nsw cdrt

child death review team

Causes of death of children with a child protection history 2002-2011

A Special Report to Parliament under s.34H of the Community Services (Complaints, Reviews and Monitoring) Act 1993

April 2014

nsw
cdrt
child death
review team

Causes of death of children with a child protection history 2002-2011

A Special Report to Parliament under s.34H of the *Community Services (Complaints, Reviews and Monitoring) Act 1993*

April 2014

Foreword

This special report to Parliament outlines the findings from research undertaken by the NSW Child Death Review Team into the causes of death of children with a child protection history over the 10-year period 2002-2011.

Amongst other things, the research has identified that children with a child protection history have a higher rate of death than children without a child protection history, and have a much higher rate of death from certain causes, including sudden unexpected death in infancy, and unnatural causes, such as fire and assault.

As both Convenor of the Team and the NSW Ombudsman, I am tabling this report in conjunction with a report by my office on the significant initiatives and challenges in the NSW child protection system. Given the findings of the Team's research and the complexities involved, it is important that the research is supplemented by broader consideration and analysis of the child protection system.

In tabling both reports together, we are giving effect to the vision of the Special Commission of Inquiry into Child Protection Services in NSW, headed by Justice James Wood. The final report from the Inquiry noted the importance of examining and comparing the contexts in which child deaths occur, and indicated that this would be enhanced through an integrated child death review function. In line with the recommendations of the Inquiry, responsibility for the Team transferred to my office in 2011, to facilitate integration between the work of the Team and the reviewable death functions of my office. To provide the necessary context and minimise confusion in relation to child death information, we will continue to align our review work and reporting wherever possible.

Reducing child deaths relies on the ability to effectively identify and target relevant prevention strategies to those who are most at-risk. The findings from this research project are important in this regard; the analysis has assisted the Team to identify where further work is required to clarify where, and how, prevention strategies ought to be targeted.

Bruce Barbour
Convenor, Child Death Review Team
NSW Ombudsman

NSW Child Death Review Team

Statutory members

Mr Bruce Barbour
Convenor
NSW Ombudsman

Ms Kerryn Boland
A/Commissioner for Children and Young People
Children's Guardian

Mr Steve Kinmond
Community and Disability Services Commissioner
Deputy Ombudsman

Agency representatives

Ms Robyn Bale
Director, Student Engagement and Interagency
Partnerships
Department of Education and Communities

Detective Superintendent Michael Willing
Commander Homicide
NSW Police Force

Ms Christine Callaghan
Director, Community Access
Ageing, Disability and Home Care

Ms Kate Alexander
Executive Director, Office of the Senior Practitioner
Community Services

Mr Marcel Savary
Courts Policy Manager
Department of Attorney General and Justice

Ms Jane Gladman
Coordinator of the Coronial Information
and Support Program
State Coroner's Office

Professor Les White
NSW Chief Paediatrician
Ministry of Health

Aboriginal representatives

Professor Ngiare Brown
Executive Manager, Research
National Aboriginal Community
Controlled Health Organisation

Professor Megan Davis
Director, Indigenous Law Centre
University of NSW

Independent members

Dr Susan Adams
Director, Division of Surgery and Senior Staff Specialist,
Paediatric General Surgeon, Sydney Children's Hospital

Dr Luciano Dalla-Pozza
Head of Department and Senior Staff Specialist
(Oncology)
Children's Hospital at Westmead

Dr Jonathan Gillis
National Medical Director
Organ and Tissue Authority
(Deputy Convenor)

Dr Bronwyn Gould
General Practitioner

Dr John Howard
Senior Lecturer, National Drug and Alcohol
Research Centre
University of NSW

Professor Heather Jeffery
International Maternal and Child Health
University of Sydney/Royal Prince Alfred Hospital

Professor Ilan Katz
Director, Social Policy Research Centre
University of NSW

Dr Helen Somerville
Visiting Medical Officer, Department of Gastroenterology
Children's Hospital at Westmead

Dr Ella Sugo
Paediatric Pathologist
Sydney Children's Hospital

Acknowledgements

Contents

(THIS PAGE IS INTENTIONALLY BLANK)

Chapter 1. Introduction

The NSW Child Death Review Team

The NSW Child Death Review Team (the Team) is established under Part 5A of the *Community Services (Complaints, Reviews and Monitoring) Act 1993*, for the purpose of preventing and reducing the likelihood of the deaths of children in NSW. Key functions of the Team include to:

- maintain a register of child deaths in NSW and identify trends and patterns relating to those deaths

- undertake research that aims to prevent or reduce the likelihood of child deaths, and identify areas requiring further research, and

- 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.

As part of its work, the Team may at any time – and at least every three years – report to Parliament on the results of research undertaken in the exercise of its functions.

Background

In 2007, the National Centre for Classification in Health (NCCH)[1] completed an analysis for the Ombudsman's office of the causes of death of children whose deaths were 'reviewable' between 2003 and 2006.[2] This work identified that these children were more likely to die as a result of particular causes – including intentional causes, accidental poisoning, fires, meningococcal infection, epilepsy and pneumonia – than children whose deaths were not reviewable.[3]

In 2009, the Team reported on its analysis of the deaths of 'vulnerable' children in 1999-2006, including comparison with the deaths of non-vulnerable children. The Team defined a 'vulnerable child' as any child or a child with a sibling involved in child protection reports to Community Services within the Team's annual reporting year and the two years prior to it. The Team reported that vulnerable children had a lower likelihood of death than non-vulnerable children, which appeared to be due to the lower mortality rates for deaths due to diseases and morbid conditions. However, the Team also found that vulnerable children were more likely to die as a result of pneumonia and external causes, including Sudden Unexpected Deaths in Infancy (SUDI), intentional deaths, drowning, and accidental poisoning. At the time, the Team indicated that the reasons why mortality rates for vulnerable children were sometimes lower than those for non-vulnerable children needed closer examination.[4]

Against this background, the Team contracted the Australian Institute of Health and Welfare (AIHW) in 2012-2013 to undertake analysis of the causes of death of children with a child protection history[5] in the 10-year period 2002-2011. A core component of the work included a comparative analysis of causes of death of children with a child protection history, and those without.

Consistent with its functions, the Team's purpose in undertaking this research was to identify whether any causes of death are more common amongst children with a child protection history and, if so, why this may be the case, and whether targeted prevention strategies are warranted.

---

1   NCCH is now known as the National Centre for Health Information, Research and Training (NCHIRT).

2   At the time of the NCCH analysis, 'reviewable' child deaths comprised children: who had been the subject of a report to Community Services in the three years before they died, or had a sibling who had been; who died as a result of abuse or neglect, or in suspicious circumstances; and/or who were in care or detention at the time of their death.

3   National Centre for Classification in Health (2007) *Causes of Death of Reviewable Children in New South Wales from 2003-2006: A Report for the New South Wales Ombudsman,* unpublished.

4   NSW Child Death Review Team (2009) *Annual Report 2008.*

5   In the context of changes to the child protection system in NSW, the definition of 'child protection history' in this report is:
   - For 2002-2009 inclusive: children, or siblings of children, who were the subject of a report of risk of harm to the (then) Department of Community Services within three years prior to their death.
   - For 2010-2011 inclusive: children, or siblings of children, who were the subject of a report of risk of harm/significant harm to Community Services within three years prior to their death, and/or children, or siblings of children, who were the subject of a report of risk of harm to a Child Wellbeing Unit within three years prior to their death. (The inclusion of reports to Child Wellbeing Units provides a closer comparability to the definition of 'child protection history' prior to 2010).

Reading this report

This research report is intended to inform the Team's ongoing work and further research to prevent or reduce the likelihood of child deaths. While the focus is on the causes of death of children with a child protection history, the research is a starting point for further discussion and inquiry, not a statement on, or analysis of, the NSW child protection system. The relationship between child protection history, overall risk of death and cause-specific risk of death is complex. Readers of the report should exercise caution in seeking to interpret or draw conclusions from the research, including assuming causal relationships between the operation and effectiveness of the child protection system and the deaths of children.

The middle section of the report (Chapter 3) comprises the AIHW's research report to the Team. To facilitate public understanding of the information, we have provided a brief summary of the main findings (Chapter 2), and outlined what the research means for the Team's current and future work (Chapter 4).

Chapter 2. Key findings

The AIHW's analysis has found that approximately 20% of the children whose deaths were registered in NSW over the 10-year period 2002-2011 had a child protection history.[6]

Overall higher mortality rate for children with a child protection history

Importantly, the analysis found that children with a child protection history had a higher mortality rate overall (1.4 times the rate) than children without this history, and they had a much higher mortality rate for particular causes of death, including:

- **Sudden Unexpected Death in Infancy (SUDI)[7]** (9.8 times the mortality rate of children without a child protection history)

- **external (unnatural) causes of death** (2.8 times the mortality rate of children without a child protection history), including deaths due to:

  - **fire** (23.8 times the mortality rate of children without a child protection history)

  - **assault** (6.3 times the mortality rate)

  - **accidental poisoning** (5.5 times the mortality rate)

  - **suicide** (4.1 times the mortality rate), and

  - **drowning** (2.7 times the mortality rate)

- **certain natural causes of death,** including:

  - **cerebral palsy** (3.5 times the mortality rate of children without a child protection history)

  - **meningococcal infection** (3.4 times the mortality rate)

  - **influenza and pneumonia** (2.2 times the mortality rate), and

  - **epilepsy** (2 times the mortality rate).

Overall, the leading cause of death of children with a child protection history over the 10 years was external causes, including both unintentional causes, such as drowning, fire and accidental poisoning; and intentional causes, including suicide and assault. In contrast, the overall leading cause of death of children without a child protection history was conditions arising in the perinatal period.[8]

Trends in mortality rates over 10 years

While the overall mortality rate of children without a child protection history declined by 18% over the decade, there was no significant change in the overall mortality rate for children with a child protection history.

However, there was a decline in the mortality rate of children with a child protection history in relation to particular causes of death:

- For children with and without a child protection history there were decreases in the rates of death from suicide, Sudden Infant Death Syndrome (SIDS),[9] SUDI and external causes.

- For children with a child protection history:

  - the decline in the mortality rate for external causes of death and SUDI was not as large as the decline in the mortality rate for children without a child protection history, but their rates of death from SIDS and suicide decreased significantly over the decade, and

  - for both SIDS and suicide, there was a significant reduction in the gap between children with a child protection history and those without.

---

6   The child deaths that were registered in NSW in 2012 are largely consistent with these results – the families of 18 per cent of the children who died in that period had a child protection history. See NSW Child Death Review Team (2013) *Annual Report 2012*.

7   SUDI is not a cause of death, but a classification to enable the consideration of deaths of otherwise healthy babies who died suddenly and unexpectedly.

8   Perinatal conditions are those that arise during pregnancy, or up to 28 days post-partum.

9   SIDS is a category of SUDI, and is a diagnosis of exclusion.

The impact of child protection history

The analysis has found that child protection history is significantly associated with particular causes of death – it conveys an additional risk beyond factors such as age, gender, Indigenous status, remoteness, and area socioeconomic status. Controlling for these variables, child protection history significantly increased the odds of death from fire, assault, suicide, SUDI, accidental poisoning, SIDS and cerebral palsy.

The analysis found that the significance of the impact of child protection history varied by age:

- **For infants under one year of age**, child protection history significantly increased the odds that their death was due to assault, drowning, SUDI, external causes and SIDS.

- **For children aged 1-4 years**, child protection history significantly increased the odds that their death was due to fire, assault, and external causes.

- **For children aged 10-14 years**, child protection history significantly increased the odds that their death was due to suicide and external causes. The odds of death associated with cerebral palsy were also higher for young people aged 10-14 years with a child protection history than their counterparts without this history.

- **For young people aged 15-17 years**, child protection history significantly increased the odds that their death was due to accidental poisoning, suicide, and external causes.

Child protection history significantly decreased the odds that a death was due to transport related incidents and natural causes.

Indigenous children

Indigenous children have overall higher mortality rates than non-Indigenous children, and are overrepresented in the child protection system.

The analysis has found that, amongst the deaths of all children with a child protection history in 2002-2011, Indigenous status was not significant after controlling for other variables.[10] However, amongst those without a child protection history, Indigenous status conveyed an independent risk of dying from respiratory illnesses (particularly influenza and pneumonia), fire, being a passenger in a motor vehicle accident, and SUDI.

Amongst the Indigenous children who died in the 10 year period, those with a child protection history were much more likely to have died from external causes and SIDS than those Indigenous children without a child protection history.

---

10   Age, gender, remoteness, and area socioeconomic status

Chapter 3. Analysis of Causes of Death – Children with a Child Protection History 2002-2011

Introduction

The information in this chapter was prepared by staff in the Indigenous and Children's Group at the Australian Institute of Health and Welfare (AIHW). It was commissioned by the NSW Child Death Review Team (CDRT) to support its work in preventing and reducing deaths of children in NSW by analysing the causes of death of children with a child protection history,[11] between 2002 and 2011.

Reports are made to the child protection system for a range of reasons, from concerns that a child's basic physical, psychological or medical needs are not being met, through to fears about their physical or psychological safety. Substantial numbers of children are the subject of child protection reports each year. There were 99,283 notifications to the child protection system in NSW from 1 July 2011 to 30 June 2012, representing 61,308 children (AIHW 2013). Of the notifications during this period, 23,175 were substantiated: 34% for neglect, 31% for emotional abuse, 19% for physical abuse, and 16% for sexual abuse.

By definition, children who are reported to the child protection system are a vulnerable group, and it could be expected that the circumstances that lead to their being reported may lead to higher rates of morbidity and mortality compared with other children. Between 2002 and 2010, nearly 1,100 children with a child protection history died in NSW, representing approximately 20% of all child deaths during that period (NSW Department of Family and Community Services 2011; NSW CDRT 2009).

Previous research in NSW (CDRT 2009) found that mortality rates for external causes of death such as drowning, assault, poisoning, and suicide were higher for children with a child protection history. These differences were not restricted to external causes of death (where they might be expected); other research conducted for the NSW Ombudsman's Office showed that children whose deaths were 'reviewable' were also more likely to die of certain illnesses/conditions such as meningococcal infection, pneumonia, and epilepsy (NSW Ombudsman 2007).

These findings suggest that a closer analysis of cause of death data in relation to child protection history as well as other socio-demographic factors that may be predictive both of cause of death and being reported to the child protection system is warranted. Using data supplied by the NSW CDRT on all deaths of children aged 0–17 that occurred in NSW between 2002 and 2011, this chapter includes the following:

- An overview of all-cause mortality rates over the period 2002–2011 and whether they differ for children with a child protection history.
- Comparisons of causes of death between children with a child protection history and those without, moving from broad categories to more specific causes of death.
- Trend analyses for the five leading causes of death where the likelihood of death was higher for children with a child protection history.
- Analysis of the impact of key variables on cause of death distributions for children with a child protection history and those without.

Data

One function of the NSW CDRT is to maintain a register of child deaths that occurred in NSW. The CDRT receives data directly from the NSW Registrar of Births, Deaths, and Marriages,[12] and classifies each death

---

11   This includes children, or siblings of children, who were the subject of a report of risk of harm to the Department of Community Services within three years prior to their death (2002-2009). For 2010–2011, this includes children (and siblings of children) who were the subject of a report of risk of harm/significant harm to Community Services and/or to a Child Wellbeing Unit within three years prior to their death.

12   Although Births, Deaths, and Marriages (BDM) sends the data to the ABS for the national mortality database as well as to the NSW CDRT, the ABS' national mortality database and the CDRT register are kept and coded separately. A comparison of the NSW CDRT data with data from the ABS' national mortality database is presented later in this report.

using the ICD-10-AM.[13] The registry also includes relevant demographic characteristics and child protection history on each death record.[14]

An individual level data file from this register was provided to the AIHW on 6,152 deaths of children aged 0–17 occurring in NSW between 2002 and 2011. Key variables included:

- Date of birth
- Date of death
- Age at death
- ICD-10-AM coded cause(s) of death (underlying, direct, and contributory)
- Sex
- 2001 Statistical Local Area (SLA) code
- Longitude and latitude coordinates of the child's residence at the time of their death[15]
- Whether the child's birth or death record indicated Indigenous status
- CDRT-coded Sudden Unexpected Death in Infancy (SUDI)
- CDRT-coded suicide/probable suicide
- Child protection history

In addition, the NSW Ombudsman's Office supplied data from the NSW Department of Family and Community Services on the total numbers of children with a child protection notification for each of the years. Population data is from the ABS.[16]

Approach

The overall approach to this project was to use the available data in a conceptually based, methodologically rigorous analysis of the extent to which causes of death varied between children with a child protection history and those without, and to present the results in a manner which would provide useful and practical information to the NSW CDRT.

This chapter presents numbers of deaths, population-based rates, and rate ratios comparing overall and cause-specific mortality rates between children with a child protection history and those without. These results provide population-level differences in the likelihood that children will die from a specific cause and whether there are differences for children with a child protection history.

The chapter then focuses on variations in causes of death within the population of children who died in NSW between 2002 and 2011—that is, given that a child has died, were there differences in the causes of death between children with a child protection history and those without?

Trend analyses were conducted on the top five causes of death where children with a child protection history had a higher likelihood of death than those without a child protection history to determine whether there have been significant increases or decreases in the observed rates of these causes of death between 2002 and 2011.

Both of these aggregate approaches are important for setting out the overall cause of death patterns and identifying where there are differences between children with a child protection history and those without. However, both child protection history and causes of death are likely to be related to other factors as well, such as remoteness categories, the socioeconomic status of the area in which they live, gender, Indigenous status, and age (AIHW 2012a; AIHW 2012b).

To examine the impact of these factors, this chapter presents distributions of cause of death by these factors and child protection history. The results from a series of logistic regression models are used to examine whether child protection history has a statistically significant impact on cause of death, controlling for these other key factors.

---

13 The ICD-10-AM stands for the World Health Organisation's International Classification of Diseases 10th revision, Australian Modification. These data are completely separate from data sent by BDM to the ABS. A comparison of the NSW CDRT registry data with data from the national mortality database is presented later in this report.

14 All child deaths are cross-referenced with data on child protection history held by the Department of Family and Community Services (FACS).

15 The physical address of where the child lived – not where the child died.

16 ABS. 3101.0 Australian Demographic Statistics, TABLE 51. Estimated Resident Population By Single Year Of Age, New South Wales.

The chapter also includes detailed analyses of deaths classified as SUDI (Sudden Unexpected Deaths in Infancy), deaths from cerebral palsy, and deaths from congenital malformations/abnormalities. Sensitivity analyses were performed to ensure that the results were reliable and valid.

The chapter ends with recommendations to the CDRT for future research in this area that would further explore the relationship between child protection history and the risk of dying from particular causes.

Results

Child deaths by child protection history in NSW, 2002–2011

According to the CDRT data, there were 6,152 deaths of children aged 0–17 over the period 2002–2011. Of those, 1,205 (19.6%) had a child protection history. As shown in Table 1, both the number and percentage of deaths of children with a child protection history fluctuated during the period. The largest number of deaths of children with a child protection history was 150 in 2007, with a low of 81 in 2002. In 2002, 12.5% of deaths were to children with a child protection history, compared with 25.4% in 2009.

Table 1: **Deaths of children aged 0–17, by year of death and child protection history, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Child protection history	81	120	102	116	101	150	131	146	141	117	**1,205**
No child protection history	568	533	514	543	520	454	475	428	452	460	**4,947**
Total	**649**	**653**	**616**	**659**	**621**	**604**	**606**	**574**	**593**	**577**	**6,152**
% of deaths that were to children with a child protection history	12.5	18.4	16.6	17.6	16.3	24.8	21.6	25.4	23.8	20.3	**19.6**

Source: AIHW analysis of NSW CDRT data.

Fluctuations in the number of deaths of children with a child protection history may be due to changes in reporting criteria and definitions over the period, or due to real changes in the likelihood or risk of dying among children with a child protection history.

All-cause mortality rates

The AIHW used linear regression analysis to determine whether there have been significant increases or decreases in the observed rates between 2002 and 2011. Table 2 presents the number of deaths and all-cause mortality rates separately for children with a child protection history and those without, along with rate ratios and rate differences.[17]

The percentage change estimate is the difference between the first year and the last year of the specified period based on the average annual change over the period.

Children aged 0–17 years in NSW died at a rate of 38 per 100,000 for the period 2002 to 2011. All-cause mortality rates were 1.4 times as high for children with a child protection history (52 per 100,000) as for children without a child protection history (36 per 100,000).

---

17   The average annual change in rates, rate ratios and rate differences were calculated using the least squares method.

Table 2: **All cause mortality rates, rate ratios and rate differences, by child protection history, children aged 0–17, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual change[a]	% Change over period[b]
Total deaths in NSW (children aged 0–17)													
Number	649	653	616	659	621	604	606	574	593	577	**6,152**	-8.8*	-12.2*
Rate[c]	40.3	40.7	38.5	41.1	38.6	37.5	37.6	35.5	36.5	35.3	**38.2**	-0.6*	-13.6*
Children with a child protection history													
Number	81	120	102	116	101	150	131	146	141	117	**1,205**	4.8*	52.9*
Rate[d]	48.2	61.8	49.0	53.0	43.4	59.7	48.6	52.3	54.8	49.2	**52.0**	-0.1	-2.7
Children without a child protection history													
Number	568	533	514	543	520	454	475	428	452	460	**4,947**	-13.6*	-21.5*
Rate[e]	39.4	37.8	36.9	39.3	37.8	33.4	35.4	32.0	33.0	32.9	**35.9**	-0.8*	-18.2*
Rate ratio[f]	1.2	1.6	1.3	1.4	1.1	1.8	1.4	1.6	1.7	1.5	**1.4**	0.03	21.0
Rate difference[g]	8.8	24.0	12.1	13.7	5.6	26.3	13.2	20.3	21.8	16.2	**16.8**	0.7	66.3

* Represents statistically significant differences at the p<0.05 level over the period 2002–2011.

    (a) Average annual change in rates, rate ratios and rate differences determined using linear regression analysis.

    (b) Percent change between 2002 and 2011 based on the average annual change over the period.

    (c) Rates are per 100,000 children aged 0–17 in NSW.

    (d) Rates are per 100,000 children aged 0–17 in NSW with a child protection history, which includes the unique number of children with a child protection/child concern report in that year and the two years prior.

    (e) Rates are per 100,000 children aged 0–17 in NSW without a child protection history. The denominator was calculated by subtracting the number of children with a child protection history from the total population of children in that year.

    (f) Mortality rate for children with a child protection history divided by the mortality rate for children without a child protection history.

    (g) Mortality rate for children with a child protection history minus the mortality rate for children without a child protection history.

Source: AIHW analysis of NSW CRDT data.

Figure 1. All-cause mortality rates for children aged 0-17 by child protection history, NSW, 2002-2011
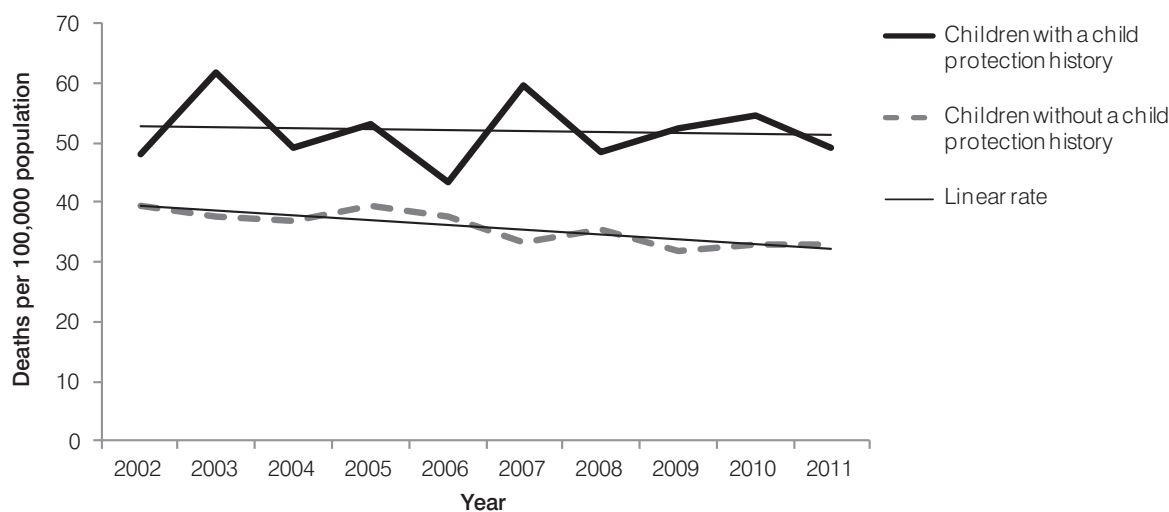
Figure 1 shows that mortality rates for children with a child protection history fluctuated somewhat between 2002 and 2011, ranging from a low of 43.4 in 2006 to a high of 61.8 in 2003. These yearly fluctuations are likely to be a reflection of small numbers. While there has been an increase in the number of child deaths for children with a child protection history (from 81 in 2002 to 117 in 2011), the fitted trend shows no significant change in the mortality rate over this period.

The number of deaths of children without a child protection history fell from 568 in 2002 to 460 in 2011. Figure 1 shows that mortality rates for children without a child protection history ranged between 32.0 and 39.4 per 100,000 between 2002 and 2011. The fitted trend shows a significant decline in the rate over this period – an average yearly decline of 0.8 per 100,000, which is equivalent to an 18% reduction.

The gap between children with a child protection history and children without a child protection history can be measured in relative (rate ratio) or absolute terms (rate difference). The relative gap remained fairly stable over the period 2002 and 2011 (ranging between 1.1 and 1.8), while the absolute gap fluctuated, ranging between 5.6 and 26.3 per 100,000. This reflects the fluctuation in mortality rates for children with a child protection history over the period. The fitted trend for both the rate ratio and rate difference showed non-significant increases in the mortality gap between 2002 and 2011 (Table 2).

Key findings

- Of the 6,152 deaths of children aged 0–17 over 2002-2011 in NSW, 1,205 (19.6%) were to children with a child protection history.

- All-cause mortality rates were 1.4 times as high for children and young people with a child protection history as those without.

- While there was no statistically significant change in mortality rates for children with a child protection history over the past decade (2002 to 2011), there was a significant decline of 18% in mortality rates for children without a child protection history, leading to an increase (although not statistically significant) in the gap between children with and without a child protection history

Characteristics of children who died in NSW by child protection history, 2002–2011

Previous research has shown that infant and child mortality rates are higher for Indigenous children, boys, children from areas with lower socioeconomic status, and those from regional and remote areas (AIHW 2008). Table 3 presents these characteristics for the children and young people who died in NSW between 2002 and 2011 by child protection history.

The data demonstrate that the characteristics of children who died differed by child protection history, with the exception of sex. Statistics show that Indigenous children are overrepresented in the child protection system itself (AIHW 2012b) – Table 3 shows that Indigenous children make up a notably higher percentage of deaths of children with a child protection history than those without: 19.9% of deaths of children with a child protection history were Indigenous, compared with 5.6% of deaths of children without a child protection history.

Table 3: **Characteristics of children aged 0–17 who died in NSW, by child protection history, 2002–2011**

Characteristic	Child protection history		No child protection history		All child deaths	
	Number	Percent	Number	Percent	Number	Percent
Sex						
Male	698	57.9	2,873	58.1	3,571	58.0
Female	507	42.1	2,074	41.9	2,581	42.0
Indigenous status [a]						
Indigenous	240	19.9	275	5.6	515	8.4
Other	965	80.1	4,672	94.4	5,637	91.6
Age at death						
Under 1 year	606	50.3	3,171	64.1	3,777	61.4
1-4 years	191	15.9	574	11.6	765	12.4
5-9 years	104	8.6	322	6.5	426	6.9
10-14 years	122	10.1	339	6.9	461	7.5
15-17 years	182	15.1	541	10.9	723	11.8
Remoteness category [b]						
Major cities	724	60.5	3,531	72.2	4,255	69.2
Inner regional areas	322	26.9	999	20.4	1,321	21.5
Outer regional areas	135	11.3	315	6.4	450	7.3
Remote areas	14	1.2	37	0.8	51	0.8
Very remote areas	1	0.1	7	0.1	8	0.0
SEIFA quintile [c]						
Quintile 5 (most advantaged)	133	11.1	1,326	27.1	1,459	23.7
Quintile 4	265	22.1	1,236	25.3	1,501	24.4
Quintile 3	443	36.9	1,352	27.6	1,795	29.2
Quintile 2	146	12.2	503	10.3	649	10.5
Quintile 1 (most disadvantaged)	213	17.8	478	9.8	691	11.2
Mean SEIFA score[d]	972.7		1,008.0		1,001.0	

(a) A child was counted as Indigenous if they were reported as Aboriginal or Torres Strait Islander on either their birth or death certificate. All missing values were assigned to the 'other' category.

(b) Each death was geocoded to the census collection district (CD) level for 2006 (the midpoint of the data collection) and remoteness status was assigned based on this CD.

(c) The 2006 Index of Relative Disadvantage (IRD) SEIFA values were assigned based on the 2006 Statistical Local Area (SLA) of the geocoded death records. State-level quintiles were assigned to each record.

(d) Mean SEIFA scores below 1000 indicate more disadvantage.

Sources: AIHW analysis of NSW CDRT data; Remoteness and SEIFA codes from the ABS; geocoding done by AIHW using MapInfo.

Comparing the age distribution of the child deaths between the two groups shows that there was a higher proportion of deaths of older children among those with a child protection history: nearly 50% of deaths of children with a child protection history were of children older than 1 year, compared with 36% of deaths of children without a child protection history. This difference may be partly due to exposure; that is, in order to be coded as having a child protection history, the child or a sibling must have been the subject of a report in the year of death or the previous two years. Even if a baby who died in the neonatal period (first 28 days) was at risk of harm, in order for them to be coded as having a child protection history, they must have been the subject of a report in that first 28 days or had an older sibling who had been reported within that year or the previous two.

A higher proportion of deaths of children with a child protection history were for those living in regional and remote areas compared to deaths of children without a child protection history. The socioeconomic status of the areas in which the children with a child protection history lived were, on average, more disadvantaged than those in which children without a child protection history lived (as measured by mean SEIFA scores as well as the distribution of the child deaths among the quintiles). It is important to emphasise that the SEIFA values refer to the socioeconomic factors of the area in which the children lived, not the socioeconomic status of their own families.

These differences in the characteristics of children who died by child protection status are likely to also be reflected in the cause of death distributions. The next section of this report addresses this issue.

Key findings

- There were substantial differences in the characteristics of children who died in NSW between 2002 and 2011 between children with a child protection history and those without.
- Children with a child protection history who died were more likely than those without a child protection history to be Indigenous, older, from regional or remote areas, and to have lived in areas with lower socioeconomic status.

Cause of death patterns - mortality rates

The distributions of underlying causes of deaths for babies, children, and young people is an important indicator of population health between age groups, and can highlight potential opportunities for interventions to prevent future deaths. For example, patterns of death for vaccine-preventable illnesses would suggest that targeted immunisation campaigns/projects would be warranted.

Children with a child protection history are likely to be at particular risk for causes of death related to the circumstances of their having been reported to child protection services in the first place—for example, deaths related to assault or neglect, lack of supervision, unstable home environments, and poorer housing. However, they may also be at higher risk of dying from certain diseases and morbid conditions. The detailed ICD-10-AM underlying cause of death codes in the dataset were coded to chapter level, and then further coded into whether the death was due to:

- Diseases or morbid conditions which are not external or unknown (natural causes)
- Causes external to the body, such as accidents, injuries, assaults, or suicide (external causes)
- SIDS (Sudden Infant Death Syndrome) or other undetermined causes.

These three categories are mutually exclusive. Table 4 presents the numbers of deaths and crude mortality rates by these broad categories and child protection history.

Table 4: **Numbers of deaths, percentage distributions, and crude mortality rates by broad cause of death categories, by child protection history, children aged 0-17, NSW, 2002-2011**

	Children with a child protection history			Children without a child protection history			Rate ratio[g]		All children		
	Deaths	Percent	CMR[e]	Deaths	Percent	CMR[f]	Percent	CMR	Deaths	Percent	CMR
Natural causes[a]	637	54.1	27.5	3,884	79.1	28.1	0.7	1.0	4,521	74.2	28.0
SIDS and undetermined causes[b]	179	15.0	285.3	273	5.6	33.0	2.7	8.7	452	7.4	50.7
External causes[c]	361	30.7	15.6	755	15.2	5.5	2.0	2.8	1,116	18.3	6.9
Total[d]	**1,177**	**100.0**		**4,912**	**100.0**				**6,089**	**100.0**	

(a) Includes ICD-10-AM chapters 1-17 (codes A00-Q99)

(b) Includes ICD-10-AM chapter 18 (codes R00-R99)

(c) Includes ICD-10-AM chapters 19-21 (there was only death attributed to chapter 19 and none in chapter 21)

(d) Does not include the 63 deaths with no cause assigned

(e) Rate per 100,000 children aged 0–17 with a child protection history. The CMR for SIDS is per 100,000 children under age 1 with a child protection history.

(f) Rate per 100,000 children aged 0–17 without a child protection history. The CMR for SIDS is per 100,000 children under age 1 without a child protection history.

(g) Percentages/rates for children with a child protection history divided by those for children without a child protection history

Sources: AIHW analysis of NSW CDRT data, child protection data supplied by the NSW Ombudsman's Office, population data from the ABS.

Table 4 shows that nearly 80% of deaths of children without a child protection history were due to natural causes compared with 54.1% of deaths of children with a child protection history. The proportion who died from SIDS and undetermined causes was 2.7 times as high for children with a child protection history, and the proportion dying from external causes was twice as high for children with a child protection history.

The population-based mortality rates show a similar pattern. During this 10-year period, there was essentially no difference between the natural cause crude mortality rates for children with and without a child protection history (27.5 compared with 28.1 per 100,000). The external cause mortality rate for children with a child protection history, however, was 3 times as high as those for children without a child protection history (15.6 compared with 5.5 per 100,000), and the rate for SIDS was 8.7 times as high.[18]

While these broad categories demonstrate that there are high-level differences between children with a child protection history and those without in terms of SIDS and external causes, they may mask smaller variations within the cause of death categories. For example, natural causes of death are a mixture of deaths from chronic and acute illnesses, and deaths from conditions present at birth and those acquired later. Tables 5 and 6 further disaggregate the data by individual ICD-10-AM chapters. Table 5 presents the population-based mortality rates and Table 6 presents the proportions of deaths due to each cause within the population of children who died. Both tables include rate ratios to highlight the extent of the differences.

---

18 The denominator for the SIDS mortality rate was the number of children less than 1, disaggregated by child protection history. Data on the number of births by child protection history was not available.

Table 5: **Crude death rates by ICD-10-AM chapter cause of death codes and child protection history, children aged 0–17, NSW (2002–2011)**[(a)]

ICD-10-AM chapter	Child protection history	No child protection history	Rate ratio	Total rate
1: Certain infectious and parasitic diseases	1.2	0.6	1.9	**0.7**
2: Neoplasms	2.5	2.7	0.9	**2. 7**
4: Endocrine, nutritional and metabolic disorders	0.8	0.5	1.6	**0. 6**
6: Diseases of the nervous system	3.5	1.9	1.9	**2.1**
9: Diseases of the circulatory system	1.0	1.1	1.0	**1.1**
10: Diseases of the respiratory system	1.5	0.7	2.1	**0.8**
16: Certain conditions originating in the perinatal period	10.1	13.2	0.8	**12.8**
17: Congenital malformations, deformations and chromosomal abnormalities	5.5	6.3	0.9	**6.2**
18: Symptoms, signs and abnormal clinical findings, not elsewhere classified (SIDS)[(b)]	285.3	33.0	8.7	**50.7**
20: External causes of morbidity	15.6	5.5	2.8	**6.9**
Total all-cause mortality rates	**52.0**	**35.8**	**1.5**	**38.2**

(a) For ICD10 chapters with at least 50 deaths over the 10 year period
(b) Per 100,000 children aged <1

Natural causes of death where the proportions are higher for children with a child protection history include certain infectious and parasitic diseases[19] (1.4 times as high), diseases of the nervous system[20] (1.3 times as high), and diseases of the respiratory system[21] (1.5 times as high).[22]

The cause-specific mortality rates are also higher for those three causes of death. In addition, the crude mortality rate for deaths due to endocrine, nutritional and metabolic disorders[23] is 1.6 times as high for children with a child protection history as those without.

---

19   This includes both viral and bacterial infections such as meningococcal, sepsis, and gastroenteritis.
20   This includes epilepsy and cerebral palsy.
21   This includes upper and lower respiratory infections, influenza, and pneumonia.
22   Although the rate ratios are above one, there were only 14 deaths due to mental, behavioural and neurodevelopmental disorders and 14 deaths due to diseases of the musculoskeletal system and connective tissue during the 10 year period.
23   This includes diabetes mellitus, disorders of the thyroid gland, and malnutrition.

Table 6:   **Distribution of child deaths by ICD-10-AM chapter cause of death codes, by child protection history, children aged 0–17, NSW, 2002–2011**

ICD-10-AM Chapter	Child protection history		No child protection history		Percentage ratio	All child deaths	
	Deaths	**Percent**	**Deaths**	**Percent**		**Deaths**	**Percent**
1: Certain infectious and parasitic diseases	28	2.3	85	1.7	1.4	112	1.8
2: Neoplasms	57	4.8	373	7.6	0.6	430	7.1
3: Diseases of the blood and blood-forming organs and certain disorders involving the immune system	8	0.7	38	0.8	0.9	46	0.8
4: Endocrine, nutritional and metabolic disorders	26	2.2	115	2.3	1.0	141	2.3
5: Mental, behavioural and neurodevelopmental disorders	5	0.4	9	0.2	2.0	14	0.2
6: Diseases of the nervous system	81	6.9	257	5.2	1.3	338	5.6
7: Diseases of the eye and adnexa	0	0.0	1	0.0	1.0	1	0.0
8: Diseases of the ear and mastoid process	1	0.1	0	0.0	0.0	1	0.0
9: Diseases of the circulatory system	24	2.0	150	3.1	0.7	174	2.9
10: Diseases of the respiratory system	34	2.9	99	2.0	1.5	133	2.2
11: Diseases of the digestive system	7	0.6	42	0.9	0.7	49	0.8
13: Diseases of the musculoskeletal system and connective tissue	5	0.4	9	0.2	2.0	14	0.2
14: Diseases of the genitourinary system	1	0.1	11	0.2	0.5	12	0.2
15: Pregnancy, childbirth and the puerperium	0	0.0	0	0.0	1.0	0	0.0
16: Certain conditions originating in the perinatal period	233	19.8	1,826	37.2	0.5	2,059	33.8
17: Congenital malformations, deformations and chromosomal abnormalities	128	10.9	869	17.7	0.6	997	16.4
18: Symptoms, signs and abnormal clinical findings, not elsewhere classified (SIDS)	179	15.2	273	5.6	2.7	452	7.4
20: External causes of morbidity	361	30.7	755	15.4	2.0	1,115	18.3
Total	**1,177**	**100.0**	**4,912**	**100.0**		**6,089**	**100.0**

Another way of presenting the data is to examine whether the top five causes of death vary between deaths of children with and without a child protection history. Table 7 shows that the cause of death profile differs between children with and without a child protection history in terms of the ordering of causes, the frequency with which they occurred, and, to a lesser extent, the causes themselves.

Table 7:   **Top 5 causes of death by child protection history, children aged 0–17, NSW, 2002–2011**

Children with a child protection history (N=1,177)		Children without a child protection history (N=4,912)	
Cause of death	**Percent**	**Cause of death**	**Percent**
External causes	30.7	Conditions originating in the perinatal period	37.2
Conditions originating in the perinatal period	19.8	Congenital malformations	17.7
SIDS	15.2	External causes	15.4
Congenital malformations	10.9	Neoplasms	7.6
Diseases of the nervous system	6.9	SIDS	5.6

For children with a child protection history, the most frequent cause of death category is external factors, which includes both intentional and unintentional injuries such as transport-related accidents, falls, drowning, poisoning, assault, and intentional self-harm. This finding is not unexpected, as the factors that put children at risk of being reported to the child protection system are the same as those that put them at risk of both deliberate harm and unintentional injury (e.g. physical abuse, drug and alcohol use in the family, unsafe home environments).

Conditions originating in the perinatal period (such as those due to length of gestation and foetal growth, maternal factors, and complications of pregnancy, labour and delivery) are the second leading cause of death among children with a child protection history (19.8%), while they are the most frequent cause of death among children without a child protection history (37.2%).

Sudden Infant Death Syndrome (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' (CDRT 2012, p. 65) – was the third leading cause of death for children with a child protection history. Although the national death rate from SIDS has decreased markedly since the introduction of the SIDS education campaign in 1991, certain groups remain at higher risk, including Indigenous infants, male infants, infants who weighed less than 2,500 grams at birth, and those from lower socioeconomic status areas. Since many of these characteristics are also associated with the likelihood of reports to child protection services, it is not surprising that SIDS is a more prevalent cause of death among children with a child protection history.

Congenital malformations, deformations and chromosomal abnormalities refer to developmental disorders of the embryo and foetus which are present at birth, such as neural tube defects, heart defects, and Down syndrome, which may lead to long-term disability and, with some disorders, increased risk of death. Although deaths due to congenital abnormalities is less frequent among children with a child protection history, it remains the fourth most common cause of death, followed by disorders of the nervous system.

Comparing the cause of death distributions for the two groups, there is overlap in four of the five causes, although their order differs. Neoplasms make up the fourth highest percentage of deaths for children without a child protection history, but is not in the top 5 for children with a child protection history.

Table 8 presents specific causes of death where mortality rates were higher for children with a child protection history. An analysis of the detailed causes of death found four natural causes of death for which children with a child protection history had higher mortality rates:[24] meningococcal infection (3.4 times as high), cerebral palsy (3.5 times as high), influenza/pneumonia (2.2 times as high), and epilepsy (2.0 times as high). Interestingly, two of the causes are acute acquired infections (meningococcal and influenza/pneumonia) and two represent long-term conditions (epilepsy and cerebral palsy).

The specific external causes of death with higher rates for children with a child protection history include accidental drowning (2.7 times as high), accidental poisoning (5.5 times as high), assault (6.3 times as high), and fire (23.8 times as high). Pedestrian death rates and passenger death rates were twice as high for children with a child protection history.

---

24   With at least 20 deaths total over the 10-year period.

Table 8: **Specific causes of death where the mortality rates are higher for children with a child protection history, children aged 0–17 years, NSW, 2002–2011**

Cause of death	Child protection history		No child protection history		Rate ratio	All child deaths	
	Deaths	CDR	Deaths	CDR		Deaths	CDR
Epilepsy	10	0.4	30	0.2	2.0	40	0.3
Meningococcal	9	0.4	16	0.1	3.4	25	0.2
Influenza and pneumonia	17	0.7	46	0.3	2.2	63	0.4
Cerebral palsy	28	1.2	48	0.4	3.5	76	0.5
Accidental poisoning	12	0.5	13	0.1	5.5	25	0.2
Fires	28	1.2	7	0.1	23.8	35	0.2
Accidental drowning	48	2.1	107	0.8	2.7	155	1.0
Pedestrian	23	1.0	69	0.5	2.0	92	0.6
Passenger in a motor vehicle	50	2.2	159	1.2	1.9	209	1.3
Assault	57	2.5	54	0.4	6.3	111	0.7
CDRT coded SUDI[b]	232	371.4	314	37.8	9.8	546	61.3
CDRT coded suicide[a]	59	6.3	97	1.5	4.1	156	2.2

(a) Per 100,000 children aged 10-17, disaggregated by child protection history

(b) Per 100,000 children age < 1, disaggregated by child protection history

In addition to the ICD-10-AM codes, the CDRT codes cases of Sudden Unexpected Death in Infancy (SUDI) and suicide/suspected suicide. SUDI is not a cause of death, but a way of classifying unexpected deaths in otherwise seemingly healthy infants. As such, it includes all cases of SIDS, but also includes deaths due to fatal sleep accidents, undiagnosed infections, cardiovascular anomalies, metabolic or genetic disorders, and to child abuse that was not recognised at the time of death. As with SIDS, there is an association between sex, Indigenous status, remoteness, socioeconomic status and the risk of SUDI (AIHW 2012a; Spencer and Logan 2004).

Table 8 shows that rates of SUDI are 9.8 times as high for babies with a child protection history and suicide is 4.1 times as high for young people (age 10–17) with a child protection history.

Key findings

- Mortality rates from external causes were 2.8 times as high for children with a child protection history. Specific causes with higher mortality rates included accidental poisoning, fires, accidental drowning, pedestrian accidents, assault, and suicide.

- Mortality rates for SIDS were nearly 9 times as high for infants with a child protection history and rates for infant deaths classified as SUDI were 9.8 times as high for infants with a child protection history.

- Mortality rates for natural causes of death as a category did not differ by child protection history, but higher mortality rates were found for meningococcal infection and cerebral palsy among children with a child protection history.

- The top five causes of death among children and young people with a child protection history were external causes (30.7%), conditions originating in the perinatal period (19.8%), SIDS (15.2%), congenital malformations (10.9%), and disorders of the nervous system (6.9%).

Trend analyses

The AIHW conducted trend analyses on the top five causes of death where children with a child protection history had a higher likelihood of death than those without a child protection history to determine whether there have been significant increases or decreases in the observed rates of these causes of death between 2002 and 2011.

Trend analyses were conducted on deaths due to:

- External causes
- SIDS and other undetermined causes
- Deaths classified as SUDI
- Deaths classified as suicide
- Deaths due to diseases of the nervous system

Because reliable and valid trend analyses require 10 deaths per year at the minimum, trend analyses could not be conducted on causes of death such as cerebral palsy. The trend analysis for all-cause mortality rates was presented earlier in this chapter.

For each cause of death, linear regression analysis was used to determine whether there have been significant increases or decreases in the observed rates between 2002 and 2011. The average annual change in rates, rate ratios and rate differences were calculated using linear regression which uses the least squares method to calculate a straight line that best fits the data. These results, along with the yearly numbers and rates, are presented for each cause of death, along with graphs of the observed data and fitted trend lines.

External causes of mortality

Table 9 presents the results for the children who died of external causes. Children aged 0–17 years in New South Wales died at a rate of 7 per 100,000 population for external causes of death for the period 2002 to 2011. On average, mortality rates were 2.8 times as high for children with a child protection history (15.6 per 100,000) as for children without a child protection history (5.4 per 100,000).

Table 9: **External cause mortality rates, rate ratios and rate differences, by child protection history, children aged 0–17 years, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual change	% Change over period
Total deaths in NSW (children aged 0–17)													
Number	131	132	122	116	124	115	87	102	98	89	**1,116**	-4.9*	-33.8*
Rate	8.1	8.2	7.6	7.2	7.7	7.1	5.4	6.3	6.0	5.4	**6.9**	-0.3*	-35.0*
Children with a child protection history													
Number	26	46	39	31	32	44	30	44	36	33	**361**	0.2	5.7
Rate	15.5	23.7	18.7	14.2	13.7	17.5	11.1	15.8	13.9	13.9	**15.6**	-0.6	-36.4
Children without a child protection history													
Number	105	86	83	85	92	71	57	58	62	56	**755**	-5.1*	-43.6*
Rate	7.2	6.0	5.8	5.9	6.5	5.2	4.3	4.3	4.5	4.0	**5.4**	-0.3*	-41.6*
Rate ratio	**2.1**	**3.9**	**3.1**	**2.3**	**2.1**	**3.4**	**2.6**	**3.6**	**3.1**	**3.5**	**2.8**	**0.1**	**27.9**
Rate difference	**8.2**	**17.6**	**12.8**	**8.0**	**7.1**	**12.3**	**6.9**	**11.4**	**9.4**	**9.9**	**10.1**	**-0.3**	**-31.7**

Overall, there were declines of 36% in mortality rates from external causes for children with a child protection history and 42% for children without a child protection history over the period, leading to a decrease (although not statistically significant) in the difference in the gap between children with and without a child protection history.

Figure 2 shows that external cause mortality rates for children with a child protection history were highest at 24 per 100,000 in 2003 and lowest at 11 in 2008. The fitted trend shows a significant decline in the rate over this period with an average yearly decline in the rate of 0.6 per 100,000 which is equivalent to a 36% reduction in the rate over the period.

The number of deaths due to external causes for children without a child protection history fell from 105 in 2002 to 56 in 2011. Figure 2 shows the mortality rate for children without a child protection history also declined over the period from 7.2 in 2002 to 4.0 in 2011. The fitted trend shows a significant decline in the rate over the period with an average yearly decline of 0.3 per 100,000, equivalent to a 42% reduction in the rate.

Both the absolute and relative gap remained relatively stable over the period. There was no significant change in the mortality rate ratio between children with a child protection history and children without a child protection history and a non-significant decline in the absolute gap between 2002 and 2011.

Figure 2. External cause mortality rates, rate ratios and rate differences between children with a child protection history and children without a child protection history, children aged 0–17, NSW, 2002–2011
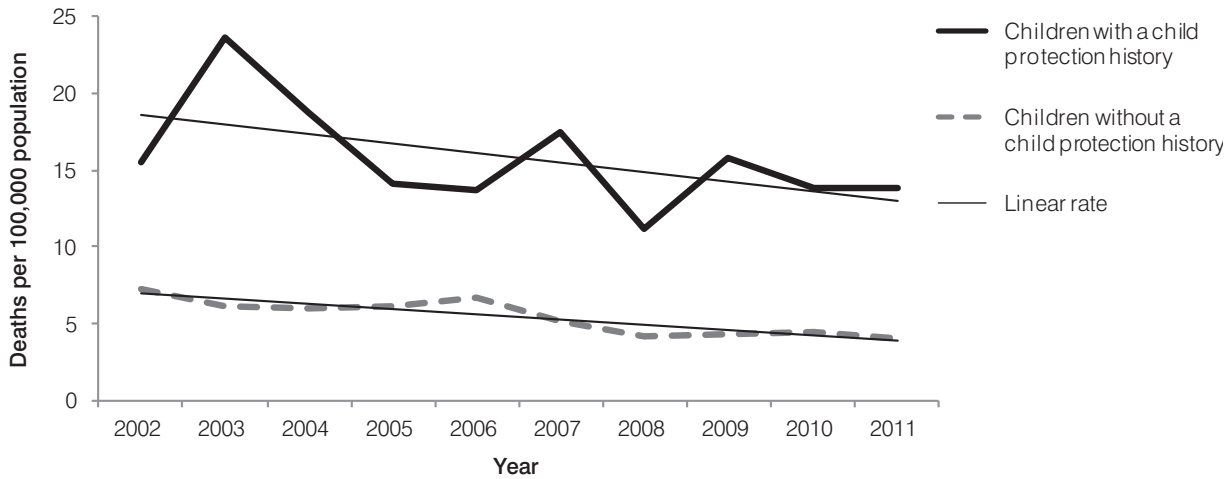
SIDS and other undetermined causes

The results for deaths due to SIDS and other undetermined causes among children aged less than 1 are presented in Table 10. The data show that children aged less than 1 in NSW died at a rate of 51 per 100,000 for SIDS and other undetermined causes for the period 2002 to 2011. SIDS and other undetermined cause mortality rates were almost 9 times as high for children with a child protection history (285 per 100,000) as among children without a child protection history (33 per 100,000).

Table 10: **SIDS and other undetermined mortality rates, rate ratios and rate differences, by child protection history, children aged less than 1, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual change	% Change over period
Total NSW children aged less than 1													
Number	63	55	42	51	55	59	42	40	30	15	**452**	-3.9*	-55.4*
Rate	75.7	65.5	50.2	59.5	60.8	66.6	45.6	42.5	32.0	15.7	**50.7**	-5.1*	-61.2*
Children with a child protection history													
Number	16	23	17	15	21	29	16	23	14	5	**179**	-0.7	-41.3
Rate	375.1	858.5	355.8	268.5	308.8	352.5	180.4	260.0	219.5	79.2	**285.3**	-47.5*	-113.9*
Children without a child protection history													
Number	47	32	25	36	34	30	26	17	16	10	**273**	-3.1*	-60.2*
Rate	59.5	39.4	31.7	44.9	40.6	37.3	31.3	19.9	18.3	11.2	**33.0**	-4.2*	-62.8*
Rate ratio	6.3	21.8	11.2	6.0	7.6	9.4	5.8	13.1	12.0	7.1	**8.7**	-0.3	-44.6
Rate difference	315.6	819.2	324.1	223.6	268.1	315.2	149.1	240.1	201.2	68.0	**252.3**	-43.3*	-123.6*

Figure 3. SIDS and other undetermined cause mortality rates for children under 1, by child protection history
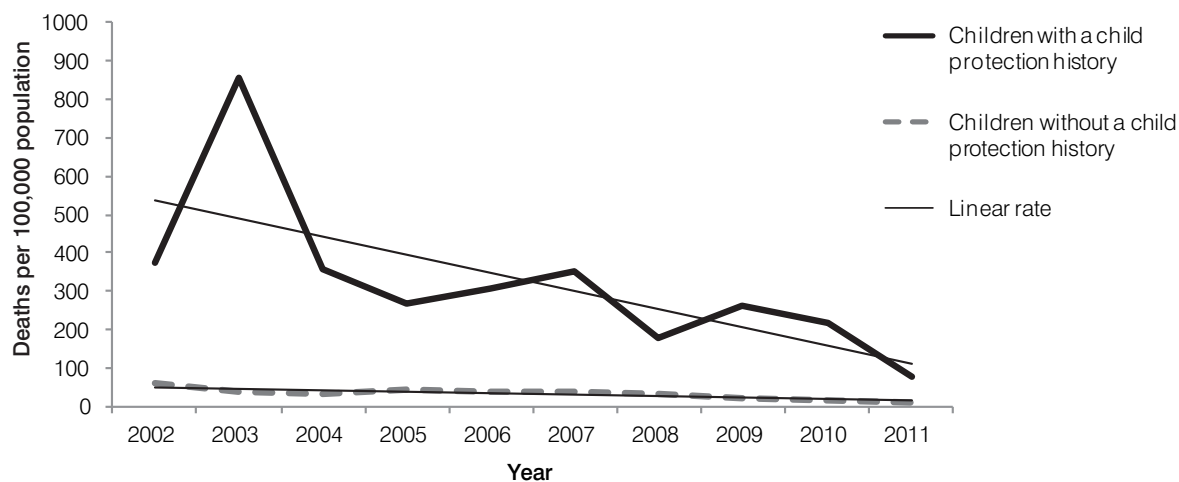
Overall, there have been significant declines in mortality rates over the last decade (2002 to 2011) with a 114% decline in mortality rates for children with a child protection history and a 63% decline in the rate for children without a child protection history, leading to a significant decrease in the gap between children with and without a child protection history.

Figure 3 shows a downward trend in mortality rates for children with a child protection history peaking at 858.5 in 2003 and falling to 79.2 in 2011. The fitted trend shows a significant decline in the rate over the period.

The number of deaths for children without a child protection history fell from 47 in 2002 to 10 in 2011. Figure 3 shows the mortality rate also declined over this period from 59.5 in 2002 to 11.2 in 2011. The fitted trend displays a significant decline in the mortality rate over the period with an average yearly decline of 4.2 per 100,000 which is equivalent to a 63% reduction.

The relative gap between children with and without a child protection history fluctuated somewhat, ranging between 6.0 and 21.8 per 100,000 with the fitted trend showing a non-significant decrease in the gap. The absolute gap fell over the period from 315.6 in 2002 to 68 per 100,000 in 2011. The fitted trend shows a significant decrease in the gap between children with a child protection history and those without between 2002 and 2011.

SUDI

The results for deaths classified as SUDI among children aged less than 1 are presented in Table 11. Note that the results of analyses for SUDI are similar to those of SIDS since SIDS accounts for a large proportion of SUDI deaths. Children aged less than 1 in NSW died at a rate of 61 per 100,000 for SUDI for the period 2002 to 2011. SUDI mortality rates were almost 10 times as high among children with a child protection history (371 per 100,000) as among children without a child protection history (38 per 100,000).

Overall, SUDI mortality rates for children with a child protection history decreased non-significantly over the decade (2002–2011) while there was a significant decrease of 46% in SUDI mortality rates for children without a child protection history, leading to a decrease (although not significant) in the gap between children with and without a child protection history.

Table 11: **SUDI mortality rates, rate ratios and rate difference, by child protection history, children aged less than 1 year, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual change	% Change over period
Total NSW children under 1													
Number	60	62	52	55	58	68	46	45	52	48	**546**	-1.4	-20.9
Rate	72.1	73.9	62.2	64.1	64.1	76.8	50.0	47.8	55.5	50.2	**61.3**	-2.6*	-32.3*
Children with a child protection history													
Number	14	23	21	21	24	39	18	28	23	22	**233**	0.7	44.0
Rate	328.3	858.5	439.5	375.9	352.9	474.0	203.0	316.6	360.6	348.5	**371.4**	-26.2	-71.7
Children without a child protection history													
Number	46	39	31	34	34	29	28	17	29	26	**313**	-2.1*	-40.7*
Rate	58.2	48.0	39.3	42.4	40.6	36.1	33.7	19.9	33.2	29.1	**37.8**	-3.0*	-46.2*
Rate ratio	**5.6**	**17.9**	**11.2**	**8.9**	**8.7**	**13.1**	**6.0**	**15.9**	**10.9**	**12.0**	**9.8**	**0.2**	**26.3**
Rate difference	**270.0**	**810.5**	**400.2**	**333.5**	**312.2**	**438.0**	**169.3**	**296.6**	**327.4**	**319.4**	**333.6**	**-23.2**	**-77.2**

Figure 4. SUDI mortality rates by child protection history, children aged less than 1, NSW, 2002–2011
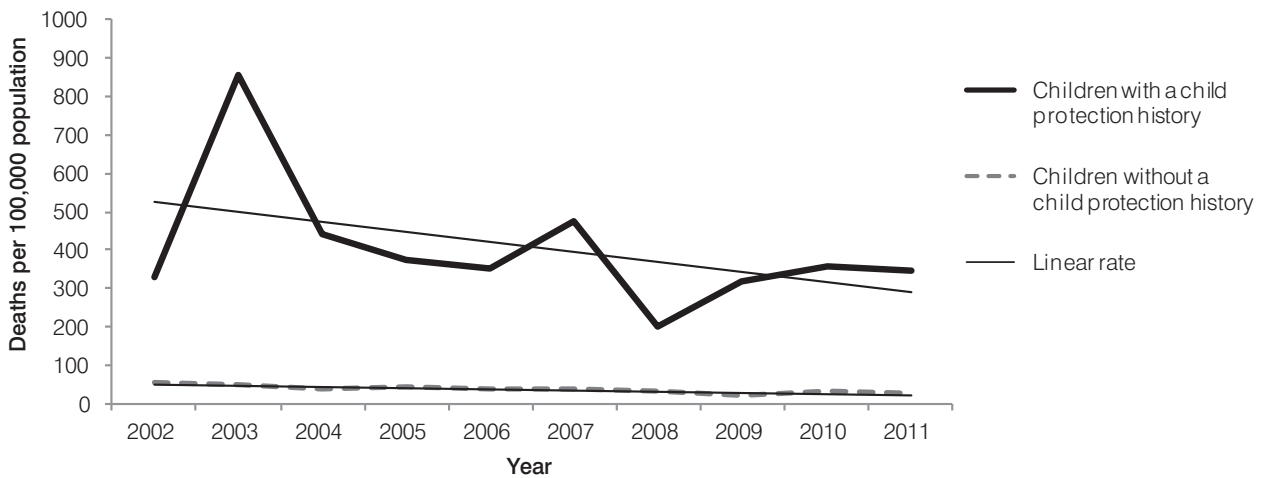
Figure 4 shows that mortality rates for children with a child protection history were highest at 858.5 in 2003 and lowest at 203 in 2008. While the rate fell from 858.5 in 2003 to 348.5 in 2011, the fitted trend shows no significant change in the rate.

The number of SUDI deaths for babies without a child protection history fell from 46 in 2002 to 26 in 2011. Figure 4 shows that mortality rates for children without a child protection history ranged from 20 to 58 per 100,000 between 2002 and 2011. The fitted trend shows a significant decline in the rate with an average yearly decline of 3 per 100,000, equivalent to a 46% reduction in the rate over the period.

The relative gap between children with a child protection history and children without a child protection history fluctuated somewhat over 2002 to 2011 (ranging between 5.6 and 17.9 per 100,000), while the absolute rate fluctuated from 169.3 to 810.5 per 100,000. The fitted trend for the rate ratio shows a non-significant increase in the gap, while the rate difference shows a non-significant decrease in the gap.

Suicide

The results for deaths classified as suicide among children aged 10–17 are presented in Table 12. Young people aged 10–17 years died at a rate of 2 per 100,000 for suicide for the period 2002 to 2011 in NSW. Suicide rates were 4 times as high among children with a child protection history (6.3 per 100,000) as among children without a child protection history (1.5 per 100,000).

Over the past decade there was a significant decline of 41% in suicide mortality rates for young people with a child protection history, while there was a non-significant decrease in the rate for children without a child protection history, leading to a significant decrease in the gap between children with and without a child protection history.

Table 12: **Suicide rates, rate ratios and rate differences, by child protection history, children aged 10–17 years, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual change	% Change over period
Total NSW children aged 10-17													
Number	20	16	18	18	10	14	13	18	13	16	**156**	-0.4	-18.5
Rate	2.8	2.2	2.5	2.5	1.4	1.9	1.8	2.5	1.8	2.2	**2.1**	-0.1	-17.5
Children with a child protection history													
Number	7	6	6	4	5	8	7	5	7	4	**59**	-0.1	-10.1
Rate	10.2	8.1	7.6	4.9	5.1	7.6	6.3	4.3	6.5	4.0	**6.3**	-0.5*	-40.7*
Children without a child protection history													
Number	13	10	12	14	5	6	6	13	6	12	**97**	-0.3	-23.1
Rate	2.0	1.5	1.8	2.2	0.8	1.0	1.0	2.1	1.0	1.9	**1.5**	0.0	-16.8
Rate ratio	5.2	5.3	4.1	2.3	6.5	8.0	6.4	2.0	6.6	2.1	**4.1**	-0.1	-15.6
Rate difference	8.2	6.5	5.7	2.8	4.3	6.7	5.3	2.2	5.5	2.1	**4.7**	-0.4*	-46.4*

As shown in Figure 5, suicide mortality rates for children without a child protection history ranged between 0.8 and 2.2 per 100,000 between 2002 and 2011. The fitted trend shows no significant change in the rate over the period.

The relative gap remained relatively stable over the period with rates ranging between 2.0 and 8.0 per 100,000. The fitted trend shows a non-significant decrease in the gap, while the absolute gap decreased from 8.2 in 2002 to 2.1 in 2011. The fitted trend shows an average yearly decline of 0.4 per 100,000, which is equivalent to a 46% decline in the gap between children with and without a child protection history over 2002 to 2011.

Figure 5. Suicide mortality rates by child protection history, children aged 10–17, NSW, 2002–2011

Diseases of the nervous system

The results for deaths due to diseases of the nervous system are presented in Table 13. Children aged 0–17 years in NSW died at a rate of 2 per 100,000 for diseases of the nervous system for the period 2002–2011. Mortality rates for diseases of the nervous system for children with a child protection history (3.5 per 100,000) were almost 2 times as high for children without a child protection history (1.9 per 100,000).

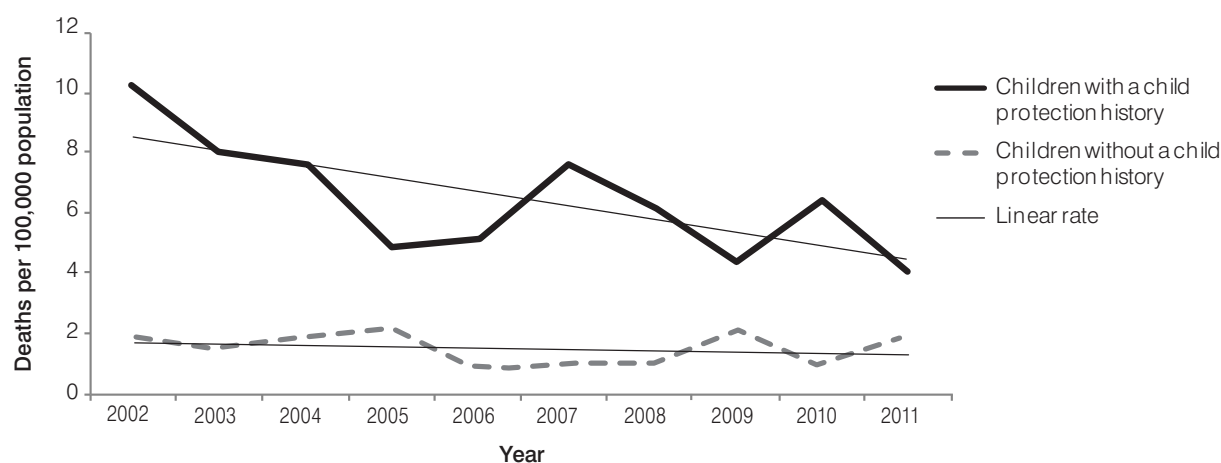Table 13: **Diseases of the nervous system mortality rates, rate ratios and rate differences, by child protection history, children aged 0–17, NSW, 2002–2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual change	% Change over period
Total NSW children aged 0-17													
Number	44	47	45	35	37	17	25	33	27	28	**338**	-2.4*	-48.8*
Rate	2.7	2.9	2.8	2.2	2.3	1.1	1.6	2.0	1.7	1.7	**2.1**	-0.2*	-50.0*
Children with a child protection history													
Number	8	9	9	10	4	5	8	11	11	6	**81**	0.0	0.7
Rate	4.8	4.6	4.3	4.6	1.7	2.0	3.0	3.9	4.2	2.5	**3.5**	-0.2	-33.6
Children without a child protection history													
Number	36	38	36	25	33	12	17	22	16	22	**257**	-2.4*	-59.8*
Rate	2.5	2.7	2.6	1.8	2.4	0.9	1.3	1.6	1.2	1.6	**1.9**	-0.2*	-58.5*
Rate ratio	**1.9**	**1.7**	**1.7**	**2.5**	**0.7**	**2.3**	**2.3**	**2.4**	**3.6**	**1.6**	**1.9**	**0.1**	**43.3**
Rate difference	**2.3**	**1.9**	**1.7**	**2.8**	**-0.7**	**1.1**	**1.7**	**2.3**	**3.1**	**0.9**	**1.6**	**0.0**	**-6.2**

Figure 6. Diseases of the nervous system mortality rates by child protection history
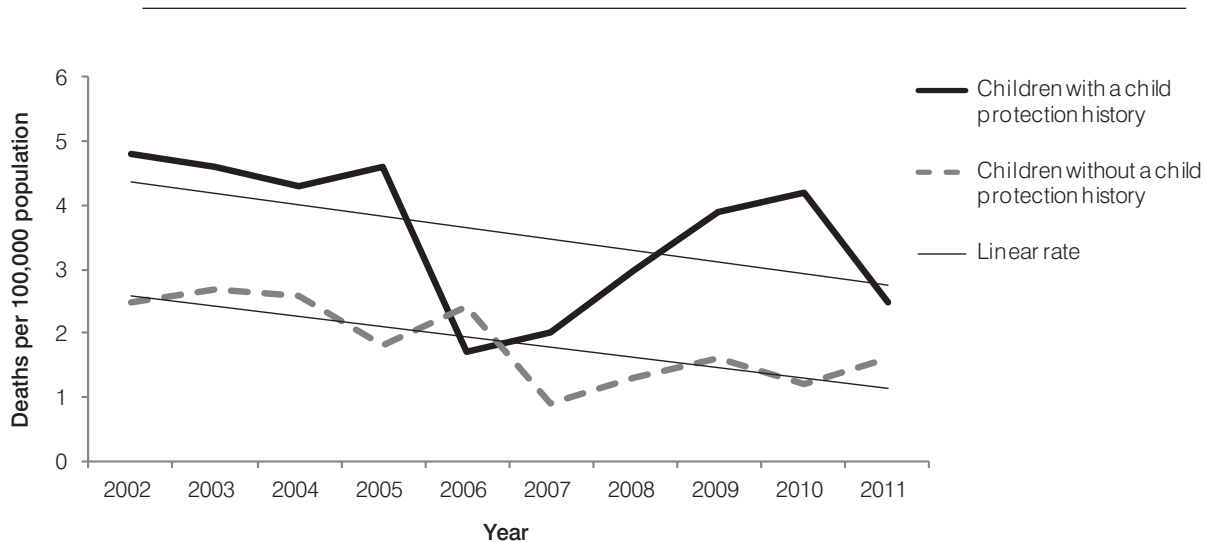
While there was no significant change in nervous system mortality rates for children with a child protection history over 2002–2011, there was a significant decline of 59% in mortality rates for children without a child protection history.

Figure 6 shows mortality rates for children with a child protection history fluctuated from 4.8 in 2002 to 2.5 in 2011 with a trough of 1.7 per 100,000 in 2006; however the fitted trend shows no significant decline in the rate over the period.

The number of deaths for children without a child protection history fell from 36 in 2002 to 22 in 2011. Figure 6 shows that mortality rates for children without a child protection history ranged between 0.9 and 2.7 throughout 2002 to 2011. The fitted trend shows a significant decline in the rate over this period with an average yearly decline of 0.2 per 100,000, equivalent to a 59% decrease in the rate over the period.

Both the relative and absolute gap remained relatively stable between 2002 and 2011 with the relative gap ranging between 0.7 and 3.6 and the absolute gap ranging between -0.7 and 3.1 per 100,000. The fitted trend for the rate ratio and rate difference showed no significant changes in the gap between children with a child protection history and those without.

Key findings

Data over the period 2002 to 2011 shows that:

• There have been substantial declines in all five cause-specific mortality rates for children with a child protection history.

• There were significant decreases in mortality rates for SIDS and other undetermined causes, and suicide for children with a child protection history.

• SIDS and other undetermined causes had the biggest decrease in mortality rates for children with a child protection history.

• There was a significant reduction in the gap between children with a child protection history and those without for SIDS and other undetermined causes, and suicide.

Variations by key characteristics

The data presented in this report so far have shown that there are:

• Differences in the socio-demographic characteristics of children who have died depending on their child protection history

• Differences in cause of death patterns by child protection history

The relationship between these factors is complex. As shown in the diagram below, children's individual characteristics may have a direct impact on all-cause mortality or cause-specific mortality. They may also have an indirect impact on mortality that works through child protection history. In addition, being reported to child protection services may independently increase the overall likelihood of dying, or it may increase the likelihood of dying from particular causes such as assault.

Individual characteristics

• Age
• Sex
• Remoteness
• Indigenous status
• Area socioeconomic

Risk of being reported to child protection services

Overall risk of dying

Cause-specific risks
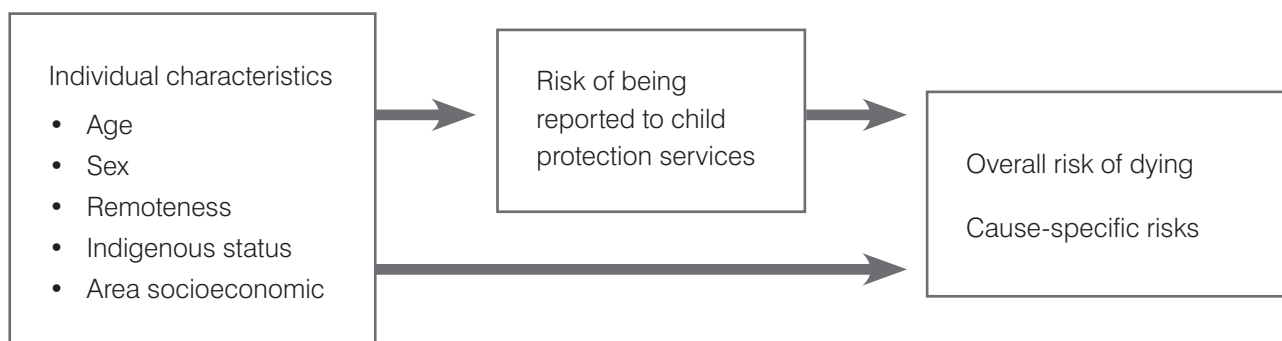
There are several ways the NSW CDRT data can be used to examine these issues:

- Do cause of death patterns within these groups vary by child protection history? For example, do the causes of death for Indigenous children with a child protection history differ from the causes of death for Indigenous children without a child protection history?

- Do the characteristics of children who died from a particular cause of death vary by whether they had a child protection history? For example, among children who died of SIDS, are there differences in characteristics between those with a child protection history and those without?

These two approaches provide evidence of associations between socio-demographic characteristics, child protection history, and cause of death. They are important from a policy perspective because they identify overall groups at risk of particular causes of death – for example, Indigenous babies and the risk of SIDS present opportunities for intervention or prevention.

However, because many of these factors are inter-related, it is important to statistically test their relationship with cause of death. For example, does child protection history still increase the likelihood of dying from SIDS after controlling for other factors such as sex, age, remoteness, Indigenous status, and SES? If the answer is yes, then it suggests that child protection history conveys an additional risk above and beyond the other risk factors.

The following section discusses the associations between the individual characteristics of the children who died, their child protection history and cause of death. Results from a series of logistic regression models are then used to assess the independent effect of child protection history, controlling for these other factors. Finally, results from another series of regressions examine whether the same sets of characteristics affect cause of death for those with a child protection history and those without.

Variation in cause of death by individual characteristics

Indigenous status

In Australia, Indigenous babies are significantly more likely to be born pre-term, of low birth weight, and to die before their first birthday than are non-Indigenous babies. This higher risk of death continues throughout childhood and adulthood (AIHW 2011a,b). Because Indigenous status is such a strong predictor of mortality, the CDRT data were first divided solely by Indigenous status to examine whether there were differences in cause of death patterns between Indigenous and non-Indigenous children.

Table 14: **Top 5 causes of death by Indigenous status, children aged 0–17, NSW, 2002–2011**

Indigenous children (N=506)		Non-Indigenous children (N=5,583)	
Cause of death	**Percent**	**Cause of death**	**Percent**
Conditions originating in the perinatal period	31.2	Conditions originating in the perinatal period	34.0
External causes	23.7	External causes	17.8
SIDS	13.6	Congenital malformations	16.7
Congenital malformations	13.0	Neoplasms	7.3
Nervous system	4.0	SIDS	6.9

Table 14 shows that the highest proportion of deaths for both groups was for deaths due to conditions originating in the perinatal period, and external causes. Echoing previous research, the percentage of deaths due to SIDS was nearly twice as high for Indigenous children. While neoplasms were the fourth largest cause of death for non-Indigenous children, they were not in the top five causes for Indigenous children.

As shown in Table 15, however, cause of death patterns differ within the population of Indigenous children who died, by child protection history. Nearly a third of deaths of Indigenous children with a child protection history were due to external causes, which is over twice the percentage to Indigenous children without a child protection history. The percentage of deaths due to SIDS was 1.6 times as high for Indigenous children with a child protection history than for Indigenous children without a child protection history.

The cause of death patterns for Indigenous children without a child protection history is similar to that of non-Indigenous children (shown in Table 15), although the percentage of deaths due to SIDS is still higher among Indigenous children.

Table 15: **Top 5 causes of death by child protection history, Indigenous children aged 0–17, NSW, 2002–2011**

Indigenous children with a child protection history (N=234)		Indigenous children without a child protection history (N=272)	
Cause of death	**Percent**	**Cause of death**	**Percent**
External causes	32.9	Conditions originating in the perinatal period	41.9
Conditions originating in the perinatal period	18.8	External causes	15.8
SIDS	17.1	Congenital malformations	15.8
Congenital malformations	9.8	SIDS	10.7
Nervous system	5.6	Respiratory system	3.7

Age

There is a distinct age pattern to infant and childhood mortality in developed countries: mortality rates are highest in the first year of life, then drop until age 15 when they begin to rise again. Certain causes of death are only applicable within particular age groups (e.g. SIDS and SUDI to infants; in general, suicide and self-harm from about age 10), while other causes of death affect all age groups. Thus, it is important to examine cause-of-death patterns within each age group by child protection history. Table 16 presents the top five causes of death by child protection history for infants aged less than 1, children aged 1–4 and 5–9, and young people aged 10–14 and 15–17.

The data in Table 16 show that 81.4% of the deaths to babies without a child protection history were due to either conditions originating in the perinatal period or congenital malformations compared with 55.3% of deaths of babies with a child protection history. Babies with a child protection history were more likely to have died from SIDS, external factors, and diseases/disorders of the respiratory system.

Among children aged 1–4, the highest proportion of deaths for both children with and without a child protection history were due to external causes, although the proportion was much higher for children with a child protection history. The proportion of deaths due to neoplasms for children with a child protection history was nearly half that of children without a child protection history, and SIDS and unidentified causes made up 7% of all deaths for children with a child protection history.

Children aged 5–9 who died during this period shared the same top five causes of death regardless of their child protection history, although their rankings varied. Again, deaths due to external causes were more frequent among children with a child protection history, but the difference was small. Neoplasms continued to be a less prevalent cause of death among children with a child protection history than those without.

The highest proportion of deaths of young people aged 10–14 was due to external causes, although the proportion was 1.4 times as high for children with a child protection history. Diseases of the nervous system accounted for approximately 15% of deaths in this age group regardless of child protection history, while deaths due to neoplasms were once again higher in children without a child protection history.

Table 16: **Top 5 causes of death by child protection history, by age group, NSW, 2002–2011**

Children with a child protection history		Children without a child protection history	
Cause of death	**Percent**	**Cause of death**	**Percent**
Babies (<1 year)			
(N=584)		**(N=3,144)**	
Conditions originating in the perinatal period	39.4	Conditions originating in the perinatal period	57.5
SIDS	27.2	Congenital malformations	23.9
Congenital malformations	15.9	SIDS	7.6
External causes	7.4	Nervous system	2.7
Respiratory system	2.9	External causes	1.5
1–4 years			
(N=188)		**(N=573)**	
External causes	54.3	External causes	31.4
Nervous system	8.0	Neoplasms	15.2
Neoplasms	8.0	Nervous system	10.5
SIDS and unidentified causes	6.9	Congenital malformations	10.3
Congenital malformations	5.9	Circulatory system	6.1
5–9 years			
(N=104)		**(N=318)**	
External causes	34.3	External causes	28.9
Nervous system	15.4	Neoplasms	28.0
Neoplasms	15.4	Nervous system	9.4
Congenital malformations	10.4	Circulatory system	6.9
Circulatory system	6.7	Congenital malformations	5.3
10–14 years			
(N=120)		**(N=339)**	
External causes	42.5	External causes	31.3
Nervous system	15.8	Neoplasms	23.6
Neoplasms	10.0	Nervous system	13.9
Congenital malformations	8.3	Circulatory system	8.0
Respiratory system	5.8	Congenital malformations	7.1
15–17 years			
(N=181)		**(N=538)**	
External causes	70.2	External causes	61.5
Nervous system	10.5	Neoplasms	15.4
Neoplasms	6.6	Nervous system	6.3
Circulatory system	3.3	Circulatory system	5.0
Other, unclassified	2.8	Congenital malformations	3.3

External causes accounted for 70.2% of deaths of young people aged 15-17 with a child protection history and 61.5% of deaths of those without a child protection history. Natural causes of death made up the remainder of the deaths of young people without a child protection history. Nearly 3% of deaths of young people with a child protection history fit into the ill-defined conditions/not elsewhere classified (ICD10-AM-chapter 18), which are essentially of unknown aetiology and do not fit into one of the other categories.

Sex

At all ages, male children have higher all-cause mortality rates than do female children (Draper et al. 2004). Male babies are more likely than female babies to die from SIDS as well as accidents and injuries, and higher death rates due to external causes remain throughout childhood. Table 17 presents the top five causes of death by sex and child protection history.

Table 17: **Top 5 causes of death by child protection history, by sex, NSW, 2002–2011, children aged 0–17 years**

Children with a child protection history		Children without a child protection history	
Cause of death	**Percent**	**Cause of death**	**Percent**
Male			
(N=683)		**(N=2,856)**	
External causes	32.7	Conditions originating in the perinatal period	36.3
Conditions originating in the perinatal period	19.6	External causes	17.8
SIDS	15.8	Congenital malformations	16.3
Congenital malformations	9.7	Neoplasms	7.1
Suicide	5.6	SIDS	6.0
Female			
(N=494)		**(N=2,056)**	
External causes	27.9	Conditions originating in the perinatal period	38.4
Conditions originating in the perinatal period	20.0	Congenital malformations	19.6
SIDS	14.4	External causes	12.0
Congenital malformations	12.6	Neoplasms	8.3
Nervous system	9.1	Nervous system	5.4

Several clear patterns emerge from Table 17. The first is the higher number of deaths of male than female children. The second is the strong relationship between child protection history and cause of death, regardless of the child's sex, with children of either sex with a child protection history much more likely to die from external causes. Third, suicide accounted for approximately 6% of deaths of male children with a child protection history. This statistic understates the total impact of suicide as a cause of death for boys with a child protection history, as it is calculated on all deaths (not just among 10-17 year old males).

Variations in individual characteristics by cause of death

The previous section examined whether there were differences in causes of death for children with a child protection history and those without a child protection history, within particular groups (e.g. Indigenous children, males/females, and by age group).

A different way of examining the potential relationship between individual characteristics, child protection history, and cause of death is to examine whether there are differences in the individual characteristics of the children who died of a particular cause. That is, given that children have died of a specific cause, are there

differences in the characteristics of the deaths of children with a child protection history and those without? This section presents data for deaths due to external causes, natural causes, deaths classified as SUDI, and suicides.

Table 18 demonstrates that even within the population of children who died from external causes, there are some characteristics which differ between children with a child protection history and those without.

Table 18: **Distribution of characteristics among children who died of external causes, by child protection history, children aged 0–17 years, NSW, 2002–2011**

Characteristic	Child protection history		No child protection history		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Sex						
Male	223	61.8	508	67.3	731	65.5
Female	138	38.2	247	32.7	385	34.5
Indigenous status						
Indigenous	77	21.3	43	5.7	120	10.8
Other	284	78.7	712	94.3	996	89.2
Age at death						
Under 1 year	43	11.9	46	6.1	89	8.0
1-4 years	103	28.5	180	23.8	283	25.4
5-9 years	37	10.2	92	12.2	129	11.6
10-14 years	51	14.1	106	14.0	157	14.1
15-17 years	127	35.2	331	43.8	458	41.0
Remoteness category						
Major cities	195	54.3	411	54.7	606	54.6
Inner regional areas	97	27.0	243	32.4	340	30.6
Outer regional areas	60	16.7	87	11.6	147	13.2
Remote areas	7	1.9	9	1.2	16	1.4
Very remote areas	0	0.0	1	0.1	1	0.1
SEIFA quintile						
Quintile 5 (most advantaged)	45	12.5	153	20.4	198	17.8
Quintile 4	77	21.3	178	23.7	255	23.0
Quintile 3	132	36.6	217	28.9	349	31.4
Quintile 2	48	13.3	102	13.6	150	13.5
Quintile 1 (most disadvantaged)	59	16.3	100	13.3	159	14.3

For example, there were a higher proportion of deaths due to external causes for children with a child protection history compared to those without a child protection history among babies (aged less than 1) (11.9% compared with 6.1%) and among Indigenous children (21.3% compared with 5.7%). However, the percentage of deaths that occurred in major cities was the same between the two groups.

Table 19 presents the characteristics of children who died of natural causes by child protection history. Among deaths of children with a child protection history, a higher proportion were to Indigenous children (most likely due to their higher mortality rates overall as well as overrepresentation in child protection services).

Again there is a clear difference in the age pattern in deaths by child protection history, with a lower proportion of natural cause deaths among babies and children under 5 with a child protection history.

Table 19: **Distribution of individual characteristics of children who died of natural causes, by child protection history, 0–17 years, NSW, 2002–2011**

Characteristic	Child protection history		No child protection history		Total	
	Number	Percent	Number	Percent	Number	Percent
Sex						
Male	352	55.3	2,178	56.1	2,530	56.0
Female	285	44.7	1,706	43.9	1,991	44.0
Indigenous status						
Indigenous	117	18.4	200	5.1	317	7.0
Other	520	81.6	3,684	94.9	4,204	93.0
Age at death						
Under 1 year	382	60.0	2,860	73.6	3,242	71.7
1-4 years	72	11.3	368	9.5	440	9.7
5-9 years	66	10.4	223	5.7	289	6.4
10-14 years	68	10.7	229	5.9	297	6.6
15-17 years	49	7.7	204	5.3	253	5.6
Remoteness category						
Major cities	408	64.7	2,918	76.2	3,326	74.5
Inner regional areas	164	26.0	685	17.9	849	19.0
Outer regional areas	52	8.2	199	5.2	251	5.6
Remote areas	7	1.1	25	0.7	32	0.7
Very remote areas	0	0.0	4	0.0	4	0.1
SEIFA quintile						
Quintile 5 (most advantaged)	68	10.8	1,110	28.9	1,178	26.4
Quintile 4	149	23.6	973	25.4	1,122	25.1
Quintile 3	228	36.1	1,052	27.4	1,280	28.6
Quintile 2	72	11.4	361	9.4	433	9.7
Quintile 1 (most disadvantaged)	115	18.2	342	8.9	457	10.2

Children who died from natural causes and did not have a child protection history were more likely to have lived in more advantaged areas compared with children who did have a child protection history. Although the majority of deaths in both groups were to children who lived in major cities, a higher proportion of deaths within the child protection history group were to those who lived in regional or remote areas.

Table 20 includes only those deaths coded by the CDRT as SUDI deaths. Again, this is not a cause of death per se, but a category which includes SIDS as well as other unexpected deaths of otherwise seemingly healthy infants.

The data shows that there were differences in the characteristics of babies whose deaths were coded as SUDI depending on their child protection history. More babies with a child protection history whose death was coded as SUDI were of Indigenous status (although Indigenous babies are overrepresented among both groups), lived in regional areas, and came from more disadvantaged areas. They were also less likely to die early (in the first day/week of life).

Table 20: **Characteristics of babies (aged less than 1 year) whose death was classified as SUDI, by child protection history, NSW, 2002–2011**

Characteristic	Child protection history		No child protection history		Total	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Sex						
Male	134	57.8	191	60.8	325	59.5
Female	98	42.2	123	39.2	221	40.5
Indigenous status						
Indigenous	58	25.0	40	12.7	98	17.9
Other	174	75.0	274	87.3	448	82.1
Age at death						
<1 day	1	0.4	4	1.3	5	0.9
1 day - < 1 week	3	1.3	21	6.7	24	4.4
1 week – 27 days	22	9.4	30	9.6	52	9.5
28 days – 364 days	206	88.8	259	82.5	465	85.2
Remoteness category						
Major cities	131	56.2	203	64.9	334	61.3
Inner regional areas	71	30.6	68	21.7	139	25.5
Outer regional areas	27	11.6	36	11.5	63	11.6
Remote areas	2	0.9	4	1.3	6	1.1
Very remote areas	1	0.4	2	0.6	3	0.6
SEIFA quintile						
Quintile 5 (most advantaged)	19	8.2	58	18.5	77	14.1
Quintile 4	46	19.8	79	25.2	125	22.9
Quintile 3	91	39.2	90	28.8	181	33.2
Quintile 2	33	14.2	41	13.1	74	13.6
Quintile 1 (most disadvantaged)	43	18.5	45	14.4	88	16.1

Table 21 presents the results for CDRT classified suicides/suspected suicides. The data show that there were 8 deaths of Indigenous young people that were classified as suicide, and 7 of those were young Indigenous adults with a child protection history.

In both groups, males were more likely than females to have committed suicide, although a slightly higher percentage of suicide deaths among those with a child protection history were females compared with those without a child protection history.

There is a complex relationship between the socioeconomic status of the area in which the young people lived, child protection history, and suicide. Among those without a child protection history, there was a positive relationship between socioeconomic status and suicide – that is, the highest proportion of young people without a child protection history who suicided were from the least socioeconomically disadvantaged areas, while the highest proportion of suicide deaths among young people with a child protection history were those in the middle SEIFA quintile.

Table 21: **Characteristics of deaths of young people that the CDRT coded as suicide, by child protection history, 10–17 years, NSW, 2002–2011**

Characteristic	Child protection history		No child protection history		Total	
	Number	Percent	Number	Percent	Number	Percent
Sex						
Male	38	64.4	70	72.2	108	69.2
Female	21	35.6	27	27.8	48	30.8
Indigenous status						
Indigenous	7	11.9	1	1.0	8	3.2
Other	52	88.1	96	99.0	148	96.8
Age at death						
10-14	9	15.3	16	16.5	25	16.0
15-17	50	84.7	81	83.5	131	84.0
Remoteness category						
Major cities	36	62.1	58	59.8	94	60.6
Inner regional areas	12	20.7	28	28.9	40	25.8
Outer regional areas	10	17.2	9	9.3	19	12.3
Remote areas	0	0.0	2	2.1	2	1.3
Very remote areas	0	0.0	0	0.0	0	0.0
SEIFA quintile						
Quintile 5 (most advantaged)	15	25.4	30	31.6	45	28.8
Quintile 4	12	20.3	27	27.4	39	25.0
Quintile 3	19	32.2	21	21.1	40	25.6
Quintile 2	5	8.5	12	12.6	17	10.9
Quintile 1 (most disadvantaged)	8	13.6	7	7.4	15	9.6

Using descriptive data, this section has demonstrated that there are complex relationships between child protection history, individual characteristics of the children who died, and cause of death.

Statistical analyses are required to test whether child protection history is a significant predictor of cause of death, controlling for the individual level characteristics of the children and young people who died.

Statistical analyses

To test whether child protection history confers an additional risk for particular causes of death over and above characteristics such as age, sex, Indigenous status, remoteness, and socioeconomic status of the area in which the child lived, a series of logistic regression analyses were conducted. Logistic regression models allow the effects of multiple variables to be jointly modelled; that is, the individual effects of variables can be estimated while controlling for other potentially confounding factors. It is important to note that these models do not predict whether a child with a child protection history will die, but analyse variations in the causes of death among children who did die.

Analytic strategy

The following strategy was adopted:

- A series of cause of death dummy variables were created for each record, capturing whether or not the child died from a particular cause of death.[25] They include the broad categories of external causes, natural causes and SIDS, the CDRT coded categories of SUDI and suicide, and the more specific causes of death where the risk of that cause of death was higher for children with a child protection history. Table 22 presents the series of dependent variables and their definitions.[26]

- Logistic regression models the effect of a series of explanatory variables on a categorical outcome. In the present case, a specific model – that is, a logit – was used because the outcome is binary: whether the death was due to a specific cause or not. Separate logistic regressions were estimated for each of the causes of death.

- Explanatory variables included child protection history as well as the other individual characteristics available in the data (age, sex, Indigenous status, remoteness status, and socioeconomic status of the area in which they lived). Table 23 presents the definitions and reference levels for the independent variables.

- To test whether the impact of child protection history on cause of death categories was similar across all age groups, the data were stratified by age category (children aged less than 1, 1–4 years, 5–9 years, 10–14 years, and 15–17 years).[27] Logistic regression analyses were then conducted on applicable cause of death categories for each age group.

- To test whether the explanatory variables had the same impact on cause of death for children with and without a child protection history, the data were then stratified by child protection history and the models were rerun on these subgroups (omitting child protection history from the model).

Dependent variables

The dependent variables and their definitions are presented below in Table 22, along with the number of deaths coded as 0 and 1 for each dependent variable. As previously noted, it is important to remember that the comparisons in these analyses are between children who died of a particular cause (1) and children who died of all other causes (0).

---

25 Deaths where the cause of death was unknown were excluded from the models.

26 There were two potential analytic strategies which could have been used with this data. The selected strategy compares deaths to a specific cause to all other deaths. Another strategy would have been to compare specific causes of death with each other – for example, deaths due to assault with deaths due to fire. Because this report is focused on the impact of child protection history on the likelihood that a death was due to a specific cause, the former strategy was selected. Future work could compare individual causes of death with each other.

27 Initial testing with interaction terms suggested that the size and strength of the relationship between child protection history and cause of death may differ between age groups. Separate models were estimated by age group both for ease of presentation and because specific causes of death apply only within specific age groups (e.g. SUDI for babies, suicide for children aged 10–17).

Table 22: **Dependent variables and their definitions**

Dependent variable	Coded 1 if ICD-10 codes equal	Number of deaths by code	
		1	0
Broad causes			
External	V00-Y99	1,116	4,973
Natural	A00-Q99	4,521	1,568
SIDS and other undetermined	R00-R99	452	5,637
Natural causes			
Infectious and parasitic	A00-B99	112	5,977
Endocrine/nutritional	E00-E89	141	5,948
Nervous system	G00-G99	338	5,751
Respiratory	J00-J99	133	5,956
Meningococcal infection	A39-A39.9	25	6,064
Epilepsy	G40-G47	40	6,049
Influenza and pneumonia	J09-J18	63	6,026
Cerebral palsy	G80-G80.9	76	6,013
External causes			
Accidental poisoning	X40-X49	25	6,064
Accidental drowning & submersion	W65-W74	155	5,934
Assault	X85-Y09	111	5,978
Fire (exposure to smoke, fire & flames)	X00-X09	35	6,054
All transport	V01-V99	468	5,621
Pedestrian	V01-V09	92	5,997
Passenger in a motor vehicle	V40-V49 where the 3rd character is 6	209	5,880
CDRT coded			
SUDI	Coded by the CDRT	546	5,543
Suicide	Coded by the CDRT	156	5,933

Table 23 presents the set of independent variables[28] used in the model and their reference levels.

Table 23: **Explanatory variables included in the logistic regression analyses**

Variable	Level	Reference level
Child protection history	Child or a sibling was the subject of a child protection notification in the year of death or two years prior	No notification for child or a sibling in the year of death or two years prior
Sex	Male	Female
Indigenous status[a]	Indigenous	Non-Indigenous
Age at death	Less than one year	Aged 5–9
	Aged 1–4 years	Aged 5–9
	Aged 10–14 years	Aged 5–9
	Aged 15–17 years	Aged 5–9
Age at death (babies only)	Less than one day	28 days to < 1 year
	1–6 days	28 days to < 1 year
	7–27 days	28 days to < 1 year
Year of death[b]	2002	2006
	2003	2006
	2004	2006
	2005	2006
	2007	2006
	2008	2006
	2009	2006
	2010	2006
	2011	2006
Remoteness category[c]	Inner regional	Major cities
	Outer regional	Major cities
	Remote/very remote	Major cities
Index of relative socio-economic disadvantage[d]	Bottom quintile (lowest 20%)	Highest quintile (top 20%)
	2nd quintile	Highest quintile (top 20%)
	3rd quintile	Highest quintile (top 20%)
	4th quintile	Highest quintile (top 20%)

(a) A child was counted as Indigenous if they were reported as Aboriginal or Torres Strait Islander on either their birth or death certificate. All missing values were assigned to the 'other' category.

(b) 2006 was chosen as the reference level for year of death as this is the mid-point of the data collection, and a Census year.

(c) Each death was geocoded to the census collection district (CD) level for 2006 (the midpoint of the data collection) and remoteness status was assigned based on this CD.

(d) The 2006 Index of Relative Disadvantage (IRD) SEIFA values were assigned based on the 2006 Statistical Local Area (SLA) of the geocoded death records. State-level quintiles were assigned to each record.

For the categorical variables, a comparison category was selected based on substantive reasons. For example, for year of death, 2006 was chosen as it was a midpoint and the census year.

---

28   Their distributions were presented earlier in Table 3.

Results: impact of child protection history

Odds ratios – the exponential function of the coefficients generated by the logistic regression – indicate the direction of the relationship (positive – signified by a value of more than 1, or negative – signified by a value of less than 1) between determinant and outcome. They also quantify the strength of that relationship. The greater the difference of the odds ratio is from 1, the stronger is the effect of the respective explanatory variable on the outcome variable.

Because the focus of this analysis is on whether child protection history is statistically significant after controlling for the other variables in the model, a summary table (Table 24) was constructed which presents the odds ratio for child protection history for each of the cause of death regressions, the level of statistical significance, and the overall model fit. An expanded table is included as Appendix Table A1, which highlights the other variables that have a statistically significant effect, and their direction.

Table 24: **Odds ratios and statistical significance for child protection history on specific causes of death, children aged 0–17, NSW, 2002–2011**

Cause of death	Odds ratio	P value	Overall model fit (Chi-square, df, p value)
Broad causes			
External	2.0	p<.001	2099.4, 23 df, p<.001
Natural	0.3	p<.001	1364.1, 23 df, p<..001
SIDS and other undetermined	2.5	p<.001	827.2, 22 df, p<.001
Specific causes			
Infectious and parasitic		n.s.	59.4, 23 df, p<.001
Endocrine/nutritional		n.s.	104, 23 df, p<.001
Nervous system		n.s.	203.6, 23df, p<.001
Respiratory		n.s.	86.2, 23df, p<.001
Meningococcal		n.s.	44.0, 23df, p<.001
Epilepsy		n.s.	79.2, 23df, p<.001
Influenza/pneumonia		n.s.	48.0, 23df, p<.001
Cerebral palsy	1.9	p<.05	147.4, 23df, p<.001
Accidental poisoning	2.9	p<.05	92.4, 23df, p<.001
Accidental drowning		n.s.	308.2, 23df, p<.001
Assault	3.6	p<.001	143.2, 23df, p<.001
Fire	10.8	p<.001	162.4, 23df, p<.001
All transport	0.7	p<.01	1032.8, 23 df, p<.001
Pedestrian		n.s.	189.5, 23df, p<.001
Passenger		n.s.	391.5, 23df, p<.001
CDRT coded SUDI	3.2	p<.001	1193.7, 22df, p<.001
CDRT coded Suicide	3.5	p<.001	95.5, 20df, p<.001

Note: Regressions for SIDS and SUDI were run only on deaths of infants, and the previously defined age categories by days were used. Regressions for Suicide were run only on deaths of young people aged 10–17 years, and age was included as a continuous variable.

The results show that, controlling for other variables, child protection history significantly increased the odds that a death was due to:

- SIDS (2.4)
- Cerebral palsy (1.9)
- Accidental poisoning (2.9)

- Assault (3.6)
- Fire (10.8)
- SUDI (3.2)
- Suicide (3.5)

Thus, for the causes of death for which child protection history was statistically significant, it had the largest impact on whether a death was fire-related, and the smallest impact on whether a death was due to cerebral palsy.

Child protection history also decreased the odds that a death was due to natural causes (0.4) and all transport related accidents (0.7).[29]

For all other causes of death (including the detailed cause of death categories other than cerebral palsy), child protection history was not statistically significant when the other variables were included in the model.

The next section presents regression results separately by age group for causes of death where child protection history had a statistically significant effect.

Regression results: Infants aged less than 1 year

Table 25 presents the results from a series of regressions for babies (aged less than 1) who died in NSW between 2002 and 2011.

The results show that child protection history significantly increased the odds that a baby's death was from:

- External causes (2.7)
- SIDS (2.4)
- Accidental drowning (3.5)
- Assault (12.3)
- SUDI (3.2)

The highest odds were for deaths due to assault, with the odds that the death of a baby with a child protection history was due to assault being 12 times as high as babies without a child protection history (controlling for the other variables in the model).

The odds that the death of a baby with a child protection history was due to natural causes was lower than babies without a child protection history (0.3), as were deaths due to congenital malformations (0.6) and diseases of the nervous system (0.4).[30]

Table 25: **Odds ratios and statistical significance for child protection history on specific cause of death, children aged less than 1, NSW, 2002–2011**[31]

Cause of death	Odds ratio	P value	Overall model fit (Chi-square, df, p value)
External	2.7	p<.001	180.4, 22 df, p<.001
Natural	0.3	p<.001	1036.2, 22 df, p<.001
SIDS and other undetermined	2.4	p<.001	827.2, 22 df, p<.001
Congenital malformations, deformations and chromosomal abnormalities	0.6	p<.001	94.8, 22 df, p<.001
Nervous system	0.4	p<.05	173.1, 22 df, p<.001
Accidental drowning	3.5	p<.05	38.4, 22 df, p<.05
Assault	12.3	p<.001	74.6, 22 df, p<.001
SUDI	3.2	p<.001	1193.7, 22df, p<.001

---

29 Because it can be difficult to interpret odds that are less than 1, it is possible to take the inverse of the odds (1/odds) and switch the comparison group. For example, the impact of having a child protection history on the odds that the death was due to natural causes was .35. The inverse is 1/.35 or 2.86. What this means is that the odds that a death was due to natural causes was 2.86 times as high for children without a child protection history, compared to those with a child protection history.

30 We undertook a detailed analysis of the individual cause of death codes and completed a data check to ensure that these findings were correct.

31 The model fits for epilepsy, cerebral palsy, accidental poisoning, and fire were not significant, and so they were not included in the table. There were also no pedestrian deaths to infants.

Regression results: Children aged 1–4

Table 26 summarises the regression results on the deaths of children aged 1–4. Child protection history was statistically significant in four causes of death: child protection history significantly increased the odds of having died from an external cause (2.4), assault (7.6) and fire (11.7). Having a child protection history decreased the odds of having died from a natural cause (0.4).

Table 26: **Odds ratios and statistical significance for child protection history on specific cause of death, children aged 1–4, NSW, 2002–2011[32]**

Cause of death	Odds ratio	P value	Overall model fit (Chi-square, df, p value)
External	2.4	p<.001	75.5, 20 df, p<.001
Natural	0.4	p<.001	81.6, 20 df, p<.001
Assault	7.6	p<.001	46.9, 20 df, p<.001
Fire	11.7	p<.001	58.8, 20 df, p<.001

One reason for the smaller number of models which fit the data well may be due to small numbers — eg, while there were 3,777 deaths of babies between 2002 and 2011, there were 765 deaths of children aged 1–4.

Regression results: Children aged 5–9

During the period 2002–2011, there were 426 deaths of children aged 5–9. As shown in Table 27, the only cause of death for which child protection history was statistically significant was on passenger deaths. The level of statistical significance is relatively weak at the p<.05 level, and the impact is negative (that is, the odds that a death was due to being a passenger in a motor vehicle accident was lower for children with a child protection history than those without).

Table 27: **Odds ratios and statistical significance for child protection history on specific cause of death, children aged 5–9, NSW 2002–2011[33]**

Cause of death	Odds ratio	P value	Overall model fit (Chi-square, df, p value)
Passenger	0.2	p<.05	50.4, 20 df, p<.001

Regression results: Children aged 10–14

The results for the 461 deaths of young people aged 10–14 are presented in Table 28. For young people with a child protection history, the odds that their death was due to external causes were 1.8 times as high as those without a child protection history (controlling for the other variables). The odds that the death was due to natural causes was only half as likely for young people with a child protection history as for those without (0.5).

Table 28: **Odds ratios and statistical significance for child protection history on specific cause of death, children aged 10–14, NSW, 2002–2011[34]**

Cause of death	Odds ratio	P value	Overall model fit (Chi-square, df, p value)
External	1.8	p<.05	59.4, 20df, p<.001
Natural	0.5	p<.05	53.2, 20 df, p<.001
Cerebral palsy	5.1	p<.001	n.s.
CDRT coded suicide	2.7	p<.05	42.1, 20 df, p<.001

---

32   Model fits for deaths due to infectious and parasitic diseases, endocrine/nutritional, respiratory, meningococcal, epilepsy, influenza/pneumonia, cerebral palsy, accidental poisoning, accidental drowning, and pedestrian accidents were not statistically significant, so they are not included in the table.

33   Model fits for deaths due to all natural causes, infectious and parasitic diseases, endocrine/nutritional, nervous system, respiratory, meningococcal, epilepsy, influenza/pneumonia, accidental poisoning, accidental drowning, assault, and pedestrian accidents were not statistically significant, so they are not included in the table.

34   Model fits for deaths due to infectious and parasitic diseases, endocrine/nutritional, nervous system, respiratory, meningococcal, epilepsy, influenza/pneumonia, accidental poisoning, accidental drowning, assault, and pedestrian accidents were not statistically significant, so they are not included in the table.

Although the overall model fit for cerebral palsy was not statistically significant, the coefficient for child protection history was significant (no other variables in the model were significant). A regression including only child protection history as an independent variable was run and this association persisted (and that model fit was significant). The odds that a death was due to cerebral palsy was 5 times as high for young people aged 10–14 with a child protection history than their counterparts without a child protection history.

The relationship between child protection history and suicide seen in the descriptive analysis holds in the multivariate regression – the odds that the death of a young person aged 10–14 was due to suicide was 2.7 times as high for those with a child protection history compared to those with no history.

Regression results: Children aged 15–17

Table 29 presents the regression results for children aged 15–17. The number of deaths in this age group was 723, highlighting the fact that death rates begin to rise in the later teenage years.

Table 29: **Odds ratios and statistical significance for child protection history on specific cause of death, young people aged 15–17, NSW, 2002–2011[35]**

Cause of death	Odds ratio	P value	Overall model fit (Chi-square, df, p value)
External	1.6	p<.05	75.9, 20 df, p<.001
Natural	0.5	p<.01	76.2, 20 df, p<.001
Accidental poisoning	6.1	p<.001	44.9, 20 df, p<.001
CDRT coded suicide	2.5	p<.001	39.9, 20 df, p<.01

The results show that the odds of dying from three causes were significantly higher for young people with a child protection history than those without: external causes (1.6 times as high), accidental poisoning (6.1 times as high), and suicide (2.5 times as high), and that it was lower for natural causes (0.5).

Although the model fits were significant, child protection history did not affect the likelihood that deaths were due to diseases of the nervous system, cerebral palsy, assault, all transport, or being a passenger in a motor vehicle accident.

Results from Appendix Table A6 show that living in lower socioeconomic status areas (compared with those in the top quintile) significantly lowered the odds that a young person's death was due to suicide. In other words, those from the highest socioeconomic areas had the highest risk of suicide, controlling for other factors in the model.

Key findings

- After controlling for other variables in a series of logistic regressions, child protection history significantly increased the odds that a child's death was due to external causes, SIDS, cerebral palsy, accidental poisoning, assault, fire or to be classified as SUDI or suicide. The size of the impact of child protection history ranged from a low of 1.9 for deaths due to cerebral palsy to 10.8 for deaths due to fire.

- Child protection history significantly decreased the odds that deaths were due to natural causes or transport-related accidents.

- The results from a series of age-specific multivariate regressions illustrated that the size and significance of child protection history varied by age group. For example, child protection history increased the odds that an infant's death was due to assault by 12.3 and for young children (aged 1–4) by 7.6. For the other age groups, however, there was no statistically significant relationship between child protection history and the likelihood that a child's death was due to assault.

---

35   Model fits for deaths due to infectious and parasitic diseases, endocrine/nutritional, respiratory, meningococcal, epilepsy, influenza/pneumonia, accidental drowning, fire, and pedestrian accidents were not statistically significant, so they are not included in the table.

Results: demographic and socioeconomic factors

The focus of the previous section was on the independent impact that child protection history had on specific causes of death, controlling for other characteristics. From a policy perspective, however, it would also be useful to know whether there are particular variables (e.g. age, sex, Indigenous status) which are significantly associated with causes of death for children with a child protection history. These findings could then be used to target preventative interventions at those specific groups. However, it is also important to know whether they have the same effect on deaths of children who did not have a child protection history.

To test this, logistic regression models were run separately for children with a child protection history and those without a child protection on each of the causes of death used in the previous set of analyses. The significant predictors and the direction of their impact are included as Appendix Table A7.

Indigenous status is related both to the likelihood of being reported to child protection services and to the risk of dying during childhood. Table A7 shows that among deaths of children with a child protection history, Indigenous status is not significant after controlling for the other variables. Among deaths of children without a child protection history, however, Indigenous status conveys an independent risk of dying from respiratory illnesses, influenza and pneumonia, fire, being a passenger in a motor vehicle accident, and having their death classified as SUDI. In addition, Indigenous status decreases the odds that the death was due to natural causes.

Socioeconomic status of the area in which the child lived has often been linked with the overall likelihood of death in childhood, as well as to specific causes of death. In these models, area socioeconomic status is measured by quintiles of Socio-Economic Indexes for Areas Index of Relative Disadvantage (SEIFA IRD) values at the Statistical Local Area (SLA) level.

Among deaths of children with a child protection history, area socioeconomic status is a significant predictor of cause of death once other variables are held constant for only three causes of death (diseases of the nervous system, cerebral palsy, and accidental drowning).

Among deaths of children without a child protection history, however, area socioeconomic status has more predictive value. For example, living in more disadvantaged areas increased the odds that a death was specifically due to SUDI, transport-related causes, or to being a passenger, and decreased the odds that a death was due to suicide.

There are several potential explanations for the lack of impact of area-level socioeconomic status, particularly among deaths of children with a child protection history. First, because area-level socioeconomic status is so closely linked with the individual level risk factors, once these individual characteristics are included in the model, the impact of area-level socioeconomic status becomes relatively insignificant. The second set of explanations are more methodological: quintiles of SEIFA are used rather than SEIFA as a continuous variable or more specific groupings (e.g. bottom 10%, or top 5% to capture the high and low ends of advantage/ disadvantage; SEIFA values are used at the SLA level which can represent large geographic areas (although not as large as postcodes); also, SEIFA values are an area-wide average and mask considerable variation within the area. However, we have been careful in this report not to assume that the SEIFA level of an area in which an individual child lived represents their individual level socioeconomic status.

Detailed analyses of particular causes of death

The previous section demonstrated that child protection history is significantly associated with a number of causes of death, even after controlling for other risk factors. This means that child protection history conveys an additional risk beyond factors such as age, sex, Indigenous status, remoteness, and area socioeconomic status.

One of the purposes of this project was to identify particular causes of death for which children with a child protection history had a higher likelihood of death so that the CDRT can use this information to identify potential areas for intervention and policy change or do more in-depth analysis of cases to identify patterns for potential triggers or flags that may help prevent further deaths. Of particular interest for the CDRT were deaths classified as SUDI and any natural causes of death where children with a child protection history had a higher likelihood of death.

Although there were several natural causes of death for which children with a child protection history had a higher risk in the descriptive analyses (such as influenza/pneumonia and meningococcal infection), the only natural cause of death for which child protection history was statistically significant in the multivariate regression analyses was cerebral palsy.

To assist the CDRT, this section provides more detailed analyses for SUDI and deaths from cerebral palsy and addresses the issue of the negative relationship between child protection history and the risk of dying from congenital malformations.

SUDI

The following definition of SUDI has been used by the CDRT since 2009:

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* (NSW CDRT 2012).

The CDRT data contains information on 546 deaths which were classified as SUDI, which represents 14.5% of all deaths of babies between 2002 and 2011. Babies with a child protection history, however, are significantly overrepresented in SUDI:

- While 10% of deaths of babies without a child protection history were classified as SUDI, 39.7% of deaths of babies with a child protection history were classified as SUDI.

- Although babies with a child protection history represent 15.7% of all infant deaths, they represent 42.5% of all SUDI.

- The SUDI crude mortality rate (deaths classified as SUDI per 100,000 babies aged less than 1) was 371.4 for babies with a child protection history, compared with 37.8 for babies without a child protection history, which is 9.8 times as high.

Table 30 shows that babies whose death were classified as SUDI and had a child protection history were more likely to be Indigenous, older infants, live outside major cities, and live in more socioeconomically disadvantaged areas than those without a child protection history.

The logistic regressions found that child protection history significantly increased the odds that a baby's death was classified as SUDI by 3.3, holding the other variables constant. Table 30 presents the full regression results for this model.

Table 30: **Logistic regression results for deaths classified as SUDI compared with other deaths, infants aged less than 1**

Variable	Odds ratio	Standard error	Significance level
Child protection history	3.2	0.1	0.000
Male	1.2	0.1	0.154
Indigenous	1.6	0.2	0.015
Age at death			
< 1 day	0.0	0.5	0.000
1 day to < 1 week	0.0	0.2	0.000
1 week to 27 days	0.2	0.2	0.000
(28 – 364 days)			
Remoteness category			
(Major cities)			
Inner regional areas	1.4	0.2	0.036

Variable	Odds ratio	Standard error	Significance level
Outer regional areas	1.4	0.2	0.160
Remote/very remote areas	1.4	0.5	0.549
SEIFA quintile			
(Quintile 5 (most advantaged))			
Quintile 4	1.2	0.2	0.415
Quintile 3	1.7	0.2	0.004
Quintile 2	1.5	0.2	0.074
(Quintile 1 (most disadvantaged))	1.4	0.2	0.115
Year of death			
2002	1.2	0.2	0.543
2003	1.0	0.2	0.898
2004	0.9	0.3	0.647
2005	0.9	0.2	0.598
(2006)			
2007	1.5	0.3	0.134
2008	0.9	0.3	0.664
2009	0.7	0.3	0.204
2010	0.9	0.3	0.803
2011	1.1	0.3	0.626
Constant	0.3	0.2	0.000
Model fit (Chi-square, df)	11,93.7, 22 df, p<.001		

The results show that of all the variables included in the model, child protection history had the largest impact on the likelihood that the death was classified as SUDI, followed by living in a middle quintile SEIFA area, Indigenous status, and living in an inner regional area.

Although the age coefficients were statistically significant, their actual impact on the odds that the death was coded as SUDI was small. None of the other variables were statistically significant.

Because SUDI is not an actual cause of death, but a classification of other causes, it is important to disaggregate SUDI into the ICD-10-AM codes to examine whether there are differences in the underlying causes of death between babies with a child protection history and those without. Table 31 presents the broad cause of death distribution categories by child protection history, along with the rate ratios. It is important to note that there were 39 cases which were classified as SUDI but had no cause of death code.

Table 31: **Cause of death distribution (broad categories) for SUDI, children aged less than 1, by child protection history, NSW, 2002–2011**

Cause	Child protection history		No child protection history		
	Deaths	**Percent**	**Deaths**	**Percent**	**Rate ratio**
Natural causes of death	30	12.9	54	17.2	0.8
SIDS and other undetermined causes	157	67.7	224	71.3	1.0
External causes of death	27	11.6	15	4.8	2.4
Cause of death not coded	18	7.8	21	6.7	1.2
Total	**232**	**100.0**	**314**	**100.0**	

The data show that the majority of SUDI were classified as SIDS and other undetermined causes for babies with and without a child protection history. The differences are in the other two major classifications – natural and external causes of death. Babies with a child protection history were 2.4 times as likely as babies without a child protection history to have had an external cause of death, and there was little difference in the number of deaths due to natural and external causes among the babies with a child protection history (30 and 27, respectively). This differs significantly from the pattern for deaths of babies without a child protection history, for whom only 15 deaths were due to external causes.

Table 32 further disaggregates these categories into more detailed cause of death codes. In terms of other natural causes, for babies with a child protection history, the highest number of deaths were due to respiratory illnesses (14), followed by congenital malformations, deformations and chromosomal abnormalities (7) which had not been identified prior to death. The order was reversed for babies without a child protection history, with congenital malformations, deformations and chromosomal abnormalities responsible for 14 deaths and respiratory illnesses responsible for 13 deaths.

Babies with a child protection history were 1.5 times as likely to have died from respiratory illnesses as babies without a child protection history. Twelve of the respiratory deaths for babies with a child protection history and 11 of the respiratory deaths for babies without a child protection history were due to influenza and pneumonia. Five of the congenital malformation deaths for babies with a child protection history were due to congenital malformations of the circulatory system.

The data also show that there were variations within Chapter 18 (Symptoms, signs and abnormal clinical findings, not elsewhere classified) by child protection history, with 58.3% of deaths of babies without a child protection history categorised as SIDS, compared with 47.0% of deaths of babies with a child protection history. In addition to those classified as SIDS, an additional 20.8% of deaths of babies with a child protection history remained unexplained, compared with 12.4% for babies without a child protection history.

In terms of external causes, a higher percentage of babies with a child protection history died from accidental suffocation and strangulation in bed compared to babies without a child protection history (6.0% compared with 3.2%). They were also more likely to be the victims of assault, but the numbers are small: 8 deaths during the 10 years (which includes a methadone poisoning). It is important to note, however, that these assaults only include those for which the cause of death was unknown at the time of death (not all assault deaths).

Table 32: **Detailed cause of death distribution for SUDI, children aged less than 1, by child protection history, NSW, 2002–2011**

ICD10 Chapter	Child protection history		No child protection history	
	Number	Percent	Number	Percent
1: Certain infectious and parasitic diseases	3	1.3	3	1.0
3: Diseases of the blood and blood-forming organs and certain disorders involving the immune system	0	0	1	0.3
4: Endocrine, nutritional and metabolic disorders	0	0	5	1.6
6: Diseases of the nervous system	3	1.3	2	0.3
9: Diseases of the circulatory system	0	0	5	1.6
10: Diseases of the respiratory system	14	6.0	13	4.1
11: Diseases of the digestive system	0	0	1	0.3
13: Diseases of the musculoskeletal system and connective tissue	1	0.4	1	0.3
14: Diseases of the genitourinary system	0	0	1	0.3
16: Certain conditions originating in the perinatal period	1	0.4	8	2.5
17: Congenital malformations, deformations and chromosomal abnormalities	7	3.0	14	4.5
18: Symptoms, signs and abnormal clinical findings, not elsewhere classified				
All SIDS	109	47.0	183	58.3
SIDS (R95)	(33)	(14.2)	(93)	(29.6)
SIDS IA (R95.0)	(6)	(2.6)	(15)	(4.8)
SIDS IB (R95.1)	(8)	(3.4)	(12)	(3.8)
SIDS II (R95.2)	(55)	(23.7)	(53)	(16.9)
SIDS, unclassified (R95.3)	(7)	(3.0)	(10)	(3.2)
Other sudden, unexpected death, cause unknown	0	0	2	0.6
Death occurring < 24 hours from onset of symptoms, not explained	31	13.4	24	7.6
Unattended death, no cause discovered	2	0.9	1	0.3
Other ill-defined and unspecified	15	6.5	14	4.5
20: External causes of morbidity	0	0	0	0
Other specified drowning & submersion	1	0.4	0	0
Accidental suffocation & strangulation in bed	14	6.0	10	3.2
Inhalation of gastric contents	2	0.9	0	0
Inhalation of food	0	0	1	0.3
Other specified threats to breathing	1	0.4	1	0.3
Unspecified threats to breathing	1	0.4	1	0.3
Exposure to heat of non-man made origin	1	0.4	0	0
Exposure to excessive natural heat	0	0	1	0.3
Assault by drugs, medications, etc.	1	0.4	0	0
Assault	1	0	0	0
Assault by bodily force, parent	1	0.4	1	0.3
Assault by bodily force, person unspecified	4	1.7	0	0
Assault by unspecified means, parent	1	0	0	0
Cause of death not coded	18	7.8	21	6.7
Total	**232**	**100.0**	**314**	**100.0**

Cerebral palsy

Cerebral palsy is a permanent, non-progressive condition caused by abnormal brain development or brain injury during the perinatal period (including at or shortly after birth). The most recent reported data from the Australian Cerebral Palsy Registry show that between 1993 and 2003, there were 622 children born in NSW with cerebral palsy (who were included on the register). The physical impact of cerebral palsy varies in severity between children, but can include a combination of spasticity/mobility impairments, feeding difficulties, seizures, respiratory difficulties, and impaired vision, while some children also experience cognitive impairments. Previous research has shown that children with more severe forms of cerebral palsy have higher risks of mortality and lower life expectancy (Hutton 2006).

In the period 2002–2011, cerebral palsy was the underlying cause of death for 76 children in NSW, of which 28 were children with a child protection history, and 48 were children without a child protection history. The crude mortality rate for cerebral palsy was 3.5 times as high for children with a child protection history as those without.

Table 33 presents the characteristics of children who died from cerebral palsy in NSW between 2002 and 2011 by child protection history. The largest difference between children with and without a child protection history was in the age pattern of the deaths. The number of deaths caused by cerebral palsy was highest among those aged 10–14 for children with a child protection history, while for children without a child protection history, they were highest amongst children aged 1–4 and 15–17.

In terms of Indigenous status, 17.9% of cerebral palsy deaths for children with a child protection history were Indigenous, compared with 4.2% of deaths for children without a child protection history.

Table 33: **Characteristics of cerebral palsy deaths by child protection history, children aged 0–17, NSW, 2002–2011**

Characteristic	Child protection history		No child protection history	
	Number	**Percent**	**Number**	**Percent**
Sex				
Male	14	50.0	27	56.3
Female	14	50.0	21	39.3
Indigenous status				
Indigenous	5	17.9	2	4.2
Other	23	82.1	46	95.8
Age at death				
< 1 year	1	3.6	1	2.1
1–4 years	4	14.3	14	29.2
5–9 years	6	21.4	11	22.9
10–14 years	12	42.9	9	18.8
15–17 years	5	17.9	13	27.1
Remoteness category				
Major cities	17	63.0	31	66.0
Inner regional areas	7	25.9	13	27.7
Outer regional areas	3	6.4	3	11.1
SEIFA quintile				
Quintile 5 (most advantaged)	7	25.9	11	22.9
Quintile 4	7	25.9	12	25.0
Quintile 3	5	18.5	13	27.1
Quintile 2	4	14.8	9	18.8
Quintile 1 (most disadvantaged)	4	14.8	3	6.3

As discussed earlier, child protection history was still statistically significant in the multivariate regression model even after controlling for these other variables. Table 34 presents the full regression results, and shows that the odds of a cerebral palsy death are 1.9 times as high for children with a child protection history as those without. The likelihood that a cerebral palsy death occurs outside infancy is much higher, as shown by the odds for the age groups.

Table 34: **Logistic regression results for cerebral palsy deaths, children aged 0–17, NSW, 2002–2011**

Variable	Odds ratio	Standard error	Significance level
Child protection history	1.9	0.3	0.016
Male	0.8	0.2	0.356
Indigenous	1.2	0.4	0.678
Age at death			
< 1 year	0.0	0.8	0.000
1–4 years	0.5	0.4	0.071
(5–9 years)	…	…	…
10–14 years	1.1	0.3	0.698
15–17 years	0.6	0.4	0.125
Remoteness category			
(Major cities)			
Inner regional areas	1.1	0.3	0.446
Outer regional areas	0.8	0.5	0.664
SEIFA quintile			
(Quintile 5 most advantaged)			
Quintile 4	1.0	0.4	0.916
Quintile 3	0.6	0.4	0.217
Quintile 2	1.3	0.4	0.563
Quintile 1 (most disadvantaged)	0.7	0.5	0.472
Year of death			
2002	0.8	0.5	0.625
2003	1.0	0.5	0.934
2004	0.8	0.5	0.624
2005	0.7	0.5	0.479
(2006)			
2007	0.4	0.6	0.167
2008	0.7	0.5	0.471
2009	1.2	0.5	0.636
2010	0.4	0.6	0.182
2011	0.8	0.5	0.696
Constant	0.1	0.5	0.000
Model fit (Chi-square, df)	147.4, 23 df, p<.001		

Although we cannot measure the actual severity of the cerebral palsy itself, the ICD-10-AM codings do separate the causes of death by the type of cerebral palsy. As shown in Table 35, there were some differences in these distributions by child protection history.

Table 35: **Cause of death distribution for cerebral palsy deaths by child protection history, children aged 0–17, NSW, 2002–2011**

Cause of death	Child protection history Deaths	Child protection history Percent	No child protection history Deaths	No child protection history Percent
G80.00 - Spastic cerebral palsy, unspecified	1	3.6	0	0
G80.03 - Spastic quadriplegic cerebral palsy	8	28.6	11	22.9
G80.3 - Dyskinetic cerebral palsy	1	3.6	1	2.1
G80.8 - Other cerebral palsy	1	3.6	0	0
G80.9 - Cerebral palsy, unspecified	17	60.7	36	75.0
Total	**28**	**100.0**	**48**	**100.0**

While most of the cerebral palsy deaths for both children with and without a child protection history were due to unspecified forms of cerebral palsy, a higher percentage of deaths for children with a child protection history were due to spastic quadriplegic cerebral palsy (28.6% compared with 22.9%), the most severe form of cerebral palsy.

Although cerebral palsy was the underlying cause of death for all 76 of these children, the contributing causes of death paint a fuller picture of the circumstances around these deaths. Some of the contributing causes of death include epilepsy, pneumonia, cardiac arrest, pneumonitis due to food and vomit, respiratory failure/respiratory arrest, asphyxia, and inhalation of foreign bodies (e.g. choking), which are likely to be related to the specific symptoms experienced by the children.

An analysis of these contributing factors found no statistically significant differences between children with a child protection history and those without. At this point we are unable to distinguish whether the higher mortality rates are due to different distributions of severity of cerebral palsy between children with and without a child protection history or because of the particular circumstances of their deaths (e.g. lack of appropriate supervision, or inappropriate feeding techniques). Further analysis is thus required from the CDRT.

Congenital anomalies

Nearly 1,000 children died in NSW between 2002 and 2011 from congenital malformations, deformations and chromosomal abnormalities. Data in this chapter have demonstrated a significant negative relationship between child protection history and the likelihood that a child's death was due to congenital anomalies. There are several potential explanations for this finding:

- Because the majority (84.7%) of these deaths occur in infancy, there is less time for babies who are actually at risk to be reported to child protection services.

- The risk of congenital malformations may be unrelated to the mother's likelihood of having been reported to the child protection system. If this is true, then because of the higher number of deaths that are related to a child protection history, mathematically, congenital malformations form a smaller percentage of all deaths of children with a child protection history than they do among deaths of children without a child protection history. This would hold both for percentage distributions, as well as the regressions, where dying from congenital malformations is compared with dying from all other causes.

- There are mistakes in the data.

Looking at the first explanation, 35.7% of the congenital anomaly deaths occurred within one day of birth, 21% occurred within one week, and 14.1% between one week and one month of birth (70.7% overall).

Of these deaths during the neonatal period, 8.9% occurred among babies with a child protection history. That percentage rises to 16.2% of post-neonatal deaths due to congenital anomalies, suggesting that time/exposure is an important factor.

To further test this hypothesis, we ran a regression including only babies who died from congenital anomalies, where the dependent variable was whether the death was of a baby with a child protection history. The results demonstrated that all three age groups less than one month were negatively associated with the baby having had a child protection history, while living in a lower socioeconomic status area was positively associated with child protection status.

In terms of the second explanation, given the data that we have, we are unable to assess whether the risk of congenital anomalies in general is related to child protection history. Linking the CDRT data with perinatal data and births data would provide information on maternal characteristics and help answer this question.

The third potential explanation centres on data quality. Aside from general data quality checks, we also used the detailed codes to test whether the broad category masked important variations in the detailed causes.

We calculated proportions in two ways: first, by taking the percentage of each detailed cause of death within the chapter (that is, among the deaths due to congenital anomalies, the number for each detailed cause of death), and then calculating rate ratios to see whether children with a child protection history had higher rates for any of the detailed causes. We also calculated the percentage of total deaths that were due to that detailed cause and did rate ratios of those. There were only a handful of detailed causes of death where the rate ratio was above 1, and most of those were weak (e.g. 1.2) or the number of cases was small (e.g. 8 over the entire 10 year period). Therefore, we are confident in the quality of the data itself.

Sensitivity analyses

The key focus of this chapter has been the comparison of patterns of causes of death between children with a child protection history and those without, and the impact of key individual characteristics on those patterns. Potentially, there are several sources of error within the data that could affect the results as presented:

- Errors in the coding of child protection history – that is, child deaths may be mistakenly coded as having had a child protection history when they did not (or were coded as not having had a child protection history when they did).
- Errors in the population denominators when calculating mortality rates.
- Errors in the specification of key characteristics, such as Indigenous status or remoteness.
- Errors in the coding of cause of death.

If these errors occur randomly, then they are unlikely to affect the overall patterns as presented, although they may affect specific rates (e.g. the mortality rate for a specific cause of death may be slightly lower or higher than what is reported).

In a check of its data, the NSW CDRT found some errors in the coding of child protection history following AIHW's initial analysis of the data. In the original AIHW analysis, the child was coded as having had a child protection history in some cases where the initial report was actually made because of the circumstances of the child's death (e.g. the only report for that child or sibling was made on the assault that resulted in the child's death, thus the child did not have a child protection history). All the results and analyses were then recalculated based on the improved data.

The specification of Indigenous status and potential under- or over-count remains problematic in numerous administrative data sets at both jurisdictional and national levels. As noted by the NSW CDRT (2012), this is an important issue for the CDRT data as well, particularly in the calculation of mortality rates, but also in the distribution of deaths. There are two potential ways of defining Indigenous status within this data set – a more restrictive definition where Indigenous status must appear on both the birth and death certificates, or a more inclusive definition where Indigenous status is assumed if it appears on either source.[36] The chosen definition will thus affect the distribution of deaths and the impact of Indigenous status. Following the practice of the NSW Ombudsman's Office, we have used the more inclusive definition in this report, but tested both definitions in both the overall distributions and analyses.

In order to ensure reliability and validity in the strength of the results for the impact of child protection history, several checks were undertaken: All analyses were run three times then compared: once with the full data set and twice on different random selections of 75% of the sample. Similar results were found across all three data sets – although the exact coefficients in the logistic regression analyses differed slightly between three sets of the analyses, both the statistical significance and directions of the coefficients were consistent.

By definition, logistic regression models allow a more precise estimate of the impact of child protection history because they control for the other available factors which may be related both to having been reported to the child protection system and to the risk of dying (or specific causes of death). Thus, the regressions provide the impact of child protection history above and beyond the impact of age, Indigenous status, year of death, sex, remoteness category, and area socioeconomic status. All available and potentially relevant variables were included in all the models, and various model/variable specifications were tested to ensure confidence in the results.

---

36 The NSW CDRT has recently obtained expert advice from the AIHW on issues related to Indigenous identification and the impact on trends/rates.

Comparisons with other findings

This chapter described and analysed cause of death patterns of children aged 0–17 who died in NSW between 2002 and 2011, focusing on the impact of whether the child (or a sibling) had been the subject of a notification to child protection services in the year of death or two years prior (known as having a child protection history). Children with a child protection history are, by definition, a vulnerable group, and one-fifth of deaths of children in NSW occur among children with a child protection history. Identifying both natural and external causes of death where these children have a significantly higher risk of death is important for progressing the work of the NSW CDRT in preventing future deaths.

The relationship between child protection history, overall risk of death, and cause-specific risk of death is complex. The reasons behind notifications were not known, nor was it known whether the report was substantiated or not. Also, the same factors that predict the likelihood that a child/family is the subject of a report, namely Indigenous status or living in a low socioeconomic area, are also the same factors that can predict overall and cause-specific mortality. In addition, the fact that a child died may be completely unrelated to the fact that they had been the subject of a notification, which means that caution must be exercised in assuming causal relationships.

Using logistic regression analyses which were able to control for some of the child's other characteristics, this report has shown that child protection history significantly increased the odds that a child's death was due to external causes, SIDS, cerebral palsy, accidental poisoning, assault, fire or to be classified as SUDI or suicide. Child protection history significantly decreased the odds that deaths were due to natural causes or transport-related accidents.

The size of the impact of child protection history ranged from a low of 1.9 for deaths due to cerebral palsy to 10.8 for deaths due to fire. The results from a series of age-specific logistic regressions illustrated that the size and significance of child protection history varied by age group. For example, child protection history increased the odds that an infant's death was due to assault by 12.3 and for young children (aged 1–4) by 7.6. For the other age groups, however, there was no statistically significant relationship between child protection history and the likelihood that a child's death was due to assault.

Comparison of findings with other data

Caution must be exercised when comparing the CDRT's data both with other jurisdictions and over time within NSW because of differences in definitions of what is considered a child protection history, whether deaths are analysed by year of death or year of registration, cause of death coding system, and how rates are calculated.

Table 36 presents available data from other jurisdictions on the percentage of deaths of children with a child protection history,[37] which varies from a low of 14.5% in Queensland to a high of 27.3% in Western Australia.

Table 36: **Deaths of children with a child protection history, by jurisdiction**

Jurisdiction	Deaths of children with a child protection history	Total child deaths	Percentage of deaths of children with a child protection history	Period
Northern Territory	62	253	24.5	2007–2011
Western Australia	453	1,662	27.3	2003/04–2011/12
South Australia	216	856	25.2	2005–2011
Queensland	356	2,448	14.5	2007/08–2011/12
New South Wales[38]	1,219	6,152	19.8	2002–2011

It is important to note that a previous NSW publication (CDRT 2009) reported that overall mortality rates were lower for children with a child protection history than for those without, while this report found the opposite.

This difference can be attributed to differences in the denominators used. For the purposes of this project, the Department of Family and Community Services (FACS) provided the number of unique children who were the

---

37 Publicly available or comparable data were not available from NZ, the ACT, Tasmania, or Victoria.
38 The data from the CDRT database may differ slightly from the numbers published by the NSW CDRT.

subject of a child protection report for each year and the two years preceding it (to match with the definition of the numerator). For example, 2006 included the number of unique children reported either in 2004, 2005, or 2006. Even if they were reported multiple times over this period, children were counted only once. In 2006, that yielded a count of 232,915 children.

FACS also provided counts of children reported in each individual year. If a child was the subject of a report in 2005 and in 2006, they were counted once in 2005 and once in 2006. Thus, the addition of yearly numbers double counts children: adding the yearly data supplied by FACS for 2004, 2005, and 2006 yields a count of 320,550.[39]

The methodology section of the CDRT (2009) report states that their data were supplied by the Department of Community Services (DoCS) and included the number of children within a reporting year and the two years prior. However, their count was 333,442 for 2006 (p. 216), which may be due to the addition of individual years of children reported.

The implications of the selection of the denominator are significant: using the larger number of children with a child protection history reduces their mortality rates and increases the mortality rates for children with no child protection history. Because the true population at risk is the unique number of children with reports in each three year period, this report uses the three yearly counts supplied by FACS which yields the higher mortality rates.

The only other comparable rates we could find were from Queensland. They also found higher mortality rates for children known to the child protection system than the total child mortality rate (55.0 compared with 45.7 per 100,000).

The findings for higher mortality rates for suicide and SUDI among children with a child protection history are consistent both with data from Queensland, and with other research demonstrating the impact that child abuse/neglect has on increasing the likelihood of suicide among adolescents (Lamont 2010).

Comparison of CDRT data with data from the National Mortality Database

As discussed earlier in the paper, CDRT data is held separately from the deaths data supplied to the ABS and which become part of the National Mortality Database. Table 37 compares the CDRT cause of death codings with those in the National Mortality Database.

In both datasets there were 5,556 deaths with assigned cause of death codes over the entire 10 year period. There are some slight differences in the total numbers of child deaths in each individual year which are likely due to differences in registrations of deaths (Table 38).

There are also differences within the ICD-10-AM codings: for example, the CDRT data has more deaths attributed to infectious/parasitic diseases, conditions originating in the perinatal period, and external causes. The ABS has more deaths assigned to the circulatory system, respiratory system, digestive system, and congenital malformations. Thus, research or reports using the ABS data may yield findings that differ slightly from the CDRT data.

Table 37: **Comparison of ABS[(a)(b)] and NSW Child Death Review Team underlying cause of death codes, children aged 0–17, NSW, 2002–2011**

	Number		Percent	
Underlying cause of death	**NSW CDRT**	**ABS**	**NSW CDRT**	**ABS**
Infectious & parasitic diseases A00-B99	102	89	1.8	1.6
Neoplasms C00-D48	380	376	6.8	6.8
Diseases of the blood D50-D89	42	47	0.8	0.8
Endocrine, metabolic & nutritional disorders E00-E89	133	134	2.4	2.4
Mental and behavioural disorders F00-F99	13	11	0.2	0.2
Nervous system diseases G00-G99	310	309	5.6	5.6
Diseases of the eye and adnexa H00-H59	1	2	0.0	0.0

39   116,735 (2004) + 104,499 (2005) + 99,316 (2006)

Underlying cause of death	Number		Percent	
	NSW CDRT	**ABS**	**NSW CDRT**	**ABS**
Diseases of the skin L00-L99	1	0	0.0	0.0
Circulatory diseases I00-I99	158	182	2.8	3.3
Respiratory diseases J00-J99	125	157	2.2	2.8
Digestive diseases K00-K93	46	75	0.8	1.3
Diseases of the skin L00-L99	0	2	0.0	0.0
Disease of the musculoskeletal system M00-M99	12	13	0.2	0.2
Genitourinary diseases N00-N99	12	7	0.2	0.1
Conditions originating in perinatal period P00-P96	1,872	1,793	33.7	32.3
Congenital malformations, deformations and chromosomal abnormalities Q00-Q99	885	920	15.9	16.6
Symptoms, signs and abnormal laboratory findings R00-R99	437	444	7.9	8.0
External causes U50-Y98	1,026	995	18.5	17.9
Total	**5,556**	**5,556**	**100.0**	**100.0**

(a) Deaths are by year of occurrence and state/territory of registration.

(b) All causes of death data from 2006 onward are subject to a revisions process—once data for a reference year are 'final', they are no longer revised. Affected data in this table are: 2006 (final), 2007 (final), 2008 (final), 2009 (revised) and 2010 (preliminary). See Causes of Death, Australia, 2010 (cat.no. 3303.0) Explanatory Notes for further information. Source: AIHW analysis of ABS Mortality Database.

Suggestions for further research

This report represents an important first step in analysing causes of death for children with a child protection history in NSW. The AIHW recommends that the NSW CDRT consider the following enhancements to its data in order to further research in this area:

- Including reason for notification to the child protection system.[40]

- Including whether the notification was substantiated.

- Creating a linked dataset with perinatal and birth records to examine whether factors such as maternal smoking during pregnancy, and birth weight mediate the impact of child protection history on cause of death.

- Area socioeconomic status, as measured by SLA levels of the SEIFA Index of Relative Disadvantage, did not (in general) have a significant impact on cause of death. Further analyses could examine collection district (CD) levels of SEIFA, or explore whether more direct census measures such as unemployment or education levels may have more explanatory power.

The above points all apply to enhancements of CDRT's data on child deaths that have already occurred. What they are unable to do, however, is address another important policy issue, which is:

- Of children who have been reported to the child protection system, what predicts which of them subsequently die, from what causes, and what individual and contextual factors predict those deaths?

The CDRT could consider linking data on all individual children reported to the child protection system with CDRT records to address this issue. Both the linkage and the analysis are feasible, and could have important implications for preventing child deaths in the future.

---

40 Discussions between the NSW CDRT and the AIHW about the feasibility of using information currently in the records led to the conclusion that the previous definitions/categorisations of reason for reporting were not robust enough for inclusion. However, there was agreement that this is an important area for standardised data collection as improvements are made to the CDRT dataset in the future.

Table 38: **Comparison of ABS(a)(b) and NSW Child Death Review Team underlying cause of death codes, children aged 0–17, NSW, by year of death**

Underlying cause of death	2002 CRDT	2002 ABS	2003 CRDT	2003 ABS	2004 CRDT	2004 ABS	2005 CRDT	2005 ABS	2006 CRDT	2006 ABS	2007 CRDT	2007 ABS	2008 CRDT	2008 ABS	2009 CRDT	2009 ABS	2010 CRDT	2010 ABS
Infectious & parasitic diseases A00-B99	14	14	14	14	8	9	8	8	20	14	13	9	9	9	8	9	8	3
Neoplasms C00-D48	48	50	53	46	53	51	40	40	35	43	43	41	34	33	30	30	44	42
Diseases of the blood D50-D89	3	5	4	3	5	8	12	14	0	3	4	3	6	5	4	3	4	3
Endocrine, metabolic & nutritional disorders E00-E89	18	20	13	14	9	10	15	17	9	8	13	16	20	19	19	17	17	13
Mental and behavioural disorders F00-F99	0	0	4	2	1	0	2	2	1	0	2	2	1	2	1	1	1	2
Nervous system diseases G00-G99	44	40	47	47	45	39	35	29	37	36	17	25	25	30	33	30	27	33
Diseases of the eye and adnexa H00-H59	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Diseases of the skin L00-L99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Circulatory diseases I00-I99	21	16	11	10	17	25	18	21	21	21	19	22	18	23	15	24	18	20
Respiratory diseases J00-J99	16	17	14	26	16	24	7	12	12	17	16	14	19	19	9	12	16	16
Digestive diseases K00-K93	3	6	5	9	3	12	8	8	8	11	6	10	7	9	4	7	2	3
Diseases of the skin L00-L99	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Disease of the musculoskeletal system M00-M99	1	1	1	0	1	2	1	1	1	0	1	2	3	3	0	1	3	3
Genitourinary diseases N00-N99	4	2	0	1	2	0	2	0	2	1	0	0	1	2	0	0	1	1
Pregnancy, childbirth and the puerperium O00-O99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conditions originating in perinatal period P00-P96	199	203	207	194	188	162	251	236	222	206	203	193	221	215	191	196	190	188
Congenital malformations, deformations and chromosomal abnormalities Q00-Q99	84	94	93	99	104	107	93	108	74	92	93	96	112	112	115	104	117	108
Symptoms, signs and abnormal laboratory findings R00-R99	63	64	55	60	42	44	51	58	55	49	59	56	42	39	40	36	30	38
External causes U50-Y98	131	123	132	134	122	119	116	106	124	125	115	110	87	86	102	99	97	93
Factors influencing health status Z00-Z99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	649	657	653	659	616	613	659	660	621	626	604	599	606	607	571	569	577	566

(a) Deaths are by year of occurrence and state/territory of registration. (b) All causes of death data from 2006 onward are subject to a revisions process – once data for a reference year are 'final', they are no longer revised. Affected data in this table are: 2006 (final), 2007 (final), 2008 (final), 2009 (revised) and 2010 (preliminary). See Causes of Death, Australia, 2010 (cat.no. 3303.0) Explanatory Notes for further information. Source: AIHW analysis of ABS Mortality Database.

Chapter 4. What the research means for the work of the CDRT and next steps

In the main, the Team's aims in undertaking this research were to identify whether any causes of death are more common amongst children with a child protection history and, if so, why this may be the case, and whether targeted prevention strategies are warranted.

The research usefully identifies key causes of death that are more common amongst children with a child protection history and suggests potential areas for targeting prevention strategies. However, further work and analysis is required by the Team to more clearly ascertain:

- why particular causes of death are more prevalent amongst children with a child protection history (including nervous system conditions such as cerebral palsy and epilepsy)[41]

- why particular causes of death are less prevalent amongst children with a child protection history (such as cancers)

- where, and how, prevention strategies ought to be targeted to reduce the deaths of children – with or without a child protection history, and

- any implications from this, and related ongoing research, for strengthening aspects of the child protection system.

Shared responsibility and collaborative work

The research underscores the importance of shared agency and broader community responsibility in reducing the deaths of children. While the research is focused on examining the causes of death of children with a child protection history, the implications for policy and preventative action are not limited to Community Services as the lead child protection agency in NSW. By way of example, we note:

- the importance of health services in reducing deaths from natural causes (including meningococcal infection and respiratory illnesses), SUDI, accidental poisoning, and suicide

- the role of education services in relation to risk of death from assault and suicide, and

- the role of housing services and local Councils in helping to reduce the deaths of children from fire and drowning.

The analysis highlights the need for effective cooperation and collaboration between agencies, and with families, to reduce the deaths of children with and without a child protection history. The information also points to potential opportunities for joint work in the targeting of prevention strategies, such as to:

- families with a child protection history, with a focus on particular causes of death and children of certain ages – such as young children and external causes such as fire, assault and drowning

- Indigenous families in relation to key causes of death where Indigenous status carries an additional risk, including SUDI, and

- children and families in particular locations, such as work in relation to suicide prevention in areas of higher socioeconomic status.

Reinforcement of the Team's findings and recommendations in relation to SUDI

The research reinforces and adds to the previous findings of the Team in relation to key areas such as SUDI, deaths from accidental poisoning, and assault. The Team has previously reported on the high proportion of children with a child protection history amongst deaths from these causes;[42] and the Ombudsman's office

---

41 We may have expected that deaths associated with cerebral palsy may be more prevalent amongst children with a child protection history during the perinatal period (given that risk factors for cerebral palsy include prematurity and low birth weight). However, the research found that for children with a child protection history, the number of deaths caused by cerebral palsy was highest amongst those aged 10-14 years.

42 See for example, CDRT (2013) *Annual Report 2012*.

has also separately reported on the prevalence of child protection history amongst the deaths of children in circumstances of abuse and neglect.[43]

The Team has undertaken considerable work over many years to seek to reduce the sudden and unexpected deaths of infants in NSW. The research supports the findings and recommendations of the Team in relation to SUDI, and underscores the importance of this work. The analysis identified that, during the 10-year period:

- infants with a child protection history were significantly overrepresented in SUDI and had a much higher SUDI mortality rate than children without a child protection history (almost 10 times the mortality rate)
- while SUDI mortality rates for children with and without a child protection history declined over the decade, the only significant decline in the SUDI mortality rate was for infants without a child protection history, and
- the sudden and unexpected deaths of infants with a child protection history were much more likely to have been due to external (unnatural) causes, such as accidental suffocation or strangulation.

In 2012, noting the overrepresentation in SUDI of infants from families with a child protection history, the Team recommended that Community Services should conduct a cohort review of SUDI where the infant's family had a child protection history. We identified that the aim of the review would be to develop targeted strategies and training resources to assist caseworkers to assess risk for infants and provide casework services to at-risk families.

At the time of the Team's latest Annual Report in October 2013, Community Services indicated that the cohort review was in progress, and the agency had met with NSW Kids and Families to discuss opportunities and strategies to strengthen the interagency response. The Team is continuing to monitor this work, and has made further recommendations in the Annual Report to this end.

Importantly, the research has emphasised the overrepresentation of Indigenous children in SUDI – both for those with and without a child protection history. In this context, it will be important for the Team to consider the findings of Community Services' cohort review and the adequacy of the intended strategies for reducing the SUDI risks for Indigenous children, and whether additional work or targeted strategies may be required.

Data enhancements

The AIHW's suggestions for data enhancements to assist with further research in this area, including data linkages and additional data fields relating to child protection reports (page 50), are timely. The Ombudsman's office is currently undertaking substantial work to develop an integrated deaths register for CDRT and reviewable deaths. Key elements of the work include consideration of:

- additions or other amendments to existing data fields to enhance analysis of child deaths data and other information, and
- potential linkages to external datasets relevant to child deaths.

The Team will take the AIHW's suggestions into account as part of the above work, and will report on progress through its annual reports.

We will also continue to refine our data capture and analysis so as to improve our capacity to identify key child protection practice issues.

Further analysis of causes of death and other relevant factors

To identify where, and how, prevention strategies ought to be targeted to reduce the deaths of children with or without a child protection history, the Team will take a closer look at specific causes of death and other relevant factors.

The work will include:

- Examination of all fire-related deaths of children in the 10-year period 2004-2013 – including comparison of the deaths of children with and without a child protection history and identification of factors relevant to prevention.

---

43   See for example, NSW Ombudsman (2013) *Report of Reviewable Deaths in 2010 and 2011, Volume 1: Child Deaths.*

- Examination of the cerebral palsy-related deaths of children with a child protection history – including consideration of the child protection history (such as the issues that were reported; the association of the reported issues with the child's disability; and the number of reports), and particular factors influencing the higher mortality rate for children with this history.[44]

- Further examination of suicide deaths – the research has identified that the suicide mortality rate for children with a child protection history has declined to a greater extent than the rate for children without that history; and noted that living in more disadvantaged areas decreased the odds of death from suicide. This year, taking these findings into account, we will take a closer look at youth suicide prevention strategies and progress; examine comparative interstate and national data; and consider the potential need for a 10-year review of suicide deaths to inform the targeting of prevention strategies.

- Discussion with health researchers in relation to deaths from cancers and tumours – the analysis has found that deaths due to neoplasms were less prevalent amongst children with a child protection history than those without. It is not immediately obvious why this would be the case. The Team will liaise with relevant health researchers in relation to this information to identify potential opportunities for further research in this area.

- Examination of the deaths of Indigenous children – in addition to their overall higher mortality rates and overrepresentation in the child protection system, the research has pointed to the overrepresentation of Indigenous children in SUDI (for those with and without a child protection history), and identified that Indigenous status also carries an independent risk of death from respiratory illnesses and fire (for those without a child protection history). In the past year, the Team has obtained expert advice from the AIHW on identifying and reporting the Indigenous status of children who have died, which has enhanced the capability of the Team to accurately report on numbers and trends relating to these children. In undertaking this work this year, the Team will take into account the findings from this research, and consider the need for targeted prevention strategies.

The deaths of children from assault are always examined in detail by the Ombudsman's office through its reviewable child deaths functions. The Ombudsman reports on the circumstances of the deaths, including relevant agency involvement, in his biennial reports on reviewable deaths. This year's report, on deaths in 2012 and 2013, will include examination of the familial homicide deaths of children over the 10-year period 2004-2013.

---

44   The NSW Ombudsman's responsibilities include reviewing the deaths of adults and children in residential care (accommodation supporting people with disabilities). The data and other information in relation to the reviewable deaths of children with cerebral palsy will provide a useful point of comparison to assist us in understanding relevant factors influencing the higher cerebral palsy mortality rate for children with a child protection history.

References

ACPR Group. 2009. *Report of the Australian Cerebral Palsy Register, Birth Years 1993-2003.*

Australian Institute of Health and Welfare. 2013. *Child protection Australia: 2011–12.* Child Welfare series no. 55. Cat. no. CWS 43. Canberra: AIHW.

Australian Institute of Health and Welfare. 2012a. *A picture of Australia's children 2012*. Cat. no. PHE 167. Canberra: AIHW.

Australian Institute of Health and Welfare. 2012b. *Child protection Australia: 2010-2011*. Child Welfare Series no. 53. Cat. No. CWS 41. Canberra: AIHW.

Australian Institute of Health and Welfare 2011a. *Headline Indicators for children's health, development and wellbeing 2011*. Cat. no. PHE 144. Canberra: AIHW.

Australian Institute of Health and Welfare 2011b. Aboriginal and Torres Strait Islander Health Performance Framework 2010: detailed analyses. Cat. no. IHW 53. Canberra: AIHW.

Australian Institute of Health and Welfare 2008. *Making progress: the health, development and wellbeing of Australia's children and young people*. Cat. no. PHE 104. Canberra: AIHW.

CDRPC. 2012. *Annual Report 2011-2012*, Northern Territory Child Deaths Review and Prevention Committee, Office of the Children's Commissioner, Darwin.

Child Death and Serious Injury Review Committee, SA. 2012. *Annual Report 2011-2012.*

Commission for Children and Young People and Child Guardian, State of Queensland. 2012. *Annual report: Deaths of children and young people, Queensland, 2011-2012.*

Draper G, Turrell G & Oldenburg B 2004. *Health Inequalities in Australia: Mortality. Health Inequalities Monitoring* Series No. 1. AIHW Cat. No. PHE 55. Canberra: Queensland University of Technology and the Australian Institute of Health and Welfare.

Hutton JL. 2006. *Cerebral palsy life expectancy.* Clin Perinatol. Jun;33(2):545-55.

Lamont A. 2010. *Effects of child abuse and neglect for children and adolescents*, NCPC Resource Sheet, April 2010. National Child Protection Clearinghouse, Published by the Australian Institute of Family Studies.

NSW Child Death Review Team. 2013. *Annual Report 2012*, NSW. NSW Ombudsman: Sydney.

NSW Child Death Review Team. 2012. *Annual Report 2011*, NSW. NSW Ombudsman: Sydney.

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

NSW Department of Family and Community Services. 2011. *Child Deaths 2010 Annual Report: Learning to improve services.*

NSW Ombudsman. 2007. *Report of Reviewable Deaths in 2006: Volume 2: Child Deaths*.

NSW Ombudsman. 2013. *Report of Reviewable Deaths in 2010 and 2011: Volume 1: Child Deaths*

Ombudsman Western Australia. 2012. *Annual Report 2011-2012.*

Spencer N, Logan S.2004. *Sudden unexpected death in infancy and socioeconomic status: a systematic review.* Journal of Epidemiology Community Health 2004, 58:366-373.

Victorian Child Death Review Committee. 2012. *Annual report of inquiries into the deaths of children known to Child Protection 2012.*

Appendix A – Detailed tables

Table A1: **Summary of logistic regression results, deaths of children aged 0–17, NSW, 2002–2011**

Dependent variable (cause of death)	Significance of child protection history	Odds ratio for child protection history	Other significant variables		Overall model fit (Chi-square, df, p value)
			Positive effect	**Negative effect**	
Broad causes					
External	p<.001	2.0	Age 15-17, remote, outer regional, inner regional, male, age 1-4	2008, 2010, 2011, < 1year	2099.4, 23 df, p<.001
Natural	p<.001	0.3	Age < 1 yr, 2011, 2010, 2008, 2009	Age 15-17, outer regional, remote, age 1-4, inner regional, male, Indigenous	1364.1, 23 df, p<.001
SIDS and other undetermined	p<.001	2.4	Inner regional	< 1day, 1-6 days, 7-27 days, 2011, 2010	827.2, 22 df, p<.001
Specific causes, Natural					
Infectious and parasitic	n.s.			Age 15-17, Age < 1yr, 2005, 2004, 2010, 2009, 2008	59.4, 23 df, p<.001
Endocrine/ nutritional	n.s.		2008, 2009	Age < 1yr, Indigenous, Inner regional	104, 23 df, p<.001
Nervous system	n.s.			Age < 1 yr, 2007, Outer regional	203.6, 23df, p<.001
Respiratory	n.s.		Indigenous	Age 15-17, Age < 1yr	86.2, 23df, p<.001
Meningococcal infection	n.s.		Male, Indigenous		44.0, 23df, p<.001
Epilepsy	n.s.			Age < 1 yr	79.2, 23df, p<.001
Influenza/ pneumonia	n.s.		Indigenous	Age 15-17	48.0, 23df, p<.001
Cerebral palsy	p<.05	1.9		Age < 1 yr	147.4, 23df, p<.001
Specific causes, External					
Accidental poisoning	p<.05	2.9		Remote, Age 15-17	92.4, 23df, p<.001
Accidental drowning	n.s.		Age 1-4, male, inner regional	Age < 1 yr, 10-14, 15-17	308.2, 23df, p<.001
Assault	p<.001	3.6		Age < 1 yr	143.2, 23df, p<.001
Fire	p<.001	10.8	2005	Age < 1 yr, 15-17	162.4, 23df, p<.001
All transport	p<.01	0.7	Age 15-17, outer regional, SEIFA bottom quintile, inner regional, SEIFA 4th quintile, age 10-14	Age < 1 yr, 2008, 2010, 2011, 2002	1032.8, 23df, p<.001
Pedestrian	n.s.				
Passenger	n.s.		SEIFA bottom quintile, SEIFA third quintile, SEIFA second quintile, age 15-17, SEIFA fourth quintile, inner regional	Age < 1 yr, 2008, 2007, 2011, 2010, male	391.5, 23, p<.001
Child Death Review Team Coded					
SUDI	p<.001	3.2	SEIFA third quintile, Indigenous, inner regional	<1 day, 1-6 days, 7-27 days	1193.7, 22df, p<.001
Suicide	p<.001	3.5	Age (years)	SEIFA third quintile, SEIFA second quintile, SEIFA bottom quintile, SEIFA fourth quintile	95.5, 20, p<.001

Table A1 Notes:

1. Regressions for SIDS and SUDI were run only on deaths of infants, and the previously defined age categories by days were used. Regressions for Suicide were run only on deaths of young people aged 10-17 years, and age was included as a continuous variable.

2. The other significant variables are listed according to the size of their impact, with the largest impacts listed first.

Indigenous status increased the odds that deaths were due to meningococcal infection, respiratory illnesses, influenza/pneumonia, and SUDI, even controlling for other factors (such as area socioeconomic status, age, child protection history, and sex). Although the rates of suicide, SIDS, and SUDI are higher among boys, male sex is not a statistically significant predictor of these causes of death in the regression models.

Table A2: **Summary of regression results, deaths of infants aged less than 1 year, NSW, 2002–2011[45]**

Dependent variable (cause of death)	Significance of child protection history	Odds ratio for child protection history	Other significant variables		Overall model fit (Chi-square, df, p value)
			Positive effect	**Negative effect**	
Broad causes					
External	p<.001	2.7		2008, age 1-6 days, age < 1 day, age 7-27 days, 2003	180.4, 22 df, p<.001
Natural	p<.001	0.3	< 1 day, 1-6 days, 7-27 days, 2011, 2010, 2008,2004, 2003	Inner regional	1036.2, 22 df, p<.001
SIDS and other undetermined	p<.001	2.4	Inner regional	Age < 1day, age 1-6 days, age 7-27 days, 2011, 2010	827.2, 22 df, p<.001
Specific causes, Natural					
Congenital malformations, deformations and chromosomal abnormalities	p<.001	0.6	2011, 2010, 2009, 2008, 2004, 2007, SEIFA bottom quintile	Inner regional, age <1 day, male	94.8, 22 df, p<.001
Nervous system	p<.05	0.4		Age < 1 day, age 7-27 days	173.1, 22 df, p<.001
Specific causes, External					
Accidental drowning	p<.05	3.5		Age < 1 day	38.4, 22df, p<.05
Assault	p<.001	12.3			74.6, 22df, p<.001
Child Death Review Team coded					
SUDI	p<.001	3.2	SEIFA third quintile, Indigenous, inner regional	Age <1 day, age 1-6 days, age 7-27 days	1193.7, 22df, p<.001

---

45   The model fits for epilepsy, cerebral palsy, accidental poisoning, and fire were not significant, and so they were not included in the table. There were also no pedestrian deaths to infants.

Table A3: **Summary of regression results, deaths of children aged 1–4 years, NSW, 2002–2011[46]**

Dependent variable (cause of death)	Significance of child protection history	Odds ratio for child protection history	Other significant variables		Overall model fit (Chi-square, df, p value)
			Positive effect	**Negative effect**	
Broad causes					
External	p<.001	2.4	Outer regional, inner regional		75.5, 20 df, p<.001
Natural	p<.001	0.4		Outer regional, inner regional	81.6, 20 df, p<.001
Specific causes, External					
Assault	p<.001	7.6			46.9, 20 df, p<.001
Fire	p<.001	11.7	Age (years)		58.8, 20 df, p<.001

Table A4: **Summary of regression results, deaths of children aged 5–9 years, NSW, 2002-2011[47]**

Dependent variable (cause of death)	Significance of child protection history	Odds ratio for child protection history	Other significant variables		Overall model fit (Chi-square, df, p value)
			Positive effect	**Negative effect**	
Specific causes, External					
Passenger	p<.05	0.2	Remote	2002, male	50.4, 20 df, p<.001

Table A5: **Summary of regression results, deaths of children aged 10–14 years, NSW, 2002–2011[48]**

Dependent variable (cause of death)	Significance of child protection history	Odds ratio for child protection history	Other significant variables		Overall model fit (Chi-square, df, p value)
			Positive effect	**Negative effect**	
Broad causes					
External	p<.05	1.8	Male, age (years), bottom 20% SEIFA, 2011	2010	59.4, 20df, p<.001
Natural	p<.05	0.5	2010	Male, inner regional, age (years),	53.2, 20df, p<.001
Specific causes, Natural					
Cerebral palsy	p<.001	5.1			Not significant
Child Death Review Team coded					
Suicide	p<.05	2.7	Age (years)		42.1, 20df, p<.001

---

46   Model fits for deaths due to infectious and parasitic diseases, endocrine/nutritional, respiratory, meningococcal infection, epilepsy, influenza/pneumonia, cerebral palsy, accidental poisoning, accidental drowning, and pedestrian accidents were not statistically significant, so they are not included in the table.

47   Model fits for deaths due to all natural causes, infectious and parasitic diseases, endocrine/nutritional, nervous system, respiratory, meningococcal infection, epilepsy, influenza/pneumonia, accidental poisoning, accidental drowning, assault, and pedestrian accidents were not statistically significant, so they are not included in the table.

48   Model fits for deaths due to infectious and parasitic diseases, endocrine/nutritional, nervous system, respiratory, meningococcal infection, epilepsy, influenza/pneumonia, accidental poisoning, accidental drowning, assault, and pedestrian accidents were not statistically significant, so they are not included in the table.

Table A6: **Summary of regression results, deaths of children aged 15–17 years, NSW, 2002–2011[49]**

Dependent variable (cause of death)	Significance of child protection history	Odds ratio for child protection history	Other significant variables		Overall model fit (Chi-square, df, p value)
			Positive effect	**Negative effect**	
Broad causes					
External	p<.05	1.6	Outer regional, inner regional, male, age (years)		75.9, 20 df, p<.001
Natural	p<.01	0.5		Outer regional, inner regional, male, age (years)	76.2, 20 df, p<.001
Specific causes, External					
Accidental poisoning	p<.001	6.1	Remote		44.9, 20 df, p<.001
Child Death Review Team coded					
Suicide	p<.001	2.5	2005, 2009	SEIFA 2nd quintile, 3rd quintile, 1st quintile, 4th quintile	39.9, 20 df, p<.01

---

49   Model fits for deaths due to infectious and parasitic diseases, endocrine/nutritional, respiratory, meningococcal infection, epilepsy, influenza/pneumonia, accidental drowning, fire, and pedestrian accidents were not statistically significant, so they are not included in the table.

Table A7: **Comparison of significant predictors of cause of death[a] by child protection history, children aged 0–17 years, NSW, 2002-2011**

Dependent variable	Child protection history		No child protection history	
	Positive effect	Negative effect	Positive effect	Negative effect
Broad causes				
External	15-17, remote, outer regional, ages 1-4	Age <1 yr, 2008, 2010	15-17, outer regional, remote, inner regional, male	Age < 1 yr, 2008
Natural	2008, 2010, 2011	Age 15-17, Age 1-4, outer regional, male	Age <1, 2011, 2010, 2008, 2009	Age 15-17, outer regional, remote, inner regional, Indigenous, male
SIDS and other undetermined		Baby age 1-6 days, 7-27 days		Baby age < 1 day, 1-6 days, 7-27 days, 2011, 2010, 2004
Specific causes, Natural				
Infectious and parasitic	Model not significant			2005, Age 15-17, < 1 yr, 2004
Endocrine/nutritional		Age < 1 yr		Age < 1 yr, inner regional
Nervous system		Age < 1 yr, age 1-4, SEIFA quintile 3, male	SEIFA quintile 4	Age < 1 yr, 2007
Respiratory	Model not significant		Indigenous, outer regional	Age < 1 yr, age 15-17
Epilepsy				Age < 1 yr
Influenza/pneumonia			Indigenous	Age 15-17, age < 1 yr
Cerebral palsy		Age < 1 yr, SEIFA quintile 3, age 1-4		Age < 1 yr
Specific causes, External				
Accidental drowning	SEIFA fourth quintile, ages 1-4	Age < 1 yr, age 15-17	Age 1-4, outer regional, inner regional, male	Age < 1 yr, age 10-14
Assault		Age 15-17		Age < 1 yr
Fire	Remote, age 1-4		Indigenous	
All transport	Age 15-17, age 10-14, outer regional	Age < 1 yr	Age 15-17, SEIFA bottom quintile, outer regional, inner regional, SEIFA third quintile	Age < 1 yr, 2008, 2011, 2010, 2009, 2002
Passenger	Age 15-17, age 10-14	Age < 1 yr	SEIFA bottom quintile, SEIFA third quintile, Indigenous, SEIFA fourth quintile, inner regional	Age < 1 yr, 2011, 2008, 2007, 2010, age 1-4,
Child Death Review Team Coded				
SUDI		Age < 1 day, age 1-6 days, age 7-27 days	Indigenous, SEIFA bottom quintile, SEIFA third quintile	Age < 1 day, age 1-6 days, age 7-27 days
Suicide		Age (years)	Remote, 2009, 2004, 2005, age (years)	SEIFA quintile 1, SEIFA quintile 3

(a) Significant variables are shown where the overall model fit was statistically significant.