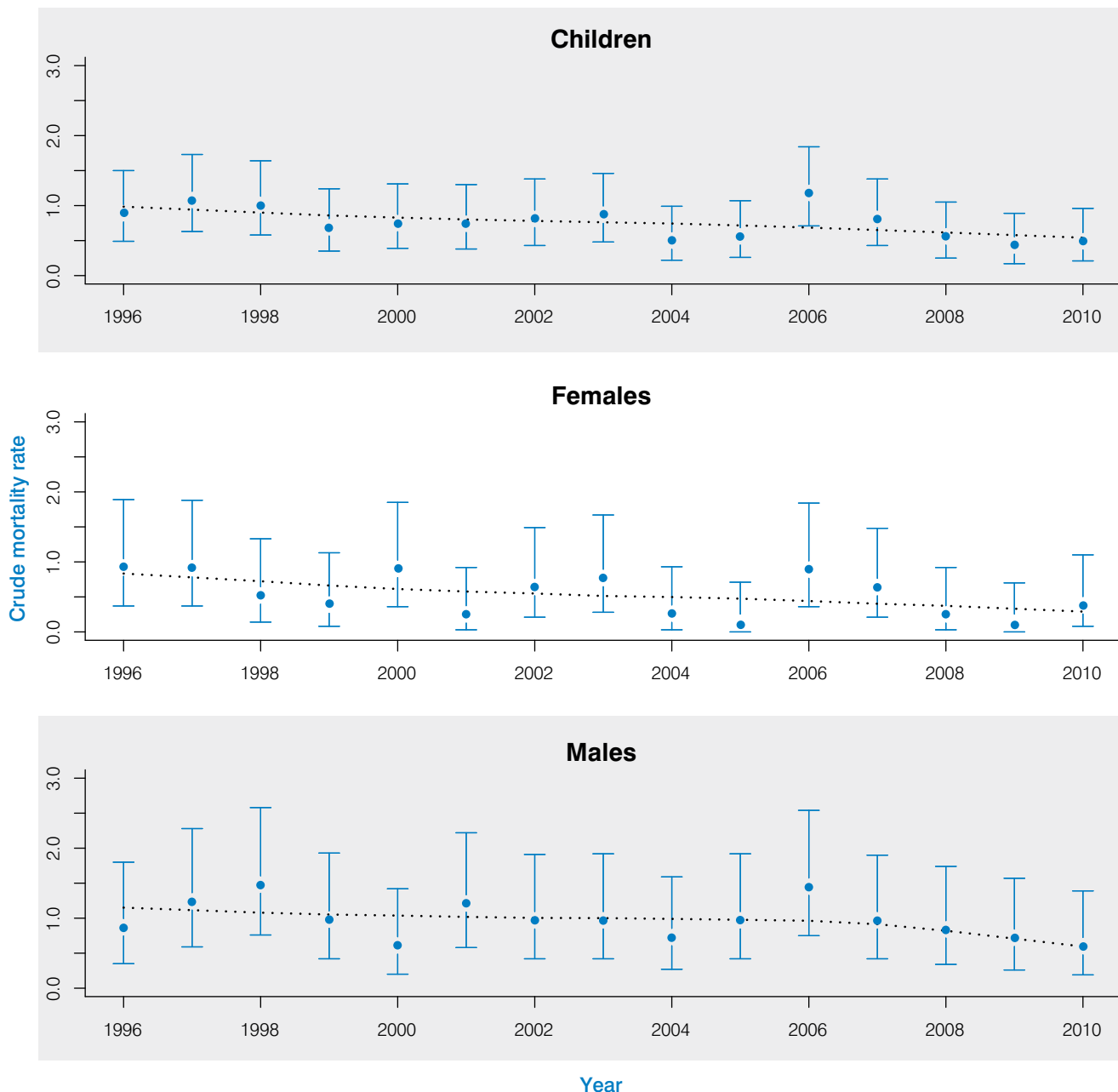
6.8 Deaths from certain infectious and parasitic diseases

In 2010, eight children whose deaths were registered in NSW died as a result of infection.

Infectious diseases are caused by organisms such as bacteria, viruses, parasites or fungi and can be passed directly or indirectly from person to person.³⁷ Examples of infectious diseases are septicaemia, gastroenteritis and meningococcal disease. There were no confirmed deaths from parasitic diseases registered in 2010.

In Australia, there has been a decrease in death due to infectious diseases over the past 30 years. This decrease is largely attributed to the vaccination program and advances in public health.³⁸ This is reflected in Figure 18, which shows a declining trend in child deaths from infection in NSW since 1996.

Figure 18: Trends in deaths due to infectious and parasitic diseases by gender – deaths registered 1996-2010



37 World Health Organisation 2011, *Infectious Diseases*, accessed via http://www.who.int/topics/infectious_diseases/en/

38 Australian Institute of Health and Welfare 2011, *Young Australians: their health and wellbeing 2011*, p 46, accessed www.aihw.gov.au/publication-detail/?id=10737419261 AIHW Canberra

6.8.1 Demographic and individual characteristics

Table 47 provides an overview of the key demographic characteristics of the eight children who died due to infectious diseases and whose deaths were registered in 2010.

Table 47: Key demographic and individual characteristics- deaths due to infectious and parasitic diseases in NSW 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	8	100	0.5	0.2 - 1.0	
Gender					
Female	3	38	0.4	0.1 - 1.1	
Male	5	62	0.6	0.2 - 1.4	1.6
Age					
Infants (less than 1 year)	4	50	4.2 (IMR 0.04)*	2.3 - 14	
1-4 years	3	38	0.8	0.2 - 2.4	0.2
5-9 years	1	12	0.2	0.01 - 1.3	0.06
10-14 years	0	0			
15-17 years	0	0			
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	8	100	0.5	0.2 - 1.0	
Aboriginal and Torres Strait Islander	0	0			
Remoteness					
Major cities	6	75	0.5	0.2 - 1.1	
Inner regional	1	13	0.3	0.01 - 1.6	0.6
Outer regional	1	13	0.9	0.02 - 5.1	1.8
Socioeconomic status					
High	3	38	0.3	0.7 - 0.9	
Low	5	62	0.6	0.2 - 1.3	1.8

* IMR (Infant Mortality Rate)

Age, gender and Torres Strait Islander status

All of the children were aged less than 10 years, and most (seven) were less than five years of age. Males were more likely to die from infectious diseases than females. As table 48 shows, this has been the case consistently since 1996.

Table 48: Gender of children who died from infectious and parasitic diseases, deaths registered 1996 – 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	7 (0.9)	7 (0.9)	4 (0.5)	3 (0.4)	7 (0.9)	2 (0.3)	5 (0.6)	6 (0.8)	2 (0.3)	1 (0.1)	7 (0.9)	5 (0.6)	2 (0.3)	1 (0.1)	3 (0.4)
Male	7 (0.9)	10 (1.2)	12 (1.5)	8 (1.0)	5 (0.6)	10 (1.2)	8 (1.0)	8 (1.0)	6 (0.7)	8 (1.0)	12 (1.5)	8 (1.0)	7 (0.8)	6 (0.7)	5 (0.6)
Children	14 (0.9)	17 (1.1)	16 (1.0)	11 (0.7)	12 (0.8)	12 (0.7)	13 (0.8)	14 (0.9)	8 (0.5)	9 (0.6)	19 (1.2)	13 (0.8)	9 (0.6)	7 (0.4)	8 (0.5)

In 2010, no Aboriginal or Torres Strait Islander children had an underlying cause of death of infectious or parasitic disease. As illustrated in table 49, for the 15 years from 1996, the mortality rate of Aboriginal and Torres Strait Islander children from infectious or parasitic diseases has been highly variable, but has been comparable to that of non-Indigenous children in recent years.

Table 49: Aboriginal and Torres Strait Islander status of children who died due to infectious or parasitic diseases in NSW, 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Aboriginal and Torres Strait Islander	3 (5.6)	3 (5.4)	4 (7)	0 (0)	0 (0)	1 (1.6)	2 (3.2)	6 (9.3)	0 (0)	4 (6.1)	1 (1.5)	1 (1.5)	0 (0)	1 (1.4)	0 (0)
Non-Indigenous	11 (0.7)	14 (0.9)	12 (0.8)	11 (0.7)	12 (0.8)	11 (0.7)	11 (0.7)	8 (0.5)	8 (0.5)	5 (0.3)	18 (1.2)	12 (0.8)	9 (0.6)	6 (0.4)	8 (0.5)

No differences in mortality rates were found for remoteness of residence and socioeconomic status.

6.8.2 Leading causes of death due to infectious and parasitic diseases

The most frequent underlying cause of death due to infectious disease was septicaemia, with two cases due to *Streptococcus sp.* and one to *Staphylococcus aureus*.

Notifiable diseases

To assist in control of infectious diseases, certain communicable diseases are required to be notified to NSW Health under the *Public Health Act 1991 (NSW)*. In 2010, one child died due to a notifiable disease (meningococcal disease – type unspecified).

6.9 Deaths from other natural causes

In 2010, 10 children whose deaths were registered in NSW died as a result of other natural cause conditions.

The most common were diseases of the blood, blood-forming organs, and immune system (four of the 10 children). All were boys, three of whom were less than three years of age. In the younger boys, a variety of influences had contributed to their deaths, including infections and in the youngest, prematurity. The oldest boy, almost sixteen, suffered from an unspecified immune disorder, aplastic anaemia and a viral infection.

Disorders of the digestive system were the underlying cause of death in two cases, both very young boys. Both apparently died from hepatic failure, with one having obstruction of the bile duct as the underlying cause.

Disorders of the musculoskeletal system also accounted for two cases, again both boys. The older teenage boy had staphylococcal arthritis as the underlying cause and died from staphylococcal pneumonia, while the younger child, aged eight years, had an unspecified muscle disorder and died from hypokalaemia.

One teenage girl had an underlying cause of death of unspecified renal failure, complicated by hyperkalaemia, cardiac arrest and a metabolic disorder.

Another girl aged 12 years suffered from Rett syndrome and died from unspecified bronchopneumonia and hyperostosis (excessive bone growth).

Overall, these children tended to have chronic conditions that were often life-threatening in themselves, and they died as a result of disparate combinations of conditions.

Chapter 7. Deaths of infants and Sudden Unexpected Death in Infancy (SUDI)

7.1 Deaths of infants

In 2010, the deaths of 364 infants under one year of age were registered in NSW, representing the majority of all child deaths in NSW. Fifty (14 per cent) of these deaths were Sudden Unexpected Death in Infancy (SUDI).

SUDI is not a cause of death, but a classification to enable the consideration of deaths of otherwise normal babies who, for unknown reasons, do not survive.³⁹

The deaths of twelve of the infants will be reviewed as a reviewable death by the Ombudsman. Nine of the infant deaths are considered to be related to neglect, and the deaths of another three infants are reviewable deaths because the infants were in care. Table 50 provides an overview of the key demographic characteristics all infants who died in 2010.

Table 50: Key demographic and individual characteristics – deaths of infants from all causes in NSW 2010

	Number	Percent	Infant Mortality Rate ⁴⁰	95% Confidence Interval	Incident Rate Ratio
Total	364	100	3.9	3.5 - 4.4	
Gender					
Female	147	40	3.3	2.7 - 3.8	
Male	217	60	4.6	4.0 - 5.2	1.4
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	316	87	3.6	3.2 - 4.0	
Aboriginal and Torres Strait Islander	48	13	11.6	8.6 - 15.4	3.3
Remoteness					
Major cities	234	64	4.2	3.7 - 4.8	
Inner regional	84	23	3.1	2.5 - 3.9	0.7
Outer regional	42	12	4.8	3.4 - 6.5	1.1
Remote	4	1	3.9	1.1 - 10.1	0.9
Socioeconomic status					
High	153	42	3.4	2.9 - 4.0	
Low	211	58	4.4	3.8 - 5.1	1.3

Table 51 shows that the most common causes of death for infants were perinatal conditions, that is, conditions that arise around the time of childbirth and affect the newborn baby, and congenital malformations and chromosomal abnormalities. Both these causes of death are considered separately in the relevant sections.⁴¹

Deaths of infants due to causes other than perinatal or congenital malformations and chromosomal abnormalities fall broadly into two major groups: injury related deaths and those due to ill-defined conditions. Both categories are loosely defined. Injury related deaths include, for example, those due to fatal assault, drowning, transport incidents, fires or falls. Ill-defined conditions include Sudden Infant Death Syndrome (SIDS) and other causes such as unspecified respiratory failure and ill-defined cancer sites.

Of child deaths registered in 2010, injury-related deaths accounted for approximately three per cent of all infant deaths, and include deaths due to unintentional suffocation (6), fatal assault (1), drowning (1), complications following medical treatment (1), and transport incidents (2). Infant deaths due to ill-defined conditions included 10 deaths classified as Sudden Infant Death

39 Queensland Commission for Children and Young People and Child Guardian 2010, *Annual report deaths of children and young people Queensland 2009 – 2010*, Commission for Children and Young People and Child Guardian, Brisbane, p137

40 IMRs are calculated per 1000 live births in 2009

41 Causes of death for 32 infants are pending coronial investigation

Syndrome (SIDS), of which there are a number of sub-classifications (see appendix 4). Ill-defined conditions accounted for approximately three per cent of all infant deaths registered in 2010. Deaths classified as SIDS and those due to accidental suffocation are both included in the group of infant deaths reported as SUDI.

Males are overrepresented in infant deaths, but only in perinatal, ill-defined and injury deaths relating to external causes.

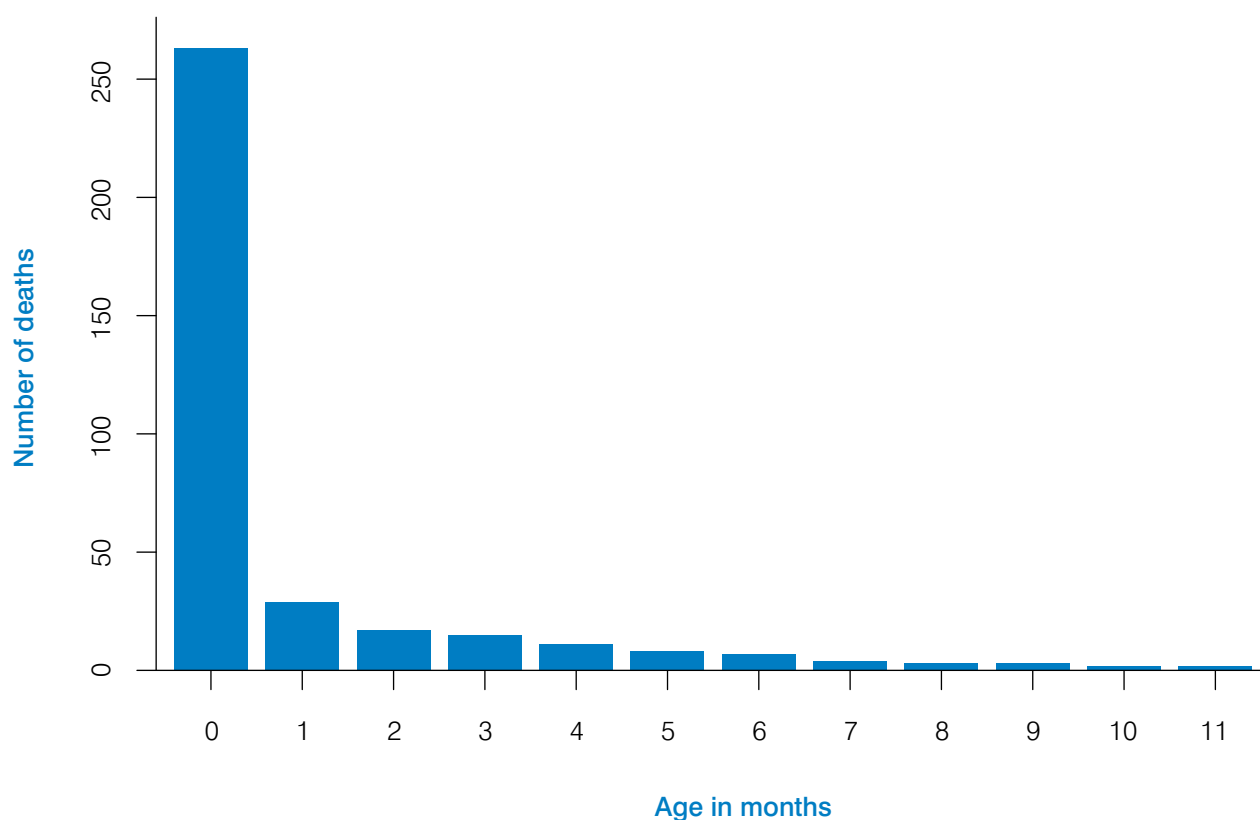
Table 51: Ten leading causes of infant death registered in 2010

ICD chapter (Code range)	No. of deaths			CMR*
	Female	Male	Total	
Perinatal (P00-P96)	71	110	181	2.0
Congenital/chromosomal (Q00-Q99)	49	50	99	1.1
Ill-defined (R00-R99)	2	8	10	0.1
Injury/External causes (S00-Y98)	4	7	11	0.1
Endocrine/metabolic (E00-E90)	2	5	7	0.08
Respiratory system (J00-J99)	4	2	6	0.06
Nervous system (G00-G99)	2	3	5	0.05
Circulatory system (I00-I99)	2	3	5	0.05
Infectious/parasitic diseases (A00-B99)	1	3	4	0.04
Neoplasms (C00-D48)*	0	1	1	0.01

* Diseases of the digestive system also accounted for one death

Figure 19 shows that the largest number of deaths occurred among infants less than one month old. Perinatal conditions and congenital malformations or chromosomal abnormalities accounted for 96 percent of these deaths. Deaths due to these causes decrease rapidly to average less than 25 percent of deaths for infants older than four months.

Figure 19: Age distribution (months) of infants who died 2010



7.2 Sudden Unexpected Death in Infancy

7.2.1 Defining Sudden Unexpected Death in Infancy

As SUDI is not a standardised classification, there is variation within Australia and internationally as to how it is defined. Not all definitions, for example, include neonates.

Most SUDI deaths are attributed to Sudden Infant Death Syndrome (SIDS) or a fatal sleep accident.⁴² SIDS is a category of SUDI and is a diagnosis of exclusion. In 2004, the first Australian Sudden Infant Death Syndrome Pathology Workshop in Canberra led to a broadly accepted national definition of SIDS:

*The sudden and unexpected death of an infant under 1 year of age, with onset of the lethal episode apparently occurring during sleep, that remains unexplained after a thorough investigation including performance of a complete autopsy, and review of the circumstances of death and the clinical history.*⁴³

As noted, there are a number of sub-classifications of SIDS (see appendix 4).

Since 2009, the Team has used the following definition of SUDI:

Where an infant less than one year of age dies suddenly and unexpectedly. Included in SUDI are:

- Deaths that were unexpected and unexplained at autopsy (ie those meeting the criteria for Sudden Infant Death Syndrome)
- Deaths occurring in the course of an acute illness that was not recognised by carers and/or by health professionals as potentially life threatening
- Deaths arising from a pre-existing condition that had not been previously recognised by health professionals
- Deaths resulting from accident, trauma or poisoning where the cause of death was not known at the time of death.

The Team has specifically excluded from this definition infants who died unexpectedly in misadventures due to external injury where the cause of death was known at the time of death (such as transport incidents and accidental drowning), and deaths that occurred in the course of a known sudden acute illness in a previously healthy infant.

Prior to 2009, the Team restricted the SUDI definition to infants who had been placed for sleep. This is the case for the majority of SUDI.

Table 52 shows that the number of SUDI deaths recorded in the child death register for 1996 was much higher than in subsequent years. If this outlying figure is excluded, the decline in SUDI over the past 14 years remains significant. However, there has been no significant change in the rate of SUDI since 2004.

Table 52: Number of SUDI neonatal and post-neonatal by year, child deaths registered 1996 to 2010*

Year	Neonates	Post neonates	Total
1996	15	89	104
1997	12	53	65
1998	10	48	58
1999	8	60	68
2000	9	67	76
2001	12	50	62
2002	6	54	60
2003	12	47	59
2004	4	46	50
2005	10	45	55
2006	6	52	58
2007	11	57	68
2008	8	38	46
2009	5	39	44
2010	10	40	50
Total SUDI	138	785	918
Total deaths	4,254	5,489	9743
%SUDI	3.2	14.2	9.4

*Information in this table prior to 2010 has been drawn from published Team data

42 SIDS and Kids accessed <http://www.sidsandkids.org/research/sids-and-kids-facts-figures/>

43 Krous, Henry F et al 2004, Sudden Infant Death Syndrome and unclassified sudden infant deaths: A definitional and diagnostic approach, in *Pediatrics* 200; 114; 234.

7.2.2 Demographic and individual characteristics

Table 53: Key demographics and individual characteristics – SUDI registered in 2010

	Number	Percent	Infant Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	50	100	0.5	0.4 - 0.7	
Gender					
Female	17	34	0.4	0.2 - 0.6	
Male	33	66	0.7	0.5 - 1.0	1.8
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	39	78	0.4	0.3 - 0.6	
Aboriginal and Torres Strait Islander	11	22	2.7	1.3 - 4.8	6.0
Remoteness					
Major cities	25	52	0.5	0.3 - 0.7	
Inner regional	13	27	0.5	0.3 - 0.8	1.1
Outer regional	8	17	0.9	0.4 - 1.8	2.0
Remote	2	4	2.0	0.2 - 7.1	4.4
Socioeconomic status					
High	17	35	0.4	0.2 - 0.6	
Low	33	65	0.7	0.5 - 1.0	1.8

Age, gender and Aboriginal and Torres Strait Islander status

The fifty infants who died suddenly and unexpectedly and whose deaths were registered in 2010 ranged in age from less than one day to 334 days. Ten infants were neonates aged less than 28 days, and five of these babies were less than one week old. The age range of the infants who died is broadly consistent with SUDI in previous years in NSW. Since 1996, neonatal SUDI deaths have comprised approximately 15 per cent of all SUDI in NSW.

Two thirds (33) of the infants were male. This is consistent with previous years and is broadly representative of the proportions seen in most categories of child death.

Nine of the infants were Aboriginal, and two were Torres Strait Islander children.

Gestational age

Prematurity is a recognised SUDI risk factor.⁴⁴ In NSW over the period 1992 to 2006, rates of prematurity varied between 6.3 per cent and 7.4 per cent of all births.⁴⁵ In comparison, information available to the Team for SUDI in NSW since 1996 shows that around 22 per cent were infants with a gestational age of less than 37 weeks. A small number of SUDI each year were babies born less than 28 weeks gestation (between one and four infants each year).

Information on gestational age is available for 42 infants who died suddenly and unexpectedly and whose deaths were registered in 2010. Forty percent of these infants were born premature, that is, at less than 37 weeks gestation:

- ▶ Three infants were born extremely premature, between 24 and 26 weeks gestation
- ▶ Fourteen infants were born between 32 and 36 weeks gestation.
- ▶ Twenty five infants were born at 37 or more weeks gestation.

Socioeconomic status

Overall, the incidence of SUDI deaths of infants residing in lower socioeconomic areas was twice that of those residing in higher socioeconomic areas. However, this difference did not achieve statistical significance.

44 Sullivan FM, Barlow SM 2001, Review of risk factors for Sudden Infant Death Syndrome, in *Paediatric Perinatal Epidemiology* 15 (2): 144–200.

45 NSW Health, Prematurity and Low Birth Weight, accessed at http://www.health.nsw.gov.au/publichealth/chorep/mum/mum_premilbwage.asp

Remoteness

The incidence of SUDI deaths was higher in more remote areas, but again the overall trend did not achieve statistical significance.

Child protection history

Seventeen of the infants who died suddenly and unexpectedly had been the subject of a report of risk of harm or report of risk of significant harm to Community Services prior to their death. Seven of these infants were the subject of a pre-natal report. A pre-natal report may be made to Community Services if there are concerns an unborn child may be at risk of significant harm after his or her birth. Seven of the 17 infants had also been the subject of a report to a Child Wellbeing Unit.

An additional six infants had not been the subject of a report to Community Services themselves, but had a sibling who had been.

For the 23 infants and/or their siblings, the risks most frequently reported included:

- ▶ exposure to domestic violence (14 families)
- ▶ parent/carer drug and alcohol use (10 families)
- ▶ physical harm and risks associated with physical harm (10 families)
- ▶ parent/carer mental health and emotional state (8 families)
- ▶ inadequate shelter or homelessness (6 families)
- ▶ neglect (6 families).

One infant was reported to Community Services regarding failure to thrive. For another three infants, concerns were raised in reports about medical treatment that was not being provided.

7.2.3 Cause of death

At the time of writing, Coronial information on cause of death was available for 24 of the 50 infants who died suddenly and unexpectedly.⁴⁶

Explained SUDI

The cause of death for 14 infants was identified after a comprehensive autopsy and examination of the circumstances of the death. Three of the infants were neonates.

Six of the 14 infants died due to unintentional suffocation. None of the six were neonates. The sleep environment for these infants is described below:

- ▶ An infant was placed for sleep on his side in a portable cot that contained excessive bedding and toys.
- ▶ An infant was placed for sleep on his stomach in a cot with a blanket and sheet wrapped over the foam mattress and with a loose blanket at the end of the cot.
- ▶ An infant was placed for sleep on a single bed mattress on the floor with another single mattress lying adjacent and some inches higher. There was a pillow under the infant's head and rolled-up bedding against the infant's back. The infant was found face down between the two mattresses.
- ▶ An infant was placed on the side for sleep on a sofa bed, with pillows around the mattress and another mattress up against the sofa bed, to prevent the infant falling. The infant was found lying face down in the gap between the two mattresses.
- ▶ A parent fell asleep while sitting upright on a lounge with the infant lying face down on the parent's chest. The infant was found wedged between the parent's body and the back of the lounge.
- ▶ An infant was lying in the crook of a parent's arm and co-sleeping in a queen sized bed with both parents.

Eight of the 14 infants, including three neonates, died due to an illness, abnormality or disease that was not recognised as life threatening prior to the infant's death. The cause of death included congenital malformations or chromosomal abnormalities (four), diseases of the respiratory system (pneumonia/acute bronchiolitis) (two), and diseases of the circulatory system (endocardial fibroelastosis, infective myocarditis) (two).

In four of the eight cases, it appears that symptoms of serious illness in the infant were unrecognised prior to their deaths.

⁴⁶ Forensic investigation was incomplete for 26 of the sudden and unexpected infant deaths, including six neonates

Two neonatal infants were found at autopsy to have died due to heart defects which were previously undetected. The mothers of both infants had received antenatal care and gave birth to the infants in public hospitals. Both babies had signs of being unwell in the week prior to their death, but no serious health concerns were identified by hospital staff who assessed them.

The other two infants had also recently been examined by general medical practitioners, but again, no health concerns requiring treatment were identified. Both babies had pneumonia.

Unexplained SUDI

For 10 infants, the cause of death remained unexplained after a comprehensive autopsy and examination of the circumstance of the death. One infant was a neonate. In all ten cases, the cause of death has been classified as Sudden Infant Death Syndrome, including the following sub-classifications:

- Category II SIDS (6 infants)
- Consistent with SIDS (2 infants)
- Category IIB SIDS (1 infant)
- Unclassified SIDS (1 infant).

Appendix 4 provides details of these different classifications.

7.2.4 Circumstances of death

Season of death

For deaths registered in 2010, SUDI was more common during autumn (17; 34%) than during other seasons. This is different to deaths registered in NSW in previous years, where the incidence of SUDI was usually higher in winter.

Where the incident occurred

The majority (38) of incidents leading to the sudden and unexpected death of an infant occurred in the infant's usual home. This includes two infants who were in foster care and an infant who lived with relatives by informal family agreement.

For 12 infants, the incident leading to death occurred in other places:

- In four cases, the family was transient and/or had recently moved including two cases where the family was staying with relatives.
- Another five incidents occurred at the home of a relative or friend while the infant's family were visiting. Two of these incidents occurred in the context of a large family gathering.
- An infant who was in care died while in the unauthorised care of the parents.
- One infant died in a hospital maternity ward while co-sleeping.
- In one case, it is unclear from available records in whose home the incident occurred.

Recent infant illness

The Team monitors sudden unexpected deaths in infancy to identify recent illness and medication use and has done so since 2002. Available records indicate that 23 of the 50 infants who died suddenly and unexpectedly had suffered an illness in the two weeks prior to death. This represents almost half of all SUDI in NSW registered in 2010.

The range of illness and symptoms these infants displayed include upper respiratory tract infection (13), breathing difficulties (2), thrush (2), colic (2) and generalised symptoms of being unwell (10), such as vomiting, constipation, diarrhoea, wheezing, fever and cough. Some infants displayed a combination of illness and symptoms.

Eleven of the infants had been treated with a range of prescribed and over-the-counter medications, including paracetamol (9), Nilstat (Nystatin) (2), Infacol (Simethicone) (1), Coloxyl (1), Omeprazole (1), potassium chloride (1), and a multivitamin (1).

Other infant illness

Six infants had experienced other health problems, although there was no identified illness in the two weeks prior to their death. Three infants who were born prematurely were also born methadone dependent (2) and/or tested positive at birth to cannabis (3). Two of these infants received treatment for neonatal abstinence syndrome and both also had a recent cough/cold.

Another infant was hospitalised six weeks before death with bronchiolitis and Right Upper Lobe pneumonia, but was not in hospital at the time of death. This infant was born extremely premature (26 weeks gestation) and had a recent cough.

Two infants had chronic health conditions from birth, one due to extreme prematurity and one due to a congenital cardiac problem.

Toxicology

At the time of reporting, autopsy findings and post mortem toxicology results were available for 24 infants. Toxicology results (excluding drugs used for resuscitation) revealed the following in relation to four infants:

- ▶ Paracetamol was detected in two infants, at a range within therapeutic levels.
- ▶ Diphenhydramine was detected in one infant. This substance is found in Benadryl and some other over the counter medications. It is not recommended for use in children under two years of age and it has potentially sedating effects. Diphenhydramine is excreted in breast milk⁴⁷; however, this baby was not breast fed. The significance of the presence of the drug is unclear as laboratory testing could not quantify the level of the drug. The forensic pathologist noted that *'The inability of the toxicology laboratory to quantify the levels of the drug means the drug could be a significant contributor to the death, and potentially a cause, although it may also be at such low levels as to be of minimal relevance in this case'*.
- ▶ Cannabis was detected in one infant, at a very low level. The forensic pathologist noted that *'this could have resulted from being in a room heavy with smoke from cannabis or directly from the mother's breast milk, had she been using cannabis recreationally'*. The pathologist remarked that the presence of cannabis was not considered contributory to the infant's death.

7.2.5 Risk factors associated with SUDI

Many of the maternal, infant and socio-demographic risk factors for SIDS are common to SUDI and fatal sleep accidents.⁴⁸

Providing a safe sleeping environment for infants involves putting the baby on the back for sleep from birth, making sure the baby's head remains uncovered during sleep and providing a smoke-free environment before and after birth.⁴⁹ The risks associated with co-sleeping are increased in particular circumstances, including where the adult has consumed alcohol and/or illicit drugs or has taken other drugs which may cause heavy sleeping. Co-sleeping with a baby may increase the risk of SIDS if the baby is younger than four months or if the adult smokes or if the adult sleeps on a couch/sofa/lounge.⁵⁰

The SIDS and Kids Safe Sleeping campaign recommends babies sleep in their own safe sleeping environment next to the parent's bed for the first six to 12 months of life. A cot that meets Australian standards, a mattress that is firm, clean and the right size for the cot and bedding that is not loose and will not cover the baby's head is recommended.⁵¹

Modifiable risk factors

At the time of the incident which led to death, records indicated that 47 of the 50 infants had at least one factor present in their sleep environment that could be considered unsafe. These factors included inappropriate bedding, prone or side sleep position and exposure to tobacco smoke.

More than half (27) of the fifty infants were exposed to tobacco smoke, either during pregnancy or after their birth or both.⁵² A high level of exposure of infants who died suddenly and unexpectedly to tobacco smoke has been a consistent finding of the Team since 2003.

For 47 of the 50 infants, the incident that led to death occurred during sleep. Eight of the infants were neonates. In relation to these infants:

- ▶ Twenty-two infants were sleeping in a bed that was not infant-specific, for example an adult bed or mattress or a bed suitable for older children.
- ▶ Sixteen infants were sleeping in fixed infant-specific bedding, either a cot (9) or a bassinet/crib (7).
- ▶ Seven infants were sleeping on sofas or lounges.
- ▶ Two infants were sleeping in portable infant bedding, such as a travel cot.

47 eMIMS, July 2011

48 Queensland Health 2008, *Safe infant care to reduce the risk of Sudden Unexpected Deaths in Infancy – policy statement and guidelines*, Queensland government, p 6

49 NSW Health 2005, *Sudden Infant Death Syndrome (SIDS) and safe sleeping for infants*, p 1 accessed http://www.health.nsw.gov.au/policies/gl/2005/pdf/GL2005_063.pdf

50 Ibid p 3

51 SIDS and Kids Safe Sleeping accessed <http://www.sidsandkids.org/safe-sleeping/>

52 Information on exposure to tobacco smoke was not available for five infants

Sleep position

Information on sleep position was available for 43 of the 47 infants whose death resulted from a sleep incident.

Around two thirds of the infants (28) were placed for sleep on their back. This is generally consistent with data collected by the Team for SUDI since 2003.

Five infants who were placed on their back for sleep were found on their front and four were found on their side. These infants ranged in age from two to 11 months.

Fifteen infants were placed on their side (13) or their front to sleep (2). Six of the infants placed on their side were found on their front.

Loose bedding

Loose bedding was present in the sleep environment of 40 infants, including five neonates.⁵³ Fifteen of the infants were co-sleeping.

The loose bedding in the sleep environment was typically a pillow (27). In 19 cases, a pillow was present together with other loose bedding, such as a blanket and/or doona. Six infants were sleeping with a loose blanket or blankets, and two infants were sleeping with a quilt or doona. Five infants were sleeping with other loose objects, such as a soft toy or toys.

Co-sleeping

Co-sleeping has been a consistently identified factor in SUDI where infants were placed for sleep. Almost half of the infants who died in sleep incidents were co-sleeping (20 of 47 infants). Five of these infants were neonates.

Seventeen of the infants were co-sleeping with adults; eleven with one adult and six with two adults. The other three infants were sleeping with an adult together with one or more siblings.

Fourteen infants were co-sleeping on an adult bed or mattress, including one infant who was in a hospital bed, and six infants were co-sleeping on a sofa or lounge. In the majority of cases (12), it appears the parent/s intended to co-sleep with their baby. Records indicate that for five infants, the parent/s did not intend to co-sleep with the infant, but unintentionally fell asleep while feeding or settling their baby. In three cases, it was unclear from the available records whether co-sleeping was planned or unplanned.

Eleven of the infants who were co-sleeping had been exposed to tobacco smoke before and/or after birth. Post mortem toxicology undertaken for one of the infants found a very low level of cannabis, which the pathologist concluded may have resulted from either exposure to cannabis smoke or via breast milk.

Four infants were sleeping with an adult who was either under the influence of alcohol at the time of the incident or who was reported to have consumed alcohol on the evening of the infant's death.

Cause of death has been determined for nine of the 20 infants. Two infants died as a result of unintentional suffocation. The deaths of another five infants have been classified as SiDS, and two died as a result of pneumonia.

Nine of the infants who were co-sleeping had a child protection history.

SUDI occurring outside of sleep

The deaths of three infants did not occur in the context of sleep:

- One infant died very shortly after an unplanned birth at home. The cause of the baby's death has not been established.
- An infant who was less than one week old died at home while being held in her carer's arms. The infant was known to have mild cardiomyopathy and had undergone cardiac testing. The infant's cause of death was determined at autopsy to be congenital cardiomyopathy.
- A previously well baby, aged six months, was presented at hospital with breathing difficulties and a history of a runny nose for the past few days. The baby died in hospital the following day. Autopsy revealed that the baby died as a result of viral myocarditis and pyelonephritis.

It is important that maternity and early childhood care providers be alert to the risk factors for SUDI. It is significant that at least one or more of the modifiable risk factors for SUDI were present for 94 per cent of the infants who died suddenly and unexpectedly in this reporting period. In addition to the modifiable risk factors, many of the infants were born prematurely and almost half had experienced recent illness.

⁵³ Information on loose bedding was not available for two infants

Table 54 provides an overview of the modifiable risk factors for SUDI from 1996 to 2010.

Table 54: Modifiable risk factors for SUDI – registered 1996 to 2010*

	2003	2004	2005	2006	2007	2008	2009	2010
Position placed for sleep								
On back	23	28	24	36	33	25	22	28
On side	15	9	7	8	14	7	10	13
On front	5	1	1	4	5	2	3	2
At breast	0	0	0	1	0	0	1	0
Other	0	1	0	0	1	1	0	0
Information not available	8	6	10	2	9	4	3	4
Total	51	45	42	51	62	39	39	47
Co-sleeping								
No	31	25	24	24	37	23	23	27
Yes	20	20	18	27	25	16	16	20
Information not available	0	0	0	0	0	0	0	0
Total	51	45	42	51	62	39	39	47
Exposure to tobacco smoke								
No	4	6	10	7	12	13	15	17
Yes	30	33	26	39	41	22	25	27
Information not available	23	10	16	11	14	11	3	6
Total	57	49	52	57	67	46	43	50

*Information in this table prior to 2010 has been drawn from previously published Team data

7.2.6 The Team's recommendations: SUDI response

The Team has previously made recommendations to both NSW Health and SIDS and Kids in relation to sudden unexpected deaths in infancy. The recommendations related to post-death procedures for identification of sudden unexpected death in infancy and awareness raising in relation to safe sleeping practices.

Both agencies supported the recommendations (see section 9, recommendations monitoring).

In December 2008, NSW Health released the policy directive *Death - Management of Sudden Unexpected Deaths in Infancy*. The directive is NSW Health policy for the management of SUDI. The policy has two main aspects: the diagnosis of the cause of death and the support of the surviving family members. The directive states that:

*The aim of the process is to take a comprehensive medical history to assist the forensic pathologist in the post-mortem assessment to establish as far as possible the cause of death.*⁵⁴

The policy requires that the deceased infant and the carers be conveyed to hospital in order that a paediatric interview can be conducted with, and support and medical care can be arranged for, the family. The directive provides for standardised autopsy protocols for SUDI to be followed.

For its 2009 report, the Team examined documents available at the time for evidence of performance of some of the roles detailed in the directive.⁵⁵ The Team found compliance with the policy directive was low. Not all 39 infants were transferred to hospital after death (27 of 39); support was offered to less than half of the infant's families (17 of 39); and the paediatric interview was conducted for only six of the infants.⁵⁶

54 NSW Health 2008, *Death – Management of Sudden Unexpected Death in Infancy*, p 2 accessed http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_070.pdf

55 NSW Child Death Review Team 2010, *Annual Report 2009*, p 173 Commission for Children and Young People, Sydney

56 *Ibid*, p 173

It is difficult to monitor the full implementation of the policy directive drawing on records. However, the critical aspect of the policy for prevention purposes is documentation of the child's medical history. In that context, for SUDI registered in 2010, we examined available post death health records for 41 cases.

The records indicate low compliance with the policy directive:

- Interviews with parents/other carers were conducted and medical history was recorded for only nine infants. In three of the nine cases, however, the medical history was incomplete because of the carer's personal circumstances or distress.

In the 32 SUDI cases where records indicate non-compliance with the directive:

- No medical history was documented for three infants who died in hospital
- In one case, the hospital staff followed the requirements of an out-dated policy
- In one case, the hospital staff were not aware of the policy when the infant was brought to the hospital, and unsuccessfully attempted to complete the requirements some weeks later
- In one case, the police officers who attended the infant's home were not aware of the policy, and transported the infant but not the parents to the hospital.

In some cases where there was no record of a medical history being taken following the infant death, there was evidence that police and/or allied health staff complied with other aspects of the policy. For example, some families were provided with information about the Coroner's role, or the family was referred to SIDS and Kids or provided other psycho-social support.

NSW Health has advised the Team that it is currently reviewing the implementation of the policy directive. The Team will continue to monitor implementation of the directive.

7.2.7 Preventative measures

As noted above, the risk factors for SIDS are common to SUDI and fatal sleep accidents. In this context, prevention strategies targeted to SIDS are also relevant to the broader SUDI category.

Modifiable risk factors associated with infant sleep have been the subject of major campaigns over the last decade, and NSW – along with other states and internationally – has seen a decrease in SIDS deaths. Between 1985 and 2005, deaths from SIDS in Australia declined by 83 per cent, from 523 deaths in 1985 to 87 in 2005.⁵⁷ The decline has been associated with the SIDS and Kids public health campaign, which raised awareness of the risk factors for sudden infant death and promoted the importance of safe sleeping practices to reduce the risk of SIDS.⁵⁸

The campaign promotes key messages to:

- Sleep baby on the back from birth;
- Sleep baby with face uncovered;
- Avoid exposure to tobacco smoke before and after birth;
- Provide a safe sleeping environment; and
- Sleep baby on its own in a safe sleeping environment next to the parent's bed for the first 6 – 12 months.

57 Australian Bureau of Statistics 2008, *4192.0 Australian social trends 2007, Australia's babies*, accessed <http://www.abs.gov.au/AUSSTATS/abs@nsf/>

58 Ibid

Chapter 8. Deaths from External Causes (Injuries)

In 2010, 97 children whose deaths were registered in NSW died from external (injury-related) causes.

This chapter summarises the deaths of these children. The major types of injury related deaths – drowning, transport, suicide and assault – are discussed in separate sections below. Table 55 describes the demographic and individual characteristics of the children.

One important division of such deaths is by intent. Seventy deaths have been classified as unintentional or accidental. Twenty seven of the deaths were considered intentional (fatal assault and suicide).

Table 55: Key demographic and individual characteristics – deaths of children due to external causes registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	97	100	5.8	4.7 - 7.1	
Gender					
Female	30	31	3.6	2.4 - 5.2	
Male	67	69	7.9	6.1 - 10	2.2
Age					
Infants (less than 1 year)	11	11	11 (IMR 0.12)*	5.7 - 20	
1-4 years	20	21	5.5	3.3 - 8.4	0.5
5-9 years	10	10	2.3	1.1 - 4.2	0.2
10-14 years	10	10	2.2	1.1 - 4.2	0.2
15-17 years	46	47	16	11 - 20	1.4
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	82	85	5.1	4.0 - 6.4	
Aboriginal and Torres Strait Islander	15	15	21	12 - 35	4.2
Remoteness					
Major cities	46	48	3.8	2.7 - 5.1	
Inner regional	34	35	9.9	6.9 - 14	2.6
Outer regional	12	13	11	5.7 - 19	2.9
Remote	3	3	36	7.5 - 110	9.6
Very remote	1	1	100	2.5 - 560	27
Socioeconomic status					
High	39	40	4.2	3.0 - 5.7	
Low	58	60	6.6	5.0 - 8.5	1.6

* IMR (Infant Mortality Rate)

Males and Aboriginal children were over-represented in external cause deaths.

Children with a child protection history were also over-represented. This is consistent with the Team's previous findings.⁵⁹

Aboriginal children were most noticeably over-represented in assault, fire, suicide and transport deaths.

Mortality rates for external cause deaths increased with remoteness, but the number of deaths in remote areas was small. The mortality rate for children residing in areas of low average socioeconomic status was somewhat higher.

These differences will be discussed in detail in the following sections on specific types of external cause deaths, as will the historical trends in those types of deaths.

59 NSW Child Death Review Team 2009, *Annual Report 2008*, Commission for Children and Young People, Sydney, p. 221

8.1 Transport deaths

The deaths of 35 children in 32 transport incidents were registered in 2010.

The majority (19) of the children were passengers in vehicles. Passenger deaths have consistently been the single largest grouping of transport fatalities (see table 56).

Eight young people were driving a vehicle; six were driving a motor vehicle, one a watercraft and one a motorcycle. One child was riding a bicycle.

Seven children who died were pedestrians.

While transport fatalities remain the leading external cause of death for children and young people in NSW, there has been an overall decline in the rate of transport deaths since 1996. This is predominantly in relation to pedestrian deaths. In 2009, NSW had the lowest rate of child death resulting from transport incidents when compared with other states.⁶⁰

Table 56: Trends in deaths of children due to transport incidents by type – registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Driver	14 (0.9)	16 (1.0)	28 (1.8)	16 (1.0)	14 (0.9)	2 (0.1)	11 (0.7)	11 (0.7)	9 (0.6)	8 (0.5)	15 (0.9)	13 (0.8)	7 (0.4)	8 (0.5)	8 (0.5)
Passenger	35 (2.2)	38 (2.4)	19 (1.2)	29 (1.8)	35 (2.2)	39 (2.4)	34 (2.1)	33 (2.1)	30 (1.9)	27 (1.7)	34 (2.1)	18 (1.1)	16 (1.0)	26 (1.6)	19 (1.2)
Pedestrian	24 (1.5)	20 (1.3)	23 (1.5)	20 (1.3)	26 (1.6)	21 (1.3)	12 (0.7)	13 (0.8)	12 (0.8)	8 (0.5)	11 (0.7)	7 (0.4)	5 (0.3)	6 (0.4)	7 (0.4)
Bicycle rider.	8 (0.5)	7 (0.4)	2 (0.1)	4 (0.3)	0 (0)	7 (0.4)	1 (0.1)	1 (0.1)	5 (0.3)	3 (0.2)	2 (0.1)	5 (0.3)	2 (0.1)	2 (0.1)	1 (0.1)

The deaths of six of the children reported here are reviewable by the Ombudsman. The deaths of five children are considered to be neglect-related, and the death of one child occurred whilst the child was in out-of-home-care.

This chapter considers non-intentional transport deaths. The death of one child due to a transport incident occurred in the context of an assault. This child's death is considered in section 8.5 (fatal assault).

60 Queensland Commission for Children and Young people (2010) *Annual report, deaths of children and young people, Queensland, 2009 – 10*. P 160, Commission for Children and Young People and Child Guardian, Brisbane (WA, NT and ACT do not provide data)

8.1.1 Demographic and individual characteristics

Table 57 provides an overview of the main demographic characteristics of children who died in transport incidents, and whose deaths were registered in 2010.

Table 57: Key demographic and individual characteristics – deaths of children registered 1996 to 2010, number and (crude mortality rate)

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	35	100	2.2	1.5 - 3.0	
Gender					
Female	14	40	1.8	1.0 - 2.9	
Male	21	60	2.5	1.6 - 3.8	1.4
Age					
Infants (less than 1 year)	2	6	2.1 (IMR 0.02)*	0.3 - 7.5	
1-4 years	4	11	1.1	1.3 - 2.8	0.5
5-9 years	6	17	1.4	0.5 - 3.0	0.7
10-14 years	5	14	1.1	0.4 - 2.6	0.5
15-17 years	18	51	6.4	3.8 - 10	3.1
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	31	89	1.9	1.4 - 2.8	
Aboriginal and Torres Strait Islander	4	11	5.7	1.5 - 14	3.0
Remoteness					
Major cities	16	46	1.4	0.8 - 2.2	
Inner regional	13	37	3.8	2.0 - 6.5	2.8
Outer regional	4	11	3.7	1.0 - 9.4	2.7
Remote	1	3	12.1	0.3 - 68	8.9
Very remote	1	3	100	2.5 - 560	73
Socioeconomic status					
High	12	34	1.3	0.7 - 2.3	
Low	23	66	2.6	1.7 - 3.9	2.0

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Transport incidents were the leading external cause of death for all age groups excepting very young children aged between 0 and 4 years. Notably however, as illustrated in figure 20, over half of all those who died were young people aged between 15 and 17 years.

Just under two thirds of children and young people who died in transport incidents were boys. The over-representation of boys was most noticeable in pedestrian deaths. All seven pedestrians who died were boys.

The higher rate of male deaths is consistent with the Team's findings in previous years, and is again concentrated in the older age groups, as illustrated in Table 58.

Four of the 35 children were Aboriginal. Contrary to the overall decline in transport deaths of children in NSW, the number of deaths of Aboriginal and Torres Strait Islander children has shown an increasing trend. However, because of small numbers and high annual variability, this trend should be interpreted with caution.

Table 58: Trends in deaths of children due to transport incidents by gender, 1996 to 2010- number (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	24 (3.1)	27 (3.5)	22 (2.9)	31 (4.0)	25 (3.2)	17 (2.2)	18 (2.3)	21 (2.7)	23 (3.0)	15 (1.9)	15 (1.9)	13 (1.7)	6 (0.8)	19 (2.4)	14 (1.8)
Male	57 (7.1)	54 (6.7)	50 (6.2)	38 (4.7)	50 (6.1)	52 (6.3)	40 (4.8)	37 (4.3)	33 (4.0)	31 (3.8)	47 (5.7)	30 (3.6)	24 (2.9)	23 (2.8)	21 (2.5)
Children	81 (5.2)	81 (5.1)	72 (4.6)	69 (4.3)	75 (4.7)	69 (4.3)	58 (3.6)	58 (3.6)	56 (3.5)	46 (2.9)	62 (3.9)	43 (2.7)	30 (1.9)	42 (2.6)	35 (2.1)

Figure 20: Transport deaths of children registered in 2010, by age and gender

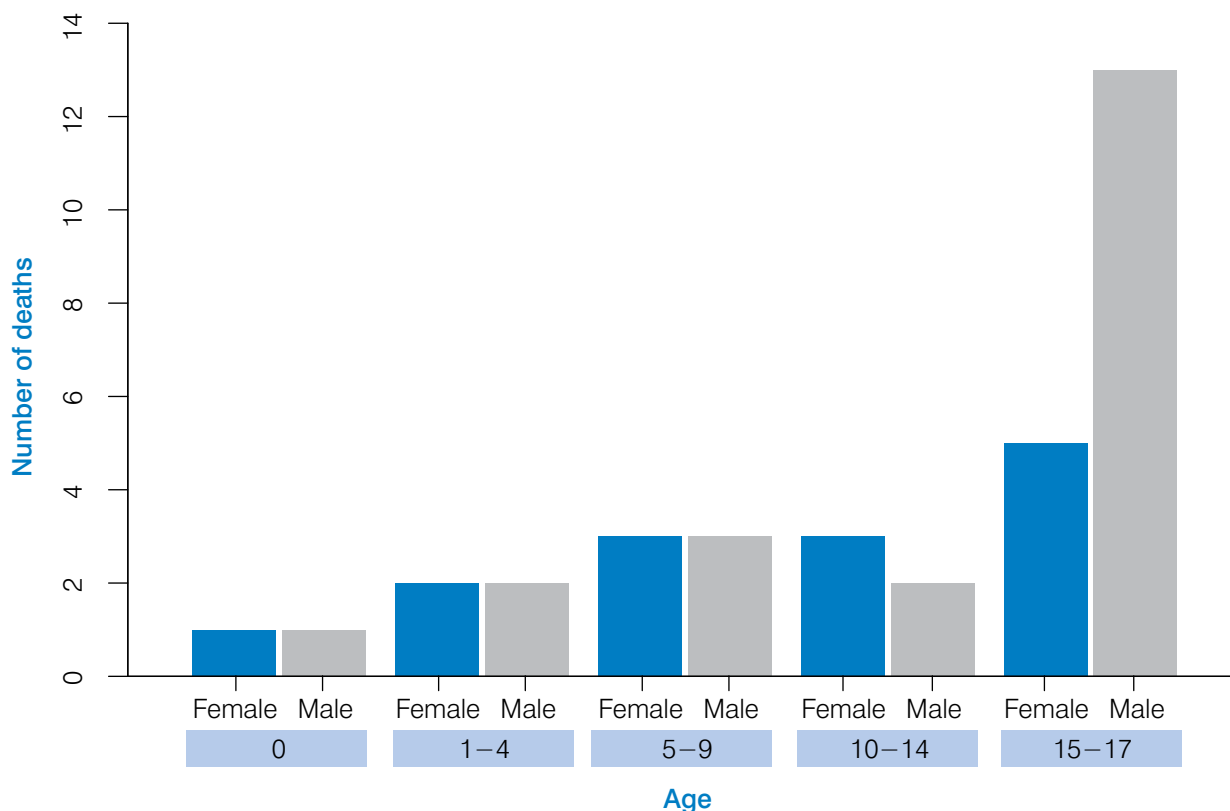


Table 59 shows the type of incident in which children and young people died by age group. Passenger and pedestrian deaths occurred across all age groups. Eight young people who died were driving a vehicle, which included six motor vehicles, a watercraft and a motorcycle.

Table 59: Deaths of children due to transport incidents registered in 2010 – age and type

	Under 1	1-4	5-9	10-14	15-17	Total
Driver	0	0	0	0	8	8
Passenger	2	2	5	3	7	19
Pedestrian	0	2	1	1	3	7
Bicycle rider.	0	0	0	1	0	1

Socioeconomic status

Over half (21) of the children who died in transport incidents lived in areas of relative socioeconomic disadvantage. This over-representation of children from lower socioeconomic areas was only apparent in passengers and pedestrians, whereas drivers were somewhat more likely to live in higher socioeconomic areas.

Where the incident occurred

Of the 32 transport incidents, 13 occurred on highways or freeways. Main roads (7), and local roads (7), were the next most common site for an incident. Four incidents occurred off-road, and one involved a watercraft and occurred in a river.

The majority of incidents (29 of 32) occurred in highly accessible or accessible regions of the state. However, in the historical analysis the mortality rates were significantly higher in more remote areas, except for very remote.

Child protection history

Seven children who died in transport incidents had been the subject of a report of risk of harm or report of risk of significant harm to Community Services within the three years prior to their death. There were no children who, while not the subject of a report themselves, had a sibling who had been the subject of a report.

No children had been the subject of a report to a Child Wellbeing Unit.

The main issues raised – primarily domestic violence – were not directly related to the circumstances of the children's deaths. In two cases parental substance abuse was an identified issue, although this was not an identified factor in either crash. In one case, a child had previously been the subject of a report for being unattended in a vehicle, and a contributory factor in the child's death was inappropriate restraint.

8.1.2 Motor vehicle crashes

Twenty six of the 35 children died as a result of a motor vehicle crash. This includes one young person who was piloting a watercraft. There were three crashes in which more than one child died.

Passengers

Nineteen children died as passengers in a motor vehicle. Twelve children were being driven by a relative and seven young people were in a vehicle being driven by a peer. The seven young people who died ranged in age from 13 to 17 years, and the drivers were aged between 15 and 20 years. None of the peer drivers held a full licence: one was unlicensed; three held 'provisional P1' (P1) licences; and two held 'provisional P2' (P2) licences.

For all three P1 licence holders, the crash occurred within the hours when it is permissible to carry peer passengers.

Drivers

Seven young people who died were driving a vehicle that crashed. The young people were aged 16 and 17 years old.

Three held a P1 licence, two held provisional licences issued in the Australian Capital Territory, one young person held a learners licence and one young person did not require a licence in the circumstances. The young person who held a learners licence did not have an authorised supervising driver with them at the time of the crash.

Contributing factors in 2010 crashes

Speed has been identified as a contributing factor in almost half of all fatal motor vehicle crashes. Alcohol or other drug use, lack of appropriate restraint and fatigue are also recognised contributing causes, as well as environmental and behavioural factors including weather conditions, problems associated with the vehicle, driver distraction and unintended driver error.⁶¹

In relation to most of the deaths of children and young people registered in 2010, police identified contributing factors that are largely preventable:

- ▶ In 13 crashes, police identified dangerous or reckless driving, including not obeying road rules, not driving appropriately for the conditions, or driving with bald tyres.
- ▶ Police reports of the incident identified speeding as a factor in 10 crashes, and a possible factor in an additional crash. In eight of the 10 crashes the driver was a young person. In a further crash, where a young person was driving, police noted that although the driver was within the posted speed limit, they were driving too fast for the conditions.
- ▶ In five crashes, the child who died was not appropriately restrained. In four cases, police records indicated the children who died were either not in a child restraint, or were not restrained in accordance with legislation. One child was restrained with an adult lap sash, and while the child was not required by legislation to be placed in a booster seat, they were below the recommended height for an adult lap sash. In the fifth crash, the young person who died was not wearing a seat belt.

61 Bureau of Infrastructure, Transport and Regional Economics 2011, *Fatal road crashes in Australia in the 1990s and 2000s: crash types and major factors*, Information Sheet 41, p 6

- Driver drug and /or alcohol use was identified in three crashes, including two involving young drivers. In a further crash involving a young driver, it was a possible factor.
- Fatigue was identified by police as a contributing factor in two crashes, including one where a young person was driving.
- Eight crashes occurred while it was raining, or the road was wet. In most of these crashes (six) young people were driving. Half of the crashes (13) occurred during daylight hours. Of the 10 crashes which occurred when it was dark, seven involved young drivers.

In a number of crashes, multiple risk factors were present, including for example, dangerous driving behaviour combined with poor vehicle condition and / or inclement weather.

Factors associated with motor vehicle crashes and preventative measures

The NSW Centre for Road Safety, established in 2008 as part of the NSW Roads and Traffic Authority, has a mandate to 'change cultural values on road safety in NSW', targeting strategies to 'safer roads, safer people, safer vehicles'. The Centre has undertaken a number of campaigns to address speeding, drink driving and other driving risks. In recognition of the inevitability of human error the Centre also pursues research into road and vehicle design which minimises risk to life in the event of a crash.⁶²

The need for adequate restraints for children travelling in vehicles has also been the subject of recent legislative change. New requirements for child restraints came into force through an amendment to the *Road Rules 2008 (NSW)*.⁶³ The new Rules introduce an age-graduated system which requires children seven years and younger to be seated in child safety restraints appropriate for their age.

Although the legislation is age based the important aspect is that children are in appropriate restraints for their height and weight. It is recommended that a child remain in a booster seat past seven years of age if they are less than 145 centimetres in height, although this is not required by legislation.⁶⁴

Young people, particularly young men, are consistently overrepresented both in deaths and serious injury resulting from transport incidents.⁶⁵

Inexperience is an important factor in crashes for young drivers. Young drivers are most likely to crash within the first six to 12 months of getting their licence. The risk associated with novice drivers is connected with age and the risk decreases with older novice drivers.⁶⁶

In addition, young people have a higher tendency towards risk taking. A range of factors influence young drivers risk taking behaviour, including sensation seeking, anger or aggression, a general perception of invulnerability, peer influence and a low perceived likelihood of being caught.⁶⁷

NSW has a Graduated Licensing Scheme. This employs a range of methods to minimise young drivers' exposure to risk situations whilst enabling them to gain driving experience. There are three different stages, learners, P1 and P2.

In order to promote positive behaviour among young drivers, the NSW Roads and Traffic Authority is currently participating in the 'P Drivers Project' with the Victorian Government. The Project is a large scale road safety research project. It aims to develop a driver education model for inclusion in the Graduated Licensing Scheme. The trial is scheduled to commence in October 2011, following pilot testing in May and August 2011.⁶⁸

In addition to the Graduated Licensing Scheme, the Roads and Traffic Authority runs a number of campaigns to raise awareness of the major risk factors contributing to road crashes and, in 2009, released a resource aimed at senior schools students to support teaching and learning about safe driver and passenger behaviour.

62 See <http://www.rta.nsw.gov.au/roadsafety/index.html>

63 NSW Government *Road Amendment (Isabelle Broadhead Child Restraint Measures) Rules 2010*

64 RTA 2010, *Choose Right, Buckle Right*, accessed http://www.rta.nsw.gov.au/roadsafety/downloads/choose_right_buckle_right.pdf

65 Australian Institute of Health and Welfare 2011, *Trends in Serious Injury due to Land Transport Accidents, Australia 2000-01 to 2007-08*, p 24 AIHW, Canberra

66 Staysafe Committee, NSW Parliamentary Committee 2008, *Report on young driver safety and education programs*, p 14

67 Fernandes and Hatfield (NSW Injury Risk Management Research Centre), 2006 *Examination of Different Predictors of Different Risky Driving Behaviours in Young NSW Drivers*, p 14

68 P Drivers Project 2010 accessed <http://pdriversproject.com/index.html>

8.1.3 Pedestrians

In 2010, seven children and young people died as pedestrians, in seven separate incidents. They ranged in age from three to 17 years. All were boys.

Traffic incidents

Five of the deaths occurred in traffic.

Three young people, in three separate incidents, were hit by vehicles while walking dangerously in traffic. All three had consumed alcohol, it was dark and the young people were seen by witnesses walking on the road. Two of the incidents occurred on a highway and one occurred on a main road. In all three cases police determined that the pedestrian was at fault, and no charges were laid against the drivers.

Two children, in two separate incidents, ran onto the road. One child was very young and had been playing in the yard with a teenager. The child's parents were inside the house. The child left the yard and ran onto the road in front of an oncoming vehicle. The second child was walking home from school. The child attempted to cross a road and moved into the line of an oncoming vehicle. The two incidents occurred on main roads. In both cases police did not find fault with the drivers, and no charges were laid.

Low speed vehicle run-over fatalities

Two children died in low-speed vehicle run-over incidents.⁶⁹

One very young child was killed by a car reversing out of a driveway. The driver of the car thought the child was inside. Records indicate the driver would not have been able to see the child from the rear vision mirror.

A second child died when a car that did not have its handbrake engaged rolled out of its parked position.

Factors associated with pedestrian deaths and preventative measures

Deaths resulting from pedestrian incidents primarily fall into two categories.

Traffic incidents: These occur when children or young people move suddenly into the path of a moving vehicle. The Team's Trends Report has shown that young people aged 15 to 17 have the highest number of pedestrian deaths. For this age group, most casualties occur late at night or in the early hours of the morning. Alcohol is also a recognised risk factor.⁷⁰

Low-speed vehicle run-over incidents: These usually occur in driveways, car parks or other non-traffic areas. Children under the age of five are most commonly victims of low-speed incidents. A consistent theme in low-speed vehicle run-over incidents is the driver understanding the child to be in a safe location.⁷¹ Poor driver visibility is also a common contributing factor, with a higher proportion of vehicles with large blind spots, such as four-wheel drives and large sedans, being involved in a low-speed vehicle run-over incident.⁷²

For young children, prevention messages are much the same as for young children around pools. Active supervision is the most important prevention measure. Where this fails, restricting the child's access to anywhere there might be moving vehicles can also contribute to keeping young children safe.⁷³

In response to recommendations made by the Team in 1998 the interagency NSW Child Driveway Safety Committee, convened by the Motor Accidents Authority (MAA), developed and implemented a number of driveway safety initiatives. As part of this work MAA developed the brochure, *'Where are your Kids? Child Safety in your Driveway'*. The brochure is distributed through early childhood centres, the NRMA website, and Kidsafe NSW. Information on driveway safety is also included in the NSW

69 Low speed vehicle run-over is a term used to describe incidents where a pedestrian, usually a child, is injured or killed by a slow moving vehicle in a traffic or non-traffic area. Queensland Parliamentary Travelsafe Committee 2007, *Investigation into Child Deaths and Injuries from Low Speed Vehicle Run-Overs*, p 11

70 Staysafe Committee (NSW Parliamentary Committee) 2009, *Report on pedestrian safety: Ministerial reference*, p 57

71 Queensland Parliamentary Travelsafe Committee 2007, *Investigation into Child Deaths and Injuries from Low Speed Vehicle Run-Overs*, p 11

72 Griffin B et al 2011, Paediatric low speed vehicle run-over fatalities in Queensland, in *Injury Prevention* February 2011, Vol 17 Supplement 1; Desapriya E et al, Injury prevention in child death review: child pedestrian fatalities. in *Injury Prevention* February 2011, Vol 17 Supplement 1;

73 Australian Transport Safety Bureau 2006, *Driveway deaths of child pedestrians*, Monograph 18, p 6

Health My First Health Record (or 'blue book'). Education on driveway safety is also delivered through the Kids and Traffic Early Childhood Education Safety Program at Macquarie University.⁷⁴

In relation to older children, Kidsafe NSW recommends that an adult hold a child's hand when crossing the road, up to the age of eight and that an adult closely supervise children around traffic up to the age of ten.⁷⁵

The Roads and Traffic Authority provides funding for the NSW School Road Safety Education Program and road safety is part of the primary and secondary school curriculum. Part of the program is specifically directed at risk taking behaviour in a pedestrian context and targeted at students aged 11 to 18.⁷⁶

8.1.4 Other transport incidents

Two children whose deaths were registered in 2010 died in two separate other transport incidents.

One child in the 10 to 14 age group died riding a bicycle. The child was attempting a trick when they fell off the bike. The child was not wearing a helmet and was riding in a non-traffic area.

The Team's 2008 report *Trends in child deaths 1996 – 2005* identified that for the ten year review period, 40 children died in bicycle incidents. This represents six per cent of children who died in transport incidents for the period.

One young person died riding a motorbike in 2010. In 2009, three young people died in similar circumstances. The young person was in the 15 to 17 age group and was riding off-road. The young person collided with a rider coming in the opposite direction. The speed of both riders is unknown. The young person was wearing a helmet.

Factors associated with other transport incident deaths and preventative measures

The primary prevention measure in relation to bicycle safety is helmet use. It is required under the Australian Road Rules whenever a person is riding a bicycle or is a passenger on a bicycle.

In many respects the risks posed to children riding bicycles in traffic situations are the same as for children as pedestrians, with increased risks presented by the speed of the bicycle and child's ability to control it.

The NSW Centre for Road Safety recommends that young children ride in areas away from traffic, such as a fenced yard or park and that an adult always closely supervise children when riding.⁷⁷ Under the Australian Road Rules a child under the age of 12 may ride a bicycle on the footpath.

The Team's recommendation

In its 2008 report *Trends in child deaths 1996 – 2005*, the Team made a recommendation to the Motor Accidents Authority to develop strategies targeted at reducing the number of driver deaths of children under 16 years that occur in the context of recreational activities. This primarily relates to dirt and quad bike riders in off-road settings.

In July 2011, the Motor Accidents Authority advised the Team that the NSW Commission for Children and Young People was conducting work in relation to preventable child injuries and that the Commission had contracted the Australian Institute of Health and Welfare to report on the incidence of serious childhood injury in NSW. Part of this work will include a specific focus on injuries to children as a result of off-road motor cycle incidents.

74 Information from the Motor Accidents Authority of NSW, provided to the Convenor in correspondence received September 2011.

75 Kidsafe NSW "Pedestrian Safety" accessed http://www.kidsafensw.org/roadsafety/pedestrian_safety.htm,

76 NSW Roads and Traffic Authority 2010, *Response to the Recommendations of the Report on Pedestrian Safety*, p 3

77 NSW Centre for Road Safety 2008, *Playing Safely* accessed <http://www.rta.nsw.gov.au/roadsafety/children/playsafely.html>

8.2 Deaths from drowning

In NSW in 2010, the drowning deaths of 14 children were registered in NSW. Drowning was the second most frequent external cause of death- along with suicide, for which 14 deaths were also recorded in 2010 – for children and young people in this State.

Child death data collated by the Queensland Commission for Children and Young People indicates that in 2008, and of five states in Australia, Queensland had the highest rate of drowning death (33.2 per 100,000) followed closely by NSW (29.7).⁷⁸ In the 10 years to 2010, 307 children and young people drowned in NSW.

Table 60 shows a continued decrease in drowning deaths since 1996. This is the case for drowning deaths generally: in the year 2009-10, 103 people drowned in NSW, which was five per cent below the five year average.⁷⁹

International research indicates that for every drowning death, there are between ten and twenty non-fatal drowning incidents that require medical attention.⁸⁰ In Australia, the highest age-specific rates of hospitalisation have been found in the 0–4 year age group. In 1999-00 to 2003-04, the rate was 18.0 separations per 100,000 population. The next highest rate was 3.0 per 100,000 among those aged 15–24.⁸¹

Of the 14 children who drowned in NSW:

- ▶ Six children drowned in private swimming pools
- ▶ Five children drowned in natural bodies of water
- ▶ Two children drowned in bathtubs
- ▶ One child drowned in a dam.

This section considers unintentional drowning deaths only, and therefore excludes drowning deaths resulting from assault or suicide. It does not include drowning deaths resulting from motor transport incidents. The drowning deaths of two children were the result of fatal assault, and another child drowned in the context of a transport incident. These deaths are considered in the relevant sections.

The drowning deaths of six of the 14 children reported here are considered neglect-related, and will be reviewed as reviewable deaths by the Ombudsman.

Table 60: Trends in deaths of children due to drowning by gender, 1996 - 2010 - number (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	3 (0.4)	9 (1.2)	11 (1.4)	10 (1.3)	3 (0.4)	7 (0.9)	10 (1.3)	4 (0.5)	8 (1)	5 (0.6)	3 (0.4)	11 (1.4)	6 (0.8)	4 (0.5)	3 (0.4)
Male	20 (2.5)	21 (2.6)	19 (2.3)	19 (2.3)	18 (2.2)	13 (1.6)	18 (2.2)	16 (1.9)	8 (1)	7 (0.9)	12 (1.5)	11 (1.3)	11 (1.3)	7 (0.8)	11 (1.3)
Children	23 (1.5)	30 (1.9)	30 (1.9)	29 (1.8)	21 (1.3)	20 (1.2)	28 (1.7)	20 (1.2)	16 (1)	12 (0.7)	15 (0.9)	22 (1.4)	17 (1)	11 (0.7)	14 (0.9)

Table 61 shows the trends in drowning death of children 1996 – 2010 by incident location. During the fifteen years from 1996 to 2010, 328 drowning deaths were recorded. Over that period, bathtub drowning has declined with marginal significance, but the small numbers involved argue for caution in interpreting this result. Pool drowning has remained at the same level for the entire period, while drowning in natural and other bodies of water has declined significantly.

78 Queensland Commission for Children and Young People 2010, *Annual report, deaths of children and young people, Queensland, 2009 – 10*. P 160, Commission for Children and Young People and Child Guardian, Brisbane

79 Royal Life Saving Society- NSW Branch 2010, *NSW Drowning Report 2010*, p1 accessed <http://www.royallifesaving.com.au/www/html/1537-nsw-drowning-reports.asp>

80 Shepherd, S.M. & Shoff, W.H 2009, Drowning. URL: <http://emedicine.medscape.com/article/772753-overview>, accessed 9/6/2010.

81 Australian Institute of Health and Welfare 2010, *Deaths and Hospitalisations due to Drowning, Australia 1999-00 to 2003-04*, p 6 AIHW Canberra

Table 61: Trends in deaths of children due to drowning by location – registered 1996 to 2010, number and (Crude Mortality Rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Swimming Pool	5 (0.3)	12 (0.8)	6 (0.4)	7 (0.4)	6 (0.4)	4 (0.3)	10 (0.6)	10 (0.6)	6 (0.4)	6 (0.4)	5 (0.3)	14 (0.9)	10 (0.6)	7 (0.4)	6 (0.4)
Natural Body of water	16 (1.0)	11 (0.7)	15 (1.0)	14 (0.9)	9 (0.6)	13 (0.8)	10 (0.6)	7 (0.4)	7 (0.4)	1 (0.1)	5 (0.3)	8 (0.5)	5 (0.3)	3 (0.2)	5 (0.3)
Bathtub	3 (0.2)	3 (0.2)	8 (0.5)	5 (0.3)	2 (0.1)	2 (0.1)	7 (0.4)	3 (0.2)	4 (0.3)	2 (0.1)	3 (0.2)	1 (0.1)	3 (0.2)	2 (0.1)	2 (0.1)
Other	3 (0.2)	5 (0.3)	1 (0.1)	3 (0.2)	5 (0.3)	6 (0.4)	2 (0.1)	1 (0.1)	0 (0.0)	3 (0.2)	2 (0.1)	1 (0.1)	3 (0.2)	0 (0.0)	1 (0.1)
Total	27 (1.7)	31 (2.0)	30 (1.9)	29 (1.8)	22 (1.4)	25 (1.6)	29 (1.8)	21 (1.3)	17 (1.1)	12 (0.8)	15 (0.9)	24 (1.5)	20 (1.2)	12 (0.7)	14 (0.9)

8.2.1 Demographic and individual characteristics

Table 62 provides an overview of the key demographic characteristics of the 14 children who drowned and whose deaths were registered in 2010.

Table 62: Key demographic and individual characteristics – deaths of children due to drowning registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	14	100	0.9	0.5 - 1.4	
Gender					
Female	3	21	0.4	0.1 - 1.1	
Male	11	79	1.3	0.7 - 2.4	3.5
Age					
Infants (less than 1 year)	1	7	1.0 (IMR 0.001)*	0.03 - 5.8	
1-4 years	9	64	2.5	1.1 - 4.7	2.4
5-9 years	2	14	0.5	0.1 - 1.6	0.4
10-14 years	1	7	0.2	0.01 - 1.2	0.2
15-17 years	1	7	0.4	0.01 - 2.0	0.3
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	13	93	0.8	0.4 - 1.4	
Aboriginal and Torres Strait Islander	1	7	1.4	0.04 - 7.9	1.7
Remoteness					
Major cities	5	36	0.4	0.1 - 1.0	
Inner regional	7	50	2.1	0.8 - 4.2	4.8
Outer regional	2	14	1.8	0.2 - 6.6	4.3
Socioeconomic status					
High	8	57	0.9	0.4 - 1.7	
Low	6	43	0.7	0.3 - 1.5	0.8

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

The mortality rate for boys was over three times that of girls.

The majority of the children who drowned were very young, with 10 of the 14 aged less than five years. All of the children who drowned who were over five years of age were male.

One child who drowned in 2010 was Aboriginal.

While the age of children and young people who drown in natural bodies of water varies, age is strongly linked to the location of drowning in regard to private swimming pools and bathtubs.

The age of the five children who drowned in natural bodies of water ranged from just under one year to almost seventeen years of age. Previous Child Death Review Team data indicates that drowning in natural bodies of water occurs across all age groups, with the highest rates for children aged 1-4 and 5-9 and 16-17 years.⁸²

However, the most common location of drowning for children under the age of five is private swimming pools and bathtubs.⁸³

Five of the six children who drowned in swimming pools were younger than three years of age. The sixth child was just over five years of age.

Most children who drown in bathtubs are infants. Between 1996 and 2005, 80 per cent of children who drowned in bathtubs were aged one year or less.⁸⁴ Of the two deaths registered in 2010, one child was aged under one year, and the other just over one year.

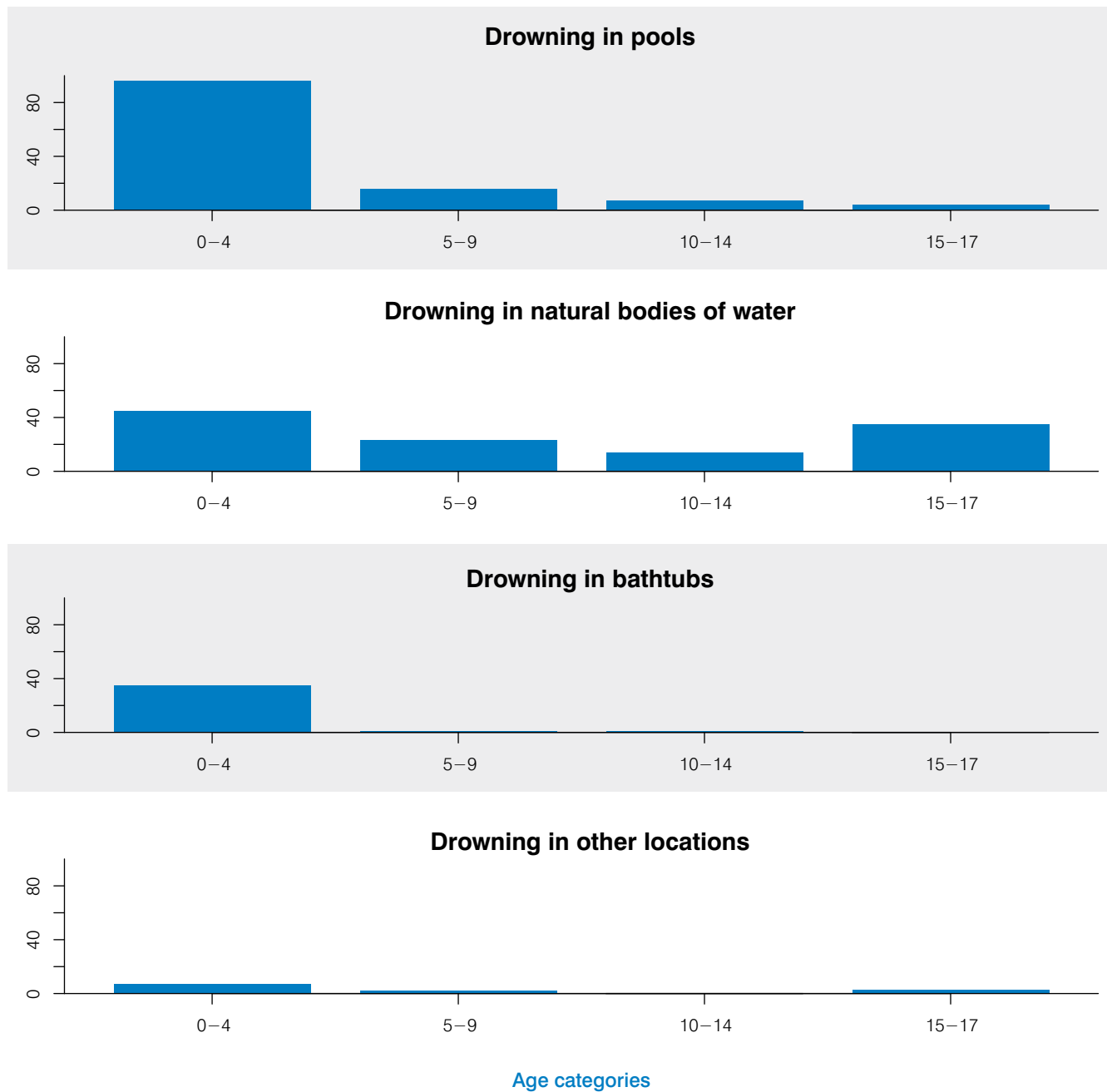
Figure 21 illustrates the location of deaths from drowning by age categories.

82 NSW Child Death Review Team 2008), *Trends in child deaths in NSW 2006 – 2005*. NSW Commission for Children and Young People. Sydney

83 Royal Life Saving Society- NSW Branch 2010, *NSW Drowning Report 2010*, accessed <http://www.royallifesaving.com.au/www/html/1537-nsw-drowning-reports.asp>

84 NSW Child Death Review Team 2008, *Trends in child deaths in NSW 2006 – 2005*. NSW Commission for Children and Young People.

Figure 21: Location of drowning incident by age – deaths of children registered 1996 to 2010



Socioeconomic status

While drowning deaths in natural bodies of water and dams were spread across socioeconomic levels, drowning deaths in swimming pools tended to occur in higher socioeconomic areas. In contrast, the two bathtub drowning deaths occurred in lower socioeconomic areas.

Where the incident occurred

Most deaths occurred in metropolitan or inner regional areas.

Drowning deaths in swimming pools tended to occur somewhat more often in population centres, while drowning deaths in natural bodies of water and dams were farther from population centres on average. In the historical analysis, all more remote areas had significantly higher mortality rates than major cities.

Child protection history

Two of the 14 children who died in drowning incidents had been the subject of a report of risk of harm or report of risk of significant harm to Community Services within the three years prior to their death. In one family, reports related to domestic violence and in the other, inadequate supervision.

There were no children who, while not the subject of a report themselves, had a sibling who had been the subject of a report. No children had been the subject of a report to a Child Wellbeing Unit.

8.2.2 Private swimming pools

The Team's *Trends in Child Deaths in NSW 1996-2005* noted that for the ten year review period, there was a decrease in the number of deaths in natural bodies of water, but no significant change in relation to swimming pools. This continues to be the case. It should be noted, however, that the rate of swimming pool drowning deaths has not been linked to any changes in the number of swimming pools in NSW. There are currently over 300,000 backyard swimming pools in NSW.⁸⁵

This year, six children drowned in private swimming pools. This is less than the average number of deaths due to pool drowning since 1996 (8.2), and almost equal to the number of drowning deaths of children in natural bodies of water.

Four drowning deaths occurred in a pool at the child's residence, and two in a pool at a relative's residence.

Notably, in all six swimming pool drowning deaths, pool gates and/or fencing did not comply with standards required under the NSW Swimming Pools legislation, and the child accessed the pool unsupervised. In two cases, the pool was installed prior to 1990, which allows for an exemption from some standards. However, it remains a requirement that such pools have a child resistant safety barrier.

The common compliance failure for all six pools was the gate latch mechanism. Pool standards require all pool gates to have a self-closing mechanism that allows the gate to return automatically to a closed position without manual force, and that requires manual release to open the gate.

Five of the six pools in which children drowned appear to have had magnetic self-closing latches installed, but all were faulty. In one case, the gate was propped open at the time the child accessed the pool. The sixth pool – which was installed prior to 1990 – had a makeshift latch installed.

In addition, four of the six pools, including one pool installed prior to 1990, had other breaches to child safety barrier requirements, including climbable zones (such as pots leaning against the pool fence); missing fence palings; and gaps under fence palings that were higher than the standard 100mm, allowing room for a child to crawl under.

The six children who drowned in pools were all out of sight of adults for periods ranging from five minutes to almost half an hour. Supervising adults were either otherwise occupied for a short period of time; or believed their child to be safely with others.

Factors associated with swimming pool drowning and preventive measures

It is broadly acknowledged, and reinforced by the Team's annual reports, that the key measure to prevent children drowning in private swimming pools is adequate and age-appropriate supervision. Effective maintenance of child safety barriers around pools is also critical. As noted by the Deputy State Coroner in a joint inquest into the drowning deaths of eight young children:

"Supervision is always the first line of protection however no matter how vigilant a carer may be supervision of a young child can break down. It is in these situations that the barrier fence gives added protection".⁸⁶

Adequate supervision varies with age. Among children under the age of five it is recommended that an adult remain within arm's reach of the child.⁸⁷ A not uncommon theme in the literature is that where supervision is occurring in a social context the supervisor can become distracted or assume that somebody else is supervising.⁸⁸

Additionally, there is strong support from water safety advocates for water familiarisation for children, and development of resuscitation skills among parents and carers.⁸⁹

85 NSW Division of Local Government, Department of Premier and Cabinet, *Swimming Pool Laws*, <http://www.dlg.nsw.gov.au/DLG/Documents/information/Swimming>

86 NSW Coroner's Court April 2010, Inquest transcript Magistrate P McMahon, p 18

87 Royal Lifesaving Australia *Fact Sheet number 1 – supervise*.

http://www.royallifesaving.com.au/resources/documents/Fact_Sheet_No._1_Supervise.pdf

88 AIHW (2010) *Deaths and Hospitalisations due to Drowning, Australia 1999-00 to 2003-04*

89 Dr Richard Franklin (2010), "Child Drowning in Australia- What More Can We Do?", presented at 2010 Australian Water Safety Conference, 13 and 14 May 2010, at Brighton Beach, NSW

Review and amendment of the *Swimming Pool Act*

In 2009, the Department of Local Government conducted a review of the *Swimming Pool Act 1992 (NSW)* to identify appropriate amendments to enhance the safety of children under the age of five years old around backyard swimming pools.⁹⁰ Subsequent amendments to the Act include:

- The removal of automatic exemptions from the requirement for child-resistant safety barriers for very small, large and waterfront properties. All new swimming pools must now have such barriers.
- A requirement that Councils investigate complaints about non-compliance with the Act.
- The provision of additional powers for Councils enabling them to undertake remedial work in situations where non-compliance with pool barrier fencing poses a significant risk to public safety.

Joint Inquest into infant swimming pool drowning

In April 2010, the State Coroner's Court conducted an inquest into the deaths of eight children aged four years and less who had drowned in backyard pools between June 2006 and January 2009.⁹¹

Supervision of children near swimming pools and maintenance of barrier fences and gates were key issues identified by the inquest. The Coroner made a number of recommendations, including:

- Media campaigns to reinforce the need for:
 - constant supervision of very young children in the vicinity of a home swimming pool,
 - approvals for construction or installation of pools,
 - regular maintenance of barriers and gates; and
 - the need to ensure gates are never propped open.
- Development of a centralised register of private swimming pools, and a systematic plan for the regular review of all private swimming pools in NSW.
- Consideration of all exemptions from the *Swimming Pools Act*.
- Legislative changes in relation to obligations on owners of rental properties to ensure swimming pool and barriers are compliant.
- Implementation of systems to ensure purchasers are made aware of their obligations on purchase of an aboveground swimming pool, and sellers advise the relevant local authority of the sale of such a pool.
- Consideration of enactment of a criminal offence in circumstances where a person dies as a result of the negligence of a third party with respect to the use or maintenance of a private swimming pool.

An inquest into the drowning death of a child in 2010 further recommended compliance audits of private swimming pools by local government, and that all private swimming pools and surrounding pool fencing be required to become compliant with Australian Standard 1926.2 – 2007 within three years; that private pool owners be required to provide certification of compliance to the relevant local government body every second year.⁹²

The Team's recommendation

In 2009, the Team made a recommendation that local authorities be required to inspect all swimming pools notified within their area, monitor compliance with the swimming pools legislation, and develop and report periodically against local council plans for inspections.

In June 2011, the Division of Local Government within Premier and Cabinet advised the Team that a NSW Government Cross Agency Working Group had been formed to consider recommendations from the two Coronial inquests detailed above, regarding strengthened swimming pools legislation, and our recommendation.⁹³ The Team was advised that the Minister had asked for this work to be expedited.

90 Department of Local Government *Review of Swimming Pool Act*, p 2, August 2008. Accessed 21/1/11, via <http://www.dlg.nsw.gov.au/dlg/dlghome/documents/Information/Swimming%20Pools%20Act%201992%20Review%20-%20Report.pdf>

91 Joint Inquest Infant Swimming Pool Drownings, Magistrate P. A MacMahon, NSW Coroners Court, Glebe, 30 April 2010.

92 Inquest into the drowning death of a child, State Coroners Court, May 2011.

93 NSW Child Death Review Team 2010, *Annual Report 2009 Volume 2: Diseases and morbid conditions*, page 362, NSW Commission for Children and Young People 2010.

8.2.3 Natural bodies of water and dams

Amongst the general population, the most common location for drowning is natural bodies of water.⁹⁴ For child deaths in NSW, the rate of drowning in natural bodies of water has declined significantly over the past fifteen years.

The drowning deaths of five children registered in 2010 occurred in natural bodies of water. Three were four years of age or younger, with the youngest being just under two years of age, and two were teenagers.

NSW has an urbanised population with most people living near a major city, and accordingly, most drowning deaths occur in these areas. However, the rate of drowning deaths is greater in rural or remote areas.⁹⁵

Residents of rural and remote NSW have access to a range of water bodies, with generally reduced accessibility to patrolled beaches and swimming pools, and greater access to irrigation channels, dams, pumps and locks which may pose increased risks to young children.

The three young children all drowned in rivers while in the company of their respective families. The oldest of these, at four years, was in a river with a strong current and the child's parents were momentarily distracted. The other two children, just under and over two years, apparently fell into the water, again while momentarily unobserved.

Both of the two older children were male. One young person was undertaking recreational activities and was reported to have fallen into a body of water. The second young person, who was reportedly a capable swimmer and involved with surf lifesaving, entered the water unaccompanied and the circumstances of his death are unclear.

Factors associated with drowning in other bodies of water and preventive measures

The circumstances of the three young children who drowned in rivers were similar to those of many young children who drown in swimming pools; falling into the water when unobserved. The main prevention strategy, as with swimming pools, is active supervision. Children with certain disabilities may also need constant supervision around water.

In the case of young people, particularly males, higher exposure to the water based activities and greater likelihood of risk-taking may be factors in higher drowning rates. In the cases this year, however, there was no evidence of risk taking behaviour.

In relation to dams, 'safe play' fenced areas on rural properties areas have been promoted as a key child safety measure.⁹⁶

8.2.4 Bathtubs

In Australia, on average, five children under the age of five drown and 47 are hospitalised due to bathtub drowning or near drowning incidents each year.⁹⁷

The deaths of two children in NSW who drowned in bathtubs were registered in 2010.

The rate of bathtub drowning has declined in NSW over the past fifteen years, but given the small numbers and high variability, this outcome should be treated with caution. In 2004, and in relation to bathtub drowning, Australia ranked about sixteenth among 37 countries with reliable statistics.⁹⁸

Both the children who died were very young – one child was an infant just under a year old, and the other just over. Both children were at their family residence and were unsupervised by an adult at the time. One entered the bathtub independently, which had been left with a small amount of water. The other child had been left in the bathtub with another child for a short period of time; between five and 10 minutes.

94 Royal Life Saving Society - NSW Branch 2010, *NSW Drowning Report 2010*. accessed <http://www.royallifesaving.com.au/www/html/1537-nsw-drowning-reports.asp>

95 Ibid, p4.

96 FarmSafe Australia, *Safe play areas on farms* (brochure) <http://www.farmsafe.org.au/index.php?article=content/for-farmers/child-safety-on-farms>

97 Royal Lifesaving Society Australia Bath time safety Fact sheet number 5, http://www.royallifesaving.com.au//resources/documents/Fact_Sheet_No._5_Bath_Time_Safety.pdf

98 World Health Organisation Statistical Information System *Drowning and submersion while in bath-tub (most recent) by country*. URL: http://www.nationmaster.com/graph/mor_dro_and_sub_whi_in_bat_tub_percap-while-bath-tub-per-capita

Factors associated with bathtub drowning and preventive measures

Drowning is mostly a silent event and can occur quickly, but parents might assume they will hear a child in difficulties.⁹⁹ Infants who are able to sit unsupported may be unable to right themselves if they slip or topple in the bathtub.

Children can drown in very small amounts of water, and toddlers who are capable of 'cruising' may also be capable of climbing into a bathtub.¹⁰⁰

Critical issues in preventing bathtub drowning – or in any body of water – are constant and active supervision of young children in bathtubs; ensuring that baths and containers of water are not accessible to small children.

The Royal Lifesaving Society has a 'Keep Watch' program which, in relation to bath time, focuses on promoting four elements: *Be prepared, be close, all of your attention, all of the time.*¹⁰¹

8.3 Other unintentional injury related deaths

Fifteen children whose deaths were registered in died as a result of other unintentional injury related deaths.

- Four children died in four separate house fires
- Four children and young people died as a result of unintentional poisoning
- Three children died as a result of injuries sustained from sporting activities
- Two children died following medical procedures
- One child died following a fall
- One child sustained crush injuries

The deaths of five of these 15 children here are considered neglect or abuse related, and will be reviewed as reviewable deaths by the Ombudsman. The death of two children occurred whilst they were in out-of-home care. These children's deaths will also be reviewed by the Ombudsman.

The chapters above have focused on specific areas of injury related deaths – transport and drowning. These are the most common unintentional injury related deaths. There are a number of unintentional injury related deaths that, while less common, occur with regularity; including deaths from fires, falls and poisoning. There are clear prevention messages in relation to these causes of death.

Due to the heterogeneous nature of these deaths, attempting to examine historical trends for the entire group would provide little useful information. However, falls, fires and poisoning are examined in Figure 22. Overall, deaths from these three causes show a decline in frequency over the past fifteen years.

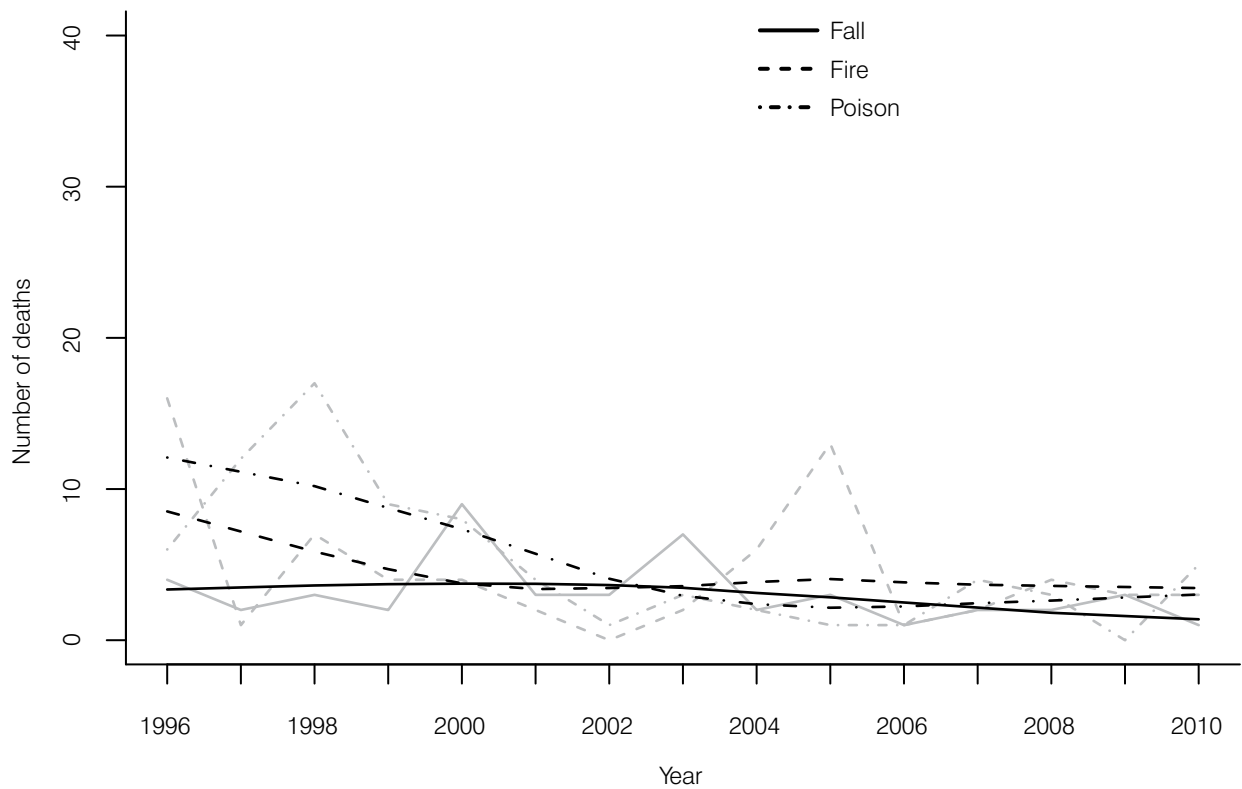
This section considers unintentional injury related deaths not covered elsewhere in this report. In NSW in 2010, six infants died due to accidental suffocation or threats to breathing whilst sleeping, and one young person died due to poisoning in a probable suicide incident. These deaths are considered in the relevant chapters.

99 Alexander, R 2007 *Child fatality review*, GW Medical Publishing Inc, St Louis, p 319

100 Ibid p 319

101 Royal Lifesaving Society Australia *Bath time safety Fact sheet number 5*, accessed http://www.royallifesaving.com.au/resources/documents/Fact_Sheet_No._5_Bath_Time_Safety.pdf

Figure 22: Trends in deaths of children due to fire, falls and poisoning – registered 1996 to 2010



8.3.1 Demographic and individual characteristics

Table 63 provides an overview of the main demographic characteristics of children who died due to other injury related deaths and whose deaths were registered in 2010.

Table 63: Key demographic and individual characteristics – other unintentional injury related deaths of children registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	15	100	0.9	0.5 - 1.5	
Gender					
Female	3	20	0.4	0.1 - 1.1	
Male	12	80	1.2	0.7 - 2.5	3.8
Age					
Infants (less than 1 year)	1	7	1.0 (IMR 0.001)*	0.0 - 5.8	
1-4 years	5	33	1.4	0.3 - 3.2	1.3
5-9 years	2	13	0.5	0.1 - 1.6	0.3
10-14 years	1	7	0.2	0.0 - 1.2	0.2
15-17 years	6	40	2.1	0.8 - 4.6	21.6
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	11	73	0.7	0.4 - 1.3	
Aboriginal and Torres Strait Islander	4	27	5.7	1.5 - 14.5	8.1
Remoteness					
Major cities	9	60	0.8	0.4 - 1.5	
Inner regional	4	27	1.2	0.3 - 3.0	1.5
Outer regional	1	7	0.9	0.0 - 5.1	1.2
Remote	1	7	12.1	0.3 - 67.5	15.7
Socioeconomic status					
High	6	40	0.7	0.2 - 1.4	
Low	9	60	1.0	0.5 - 1.9	1.6

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Deaths due to other unintentional injuries occurred across all age groups, however most deaths occurred in the 15 to 17 year age group (6), and the 1 to 4 year age group (5).

Almost all of the children who died as a result of other unintentional injuries were male (12). Four children were Aboriginal.

Socioeconomic status

The rate of death due to other unintentional injuries was higher for children from lower socioeconomic areas.

Where the incidents occurred

Most of the incidents occurred in either the family home, or the home of a friend or family member (8). In three cases the incident occurred in bush land, two incidents occurred in hospital, one incident occurred at a school and one in a public place.

Child protection history

Five children who died due to other unintentional injuries had been the subject of a report of risk of harm or report of risk of significant harm to Community Services within the three years prior to their death. There were no children who, while not the subject of a report themselves, had a sibling who had been the subject of a report.

No children had been the subject of a report to a Child Wellbeing Unit.

The nature of reports varied; however notably in relation to two children who died due to fire, reported issues related to inadequate supervision and indicated chronic neglect.

The Ombudsman report, *Reviewable Child Deaths 2008-2009*, reviewed the deaths of two children in house fires. A key risk factor identified in the Ombudsman's review was inadequate supervision and access to lighters or matches.

8.3.2 Circumstances of death

House fires

Four children died in four separate house fires. All children were in the care of family members at the time of the incident. Three of the fires started in the early morning when the occupants were sleeping and one occurred in the middle of the day.

Investigations indicate that one fire was the result of an electrical fault. Police records note there were a number of overloaded power boards at the property and that it was untidy and cluttered.

One fire is thought to have been lit by the child who died. The child was reportedly known to have an interest in fire. Adults smoked in the house and lighters were kept within reach of the child. The child was not being directly supervised at the time of the fire.

The cause of two fires is unknown.

In one case, records indicate that the occupants had removed the smoke alarm from the property.

Factors associated with fires and preventative measures

Poor maintenance and incorrect usage of power boards is a risk factor associated with building fires; the NSW Fire Brigade report that over 350 residential house fires are started by electrical faults in NSW each year.¹⁰² To minimise this risk the NSW Fire Brigade recommend the use of power boards with built in safety switches, and to avoid overloading the power board.¹⁰³

Squalor is also a recognised risk factor for house fires, clutter can increase the risk and severity of fire as it is often highly flammable.¹⁰⁴

Children will often find fire fascinating, and the NSW Fire Brigade has estimated that 10 per cent of fires in the state are started by children.¹⁰⁵ Adequate supervision, safe storage of matches and lighters, modelling of safe fire behaviour and explaining the risks associated with fire are identified as important strategies in minimising fire fascination in children.¹⁰⁶

Since 2006 legislation has required all residential dwellings to have smoke alarms. To ensure they are maintained properly the NSW Fire Brigade run the '*change your clocks, change your smoke alarm batteries*' campaign to encourage people to change their batteries at the end of Daylight Saving each year.

Poisoning

Unintentional poisoning is a leading external cause of death in NSW, but it occurs most commonly among people aged 25-44.¹⁰⁷ It is not a common cause of death among children and young people. The Team's *Trends Report* identified that between 1996 and 2005, approximately two per cent of deaths of children and young people were the result of illicit drug use.

One child, less than nine years, and three young people, aged 16 and 17 years, died due to unintentional poisoning.

The child was prescribed a significant number of medications which were stored in the child's reach.

The three young people died due to drug overdose. Two of the young people had taken illicit drugs; one was out with friends at the time of the incident and one was alone. The third young person took prescription medication and was alone at the time of the incident.

There is a link between substance (mis)use among young people and the presence of mental health problems.¹⁰⁸ In line with this, the Team has identified that in some cases where a young person dies as a result of unintentional poisoning risk factors for that young person substantially overlap with those for young people who die as result of suicide. Such risk factors include diagnosed mental illness, history of suicide or self-harming behaviour, experiences of personal crisis and trauma. Where this is the case it can be difficult to determine the young person's intent.

102 NSW Fire Brigade *Electrical Power Boards Fact Sheet*, accessed <http://www.nswfb.nsw.gov.au/page.php?id=630>

103 Ibid

104 NSW Fire Brigade *Hoarding and Squalor Facts Sheet*, accessed <http://www.nswfb.nsw.gov.au/page.php?id=913>

105 NSW Fire Brigade (2007) *Children and Fire Fascination*, accessed <http://www.nswfb.nsw.gov.au/page.php?id=307>

106 Ibid

107 Marcia Schmertmann, Caroline Finch and Ann Williamson- NSW Injury Risk Management Research Centre, University of New South Wales (2004) *NSW Injury Profile: A Review of Injury Deaths During 1998-2002*, p 24

108 *Beyond Blue Fact Sheet 9: Drug Use and Your Mental Health*, accessed <http://www.youthbeyondblue.com/factsheets-and-info/fact-sheet-9-drug-use-and-your-mental-health/>

Factors associated with poisoning and preventative measures

Unintentional poisoning deaths among children largely involve pharmaceutical medication.¹⁰⁹ In NSW it is one of the leading causes of injury related hospitalisation among children, although NSW Health has reported a decrease in the rate of poisoning hospitalisation of children in recent years.¹¹⁰ Prevention measures are directed at restricting children's access to medication by keeping it out of reach and in child-safe containers.¹¹¹

Narcotics and hallucinogens are the most common substances taken by young people who die as a result of unintentional poisoning.¹¹² The Team's *Trends Report* identified that for the ten years, 1996 to 2005, there was a decrease in the likelihood of illicit drug related deaths among children and young people in NSW.¹¹³

Protective factors that can promote general mental and emotional health include supportive relationships, a sense of control over one's life, and access to support services. Universal and targeted services directed to adolescent mental health aim to strengthen these protective factors. Strategies outlined in the section on suicide aim to increase community awareness of risk factors and appropriate responses and referral options.

For some young people unintentional poisoning may occur when they have a bad reaction to recreational or experimental substance use. NSW Health are running a campaign, *Don't Let Drugs Use You*, aimed at so-called 'club drug' use. The main message of this campaign is to seek medical assistance, without fear of a criminal response, if a friend is having a bad reaction to drugs.

Other injuries

- ▶ Three children, aged 15 and 16 years, died in three separate incidents as a result of injuries sustained from sporting activities. All three were male. Two of the three children were engaged in adventure sports. One was participating in an organised team-sport. The deaths occurred in the context of activities with a certain level of accepted risk. In all cases the child was reported to be sufficiently competent in the sport and appropriate safety measures were in place.
- ▶ Two children, one infant and one in the 1-4 year age group, died following necessary medical intervention. Both children had complex medical needs.
- ▶ One very young child, aged less than two years, died due to crush injuries.
- ▶ One child, aged less than six years, died following a fall. The child reportedly fell from a bunk bed.

Factors associated with unintentional injury and preventative measures

Risk and protective factors associated with unintentional injury can be categorised as environmental, behavioural and social. They vary with age.

Constant and active supervision is the most commonly promoted prevention message in relation to young children and accidental injury.

Where this is not possible, physically restricting a child's access to risky situations can also help to keep children safe. For example, The Children's Hospital Westmead recommends that children under the age of nine do not use bunk beds and where they are used they should comply with Australian Safety Standards and should not be placed near windows, curtains, ceiling fans or light fittings.¹¹⁴

Older children are exploring a broader environment, and are increasingly able to identify risk. As older children will be exercising increasing independence, it is not always appropriate to restrict their access to risky situations. Prevention messages are targeted to assisting children to negotiate potential risks. Older children have the lowest number of fatalities due to injury.¹¹⁵ This is reflected in 2010.

109 Cripps R and Steel D, 2006, *Childhood Poisoning in Australia*, p 4 Australian Institute of Health and Welfare, Canberra

110 Centre for Epidemiology and Research 2010), *The health of the people of New South Wales - Report of the Chief Health Officer. Summary Report, 2010*, p 98

111 AIHW (2006) *Childhood Poisoning in Australia*, p 9

112 Marcia Schmettmann, Caroline Finch and Ann Williamson- NSW Injury Risk Management Research Centre, University of New South Wales 2004, *NSW Injury Profile: A Review of Injury Deaths During 1998-2002*, p 25

113 NSW Child Death Review Team 2008, *Trends in Child Deaths in New South Wales 1996-2005*, Commission for Children and Young People, p 141 CCYP Sydney

114 Children's Hospital Westmead *Safety Fact Sheet: Bunk Beds*, accessed http://www.chw.edu.au/parents/kidshealth/safety_factsheets/pdf/bunk_beds.pdf

115 National Public Health Partnership, 2004. *The National Injury Prevention and Safety Promotion Plan 2004-2014*, p 17, accessed <http://www.nphp.gov.au/publications/sipp/nipspp.pdf>

Young people are increasingly independent and are engaging in adult activities including working, driving, introduction to alcohol and sometimes other drugs. Peer group acceptance becomes increasingly important and it is a time for exploration of newly acquired independence. Prevention measures for young people largely go to behaviour modification through raising awareness of risk factors associated with unintentional injury and possible consequences.

8.4 Suicide

The deaths of 14 young people registered in NSW in 2010 were the result of suicide.

Suicide is a relatively uncommon cause of death, accounting for approximately less than two per cent of all deaths in Australia.¹¹⁶ However, suicide disproportionately affects young people, particularly young men. After deaths due to transport incidents it is the leading external cause of death among young people aged 12 to 24 years.¹¹⁷

NSW Health estimates that for each suicide death there are 30 to 40 hospitalisations due to suicide attempts.¹¹⁸ In contrast to suicide rates, rates of self-harming behaviour and suicide attempts are higher among young women than men.¹¹⁹

This section considers the deaths of young people that occurred as a result of suicide or probable suicide. Deaths included are those where the Coroner has determined there was intentional self-harm and those where records indicate the young person probably intended suicide. Such indicators may include prior suicide attempts, expressions of suicidal intent, a history of self-harming behaviour, or the circumstances of the child's death.

For ease of reporting, the terms 'young person' and 'young people' are used throughout this section, regardless of the age of the child.

None of the deaths of young people due to suicide were reviewable by the Ombudsman.

Table 64 shows the number and rate of suicide deaths, by year, between 1996 and 2010. An interval analysis of the entire 15 year period shows a significant decline in the rate of deaths due to suicide. There is no difference between males and females in this trend. In the historical analysis, males were about twice as likely to commit suicide as females.

Table 64: Gender of children who died due to suicide, deaths registered 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	19 (7.2)	23 (8.7)	13 (4.9)	8 (3.0)	10 (3.7)	12 (4.4)	13 (4.7)	12 (4.3)	9 (3.2)	13 (4.6)	6 (2.1)	9 (3.2)	7 (2.5)	14 (4.9)	9 (3.2)
Male	6 (2.3)	10 (3.8)	2 (0.8)	13 (4.8)	8 (3.0)	5 (1.8)	6 (2.2)	6 (2.2)	7 (2.5)	6 (2.1)	2 (0.7)	4 (1.4)	5 (1.8)	4 (1.4)	5 (1.9)
Children	25 (4.9)	33 (6.4)	15 (2.9)	21 (4.0)	18 (3.4)	17 (3.2)	19 (3.5)	18 (3.3)	16 (2.9)	19 (3.5)	8 (1.5)	13 (2.3)	12 (2.2)	18 (3.2)	14 (2.5)

Aboriginal and Torres Strait Islander children were over twice as likely to commit suicide as non-indigenous children. Increasing remoteness was associated with significantly higher rates of suicide, except for very remote areas.

There are well documented issues in relation to suicide data collection. As a result of these problems, there may be an under-reporting of suicide in Australia.¹²⁰

A coronial finding of suicide is highly sensitive for a number of cultural, religious and social reasons, including a stigma which can be attached to suicide. Coroners may, therefore, be reluctant to make such a finding.¹²¹

116 ConNetica Consulting 2010, *Breaking the Silence*, p 24

117 Australian Institute of Health and Welfare 2011, *Young Australians, Their Health and Wellbeing 2011*, accessed <http://www.aihw.gov.au/publication-detail/?id=10737419261>, p 33 AIHW Canberra

118 NSW Government 2010, *NSW Suicide Prevention Strategy 2010-15*, p 10

119 Australian Institute of Health and Welfare 2008, *Injury Among Young Australians*, accessed <http://www.aihw.gov.au/publication-detail/?id=6442468094> p 29, AIHW Canberra

120 Commonwealth House of Representative Standing Committee on Health and Ageing 2011, *Before it's too late: Report on early intervention programs aimed at preventing youth suicide*, p 11

121 Commonwealth Senate Community Affairs References Committee 2010, *The Hidden Toll: Suicide in Australia*, p 26

For a finding of suicide to be made the Coroner must determine, on the balance of probabilities and with a high standard of evidence, that the person had the intent to kill themselves.¹²² This is a lengthy and complex process with the determination often not being made until after the data collection cycle for any given year.¹²³ The Coroner must also balance the needs of the bereaved family for a final finding, with leaving open findings where there is insufficient evidence.¹²⁴

Identification and reporting of suicide can be particularly difficult in cases that are equivocal, for example in relation to drug overdoses or single vehicle car crashes.¹²⁵

The recording of the deaths of children aged less than 15 years as a result of suicide is a contested issued. There are concerns in relation to establishing intent; it is held that children less than 15 years of age may not be able to form an intent to kill themselves due to an insufficient understanding of the finality of death.¹²⁶

The Australian Bureau of Statistics only reports on suicide deaths for people aged 15 and older while the Australian Institute of Health and Welfare report suicide for children from 12 years and older. We have followed the approach of the Australian Institute of Health and Welfare.

In order for policy responses to suicide to be appropriate and well targeted they need to draw on the best available information. Accurate recording of information, including accurately capturing the age of people who have committed suicide, is important for informing prevention strategies.

8.4.1 Demographic and individual characteristics

Table 65 provides an overview of the main demographic characteristics of young people who died as a result of suicide and whose deaths were registered in 2010.

Table 65: Key demographic and individual characteristics – deaths of young people due to suicide registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	14	100	2.5	1.4 - 4.3	
Gender					
Female	5	36	1.9	0.6 - 4.3	
Male	9	64	3.2	1.5 - 6.0	1.7
Age					
10-14 years	1	7	0.5	0.1 - 1.6	
15-17 years	13	93	2.5	1.0 - 5.1	4.6
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	12	85	2.3	1.1 - 4.0	
Aboriginal and Torres Strait Islander	2	15	8.6	1.0 - 5.1	3.8
Remoteness					
Major cities	5	36	1.3	0.6 - 3.4	
Inner regional	6	43	4.8	1.8 - 10	3.7
Outer regional	2	14	5.2	0.6 - 19	4.0
Remote	1	7	40	1.0 - 220	31
Socioeconomic status					
High	8	57	2.8	1.2 - 5.6	
Low	6	43	2.6	0.8 - 4.9	0.9

122 *Briginshaw v Briginshaw* 1938m, 60 CLR 336

123 Australian Institute of health and Welfare 2009, *A Review of Suicide Statistics in Australia*, Injury and Research Statistics Series No 49, p 20

124 Commonwealth House of Representative Standing Committee on Health and Ageing (2011), *Before it's too late: Report on early intervention programs aimed at preventing youth suicide*, p 12

125 Commonwealth Senate Community Affairs References Committee 2010, *The hidden toll: Suicide in Australia*, p 20

126 Suicide Prevention Australia 2010, *Position Statement: Youth Suicide Prevention*, p 3 accessed suicidepreventionaustralia.org

Age, gender and Aboriginal and Torres Strait Islander Status

The age of the young people who died as a result of suicide ranged from 14 to 17. The majority (10) were young people aged 16 and 17 years.

Just under two thirds (9) of the young people who died as a result of suicide were male. This is consistent with previous years. Tables 66 to 68 show the rate of suicide by gender since 1996.

Two young people, both male, were Aboriginal.

Table 66: Suicide deaths of children and young people registered 1996 to 2010

Year	Population	Deaths	Crude mortality rate	Directly standardised mortality rate	95% lower confidence limit	95% upper confidence limit
1996	515671	25	4.85	4.91	3.22	7.12
1997	518492	33	6.36	6.43	4.41	8.82
1998	522614	15	2.87	2.88	1.52	4.48
1999	526235	21	3.99	4.01	2.5	6.03
2000	530921	18	3.39	3.4	1.93	5.15
2001	536798	17	3.17	3.17	1.79	4.93
2002	542002	19	3.51	3.5	2.07	5.38
2003	544741	18	3.3	3.14	1.79	4.93
2004	546514	16	2.93	2.77	1.52	4.48
2005	549477	19	3.46	3.3	1.93	5.16
2006	552107	8	1.45	1.45	0.62	2.86
2007	556873	13	2.33	2.31	1.12	3.8
2008	556346	12	2.16	2.14	0.99	3.57
2009	554807	18	3.24	3.18	1.79	4.93
2010	553035	14	2.53	2.48	1.25	4.03

Table 67: Suicide deaths of young people (females) registered 1996 to 2010

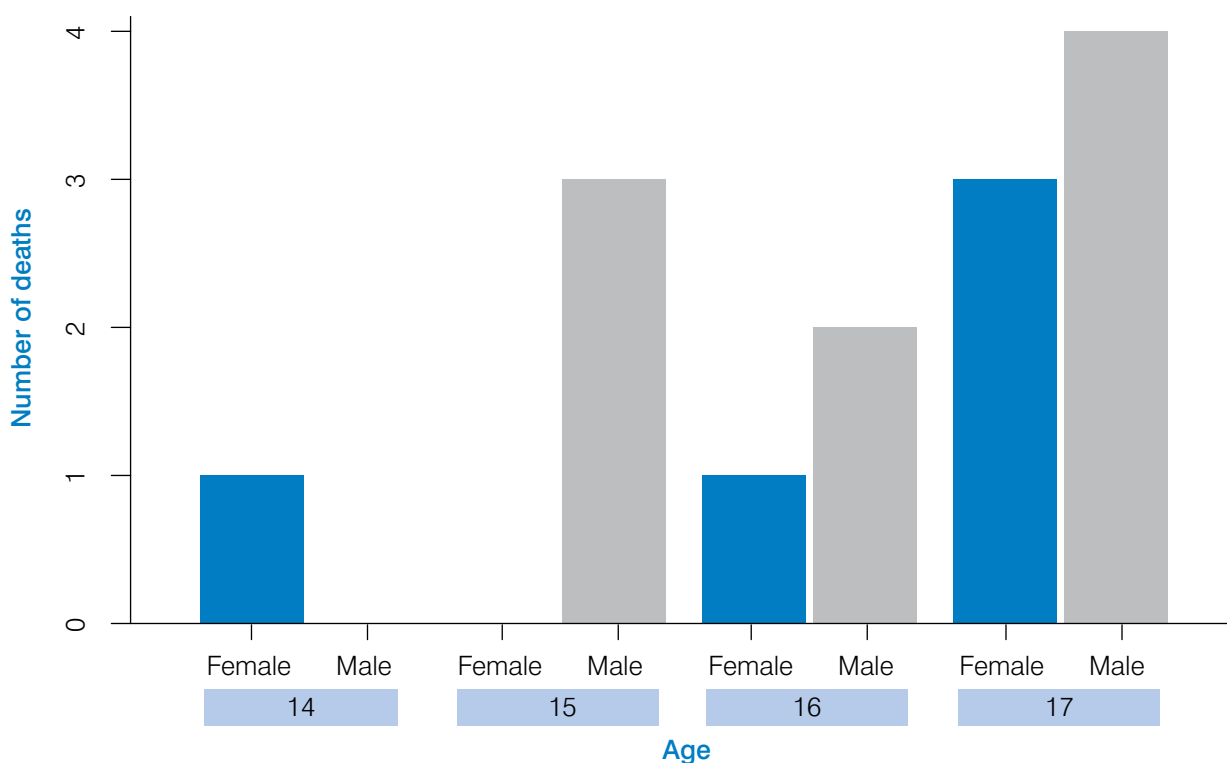
Year	Population	Deaths	Crude mortality rate	Directly standardised mortality rate	95% lower confidence limit	95% upper confidence limit
1996	208893	6	2.27	2.88	0.98	5.83
1997	210242	10	3.77	4.77	2.14	8.21
1998	211943	2	0.75	0.95	0.11	3.22
1999	213928	13	4.83	6.12	3.09	9.93
2000	216077	8	2.95	3.7	1.54	7.04
2001	218130	5	1.82	2.29	0.72	5.21
2002	220040	6	2.16	2.71	0.98	5.83
2003	220799	6	2.15	2.73	0.98	5.83
2004	221859	7	2.5	3.19	1.26	6.44
2005	222770	6	2.13	2.71	0.98	5.83
2006	224089	2	0.71	0.89	0.11	3.22
2007	226054	4	1.4	1.79	0.49	4.57
2008	227047	5	1.75	2.22	0.49	4.57
2009	226234	4	1.41	1.73	0.28	3.91
2010	226151	5	1.77	2.17	0.49	4.57

Table 68: Suicide deaths of young people (males) registered 1996 to 2010

Year	Population	Deaths	Crude mortality rate	Directly standardised mortality rate	95% lower confidence limit	95% upper confidence limit
1996	264264	19	7.19	7.3	4.31	10.89
1997	265520	23	8.66	8.74	5.42	12.59
1998	267762	13	4.86	4.86	2.44	7.84
1999	269387	8	2.97	2.98	1.22	5.56
2000	271542	10	3.68	3.7	1.69	6.49
2001	274637	12	4.37	4.36	2.18	7.4
2002	277292	13	4.69	4.69	2.44	7.84
2003	278807	12	4.3	3.94	1.93	6.94
2004	280036	9	3.21	2.87	1.22	5.56
2005	282076	13	4.61	4.28	2.18	7.39
2006	283556	6	2.12	2.12	0.77	4.61
2007	285964	9	3.15	3.07	1.22	5.56
2008	285419	7	2.45	2.41	0.77	4.61
2009	284581	14	4.92	4.84	2.44	7.84
2010	282945	9	3.18	3.12	1.22	5.56

The frequency of suicides has decreased significantly over the past fifteen years, with no difference between males and females.

Figure 23: Deaths due to suicide registered in 2010 – age and gender



Socioeconomic status

In 2010, there was no significant difference in the number of young people who committed suicide who resided in low or high socioeconomic areas. As shown in table 69, there is no discernible pattern related to the rate of suicide between low and high socioeconomic areas across the 15 years from 1996.

Table 69: Suicide deaths between low and high socioeconomic status, number and (Crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Low	10 (3.1)	12 (3.7)	8 (2.5)	7 (2.2)	9 (2.8)	11 (3.4)	10 (3.1)	8 (2.5)	8 (2.5)	7 (2.2)	5 (1.6)	3 (0.9)	4 (1.2)	9 (2.8)	8 (2.8)
High	15 (4.3)	21 (6.0)	7 (2.0)	14 (4.0)	9 (2.6)	6 (1.7)	9 (2.6)	10 (2.9)	8 (2.3)	12 (3.4)	3 (0.9)	10 (2.9)	8 (2.3)	9 (2.6)	6 (2.3)

Where the incidents occurred

There is a higher rate of suicide among people in rural and remote areas when compared with the general population. Factors which may contribute to this include underemployment, poor access to health and support services and social isolation.¹²⁷

Of the 14 young people who died due to suicide, most lived in metropolitan (5) or inner regional areas (6). Three young people lived in an outer regional (2) or remote areas (1).

Most of the incidents which led to the death occurred in the young person's family home (10). Three young people were discovered in public places and one young person was found in a non-private dwelling.

Education and employment

Seven young people were school students and one young person was at TAFE. Two young people who had left school were in part time employment. Four young people were unemployed, including one young person who had completed year 12 the previous year.

Child protection history

Half (7) of the young people who died as a result of suicide had been the subject of a report of risk of harm or report of risk of significant harm to Community Services within the three years prior to their death. There were no young people who, while not the subject of a report themselves, had a sibling who had been the subject of a report.

Two of the seven young people had also been the subject of a report to a Child Wellbeing Unit in 2010.

For five young people, reports to Community Services concerned risk of harm associated with the young person's own behaviour and/or mental health, including risk of suicide (2), risk of self harm (1) and alcohol or other drug use (4).

Other reported risk issues for the young people included exposure to adult domestic violence (4), carer alcohol/ other drug use (4), risk of physical harm (3), neglect (2), inadequate shelter (3), inadequate supervision (2), runaway child (1) and sexual assault(1).

8.4.2 Circumstances of death

Stated or inferred intent

More than half (9) of the young people who died as a result of suicide had at some time previously stated their intent to suicide, most often to a friend or family member.

Four young people had communicated their intent to suicide in the 24 hours before their death; in three cases this was by way of a text message within hours of the incident. Another five young people had either spoken or written to others about intent to suicide in the months before their death.

¹²⁷ Suicide Prevention Australia 2010, Position Statement: Youth Suicide Prevention, p 5, accessed suicidepreventionaust.org

Method

Of the 14 young people, 10 died as a result of hanging, three died from overdoses of prescription medication and one young person jumped from a high place.

Hanging is the most common method of suicide.¹²⁸ There is evidence to support arguments that restricting access to means of suicide reduces the incidence of suicide. In Australia, there has been an apparent decrease in suicides involving firearms in line with the introduction of more stringent gun laws.¹²⁹ However, a study of method substitution concluded that the increase in suicides by hanging equalled the decrease in suicide by firearms.¹³⁰ Unfortunately, it is almost impossible to restrict access to some means of suicide, especially hanging.

8.4.3 Risk factors associated with suicide

The reasons people suicide are varied and complex and greatly depend on the individual. Previously, the Team has categorised suicide deaths according to whether the child had experienced 'enduring difficulties' such as family dysfunction, mental health problems, or school related difficulties, or had experienced a 'pivotal life event' such as interpersonal issues or unemployment. There is significant overlap between the factors associated with both categories. This year we have taken a broader approach to considering risk factors.

There are a range of interacting risk factors which have been associated with suicidal behaviour. These include:

- mental illness;¹³¹
- previous suicide behaviour;¹³²
- substance misuse;¹³³
- personal crisis, including relationship difficulties with family, friends or partners, problems relating to school or work, physical illness and bereavement;¹³⁴
- family circumstances, including recent family breakdown or dysfunction, or a family history of suicide;¹³⁵
- childhood trauma, including abuse or neglect;¹³⁶ and
- social isolation or exclusion.¹³⁷

The risk of suicide has also been shown to escalate at key transition points. For young people this might include changing schools, transitioning out of the school system, leaving criminal justice settings or transitioning from child to adult services.¹³⁸

In past reports the Team has also reported on incidents of 'contagion' suicides. There is evidence that people who have been bereaved by suicide themselves have an increased tendency to suicide.¹³⁹ There is also some concern that irresponsible media reporting of suicide might increase suicidal thoughts among vulnerable populations.¹⁴⁰ Guidelines for media reporting of suicide, *MindFrame*, seek to reduce this. *MindFrame* is funded through the National Suicide Prevention Strategy and aims to encourage responsible and sensitive media reporting of mental illness and suicide. It includes resources for media professionals as well as supporting SANE Australia to monitor media reporting to ensure '*accurate and respectful representation of mental illness and suicide*'.¹⁴¹

128 Australian Institute of health and Welfare, 2009, *Injury Deaths, Australia 2004-05*, p 82 accessed www.aihw.gov.au/publication-detail/?id=6442468284

129 Mendoza J and Rosenberg S 2010, *Breaking the Silence*, p 90 Lifeline Australia, Suicide Prevention Australia, p 90

130 DeLeo D, Dwyer J, Fireman D, Neulinger K, 2003, Trends in hanging and firearm suicide rates in Australia: Substitution of method? *Suicide and life threatening behavior*, Vol 33 (2): 151 - 164

131 NSW Government 2010, *NSW Suicide Prevention Strategy 2010-15*, p 14, accessed www.health.nsw.gov.au/pubs/2010/suicide_ps.html

132 Ibid

133 Suicide Prevention Australia 2010, *Position Statement: Youth Suicide Prevention*, p 4

134 Mendoza J and Rosenberg S 2010, *Breaking the Silence*, p 90 Lifeline Australia, Suicide Prevention Australia, *Breaking the Silence*, p 54

135 Ibid

136 NSW Government (2010) *NSW Suicide Prevention Strategy 2010-15*, p 16, accessed www.health.nsw.gov.au/pubs/2010/suicide_ps.html

137 Suicide Prevention Australia 2010, *Position Statement: Youth Suicide Prevention*, p 5 accessed www.suicidepreventionaust.org/?statement=youth-suicide-prevention

138 Commonwealth House of Representative Standing Committee on Health and Ageing (2011), *Before it's too late: Report on early intervention programs aimed at preventing youth suicide*, p 17

139 Suicide Prevention Australia 2010, *Position Statement: Youth Suicide Prevention*, p 7 www.suicidepreventionaust.org/?statement=youth-suicide-prevention

140 Commonwealth Senate Community Affairs References Committee 2010, *The Hidden Toll: Suicide in Australia*, p 65

141 Ibid

Mental health

Adolescence is a time when many mental illnesses develop and young people have the highest incidence of diagnosable signs of mental illness when compared with other age groups.¹⁴²

For 11 of the 14 young people, mental health problems were identified risk factors. Seven young people had been diagnosed with a mental illness and/or were receiving treatment for mental health problems. For a further four young people, family members reported after the young person's death that they had observed symptoms of depression prior to the death, but there had been no diagnosis or treatment.

Depression was the most commonly identified mental illness (9). Seven young people had been prescribed anti-depressant medication at some time.

Three young people had no identified mental health concerns.

Previous suicidal behaviour and self harm

A previous suicide attempt is considered to be the strongest predictor of future suicide attempt or suicide.¹⁴³ Three young people had previously attempted suicide, including a young person who had attempted suicide three days before their death.

In addition, a further seven young people had expressed suicidal ideation (5) and/or previously self harmed (3). Self-harming behaviour may not necessarily be a warning of suicidal intention. There is some suggestion that self-harming behaviour is exercised as a means of controlling complex emotions.¹⁴⁴ However, there is evidence that the risk of suicide is higher among people who engage in self-harming behaviour.¹⁴⁵

From the available information, only four of the 14 young people had no recorded history of suicidal ideation or self harming behaviour.

Substance misuse

Substance misuse is strongly correlated with suicide, especially where the person also suffers depression or anxiety.¹⁴⁶

There was some evidence of a history of substance misuse in relation to eight young people, most commonly cannabis (five) and alcohol (four). Two young people had a history of chronic substance dependency.

Personal crisis

Available records indicated that many of the young people were experiencing, or had experienced one or more personal crises. Relevant circumstances included:

- ▶ school problems, such as refusing to go to school, exclusion, academic difficulties (8)
- ▶ relationship difficulties, including relationship breakdowns (5)
- ▶ chronic or recent physical health problems (4)
- ▶ sexual assault (2)
- ▶ bereavement (1).

Family circumstances

Almost all (13) of the young people lived at home with at least one birth parent. Some young people had experienced difficult family circumstances, including on-going relationship difficulties with parents or step-parents (6), family/parent separation (7) and tension with parent/s in relation to the young person's behaviour (5).

142 AIHW 2011, *Young Australians: Their health and wellbeing 2011*, p 33

143 NSW Government 2010, *NSW Suicide Prevention Strategy 2010-15*, p 14

144 Mendoza J and Rosenberg S 2010, *Breaking the Silence*, p 90 Lifeline Australia, Suicide Prevention Australia, p 31

145 Suicide Prevention Australia 2010, *Position Statement: Youth Suicide Prevention*, p 5, accessed www.suicidepreventionaust.org/?statement=youth-suicide-prevention

146 Suicide Prevention Australia 2010, *Position Statement: Youth Suicide Prevention*, p 4, accessed www.suicidepreventionaust.org/?statement=youth-suicide-prevention

Social isolation or exclusion

Social isolation and exclusion was an issue for four young people.

Bullying was identified as a possible risk factor for four young people, either as the victim (3) or the perpetrator (1).

Records for four young people indicated possible social exclusion as a result of factors such as poor self-esteem, body image, learning difficulties, or general social and behavioural difficulties.

For two young people, records reviewed indicated that the young person had been withdrawing from family, friends and usual activities in the weeks and months prior to their death.

Precipitating events

It is important to note that most people who are deemed high risk never attempt suicide. On the other hand, people who are apparently not at high risk do.¹⁴⁷ Suicide seems to occur when risk factors are accompanied by a sense of hopelessness or the experience of unendurable emotions.¹⁴⁸

Research has indicated that certain precipitating events can act as a 'tipping point' for suicide. Arguments with family, friends or partners are common precipitating events, especially among young people.¹⁴⁹ There is evidence that among young people suicide can sometimes be an impulsive act which is not always thought through or planned.¹⁵⁰

Records we reviewed identified possible precipitating events for nine of the 14 young people who died as a result of suicide. For almost all of these young people (7) the possible precipitating event was an argument with someone they were close to, including parent/s, sibling/s, boyfriend/girlfriend.

Other possible precipitating events included experiences which may have left the young person feeling vulnerable or embarrassed.

8.4.4 Preventative measures

Risk factors associated with suicide can be mitigated by the presence of protective factors. This includes things such as positive sense of self and sense of control, supportive relationships and access to support services.¹⁵¹

Prevention is aimed at strengthening protective factors. The principles underpinning prevention messages can be loosely grouped into collaboration, increasing awareness of mental health problems both for individuals and community-wide and training for relevant professionals to be able to identify risk factors and support and refer young people appropriately.

The need to better respond to mental health problems generally, and suicide specifically, has been recognised across all levels of government.

At the Federal level, two Commonwealth government inquiries were conducted in 2010 and 2011, *The Hidden Toll: Suicide in Australia* and *Before it's too Late: Report on Early Intervention Programs Aimed at Preventing Youth Suicide*. In addition the Council of Australia Governments has committed to the National Partnership on Mental Health. Underlying this is the *Living is for Everyone Framework*.

At the state level, the NSW Government has developed the *NSW Suicide Prevention Strategy 2010-2015*. This is a whole of government strategy, with NSW Health as the lead agency. As a whole of government strategy it recognises that suicide is not only a health issue. In relation to youth suicide there is a role for schools, Police, Community Services, general practitioners and others that may have a support role in a young person's life including sporting coaches, friends and family.

147 Commonwealth House of Representative Standing Committee on Health and Ageing 2011, *Before it's too late: Report on early intervention programs aimed at preventing youth suicide*, p 16, accessed www.aph.gov.au/house/committee/haa/youthsuicide/report.htm

148 Mendoza J and Rosenberg S 2010, *Breaking the Silence*, Lifeline Australia, Suicide Prevention Australia, p 90

149 *ibid*, p 55

150 Commonwealth House of Representative Standing Committee on Health and Ageing 2011, *Before it's too late: Report on early intervention programs aimed at preventing youth suicide*, p 17, accessed www.aph.gov.au/house/committee/haa/youthsuicide/report.htm

151 *Ibid* p 16

Prevention programs

Suicide prevention programs are generally targeted either to a universal audience, specific social groups with a higher risk of suicide, or specifically to the individual where risk factors have been identified.

There are a number of programs in NSW aimed at preventing youth suicide, they work across all three levels and include a range of initiatives aimed at building community awareness around identification and responding to risk, providing greater access to mental health services for young people and ensuring more age appropriate service responses.

The Team's recommendations

In the last Annual Report the Team directed three recommendations to NSW Health in relation to the NSW Suicide Prevention Strategy. These went to making use of new media to deliver prevention services to young people, developing resources to educate young people in the importance of passing on suicide risk concerns about peers and increasing collaboration between schools and youth mental health services.

NSW Health supported all three recommendations and advised the Team of a range of strategies in place to meet them. Strategies include tendering for a market research project to identify how to deliver prevention services through new media; development of a communication strategy to increase community awareness of suicide risks, prevention and to reduce the stigma associated with suicide; and development of school staff training resources around suicide risk identification and support. In addition, the Department advised of increased cooperation between Child and Adolescent Mental Health Services and the Department of Education and Communities.

8.5 Fatal assault

The deaths of 13 children and young people registered in NSW in 2010 were the result of fatal assault.

All fatal assault deaths of children and young people are reviewable by the NSW Ombudsman. The Ombudsman reports biennially on reviewable deaths, and the deaths described here will be the subject of detailed analysis and reporting in 2012.

In 2009, the Team reported on the deaths of seven children and young people in the context of fatal assault. The increase this year is exclusively in relation to the deaths of teenagers in peer-related incidents. It is important to note, however, that annual rates of fatal assault have fluctuated considerably since 1996, as shown in Table 70.

Table 70 also shows that males are consistently more likely to die as a result of fatal assault than females. In 2010, males – predominantly teenagers - were over three times as likely to die of assault (11 of the 13 deaths).

Table 70: Trends in deaths of children due to fatal assault by gender – 1996 to 2010, number and (crude mortality rate)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Female	4 (0.5)	3 (0.4)	6 (0.8)	6 (0.8)	5 (0.6)	6 (0.8)	2 (0.3)	9 (1.2)	6 (0.8)	7 (0.9)	0 (0)	2 (0.3)	5 (0.6)	3 (0.4)	3 (0.4)
Male	11 (1.4)	10 (1.2)	10 (1.2)	10 (1.2)	10 (1.2)	7 (0.9)	7 (0.9)	10 (1.2)	2 (0.2)	6 (0.7)	11 (1.3)	6 (0.7)	7 (0.8)	4 (0.5)	10 (1.2)
Children	15 (1.0)	13 (0.8)	16 (1.0)	16 (1.0)	15 (0.9)	13 (0.8)	9 (0.6)	19 (1.2)	8 (0.5)	13 (0.8)	11 (0.7)	8 (0.5)	12 (0.7)	7 (0.4)	13 (0.8)

In 12 of the 13 cases, police have laid charges against one or more persons in relation to the death. In one case, the offender(s) are unknown. At the time of writing, one conviction (manslaughter) had been recorded. As the majority of cases are still subject to criminal proceedings, we have exercised caution in describing the circumstances of the children's deaths.

8.5.1 Demographic and individual characteristics

Table 71 describes the key demographic characteristics of the 13 children and young people who were fatally assaulted.

Table 71: Key demographic and individual characteristics- deaths of children due to fatal assault registered in 2010

	Number	Percent	Crude Mortality Rate	95% Confidence Interval	Incident Rate Ratio
Total	13	100	0.8	0.4 - 1.4	
Gender					
Female	3	23	0.4	0.1 - 1.1	
Male	10	77	1.2	0.6 - 2.2	3.1
Age					
Infants (less than 1 year)	1	8	1.0 (IMR 0.001)*	0.0 - 5.8	
1-4 years	2	15	0.6	0.1 - 2.0	0.5
5-9 years	0	0			
10-14 years	2	15	0.4	0.1 - 1.6	0.4
15-17 years	8	62	2.8	1.2 - 5.6	2.8
Aboriginal and Torres Strait Islander status					
Not Aboriginal and Torres Strait Islander	9	69	0.6	0.3 - 1.1	
Aboriginal and Torres Strait Islander	4	31	5.7	1.5 - 14.5	9.9
Remoteness					
Major cities	9	69	0.8	0.4 - 1.5	
Inner regional	2	15	0.6	0.1 - 2.1	0.8
Outer regional	2	15	1.8	0.2 - 6.6	2.4
Socioeconomic status					
High	4	31	0.4	0.1 - 1.1	
Low	9	69	1.0	0.5 - 1.9	2.4

* IMR (Infant Mortality Rate)

Age, gender and Aboriginal and Torres Strait Islander status

Fatal assaults occurred most commonly among young people aged 15 to 17 years and among young children, aged less than five years. This reflects previous findings of the Team, and also the work of the Ombudsman.¹⁵² The majority of young children die in abuse-related circumstances in domestic homicides, while teenagers are more likely to die in assaults perpetrated by peers or unrelated others.

Aboriginal children were strongly over-represented in deaths resulting from assault. Three of the four Aboriginal children who were fatally assaulted were over 16 years of age. Table 72 shows the rate of assault deaths of Aboriginal children has been higher than that of non-Aboriginal children since 1996, but the two have shown some evidence of converging over the 15 year period. The sharp rise in 2010 reflects the relatively high number of deaths of Aboriginal children this year.

Remoteness was associated with higher rates of death by assault, but the number of deaths was small, and closely associated with Aboriginal status.

¹⁵² Child Death Review Team 2002, *Fatal assault of children and young people*, Commission for Children and Young People, p. 21; NSW Ombudsman 2009, Report of reviewable deaths in 2007, volume 2: child deaths, p. 36

Table 72: Aboriginal and Torres Strait Islander status of children who died due to fatal assault – deaths registered 1996 to 2010, number and (crude mortality rate)

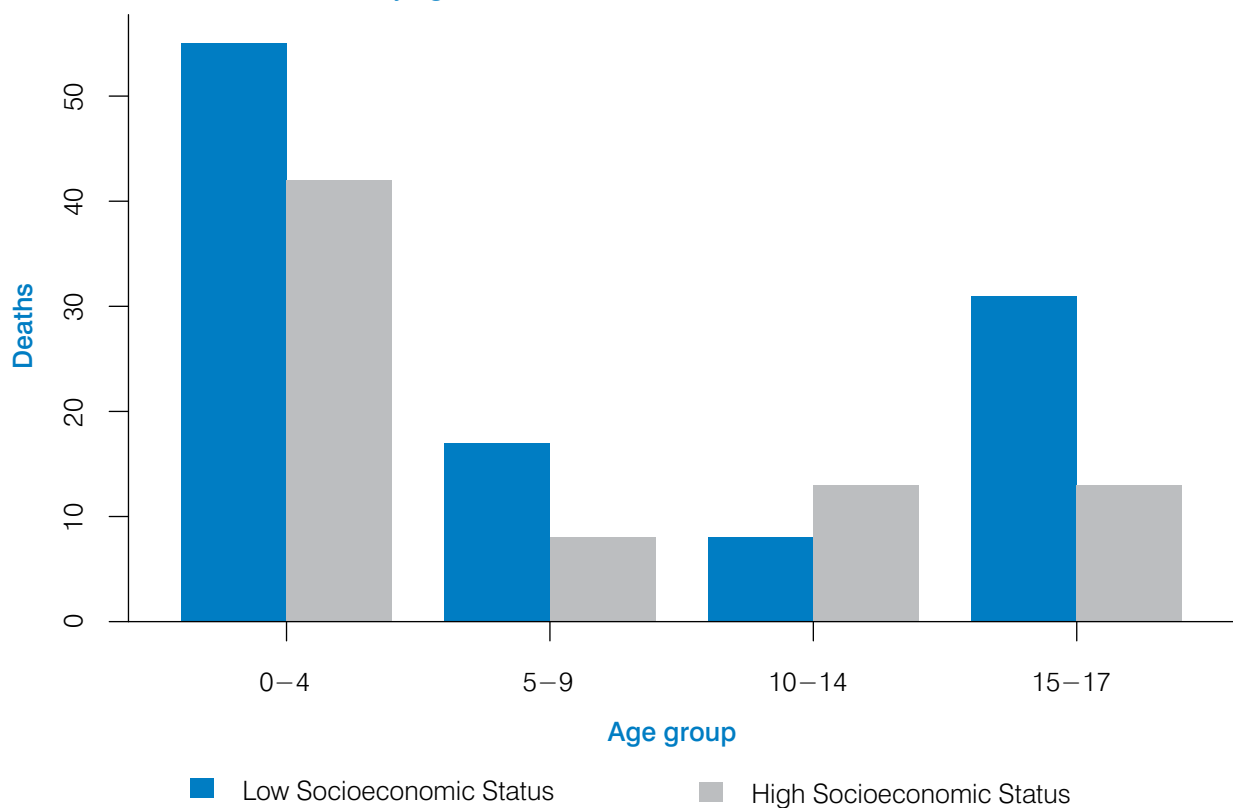
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Non Indigenous	11 (0.7)	13 (0.9)	12 (0.8)	12 (0.8)	13 (0.8)	10 (0.6)	6 (0.4)	14 (0.9)	3 (0.2)	9 (0.6)	10 (0.6)	7 (0.5)	11 (0.7)	6 (0.4)	9 (0.6)
Aboriginal and Torres Strait Islander	4 (7.4)	0 (0)	4 (7.0)	4 (6.8)	2 (3.3)	3 (4.8)	3 (4.7)	5 (7.8)	5 (7.7)	4 (6.1)	1 (1.5)	1 (1.5)	1 (1.5)	1 (1.5)	4 (5.7)

Age and socioeconomic status

Figure 24 shows the breakdown of assaults from 1996 to 2010 by age group and social disadvantage.

The rate of fatal assault of children living in low socioeconomic areas is higher than that of children living in high socioeconomic areas, except in the 10-14 year age group.

Figure 24: fatal assault of children by age and socioeconomic status – 1996 to 2010



8.5.2 Circumstances of fatal assault

There are numerous methods for classifying homicide, based on various victim, offender and incident characteristics.¹⁵³ For the purposes of this report, and most relevant to considering preventative strategies in relation to child deaths, is consideration of the specific contexts of familial homicide and fatal assaults involving peers.

Familial homicide includes intimate partner, filicide (custodial and non-custodial parents or step-parents), siblicide and killings by other family members, including extended family.¹⁵⁴ Peer-related homicide generally relates to young people in a context of confrontational violence between friends, acquaintances and strangers.¹⁵⁵ Peers are generally closer in age and social status.

Homicide research indicates that most child homicides in Australia are committed by family members, usually a parent or step-parent.¹⁵⁶ This is reflected in NSW: over three-quarters of children who died as a result of abuse in NSW between 2003 and 2009 died in family homicides.¹⁵⁷

In 2010, however, this was not the case. The majority of fatal assault deaths (seven of the 13) were teenagers allegedly killed by peers.

In relation to the 13 deaths:

- Seven young people died following assault or affray involving peers, including three who were Aboriginal. The seven young people died as a result of injuries sustained through gunshot or assault with knives or other weapons, and in one case, traumatic head injury.

In five of the seven incidents, the victim did not appear to know the alleged offender(s). Another victim was a friend of the alleged offenders, and in a further case, the victim was related to the offender's defacto partner.

In all but one case, more than one person was involved in the incident, even where only one person has been charged to date. There was some evidence that the incident that resulted in the separate deaths of two young people may have occurred in the context of group or gang rivalry. In relation to these two deaths, more than one person has been charged with murder in each case.

Four deaths occurred in a public place, and one at a party involving invited and uninvited guests. Two deaths occurred in a private home.

- Four children died in familial homicides, including one Aboriginal child. All four were allegedly killed by a parent or step-parent. Three of the four children were three years of age or less. The children died as a result of drowning, blunt force trauma or knife wounds.
- One child died following an alleged attack by an acquaintance in the context of a psychotic episode.
- One young person was killed in an incident involving unknown assailants. The young person died as a result of gunshot wounds.

Child protection history

Two children and two young people who died in fatal assault incidents had been the subject of a report of risk of harm or report of risk of significant harm to Community Services within the three years prior to their death.

Of the children who died in the context of a family homicide, one child had been the subject of a report of risk of significant harm due to physical harm, excessive discipline, verbal abuse and neglect. The second child had been the subject of two reports, neither of which raised concerns about the physical safety of the child.

153 Australian Institute of Criminology 2010, *Homicide in Australia: 2007 – 08 National Homicide Monitoring Program annual report*. AIC monitoring report 13 Marie Viruda and Jason Payne. AIC Canberra.

154 See Strang, Heather 1996, Children as victims of homicide" in *Trends and Issues in Crime and Criminal Justice*, No.53, March 1996, Australian Institute of Criminology, page 2

155 Queensland Commission for Children and Young People and Child Guardian 2010, *Annual report deaths of children and young people, Queensland, 2009 – 10*, Commission for Children and young people and Child Guardian Queensland, Brisbane, page 129.

156 Strang, Heather 1996, Children as victims of homicide in *Trends and Issues in Crime and Criminal Justice*, No.53, March 1996, Australian Institute of Criminology. Page 3

157 NSW Ombudsman 2011, *Report of reviewable deaths 2008 – 2009, volume 1: Child deaths*. Family homicide includes filicide, siblicide and killings by other family members, as well as biological, step or defacto parents. See Mouzas J and Rushforth C (2003) Family homicide in Australia, *Trends and Issues* paper 255, p 2 Australian Institute of Criminology.

Both of the two young people who died in a peer-related assault had been the subject of a number of reports including risk-taking behaviour and substance or alcohol use as a minor.

Another five young people who had not been the subject of any risk of harm concerns in the previous three years had, however, been the subject of such report(s) to Community Services in their childhood.

In addition, five of the young people who died were known to police. In the main, they were known for minor offences or concerns, including graffiti, alcohol or cannabis use (or suspected use), and transport violations. In two cases, the young people were known for involvement in violent incidents.

8.5.3 Offender characteristics and precipitating factors

Peer-related assault

More than one alleged offender has been charged in relation to the deaths of four of the seven young people, and in a fifth case, one alleged offender has been charged but there are other persons of interest. Nine of the alleged offenders are teenagers, and six are in their early to mid 20's.

At the time of writing, information was available about eleven alleged offenders who have been charged in relation to five of the seven peer-related fatal assaults.

All 11 were known to police. Five alleged offenders were known for minor offences, including alcohol use, graffiti, and minor break and enter incidents. Another six had a more significant history of criminal activity, which for four of the six included charges or events relating to violence against others.

Eight of the 11 alleged offenders had a child protection history. For five, this history related to earlier childhood and behavioural issues; in one case including violence and suicide risk.

For the other three alleged offenders, one was in statutory care at the time of the incident, and another had exited care in the weeks prior. The third had been the subject of risk of harm reports within the 12 months before the incident relating to family dysfunction, behaviour management and risk taking.

Three alleged offenders had a known history of substance abuse.

Family homicide

Two of the children who died in family homicides died in the apparent context of maternal mental illness and psychosis. In a third case of family homicide, the alleged offender had a history of mental illness and long-term substance abuse, and had recently experienced family breakdown.

In a fourth family homicide, the alleged offender had a history of being a perpetrator of domestic violence in a previous relationship. In the weeks prior to the child's death, the child had been the subject of a report of risk of significant harm to Community Services relating to physical harm.

A psychotic episode appears to have been a precipitating event in the death of another child who was allegedly assaulted by an acquaintance of the family.

8.5.4 Factors associated with fatal assault and preventative measures

It is notably difficult to identify underlying motives for child homicide within the family. One analysis in Australia found the underlying motive for child homicide within the family was undetermined in 61 per cent of cases, while the most prevalent identified motives were domestic altercations (21%) and '*jealousy/termination of the relationship – where the child is killed by one parent as the consequence of the actual or pending separation from the other parent*' (9%).¹⁵⁸ Overwhelmingly, the offenders in these circumstances are male. Mental illness has been identified as a significant factor on the part of mothers who kill their children.¹⁵⁹

Developing strategies to prevent the fatal abuse of children is complex. In regard to family homicides, it is difficult to point to any particular family type or circumstance or combination of factors where risk is likely to escalate to fatal abuse.¹⁶⁰ Further,

158 Mouzos, J and Rushforth, C 2003, Family Homicide in Australia: *Trends & issues in crime and criminal justice*, Australian Institute of Criminology, pages 3 – 4.

159 Ibid, page 4.

160 NSW Ombudsman 2009, *Report of reviewable deaths in 2007, volume 2: Child deaths*. NSW Ombudsman, Sydney, p. 47

where there is a known history of risk to children within the family, it is acknowledged that those same risk factors are present in thousands of child protection cases which do not have a fatal outcome.¹⁶¹

As noted earlier, the NSW Ombudsman is responsible for detailed review of fatal assault deaths of children, and the transfer of the Team to the Ombudsman's office provides a significant opportunity to consider preventative strategies in a holistic context.

The Ombudsman has made a range of recommendations since 2004 related to child deaths, including those due to fatal assault, particularly in the context of child protection concerns.

The child protection system in NSW has recently undergone significant change, with the commencement in 2010 of *Keep Them Safe: A shared approach to child wellbeing*. Among other changes, *Keep Them Safe* has shifted the statutory reporting threshold to 'risk of significant harm'; and has expanded the role of other agencies, such as Police, Health and Education in the delivery of child protection. Longer term goals of *Keep Them Safe* include expanding the role of non-government agencies in child protection, enhancing provision of early intervention and community based services; and improving services for Aboriginal children. The Ombudsman's office is monitoring the implementation of *Keep Them Safe*.

Fatal assault involving peers will be the subject of further detailed consideration by the Ombudsman. In particular, reporting of reviewable deaths in 2012 will consider the nature of peer-related deaths in 2010, which are quite different to those previously reported by the Team. In its 2002 *Report on fatal assaults of children and young people (1996 - 1999)*, the Team noted that most teenage fatal assaults did not involve groups, did not occur in a public place and most offenders were known to the victim.

¹⁶¹ Wood, Hon James AO QC, 2008, *Report of the Special Commission of Inquiry into Child Protection Services in NSW.*, NSW Government.

Chapter 9. Monitoring recommendations

Section 45N (e) *Commission for Children and Young People Act* provides for the Team to make recommendations to prevent or reduce the likelihood of child deaths. Recommendations may be directed to government, and non-government, agencies and the community.

The Team is also required to report, annually, on the extent to which previous recommendations have been accepted. The Team may provide comment on the extent to which those recommendations have been implemented.

The Team monitors recommendations through seeking annual progress reports from relevant agencies.

9.1 New recommendations

In the *Annual Report on Child Deaths 2009 (2010)*, the Team made three recommendations. The recommendations were all directed to NSW Health and relate to the *NSW Mental Health Strategy 2010-2015*.

In *A Preliminary Investigation of Neonatal SUDI in NSW 1996-2008: Opportunities for Prevention (2010)*, the Team made three recommendations:

- ▶ Two were directed to NSW Health and related to safe sleeping policies;
- ▶ One was directed to SIDS and Kids NSW in relation to emphasising sleeping risks.

9.2 Monitoring recommendations

At the time of the Team's transfer to the Ombudsman's Office, six recommendations were subject to ongoing monitoring. Three recommendations were directed to NSW Health and one each to the Motor Accidents Authority, the Registry of Births, Deaths and Marriages and the Division of Local Government (Premier and Cabinet).

In June 2011, the Convenor wrote to all relevant agencies seeking progress reports on these recommendations. The following section details agency responses.

The advice provided by agencies will be the subject of further detailed consideration by the Team.

9.3 NSW Health

Annual Report Child Death Review Report 2009 (2010)

Recommendation 1

That in achieving Outcome 3.2(i) of the *Suicide Prevention Strategy 2010-2015*- 'Educate communities to identify and respond to warning signs, tipping points and imminent risk factors associated with suicide'- that the NSW Government consider the range of communication mediums used by children to inform peers of their intention to suicide.

NSW Health response

NSW Health supports this recommendation.

NSW Health advised that the NSW Suicide Prevention Strategy includes action under 3.2(i) to 'develop multimedia resources to target young people and provide support and information for those affected by a suicide/ attempt'. To progress this work a suicide prevention market research project is currently being tendered. The market research will identify and review new media and social media initiatives promoting suicide prevention for young people.

In addition, NSW Health noted that the Strategy includes an action to conduct a social marketing campaign to raise awareness of suicide prevention and at-risk people, encourage help-seeking behaviour, and challenge the stigma associated with suicide. The market research project, noted above, will also inform the development of the communication strategy.

Recommendation 2	NSW Health response
<p>As part of its work to achieve Strategic Direction 2- 'Building individual resilience and the capacity for self-help'- and Strategic Direction 3- 'Improving community awareness, strength, resilience and capacity in suicide prevention'- of the <i>Suicide Prevention Strategy 2010-2015</i> that the NSW Government revise and update the resources used by schools to support importance of peers passing on concerns they have about peer intention to suicide.</p>	<p>NSW Health supports recommendations 2 and 3.</p> <p>In July 2011, NSW Health advised that they are currently updating and redeveloping the NSW School-Link Initiative Training program into a DVD training resource. This training resource incorporates suicide prevention strategies, including suicide risk and information on depression, self-harm and help seeking for the young person and their peers. The training resource will be made available in 2011 to NSW School Counsellors and NSW Child and Adolescent Mental Health Services.</p> <p>The Department further advised that the School-Link Working Party has recently agreed to work in partnership with the Department of Education and Communities and nominated representatives of the Child and Adolescent Mental Health Sub Committee to develop a set of postvention guidelines.¹⁶² The guidelines will provide a framework to assist staff in supporting their school communities in responding to suspected, attempted or completed suicide.</p>
Recommendation 3	
<p>That in achieving Outcome 3.3 (iii) of the <i>Suicide Prevention Strategy 2010-2015</i>- 'Expand the resource capacity of schools, workplaces and other relevant settings to identify and support those at risk'- the NSW Government identify the barriers to referral between schools and specialist youth mental health services and develop effective and efficient services linkage.</p>	<p>In addition, Health noted that the School-Link Shared Care Schedule is incorporated in a Memorandum of Understanding with the Department of Education and Communities. The Memorandum of Understanding facilitates links between school and Child and Adolescent Mental Health Services, and enhances the capacity of those services, schools and TAFE to work together to promote mental health for children and young people.</p>

A Preliminary Investigation of Neonatal SUDI in NSW 1996-2008: opportunities for prevention (2010)

Recommendation 1	NSW Health response
<p>NSW Health consider these findings in a review of <i>Death-Management of Sudden Unexpected Death in Infancy</i>.</p>	<p>NSW Health supports this recommendation.</p> <p>In September 2010, NSW Health advised the Team that the policy was under review. Further advice in July 2011 indicated that the review would be completed in 2011, for reissue in late 2011- early 2012, following review by the SIDS Advisory Committee.</p>
Recommendation 2	NSW Health response
<p>NSW Health assess compliance with the <i>Babies Safe Sleeping in NSW Health Maternity Facilities</i> policy.</p>	<p>NSW Health supports this recommendation.</p> <p>In September 2010, NSW Health committed to undertaking an audit to assess compliance with the policy.</p> <p>In July 2011, the Department informed the Team that 72 maternity services had been audited in November 2010 to assess the sleeping environment of all babies who were inpatients on postnatal wards. No babies were found to be co-sleeping or sleeping prone (on their stomach). While some babies were found to be in unsafe sleeping positions, discussions with staff and mothers indicated the child had been placed in that position by either the mother or a grandparent.</p> <p>NSW Health advised that the policy had been revised with the inclusion of additional emphasis on the need for antenatal education for all women. When the revised policy is issued, the Department stated that maternity services staff will be updated in relation to the new components.</p>

¹⁶² Postvention generally refers to activities and strategies undertaken after a suicide death to reduce associated trauma. Postvention responses aim to provide bereavement support and advocacy for those affected by the suicide, and to prevent further suicide. Queensland Government 2008, *Principles for providing postvention responses to individuals, families and communities following a suicide death*. State of Queensland (Department of Communities)

Trends in Child Deaths in NSW 1996-2005 (2008)

Recommendation 6

That NSW Forensic Pathology Services Committee outline progress towards achieving its aims.

NSW Health response

In 2008, NSW Health informed the Team that the Sudden Unexpected Death in Infancy Post Mortem Protocol was implemented across all pathology facilities in 2006, and an audit of compliance would be undertaken in 2009.

In 2010, the Department advised that the audit had found little change in practices of forensic pathologists before and after implementation. Five recommendations were made by Health to address this and a further audit was to be conducted at the start of 2011.

In July 2011, NSW Health advised that the audit had been completed. The 2011 audit shows that compliance with the protocols is generally good and has improved since the review in 2009.

Recommendation 8

That NSW Health lead the Sydney Children's Hospital, the Children's Hospital at Westmead, and John Hunter Children's Hospital in developing a plan to improve the quality of the medical certificates of cause of death for children and young people. This work will involve understanding the impediments to quality completion. The plan should be available within 12 months.

NSW Health response

In September 2010, NSW Health advised that in response to this recommendation, the Department had established the Children's Hospital Committee, which made four recommendations in relation to the quality of medical certificates of cause of death for children and young people. The four recommendations were:

1. That the senior clinician responsible for the care of the deceased child leads the completion of cause of death certificate;
2. That a quality improvement process for monitoring the completion of the paediatric cause of death certificate be implemented;
3. That Paediatric wards develop a Best Practice Resource Kit accompanied by the Coronial Checklist (this has been done); and
4. That the three major hospitals implement a pilot project to test the hypothesis that using an amended version of the Australian New Zealand Paediatric Intensive Care Registry (ANZPIC) Diagnostic Codes improves the quality completion of the cause of death form.

In the *Annual Report on Child Deaths 2009 (2010)* the Team raised some questions about the use of ANZPIC codes on medical certificates of cause of death.

In July 2011, NSW Health advised that the first two recommendations had been actioned.

In relation to the last two recommendations, the Department noted that an expert reference group has been formed by the Sydney Children's Hospital Network with appropriate input from John Hunter Children's Hospital to determine optimal coding for paediatric death classification based on ICD-10 and how it may interface with other currently used coding systems. The Group would also develop a Best Practices Resource Kit to assist in the completion of the medical certificate of cause of death, and a process to trial it across Child Health Networks.

Sudden Unexpected Deaths in Infancy: The NSW Experience (2005)

Recommendation 8

Pathologists should follow an agreed protocol and make consistent decisions. Post-mortem examinations should only be conducted by pathologists with specialist knowledge or experience, for example paediatric pathologists or forensic pathologists with specific training and expertise in paediatrics. The Team believes this can be achieved by mid-2006.

NSW Health response

The Team has previously reported NSW Health's progress towards implementing this recommendation, including the development of a protocol for Sudden Unexpected Death in Infancy post mortems and consistent definitions of Sudden Infant Death Syndrome.

In July 2011, Health advised that a review conducted in 2011 showed generally good compliance with the protocols. See NSW Health's response to *Trends in Child Deaths 1996-2005- Recommendation 6* for more information.

9.4 Division of Local Government

Trends in Child Deaths 1996-2005 (2008)

Recommendation 3

That the NSW Swimming Pools Regulation 2009, require local authorities to inspect all swimming pools notified within their area and monitor compliance with the legislation. This could occur through councils developing a plan for inspection and monitoring over a period of years, and reporting periodically against the plan.

Division of Local Government response

In July 2010, the Division advised that the decision had been taken not to implement a mandatory pool safety inspection program, and outlined a number of other safety measures that were contained in the amended Swimming Pools Regulation 2009. The Division further advised that the Minister was considering Coronial findings and recommendations arising from a joint inquest into pool drowning deaths of very young children, held in December 2009.

In June 2011, the Division advised that the NSW Government Cross Agency Working Group had been formed to consider the Deputy Coroner's recommendations, and additional recommendations about strengthening swimming pool legislation made following another inquest into a drowning death of a young child. In addition, the Working Group was considering the Child Death Review Team's recommendation.

The Division advised that a report would be provided to relevant Ministers by the end of June, enabling the Government to further consider these issues.

9.5 Motor Accidents Authority of NSW

Trends in Child Deaths 1996-2005 (2008)

Recommendation 4

That the Motor Accidents Authority, in consultation with other relevant agencies, develop target strategies, including public education programs, to reduce the number of driver deaths of children under 16 years that occur in the context of either organised or non-organised recreational activities.

Motor Accidents Authority response

The MAA advised the Team that in 2010, the Authority had provided \$50 000 to the Commission for Children and Young People to appoint a project officer to develop an interagency response to reduce the risk of preventable injury to children and young people. Further, the Authority advised that at that time it was a member of the Commission's Child Injury Prevention Reference Group. The MAA were recently advised by the Commission that work in this area would recommence in 2011, and that to advance the work, the Commission has engaged the Australian Institute of Health and Welfare to produce a surveillance report on serious childhood injury in NSW. Part of this work will include a specific focus on injury to children resulting from off-road motorcycle incidents.

In addition, it was noted that the MAA has provided funding to the Motorcycle Council of NSW which provides safety information to members for both road and off-road riding.

9.6 Registry of Births, Deaths and Marriages

Trends in child deaths 1996-2005 (2008)

Recommendation 7

That the NSW Registry of Births, Deaths and Marriages monitor the identification of Aboriginal children and young people who die, including the number of registrations where Aboriginal identity is not specified.

Registry of Births, Deaths and Marriages response

In July 2010, the Registry advised that in the fourth quarter of 2011 they would be implementing *Lifelink*, which will allow Indigenous status to be collected from the cause of death certificate, complementing data provided by funeral directors.

In June 2011, the Registry informed the Team that the implementation of *Lifelink* has been delayed to the second quarter of 2012. However, the Registry noted internal procedures designed to resolve inconsistencies between Indigenous status reported on the medical certificate of cause of death and that reported on the death registration. The Registry noted that these processes have improved the quality of data being recorded.

In addition, the Registry advised that they were running a *Get Your Rego Right* campaign, meeting with and training funeral directors in the use of the online deaths registration system, and highlighting the importance of supplying accurate information for death registrations.

9.7 SIDS and Kids

Preliminary Investigation of Neonatal SUDI in NSW 1996-2008 (2010)

Recommendation 3

SIDS and Kids emphasise the risks to neonatal infants of unsafe sleeping environments, particularly the potential for this when a mother is tired and may unintentionally fall asleep.

SIDS and Kids (NSW) response

SIDS and Kids noted that while supporting the recommendation, as a community-based organisation with a small staff team, '*with around 90,000 births every year in NSW, it is simply not possible for our Infant Safe Sleeping message to adequately reach the NSW community.*'

In 2010, SIDS and Kids submitted a proposal to NSW Health for funding to run safe sleeping workshops for staff from Maternity, Neonatal Intensive Care Unit and Paediatric units in NSW hospitals and Child and Family Health Nurses. SIDS and Kids advised the Team that this proposal was unsuccessful.



Appendix 1

Review and recommendations for the reporting of child deaths in NSW: Summary

National Centre for Health Information Research and Training (Queensland University of Technology)

The following sections provide a summary of the main aspects of the review and the recommendations for improvement which were provided by NCHIRT.

1. Lack of Underlying Cause of Death Data

There was extremely limited information regarding the underlying causes of death across key demographic criteria. Apart from one table in Chapter 2 which presents the underlying causes of death by ICD-10-AM chapter, there is no other information in the report which summarises all underlying causes of death across key demographic groups. Identification of the underlying cause of death (UCoD) has long been recognized as the essential factor for compiling and reporting mortality statistics and understanding causes of death.¹⁶³ Given the strict international guidelines for the selection of UCoD (from all reported causes), using the UCoD codes affords the greatest reliability for trend analyses across time and place and facilitates state, national and international comparisons of mortality data.

NCHIRT Recommendation

An UCoD chapter should be included in the revised report. To present the underlying causes of death, ICD-10 codes should be grouped to the three character ICD code level, with a table showing the count and rates of deaths overall and for each code. UCoD should then be reported separately for key individual and community demographics.

2. Omission of ranking of leading causes of death

The report does not provide a ranking of causes to indicate leading causes of death. Presentation of the leading causes of death is essential to provide an understanding of the causes of death resulting in the highest mortality burden in target populations and therefore allows prioritisation of prevention efforts. Leading causes of death enumeration depends on the approach used to group codes into categories, which will affect the rank order of causes. International standard tabulation lists are available from the World Health Organization (WHO) in the ICD-10 and provide a standardised internationally-comparable format for grouping and subsequently ranking causes of death, including a list designed specifically for infant and child mortality. The Australian Bureau of Statistics (ABS) provides leading causes of death analysis (using rank lists), as well as UCoD analysis (using three character ICD-10 codes) and MCoD analysis (for selected diseases/conditions) in their annual causes of death report.¹⁶⁴

NCHIRT Recommendation

A leading causes of death chapter should be included in the revised report. To calculate the leading causes of death, the ABS categories described above should be used to categorise ICD codes into groups. These groups should then be rank ordered by counts of deaths, and the top 10 deaths in each age group, gender, indigenous group, and socioeconomic group should be presented in tabular form. The Queensland CCYPCG CDRT report provides a table such as this for age groups and this could be used as a guide.¹⁶⁵

163 Anderson, R.N., *Coding and Classifying Causes of Death: Trends and International Differences*, in *International Handbook of Adult Mortality*, R.G. Rogers and E.M. Crimmins, Editors. 2011, Springer: Dordrecht Heidelberg London New York. p. 467 - 489.

164 2. Australian Bureau of Statistics, *Causes of Death, Australia, 2008*. 2010, Brisbane: Australian Bureau of Statistics,

165 Commission for Children and Young People and Child Guardian Queensland, *Annual Report: Deaths of children and young people, Queensland, 2009–10*, CCYPCG, Queensland, Editor. 2010: Brisbane.

3. Combining UCoD with intervening and contributory causes of death

Compounding the issue of the limited presentation of UCoD figures and a lack of leading causes of death enumeration in the CDRT report, is the lack of clear separation of underlying cause codes from immediate, intervening and contributory cause codes. The approach used in the report is to provide tables which count 'any mention' of a code anywhere on the death certificate. This results in tables which provide raw counts of codes used on death certificates, rather than counts of child deaths, which is arguably not the most useful method of presentation for prevention purposes.

In order to understand the circumstances of a child's death, the death certificate and subsequent coded data provide useful information regarding the underlying, direct, and intervening causes of death (Part I of the death certificate), and other contributory causes of death (Part II of the death certificate). However, this information is only useful in so far as links are retained between the underlying cause and other causes, to enable an understanding of the fatal chain of events from the underlying to the direct cause of death. Simply counting the number of times a disease, condition or external cause is mentioned on a death certificate does not afford an understanding of the critical point at which prevention needs to be targeted (i.e. the UCoD) or the alternative points at which strategies could be employed to mitigate the likelihood of fatal outcomes (i.e. the intervening and direct causes of death).

NCHIRT Recommendations

It is recommended that the practice of presenting aggregated counts of underlying and multiple causes data in tables is ceased, along with the practice of counting numbers of deaths in multiple sections (which results from this aggregation of underlying and multiple cause data). Death data should be reported according to the UCoD to which it pertains, with multiple cause data for each underlying cause reported only in the chapter where the underlying cause is presented.

A MCoD chapter should be included in the revised report. To enumerate the multiple causes chapter, the ABS categories described above should be used to calculate a count of the number of times the codes in each code grouping appear anywhere on the death certificate (other than as the UCoD). If several codes from the same code grouping appear multiple times on the one certificate, these should be counted once to avoid over-enumeration of the contribution of the cause group. Those code groups with a high ratio of multiple cause appearances to underlying cause codes indicate the causes of death which would be underestimated if analysis and interpretation was limited to underlying causes of death. These high ratio causes can then be used for further exploration to inform prevention initiatives and ensure they are not overlooked as opportunities for prevention activities. Given the strict ICD rules for UCoD assignment, some causes of death will be more likely to be coded as multiple causes, though these causes may be equally important from a prevention perspective as those which are ultimately assigned as underlying causes of death. Presentation of these provides a more complete picture of the circumstances of death and the burden of these causes on overall child mortality.

4. Lack of clarity regarding the choice of causes of death reported

From the documentation provided in the report, it was unclear why the particular causes of death highlighted were chosen for presentation in the report. A reference to the 'Trends in Child Deaths in NSW 1996-2005' report was provided to justify why the discrete causes were chosen, though review of this other report does not clarify this decision. There are three main issues of concern in this approach. Firstly, without a clear section to identify and describe the leading causes of death in children within the report, important changes in time trends regarding the mortality burden of different diseases/conditions/external causes cannot be adequately monitored and an appropriate response developed. While trends in the particular causes of death that are presented in the report can be tracked over time, it is equally important to monitor trends and changes in leading causes of death over time. Secondly, by continuing the focus on a defined selection of causes of death (without also adequately describing the remainder of the causes of death), patterns/trends in other significant causes and changes in leading causes which might also be amenable to more detailed review cannot be adequately monitored. Thirdly, by omitting causes of death considered 'rare events', issues of significant public health concern may be overlooked. For example, deaths due to vaccine preventable diseases are of high public health interest, yet these causes of deaths are rare events and are not systematically included in the report in the current format.

NCHIRT Recommendation

A clearer rationale is needed in the report to describe the choice of causes of death reported. The choice of which causes to present could be based on:

- ▶ A leading causes of death by age group approach, or
- ▶ Age group by leading cause approach, or
- ▶ From a public health interest/topical cause perspective, or
- ▶ A combination of approaches by presentation of all major categories of death (such as 1 - external causes: inflicted (assault, suicide) and non-inflicted (major categories such as transport, falls, drowning, fire etc), and 2 – natural causes (broken into major leading cause categories such as neoplasms, congenital anomalies etc)). This is similar to the approach used in the Queensland CCYPCG CDRT report.

All of these approaches would be valid; however, it is important to decide on one that best meets the reporting requirements of the CDRT and clearly describes how the choice of causes to report was determined. This will ensure the reader understands how causes were selected for inclusion in the report so that interpretations of the relative importance of different causes are not confused.

5. Broad age grouping limiting age-specific investigations

The CDRT report presents causes of death for two age groups: under 1 year olds and 1-17 year olds (the latter in one aggregate group). Grouping together children aged 1 to 17 years limits the usefulness of data presented, as children in different age groups have vastly different causes and rates of death, and opportunities for, and approaches to, prevention vary dramatically by children's ages. This broad age grouping may also minimise the apparent magnitude of an effect in an age group by the sheer size of the denominator.

NCHIRT Recommendation

More specific age groups need to be presented in future reports, with the broad 1-17 year age group too heterogeneous in terms of causes and risks for prevention purposes. The standard broad age groupings used by other CDRT's, health and statistical agencies when describing child health and mortality are: under 1 year of age, 1-4 years, 5-9 years, 10-14 years and 15-17 years of age.¹⁶⁶ Furthermore, these age groupings are what are suggested as the core reporting requirement by the ANZCDRT.¹⁶⁷ This age grouping reflects developmental stages of the child, and reflects more homogenous 'risk exposures' within age groups than the broad 17 year grouping reflects.

6. Lack of section/chapter with prevention recommendations

Although the role of the CDRT is to 'prevent or reduce the number of deaths' in children in NSW, there is limited information provided in the CDRT annual report which provides interpretation of causes of death patterns and outlines opportunities for prevention initiatives (except for the chapters on suicide and SUDI, where there is some discussion of preventative approaches). The bulk of the report describes raw figures or aggregate rates, with limited discussion about the implications of such figures, recommended methods for prioritisation of effort, and focus of prevention strategies.

NCHIRT Recommendations

Given the central tenet of the work of the team is the prevention of deaths, more focus is needed on the steps towards prevention beyond the initial description of the problem [6].¹⁶⁸ It is critical to ensure that risk identification and prevention messages are clearly presented throughout the report. The Queensland CCYPCG report incorporates articulation of risk factors and recommended prevention strategies within each cause of death chapter, taking a preventative approach to the

¹⁶⁶ Australian Institute of Health and Welfare, *A picture of Australia's children 2009*. Cat. no. PHE 112. 2009, Canberra: AIHW.

¹⁶⁷ Australian and New Zealand Child Death Review Teams. *ANZCDRT Agenda Paper 1: Towards National Reporting*. 2005 [cited; Available from: http://www.dhhs.tas.gov.au/__data/assets/pdf_file/0009/36864/Agenda_paper_1.pdf.

¹⁶⁸ Wintz SJ, Foster V, and Lenart GA, *Assessing and improving child death review team recommendations*. Injury Prevention, 2011. 17(Supplement 1): p. i64-i70

report.¹⁶⁹ It is recommended that the NSW CDRT consider taking the same approach to risk factor reporting and prevention messages in future reports. Each of the key causes of death which have a dedicated chapter in the report should have a section which translates the findings regarding the problem/risks/protective factors into prevention recommendations, similar to the approach used in the suicide and SUDI chapters. Instead of having separate chapters which describe alcohol/drug involvement, risk factors and supervisory issues across causes, the findings regarding these core modifiable risk factors for defined causes of death could be presented within the specific cause of death chapters. These findings could then be described in terms of prevention opportunities (i.e. through addressing the modifiable risk factors) for that particular cause of death, rather than simply describing the extent of risk identified. These recommendations could then be used in subsequent years to assess the degree to which the recommended prevention activities have been implemented and whether any resultant effect in the reported causes of death is seen.

7. Demographic tables

The NSW CDRT reports by sub-components of Socioeconomic Indexes for Areas (SEIFA) categories. While the use of these sub-components is justified in the methods section, this affects the uniformity of reporting across States and Territories.

The presentation of death rates for under 1 year olds in the NSW CDRT report is per 100,000 of the population, which affects the uniformity of reporting across States and Territories.

NCHIRT Recommendations

The ANZCDRT-recommended presentation format for socioeconomic status, Socioeconomic Indexes for Areas (SEIFA) categories, should be used for uniformity with other States and Territories.

The ANZCDRT-recommended format for presentation of death rates for infants under 1 year of age is per 1,000 live births. This is also the recommendation of the WHO in Volume 2 of the ICD-10. For uniformity of reporting across States and Territories, reporting by 1,000 live births should be considered.

8. Code grouping

Causes of death are categorised and presented either at the ICD-10-AM chapter level, or at the full five-character specified ICD-10-AM code. Both of these approaches for presentation of codes represent problems in interpretation.

Presentation of data at the chapter level can afford a useful summary, provided further breakdown of core code blocks within each chapter is provided to elaborate on the causes of death. The chapter level information only provides very broad groupings of causes of death, which does little to direct prevention efforts.

On the other hand, the use of the full five character ICD-10-AM code can provide useful specific information about causes of death, though at the expense of cell counts. That is, using the most detailed codes reduces the number of cases per cell substantially, and can make pattern interpretation difficult.

NCHIRT Recommendation

The middle ground which is often used for categorisation of codes for mortality presentation is the use of special tabulation lists (which categorise blocks of codes for related conditions together for comparison) or presentation of the codes at the three-character code level. Both of these approaches allow sufficient detail to be captured regarding the causes of death, but are not so specific as to cause the issue of small cell counts. Tabulation lists are recommended for use in the revised report.

9. Conclusion

The NCHIRT reviewed and critiqued the NSW CCYP CDRT annual report on child deaths, and provided the background, summary and interpretation of relevant topics for consideration when reporting mortality data for child death review purposes. Further detailed information which is provided in the body of the report pertaining to specific causes, ages, and analysis techniques should be used in conjunction with this chapter for a more complete understanding of the rationale behind these recommendations.

169 Commission for Children and Young People and Child Guardian Queensland, *Annual Report: Deaths of children and young people, Queensland, 2009–10*, CCYPCG, Queensland, Editor. 2010: Brisbane.

Appendix 2 Methods

Population estimates

Population estimates for the various groups examined in the report were all derived from data published or provided by the Australian Bureau of Statistics (ABS). Most estimates have been taken from ABS publications, with a few specific estimates produced by ABS to order.

Population estimates by age and gender in NSW for 2010 were taken from *3101.0 Australian Demographic Statistics*.¹⁷⁰

Births in the year 2009 were taken from a subset of the data in *3301.1 Births, Australia*¹⁷¹ that included the breakdown by gender and the number of births of indigenous children. The data for 2010 were not available at the time of writing.

Remoteness

Remoteness was measured using the ARIA-Plus index,¹⁷² a measure of access to services using proxy measures of distance to the five nearest centres of defined populations. The breakdown of population by age categories in the six ARIA categories as of 30 June 2009 was supplied by the ABS to order.

Socioeconomic status

The Index of Relative Social Disadvantage (IRSD),¹⁷³ one of the Socioeconomic Indices for Areas (SEIFA) was used as an index of socioeconomic status. The socioeconomic status of individuals and families residing in a geographic area may vary considerably, whereas with the ARIA index, all individuals and families are at approximately the same distance from services. Thus there is substantial uncertainty about the actual socioeconomic status of the families of the children who died. This uncertainty cannot be eliminated by using more or less specific indices defined by geographic area. The IRSD is a broad measure that includes information about income, education, access to personal transport, health, and other measures that are generally used in estimating socioeconomic status. The IRSD was chosen over the Index of Relative Social Advantage and Disadvantage (IRSAD) as it does not include measures such as mortgage payments that are likely to depend upon the average time of residence in the area.

The distribution of IRSD scores in the sample is quite different from that of NSW, and the sample cannot be considered representative, as shown in Figure 25 below. Improving the measurement of socioeconomic status is a priority for future reports.

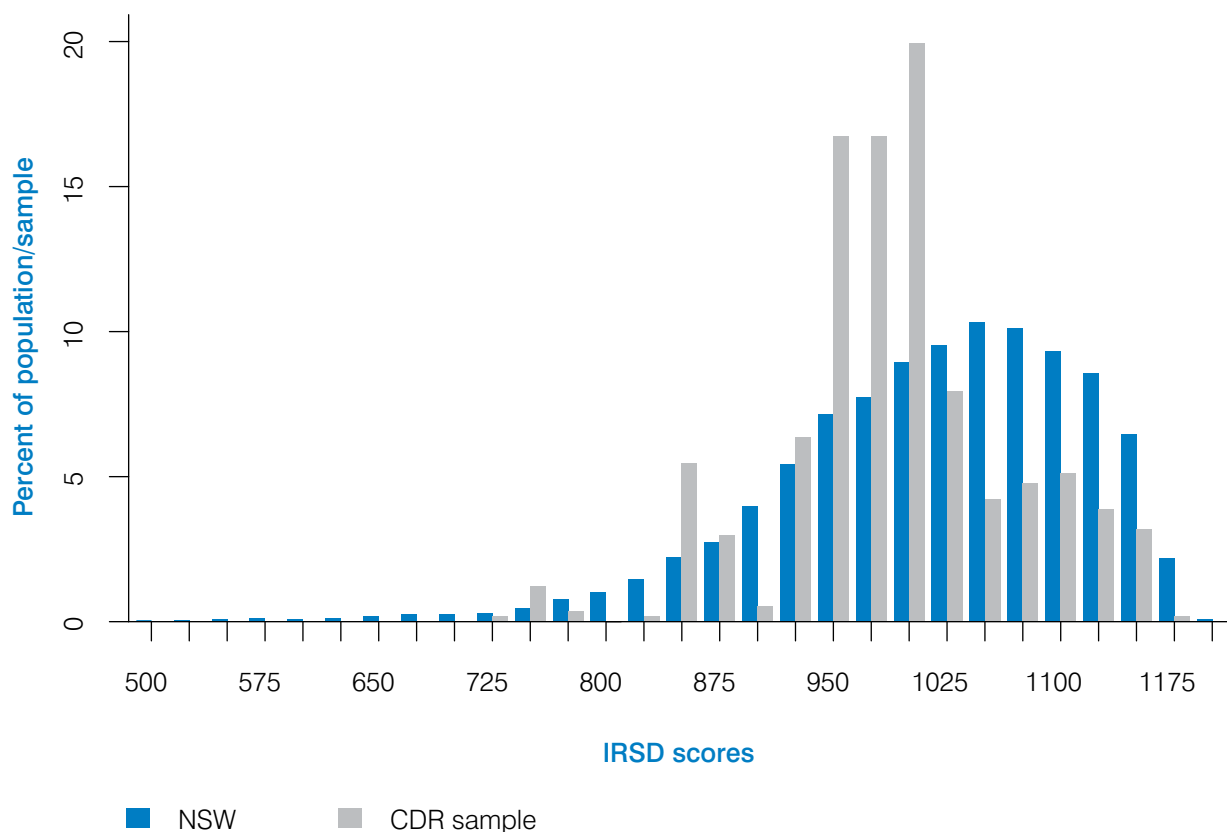
170 Australian Bureau of Statistics 2010, *3101.0 Australian Demographic Statistics*. Canberra: ABS.

171 Australian Bureau of Statistics 2010, *3301DO001_2009 Births, Australia, 2009*. Canberra: ABS.

172 Australian Bureau of Statistics 2003, *ASGC Remoteness Classification: Purpose and Use*. Canberra: ABS.

173 Australian Bureau of Statistics 2006, *2039.0 An Introduction to Socioeconomic Indexes for Areas (SEIFA)*. Canberra: ABS.

Figure 25: Distributions of IRSD scores for NSW and 2010 CDR sample



Aboriginal and Torres Strait Islander status

Aboriginal and Torres Strait Islander population estimates are relatively uncertain, given the difficulty of ascertaining Indigenous status, and defining the criteria for determining that status. Estimates of Aboriginal and Torres Strait Islander population by age categories and gender for 2010 were supplied by the ABS to order.¹⁷⁴

Aboriginal and Torres Strait Islander identity was determined through reference to the child’s death certificate and child and parent(s) birth certificates; and other available records, including those from Community Services, NSW Health, the Department of Education and the NSW Police Force Computer Operated Policing System.

Statistical software

All statistical analyses were performed using the R statistical language¹⁷⁵ and most used packages written for the R language. The packages used in this report were *prettyR*,¹⁷⁶ *plotrix*,¹⁷⁷ *epicalc*,¹⁷⁸ *epitools*¹⁷⁹ and *MASS*.¹⁸⁰

174 Source: Australian Bureau of Statistics, *Indigenous Estimates and Projections (Cat. No. 3238.0)* [supplied 21 July 2010]

175 R Development Core Team 2010, *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org>.

176 Lemon, J. 2010, *pretty R v1.9*. URL: <http://cran.r-project.org/packages/web/packages/prettyR/index.html>.

177 Lemon, J. 2006, *Plotrix: a package in the red light district of R*. *R-News*, 6(4): 8-12.

178 Chongsuvivatwong, V. 2010, *epicalc: Epidemiological calculator. R package version 2.11.1.0*. URL: <http://CRAN.R-project.org/package=epicalc>

179 Aragon, T. 2010, *epitools: Epidemiology Tools*. R package version 0.5-6. URL: <http://cran.r-project.org/package=epitools>

180 Venables, W. N. & Ripley, B. D 2002, *Modern Applied Statistics with S*. Fourth Edition. Springer, New York. ISBN 0-387-95457-0

Calculation of crude mortality rates and confidence intervals

Most crude mortality rates were calculated as per 100000 person-years, which in this case is equivalent to 100000 persons in the base population for each calculation. Confidence intervals for these crude mortality rates were calculated using the 'ci.poisson' function of the 'epicalc' package.

Crude mortality rates for deaths due to perinatal conditions

Crude mortality rates for perinatal deaths were calculated as per 1000 live births as defined by ABS. This implies a binomial distribution as suggested by Newcombe,¹⁸¹ and confidence intervals were calculated using the 'ci.binomial' function of the 'epicalc' package.

Standardisation of mortality rates

Direct standardisation of mortality rates was used in the historical analyses. The reference population strata were taken from the ABS 2006 census data. The function used to calculate the directly standardised mortality rates was written for the report.

Testing for changes in frequency of events

Due to factors such as small numbers, sporadic occurrence and seasonal distribution of child deaths, the analysis of mortality rates is complicated by over-dispersion. In the analyses of changes in the frequency of different categories of deaths, analysis by event intervals has been used. Event intervals are the reciprocal of frequencies, but do not require a specified period of observation. This removes the data segmentation that is a problem in the analysis of sparse data.

As the distribution of event intervals is usually close to negative binomial, it is possible to use generalised linear models with a negative binomial link function to analyse changes in event intervals. Where small numbers of deaths have occurred in the years examined, this method has been used to test changes in mortality rates.

181 Newcombe, R 1998, Two sided confidence intervals for the single proportion: a comparative evaluation of seven methods. *Statistics in Medicine*, 17: 857-872.

Analyses

Event interval analyses

Changes in the frequencies of child deaths were tested using a generalised linear model with a negative binomial link function (see above - Testing for changes in frequency of events).

Infectious/parasitic diseases

Other bacterial infections

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.790e+00	6.627e-01	2.701	0.00692
ob_days[-1]	1.662e-04	5.543e-05	2.997	0.00272

Intestinal infections

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	7.1373635	2.3557331	3.030	0.00245
int_days[-1]	-0.0001115	0.0001806	-0.617	0.53695

Other viral infections

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.9238538	1.9123326	2.052	0.0402
ov_days[-1]	0.0001672	0.0001524	1.097	0.2727

Neoplasms

Bone/articular cartilage

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.8626490	1.6026300	1.786	0.074
bone_days[-1]	0.0002155	0.0001307	1.649	0.099

Eye/CNS

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.022e+00	8.631e-01	3.502	0.000462
cns_days[-1]	9.671e-05	7.098e-05	1.362	0.173048

Lymph/blood

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.359e+00	6.064e-01	3.89	0.0001
lb_days[-1]	1.170e-04	5.041e-05	2.32	0.0203

Perinatal

Prematurity

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.961e+00	3.670e-01	8.067	7.18e-16
prem_days[-1]	-7.337e-05	2.942e-05	-2.494	0.0126

Maternal factors

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.086e+00	3.292e-01	6.336	2.36e-10
mat_days[-1]	-1.572e-07	2.701e-05	-0.006	0.995

Respiratory complications

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	5.594e+00	4.321e-01	12.948	< 2e-16
resp_days[-1]	-2.571e-04	3.677e-05	-6.991	2.73e-12

Congenital/chromosomal

Chromosomal

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.293e+00	5.635e-01	5.845	5.07e-09
chrom_days[-1]	8.018e-06	4.569e-05	0.175	0.86

Circulatory malformations

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.924e+00	3.865e-01	4.978	6.44e-07
circ_days[-1]	6.272e-05	3.169e-05	1.980	0.0478

Nervous system malformations

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	4.804e+00	5.925e-01	8.108	5.14e-16
nerv_days[-1]	-1.219e-04	4.693e-05	-2.597	0.00941

Respiratory

Influenza/pneumonia

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.035e+00	8.690e-01	2.342	0.0192
flu_days[-1]	1.586e-04	7.258e-05	2.186	0.0289

Chronic Lower Respiratory Diseases

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.743e-01	8.779e-01	0.426	0.67
clrd_days[-1]	3.568e-04	7.587e-05	4.702	2.57e-06

Other Acute Lower Respiratory Infections

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	7.1381522	1.3818190	5.166	2.39e-07
alri_days[-1]	-0.0001597	0.0001125	-1.419	0.156

Nervous

Cerebral palsy/paralytic

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.877e-01	1.065e+00	0.270	0.787
cp_days[-1]	3.704e-04	9.236e-05	4.011	6.05e-05

Episodic/paroxysmal

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.2030444	1.6720662	0.719	0.4718
ep_days[-1]	0.0003567	0.0001435	2.485	0.0130

Muscle/myoneural junction

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	7.7808826	1.9992029	3.892	9.94e-05
mn_days[-1]	-0.0001783	0.0001617	-1.102	0.270

Circulatory

Cerebrovascular

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	4.875e+00	1.172e+00	4.159	3.19e-05
cv_days[-1]	-1.535e-05	9.575e-05	-0.160	0.873

Other heart conditions

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.215e+00	5.827e-01	3.801	0.000144
oh_days[-1]	9.761e-05	4.811e-05	2.029	0.042470

Pulmonary conditions

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.418e+00	9.748e-01	2.481	0.0131
pu_days[-1]	1.973e-04	8.184e-05	2.410	0.0159

All heart conditions

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.778e+00	4.274e-01	4.160	3.19e-05
oa_days[-1]	9.338e-05	3.522e-05	2.651	0.00802

Endocrine/metabolic

All endocrine/metabolic

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.474e+00	5.134e-01	6.766	1.33e-11
em_days[-1]	-1.991e-05	4.132e-05	-0.482	0.63

Transport

Drivers

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	4.0628095	0.2761005	14.715	<2e-16
death_dates[-1]	0.0001837	0.0001117	1.645	0.1

Passengers

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.603e+00	2.042e-01	17.643	<2e-16
death_dates[-1]	1.692e-05	7.934e-05	0.213	0.831

Pedestrians

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	3.4647336	0.2296442	15.087	< 2e-16
death_dates[-1]	0.0005165	0.0001166	4.429	9.48e-06

Suicide

The analysis showed a decrease in frequency of suicide, but no interaction with sex.

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.344e+00	2.046e-01	11.457	< 2e-16
dates	2.257e-04	8.279e-05	2.726	0.00642
cdrts\$Sex[cases][-1]Male	2.420e-01	2.468e-01	0.981	0.32684
dates:cdrts\$Sex[cases][-1]Male	-1.229e-04	9.942e-05	-1.236	0.21652

SUDI

SUDI deaths 1996-2010

Coefficients:				
	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	4.559e-01	2.487e-01	1.833	0.0668
ddate[-1]	1.094e-04	2.054e-05	5.328	9.95e-08

SUDI deaths 1997-2010

Coefficients:				
	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	8.596e-01	2.918e-01	2.946	0.003218
ddate[-1]	7.855e-05	2.361e-05	3.328	0.000876

SUDI deaths 2004-2010

Coefficients:				
	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	8.980e-01	9.982e-01	0.900	0.368
ddate[-1]	7.671e-05	7.300e-05	1.051	0.293

Drowning

Bathtub drowning

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.557e+00	1.057e+00	1.473	0.14075
bath_days[-1]	2.708e-04	8.991e-05	3.012	0.00259

Pool drowning

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	4.168e+00	8.444e-01	4.936	7.96e-07
pool_days[-1]	-3.400e-05	6.785e-05	-0.501	0.616

Other drowning

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-1.392e-01	8.684e-01	-0.160	0.8726
other_days[-1]	1.490e-04	7.253e-05	2.054	0.0399

Assault

Assault

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.963e+00	1.838e-01	16.118	<2e-16
as_dates[-1]	9.023e-05	7.185e-05	1.256	0.209

Rate ratio analyses

Comparisons of crude mortality rates between males and females, age groups, indigenous and non-indigenous children and remoteness categories were performed for all cases in the years 1996 to 2010. These historical comparisons can provide information about whether comparisons of the groups among the 2010 cases are consistent with the larger data set, and if they are not, whether changes over time have occurred.

All cause deaths

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.342896	1.291197	1.396796	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.05443665	0.05127140	0.05774533	0	0
5-9	0.02356055	0.02179301	0.02542886	0	0
10-14	0.02666509	0.02478344	0.02865387	0	0
15-17	0.07009333	0.06600051	0.07437906	0	0
1996-2010 Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	4.015105	3.797674	4.243615	0	0
1996-1999 Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	6.683962	6.122508	7.285261	0	0
2000-2010 Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	3.082142	2.862933	3.312503	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.311584	1.277988	1.346064	0	0
Outer regional	1.863934	1.805800	1.924105	0	0
Remote	2.278110	2.115367	2.450792	0	0
Very remote	1.517206	1.324967	1.733905	6.12e-09	4.2e-10

Perinatal deaths

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.359264	1.268680	1.456637	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	4.108718	3.717572	4.530114	0	0

Congenital/chromosomal deaths

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.027262	0.929969	1.134704	0.597004	0.59677
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.023391	0.01679	0.031673	2.38e-258	0
5-9	0.007075	0.00411	0.011247	0	0
10-14	0.007868	0.00472	0.012215	0	0
15-17	0.008049	0.00414	0.013904	2.69e-255	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	3.753004	3.2341	4.331396	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	0.9007864	0.7877590	1.026630	1.18e-01	1.20e-01
Outer regional	1.4715279	1.2554403	1.714455	3.41e-06	1.05e-06
Remote	1.1575294	0.7109401	1.768494	5.36e-01	5.50e-01
Very remote	1.0965115	0.4938393	2.042097	8.03e-01	8.44e-01

All rate ratio are with 95% C.I.

Neoplasms

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.242717	1.073758	1.439529	0.00353	0.00356
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.9625516	0.5781661	1.696946	0.889295	0.909359
5-9	0.8856012	0.5370100	1.550815	0.655793	0.670722
10-14	0.6721067	0.4005044	1.191607	0.166325	0.153440
15-17	1.1562440	0.6907043	2.046469	0.592831	0.578663
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	2.628753	2.039886	3.331797	9.62e-12	9.99e-16
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.1448118	0.95075279	1.370924	1.5e-01	1.48e-01
Outer regional	1.7151434	1.36739066	2.129106	6.7e-06	1.38e-06
Remote	0.8535826	0.33505981	1.740531	6.9e-01	6.53e-01
Very remote	0.3531631	0.01551843	1.524303	2.0e-01	2.12e-01

Nervous system

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.222433	1.032390	1.449164	0.019774	0.019829
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.13552838	0.09090611	0.1990242	1.37e-24	0
5-9	0.06051357	0.03663162	0.0959320	1.29e-37	0
10-14	0.13014790	0.08976035	0.1870184	4.50e-27	0
15-17	0.18509900	0.12502942	0.2703463	1.62e-18	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	3.479568	2.674781	4.451655	2.22e-16	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.309132	1.0663320	1.597629	0.010436	0.008884
Outer regional	1.578779	1.2002839	2.044099	0.001391	0.000713
Remote	1.335850	0.5672007	2.605329	0.472484	0.485526

Circulatory system

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.221230	0.9716106	1.538238	0.086709	0.086523
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.14814024	0.09241033	0.23315841	2.36e-16	0
5-9	0.04874726	0.02465017	0.08870936	8.88e-28	0
10-14	0.09980893	0.06061811	0.16018329	1.30e-21	0
15-17	0.18587171	0.11525371	0.29388660	5.04e-13	1.44e-15
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	3.3659	2.335932	4.701582	4.56e-09	4.95e-13
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.123663	0.8404250	1.482273	0.4243139	0.425906
Outer regional	1.154805	0.7541448	1.696143	0.4924904	0.499706
Remote	1.685801	0.5924915	3.677272	0.2900475	0.272937
Very remote	3.739071	1.3141339	8.156114	0.0171760	0.002329

All rate ratio are with 95% C.I.

Endocrine/metabolic system

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.246891	0.9529038	1.636981	0.107915	0.107510
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.20831758	0.12730801	0.3383506	6.86e-10	2.18e-12
5-9	0.09895839	0.05481970	0.1722506	2.84e-16	0
10-14	0.07098223	0.03610386	0.1307706	1.34e-18	0
15-17	0.15401241	0.08415307	0.2705566	3.74e-11	1.97e-13
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	2.930174	1.848775	4.417188	2.28e-05	3.83e-07
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.0398360	0.73616517	1.440016	0.81959	0.830349
Outer regional	1.0707410	0.64206746	1.683023	0.78070	0.802128
Remote	0.4904816	0.02139537	2.148243	0.42542	0.386389
Very remote	3.0093116	0.72088409	7.917178	0.11403	0.059202

Respiratory system

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.540477	1.195222	1.995484	0.000798	0.000828
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.15016332	0.09434614	0.23488665	1.59e-16	0
5-9	0.03992196	0.01898220	0.07546711	8.91e-30	0
10-14	0.10170638	0.06231392	0.16204604	7.83e-22	0
15-17	0.08515731	0.04419526	0.15221070	9.17e-20	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	6.905739	5.071041	9.248374	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.529609	1.13105955	2.045981	0.006239	4.63e-03
Outer regional	2.150874	1.47591621	3.054229	0.000130	2.35e-05
Remote	2.295992	0.80297570	5.036242	0.109142	7.09e-02
Very remote	1.130850	0.04912222	4.934356	0.906807	9.90e-01

Infectious/parasitic diseases

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.837898	1.358203	2.512567	6.69e-05	7.46e-05
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.23699185	0.15048906	0.37252417	1.48e-09	8.41e-12
5-9	0.04610034	0.02081136	0.09112174	9.99e-23	0
10-14	0.03566439	0.01446910	0.07507547	3.24e-24	0
15-17	0.04277051	0.01452710	0.09913735	4.34e-19	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	4.072471	2.626573	6.056869	2.16e-08	8.31e-13
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.232094	0.8555007	1.739961	0.255770	0.251883
Outer regional	1.288431	0.7569169	2.062443	0.333661	0.331144
Remote	1.173670	0.1812737	3.676497	0.827428	0.901840
Very remote	3.821304	0.9105267	10.100357	0.063338	0.018180

All rate ratio are with 95% C.I.

Transport incidents

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.941284	1.687179	2.238345	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	2.154219	1.0018919	5.657868	4.94e-02	5.94e-02
5-9	1.411634	0.6487051	3.734368	4.10e-01	3.95e-01
10-14	1.808658	0.8446198	4.736255	1.36e-01	1.44e-01
15-17	7.432669	3.5871782	19.073186	2.18e-11	8.62e-09
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	4.028437	3.316308	4.85137	0	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	2.113133	1.8038392	2.470763	0	0
Outer regional	3.589029	3.0016170	4.275491	0	0
Remote	4.075162	2.6718124	5.932647	1.052e-08	6.82e-14
Very remote	2.129821	0.8350907	4.340758	1.039e-01	6.99e-02

Drowning

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	2.216416	1.730418	2.862968	9.68e-11	1.71e-10
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	2.6810119	1.2613467	6.989751	0.008056	0.013439
5-9	0.5806770	0.2415435	1.625585	0.277892	0.259154
10-14	0.3532299	0.1326538	1.044799	0.059147	0.034229
15-17	1.1668455	0.5002611	3.211698	0.736158	0.705582
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	4.834388	3.504971	6.524329	2.22e-16	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.649068	1.232212	2.186497	9.1176e-04	5.46e-04
Outer regional	3.432316	2.521037	4.616277	4.4742e-13	0
Remote	5.334606	2.795407	9.206720	8.4581e-06	6.10e-10
Very remote	4.047946	1.221702	9.570937	2.5877e-02	3.81e-03

Suicide

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.944574	1.505111	2.532053	2.29e-07	2.94e-07
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	2.612181	1.685668	3.864123	5.94e-05	2.49e-06
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.832777	1.3741897	2.424926	5.295e-05	2.12e-05
Outer regional	2.229618	1.5281854	3.171498	6.863e-05	9.78e-06
Remote	4.225756	1.9883212	7.826314	6.209e-04	6.89e-06
Very remote	2.201657	0.3407836	6.874515	3.350e-01	3.04e-01

All rate ratio are with 95% C.I.

Assault

Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Female	1.000000	NA	NA	NA	NA
Male	1.648434	1.226811	2.232552	0.000848	0.000887
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
under 1	1.000000	NA	NA	NA	NA
1-4	0.40094534	0.22407039	0.7375364	3.94e-03	1.69e-03
5-9	0.09940516	0.04219650	0.2172390	8.77e-09	1.98e-12
10-14	0.09838475	0.04176335	0.2150091	7.61e-09	1.44e-12
15-17	0.28876141	0.14492293	0.5700685	4.26e-04	1.15e-04
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Non-indigenous	1.000000	NA	NA	NA	NA
Indigenous	5.263088	3.551002	7.562884	6.60e-13	0
Predictor	estimate	lower	upper	p(mid-p)	p(Wald)
Major cities	1.000000	NA	NA	NA	NA
Inner regional	1.105512	0.7563327	1.579475	0.5950115	0.601897
Outer regional	1.840105	1.1761533	2.768808	0.0087029	0.004657
Remote	2.248199	0.6783799	5.343891	0.1618644	0.119486
Very remote	2.580399	0.3986451	8.082736	0.2588321	0.204879

All rate ratio are with 95% C.I.

Appendix 3 Definitions

3.1 Definitions - Causes of death

Underlying cause of death is defined by the World Health Organisation as the '*disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury*'.

Direct cause of death is the final condition or event that actually produces a death (for example, cardiac arrest or respiratory failure).

Intervening causes of death are other conditions that may have given rise to the immediate cause of death.

Contributory causes of death are conditions or events that were present during the sequence leading to death, but may not have been necessary influences.

In this report, unless otherwise indicated, the cause of death relates to underlying cause. This is because the underlying cause of death is recognised as the single most essential element to understanding causes of death.¹⁸²

Natural causes of death

Deaths due to natural causes are those classified in the first seventeen chapters of the ICD-10 coding system (A00-B-99 to Q00-Q99).

Certain conditions originating in the perinatal period

Certain conditions arising in the perinatal period refers to conditions that arise during pregnancy, or in the first 28 days of life. It includes conditions such as prematurity; complications of labour, including hypertension and maternal haemorrhage; and disorders associated with fetal growth. It may also include certain respiratory, cardiovascular and infectious diseases associated with the perinatal period, such as aspiration of meconium and respiratory distress of the newborn.

Deaths due to perinatal conditions are defined as one for which the underlying cause of death was included in the ICD-10 chapter "Certain conditions originating in the perinatal period" (P00-P96). This includes maternal factors (P00-P04); disorders related to length of gestation and fetal growth (P05-P08) - for continuity with previous reports, low birth weight (P07.0, P07.1) is not counted as prematurity in the absence of other information about gestational age; birth trauma (P10-P15) and certain conditions and disorders specific to the perinatal period (P20-P61).

Congenital malformations and chromosomal abnormalities

Congenital malformations and chromosomal abnormalities refer to a range of conditions, including for example, Down Syndrome, congenital hydrocephalus and trisomy 18 (Edwards Syndrome).

Deaths due to congenital malformations or chromosomal abnormalities are defined as those for which the underlying cause of death was included in the ICD-10 chapter "Congenital malformations, deformations and chromosomal abnormalities" (Q00-Q99).

Diseases of the nervous system

Diseases of the nervous system relate to a broad range of disorders such as epilepsy, cerebral palsy and muscular dystrophy, as well as inflammatory and degenerative conditions.

Deaths from diseases of the nervous system are defined as those for which the underlying cause of death was included in the ICD-10 chapter "Diseases of the nervous system" (G00-G99).

Diseases of the circulatory system

Diseases of the circulatory system relate to a broad range of conditions such as cardiac and blood vessel malformations and disorders of metabolism that lead to blocking of blood vessels.

Deaths from diseases of the circulatory system are defined as those for which the underlying cause of death was included in the ICD-10 chapter "Diseases of the circulatory system" (I00-I99).

¹⁸² National Centre for Health Information Research and Training 2011 Review and recommendations for the annual reporting of child deaths in NSW. NSW Ombudsman. Unpublished.

Endocrine, nutritional and metabolic diseases

Endocrine, nutritional and metabolic diseases include conditions such as diabetes, malnutrition and Cushing's syndrome.

Deaths from endocrine, nutritional and metabolic diseases are defined as those for which the underlying cause of death was included in the ICD-10 chapter "Endocrine, nutritional, metabolic diseases" (E00-E89).

Certain infectious and parasitic diseases

Infectious diseases are caused by organisms such as bacteria, viruses, parasites or fungi and can be passed directly or indirectly from person to person.¹⁸³ Examples of infectious diseases are septicaemia, gastroenteritis and meningococcal disease.

Deaths due to infectious and parasitic diseases are defined as those for which the underlying cause of death was included in the ICD-10 chapter "Certain infectious and parasitic diseases" (A00-B99).

Neoplasms

Deaths from neoplasms (cancers and tumours) are defined as those with an underlying cause of death included in the ICD-10 chapter "Neoplasms" (C00-D48).

Other diseases/morbid conditions

Deaths from other diseases and morbid conditions includes those for deaths for which the underlying cause of death was included in the ICD-10 chapters "Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism" (D50-D89), "Mental and behavioural disorders" (F00-F99), "Diseases of the eye and adnexa" (H00-H59), "Diseases of the ear and mastoid process" (H60-H95), "Diseases of the digestive system" (K00-K93), "Diseases of the skin and subcutaneous tissue" (L00-L99), "Diseases of the genitourinary system" (N00-N99) and "Pregnancy, childbirth and the puerperium" (O00-O99) are uncommon in children and are included in the section "Other diseases and morbid conditions".

Diseases of the respiratory system

Diseases of the respiratory system include conditions such as pneumonia, influenza and asthma.

Deaths from diseases of the respiratory system are defined as those for which the underlying cause of death was included in the ICD-10 chapter "Diseases of the respiratory system" (J00-J99).

Sudden Unexpected Death in Infancy (SUDI)

SUDI does not have a single accepted definition. The Team's definition of SUDI since 2009 is:

Where an infant less than one year of age dies suddenly and unexpectedly. Included in SUDI are:

- *Deaths that were unexpected and unexplained at autopsy (i.e. those meeting the criteria for Sudden Infant Death Syndrome)*
- *Deaths occurring in the course of an acute illness that was not recognised by carers and/or by health professionals as potentially life threatening*
- *Deaths arising from a pre-existing condition that had not been previously recognised by health professionals*
- *Deaths resulting from accident, trauma or poisoning where the cause of death was not known at the time of death.*

The Team has specifically excluded from this definition infants who died unexpectedly in misadventures due to external injury where the cause of death was known at the time of death (such as transport incidents and accidental drowning), and deaths that occurred in the course of a known sudden acute illness in a previously healthy infant.

Prior to 2009, the Team restricted the SUDI definition to infants who had been placed for sleep. This is the case for the majority of SUDI.

¹⁸³ World Health Organisation (2011) *Infectious Diseases*, accessed via http://www.who.int/topics/infectious_diseases/en/

Sudden Infant Death Syndrome (SIDS)

SIDS is a category of SUDI and is a diagnosis of exclusion. In 2004, the first Australian Sudden Infant Death Syndrome Pathology Workshop in Canberra led to a broadly accepted national definition of SIDS:

The sudden and unexpected death of an infant under 1 year of age, with onset of the lethal episode apparently occurring during sleep, that remains unexplained after a thorough investigation including performance of a complete autopsy, and review of the circumstances of death and the clinical history.

As noted, there are a number of sub-classifications of SIDS (see appendix 4 for sub-classifications).

Symptoms, signs and abnormal findings, not elsewhere classified

Symptoms, signs and abnormal findings, not elsewhere classified includes Sudden Infant Death Syndrome (SIDS). It also includes causes such as unspecified respiratory failure and certain ill-defined cancer sites.

Deaths from symptoms, signs and abnormal findings, not elsewhere classified are those for which the underlying cause of death was included in the ICD-10 chapter "Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified" (R00-R99).

External causes of death

Deaths due to external causes are those for which the underlying cause of death was included in the ICD-10 chapters "Injury, poisoning and certain other consequences of external causes" (S00-T98) or "External causes of morbidity and mortality" (U50-Y98).

Drowning

Deaths from drowning deaths are defined as those for which the underlying cause of death with an ICD code in "accidental drowning and submersion" (W65-W74), or "drowning and submersion of undetermined intent" (Y21). Intentional self harm by drowning (X71) would be included with deaths from suicide. Assault involving drowning (X92) would be included with deaths from fatal assault.

Fatal assault

Deaths from assault are defined as having an underlying cause of death with an ICD code "assault" (X85-Y09). Assault is defined in NSW as "any act which intentionally or recklessly causes another person to fear immediate and unlawful violence", and includes the commission of that violence ("battery"). That is, either the perpetrator must act with intent, or the victim must apprehend the intent, to carry out such violence. Accidental deaths from weapons or other objects handled by others (W20-W49) would be included with deaths from other external causes.

Other unintentional external cause death

A number of unintentional external cause deaths occur that are not due to transport incidents or drowning. Due to the small number and great variety of these deaths, they are described in one section of the report.

Suicide

Deaths from suicide are defined by an underlying cause of death with an ICD code in the "intentional self-harm" code range (X60-X84). (Note: This included intentional crashing of a vehicle and intentional self harm by drowning).

Transport

Deaths from transport incidents are defined as those for which the underlying cause of death was included in the ICD-10 'transport accidents' code range (V01-V99) or 'motor vehicle incidents of undetermined intent' (Y31-Y32). Intentional self harm by crashing a vehicle (X82-X83), would be included with deaths from suicide. Assault involving motor vehicles (Y02-Y03) would be included with deaths from fatal assault.

3.2 Other definitions

Child – Any person under the age of eighteen years at the time of his or her death.

Child protection history – Refers to children who had been the subject of a report of risk of harm or report of risk of significant harm to Community Services, or the subject of a report to a Child Wellbeing Unit, within the three years prior to their death. The report also notes the number of children who, while not the subject of a report themselves, had a sibling who had been the subject of a report.

Co-sleeping – Co-sleeping refers to children sleeping with an adult on a shared surface (this includes, beds, sofas or mattresses).

Confidence interval – When a sample of observations is drawn from a population, a summary statistic calculated from the sample will almost certainly differ from those of the population and from different samples drawn from the same population. A confidence interval estimates the range in which some proportion, typically 95%, of the statistics from all samples will fall. The confidence interval is thus a quantitative estimate of the uncertainty in the statistic. In this report, the sampling is by calendar year rather than a subset of the population, and the possible samples include all other intervals of one year.

Crude mortality rate – The number of deaths occurring in a specified population during a specified interval. For most of the causes of death in this report, the crude mortality rate is stated as number of deaths per 100 000 person-years, and since the interval of observation is one year, this is equivalent to deaths per 100 000 people. The exception is deaths due to perinatal conditions. The convention adopted here is to express this proportion as deaths per 1000 births.

Directly standardised mortality rate – When comparing mortality rates between different populations, it is necessary to correct for differences in population composition, where these differences are associated with different mortality rates. The method used is known as direct standardisation, and involves scaling the mortality rate for each stratum of interest by the proportions of the populations in that stratum. Age is one of the common variables with which standardisation is conducted, as in the present report.

Incident Rate Ratio – The ratio of the mortality rates for two exclusive classes of people, such as male and female, is known as the Incident Rate Ratio.

Infant – A child less than one year old.

International Classification of Diseases (ICD) – The ICD, now in its tenth revision (ICD-10), is used to classify the causes of mortality and morbidity in a standardised way. This allows comparison of causes of death that have been recorded using different methods. The ICD-10-AM (Australian modification) contains additional codes that are useful in the Australian setting, but is otherwise equivalent to the ICD-10.

Natural body of water – Oceans, lakes, rivers, creeks, lagoons and other permanent or temporary bodies of water that are due to natural processes.

Neonatal period – The period from birth to less than 28 days.

Other bodies of water – Reservoirs, dams, artificial channels, drainage or sewerage works and any other permanent or temporary body of water not due to natural processes.

Perinatal period refers to pregnancy, birth or the first 28 days of life.

Post neonatal period – The period from 28 days to less than 365 days.

Remoteness – A measure of distance from services, quantified here as the ARIA index. This measure combines the distance of a particular location to the five nearest locations of specified population and calculates the average ratio of that measure to all locations in Australia. Population of a location is taken as a proxy for services available. There are six levels of remoteness specified by the ARIA index, Highly Accessible (Major cities), Accessible (Inner Regional), Moderately Accessible (Outer Regional), Remote, Very Remote and Migratory. We have only used the first five levels, and in many cases have combined the Moderately Accessible, Remote and Very Remote levels due to the small number of deaths in the more remote levels.

Socioeconomic status – A measure of the relative material well-being of an individual or group. The indicator used in this report is the Index of Relative Social Disadvantage of the area in which a child normally resided. Due to the variation in social disadvantage within areas used, the median split of the scores was used to classify individuals and families into high and low socioeconomic status.

Young people – people aged 16 and 17 years.

Appendix 4

Definitional approach to Sudden Infant Death

The following is sourced from: Krous Henry et al, Sudden Infant Death Syndrome and Unclassified Sudden Infant deaths: A definitional and diagnostic approach, *Pediatrics* 2004; 114:234

General Definition of SIDS

SIDS is defined as the sudden unexpected death of an infant <1 year of age, with onset of the fatal episode apparently occurring during sleep, that remains unexplained after a thorough investigation, including performance of a complete autopsy and review of the circumstances of death and the clinical history.

Category IA SIDS: Classic Features of SIDS Present and Completely Documented

Category IA includes infant deaths that meet the requirements of the general definition and also all of the following requirements.

Clinical

- ▶ More than 21 days and <9 months of age.
- ▶ Normal clinical history, including term pregnancy (gestational age of ≥ 37 weeks).
- ▶ Normal growth and development.
- ▶ No similar deaths among siblings, close genetic relatives (uncles, aunts or first-degree cousins), or other infants in the custody of the same caregiver.

Circumstances of Death

Investigation of the various scenes where incidents leading to death might have occurred and determination that they do not provide an explanation for the death. Found in a safe sleeping environment, with no evidence of accidental death.

Autopsy

Absence of potentially fatal pathologic findings. Minor respiratory system inflammatory infiltrates are acceptable; intrathoracic petechial haemorrhage is a supportive but not obligatory or diagnostic finding.

No evidence of unexplained trauma, abuse, neglect, or unintentional injury.

No evidence of substantial thymic stress effect (thymic weight of <15g and/or moderate/severe cortical lymphocyte depletion). Occasional 'starry sky' macrophages or minor cortical depletion is acceptable.

Negative results of toxicologic, microbiologic, radiologic, vitreous chemistry, and metabolic screening studies.

Category IB SIDS: Classic Features of SIDS Present but Incompletely Documented

Category IB includes infant deaths that meet the requirements of the general definition and also meet all of the criteria for category IA except that investigation of the various scenes where incidents leading to death might have occurred was not performed and or ≥ 1 of the following analyses was not performed: toxicologic, microbiologic, radiologic, vitreous chemistry, or metabolic screening studies.

Category II SIDS

Category II includes infant deaths that meet category I criteria except for ≥ 1 of the following.

Clinical

Age range outside that of category 1A or 1B (i.e., 0-21 days or 270 days [9 months] through first birthday).

Similar deaths among siblings, close relatives, or other infants in the custody of the same caregiver that are not considered suspect for infanticide or recognised genetic disorders.

Neonatal or perinatal conditions (for example, those resulting from preterm birth) that have resolved by the time of death.

Circumstances of Death

Mechanical asphyxia or suffocation caused by overlaying not determined with certainty.

Autopsy

Abnormal growth and development not thought to have contributed to death.

Marked inflammatory changes or abnormalities not sufficient to be unequivocal causes of death.

Unclassified Sudden Infant Death

The unclassified category includes deaths that do not meet the criteria for category I or II SIDS but for which alternative diagnoses of natural or unnatural conditions are equivocal, including cases for which autopsies were not performed.

Post-resuscitation cases

Infants found in extremis who are resuscitated and later die ("temporarily interrupted SIDS") may be included in the aforementioned categories, depending on the fulfilment of relevant criteria.



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