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Timing impact assessment for COAG Closing the Gap targets



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*Authoritative information and statistics
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Timing impact assessment for COAG Closing the Gap targets

Child mortality

Australian Institute of Health and Welfare
Canberra

Cat. no. IHW 124

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ISBN 978-1-74249-575-0

Suggested citation

Australian Institute of Health and Welfare 2014. Timing impact assessment of COAG Closing the Gap targets: Child mortality. Cat. no. IHW 124. Canberra: AIHW.

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Published by the Australian Institute of Health and Welfare

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Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

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Acknowledgments

This report was prepared by a number of staff from the Indigenous and Children's Group including Deanna Pagnini, Sarah Cleaves, Michelle Gourley, Rachael Kitchens, Kim Cvetanovska and Tracy Oliver, with input data analysis provided by Bin Tong, Jessica Zhang and Ruth Penm. We would like to thank Fadwa Al-Yaman for providing ongoing advice, guidance and comments on this project and on the report.

The contribution of members of the National Advisory Group on Aboriginal and Torres Strait Islander Health Information and Data (NAGATSIHID) and of the National Health Information and Performance Principal Committee is gratefully acknowledged.

Funding for this project was provided by the Australian Health Ministers' Advisory Council through NAGATSIHID.

Abbreviations

ABS	Australian Bureau of Statistics
ACCHO	Aboriginal Community Controlled Health Organisation
ACCHS	Aboriginal Community Controlled Health Service
ACIR	Australian Childhood Immunisation Register
ACT	Australian Capital Territory
AGE	all-cause acute gastroenteritis
AHW	Aboriginal health worker
AIHW	Australian Institute of Health and Welfare
AMIHS	Aboriginal Maternal and Infant Health Strategy
ANFPP	Australian Nurse-Family Partnership Program
AOR	adjusted odds ratio
BBV	blood borne viruses
BFHI	Baby Friendly Hospital Initiative
BHS	Boab Health Services
BMI	body mass index
CI	confidence interval
COAG	Council of Australian Governments
DoHA	Department of Health and Ageing
DVD	digital video disc
FaHCSIA	Department of Families, Housing, Community Services and Indigenous Affairs
FASD	fetal alcohol spectrum disorders
FGR	fetal growth retardation
GP	general practitioner
Hib	haemophilus influenza type b
HR	hazard ratio
ICC	Indigenous cultural consultant
IECD	Indigenous early childhood development

ICDP	Indigenous Chronic Disease Package
IUGR	intra uterine growth retardation
MBS	Medicare Benefits Scheme
NAGATSIHID	National Advisory Group on Aboriginal and Torres Strait Islander Health Information and Data
NATSIHS	National Aboriginal and Torres Strait Islander Health Survey
NATSISS	National Aboriginal and Torres Strait Islander Social Survey
NFP	Nurse-Family Partnership
NIP	National Immunisation Program
NIRA	National Indigenous Reform Agreement
NIRAPIMG	National Indigenous Reform Agreement Performance Information Management Group
NNDSS	National Notifiable Diseases Surveillance System
NPDC	National Perinatal Data Collection
NT	Northern Territory
NPA	National Partnership Agreement
NRT	nicotine replacement therapy
NSW	New South Wales
OATSIH	Office for Aboriginal and Torres Strait Islander Health
OR	odds ratio
OVAHS	Ord Valley Aboriginal Health Service
Qld	Queensland
RCT	randomised controlled trial
RR	risk ratio
SIDS	sudden infant death syndrome
SA	South Australia
STIs	sexually transmitted infections
SUCCESS	Setting Universal Cessation Counselling Education and Screening Standards
SUDI	sudden unexpected deaths in infancy
Tas	Tasmania

USA	United States of America
WA	Western Australia
WCIPP	Waitakere Community Injury Prevention Project
WHO	World Health Organization
WIC	Women, Infants and Children

Symbols

–	nil or rounded to zero
..	not applicable
n.a.	not available

Summary

In 2008, one of the 6 Closing the Gap targets agreed by the Council of Australian Governments (COAG) was to halve the gap in mortality rates for Indigenous children under 5 by 2018. This report looks at current patterns and trends in Indigenous child mortality and associated risk factors. It examines interventions aimed at reducing child mortality; the time frames between program implementation and expected reductions in risk factors; child health outcomes; and data availability to measure outcomes achieved.

Indigenous child mortality

Mortality rates for Indigenous children aged under 5 have declined over the past decade, largely driven by decreases in infant mortality. In particular, there were significant declines in deaths from sudden infant death syndrome and deaths from certain conditions originating in the perinatal period. These contributed 42% and 25% respectively to the fall in Indigenous infant mortality between 2001 and 2011.

Conditions originating in the perinatal period and congenital malformations have continued to dominate infant mortality rates in recent years, while external causes (injury and poisoning) still account for just over one half of all deaths of Indigenous children aged 1–4. Further declines in these three causes of death will likely have the greatest impact on achieving the COAG child mortality target.

Risk factors and interventions

A number of risk factors are associated with infant and child mortality, including low birthweight and pre-term births, maternal health and behaviours (smoking and alcohol use during pregnancy; STIs; breastfeeding) and access to health services (antenatal care and immunisation).

The literature suggests that one way to improve outcomes for Indigenous mothers and babies is through improved access to, and take up of, antenatal care services, as studies have shown an association between inadequate antenatal care and increased risk of stillbirths, perinatal deaths, fetal growth retardation, low birthweight and pre-term births (Taylor et al. 2013). Culturally secure and comprehensive antenatal care services also address a number of risk factors including maternal smoking and alcohol use during pregnancy.

Time frames

Time frames from program implementation to improved health outcomes vary. For example, the impact of antenatal care, immunisation and health check initiatives can be seen fairly quickly after program implementation (for example, recent data show increases in immunisation rates and health checks for Indigenous children following the first year of funding of relevant COAG health initiatives). However, it may take several years to see the impact of population health initiatives on reductions in risk factors and child health outcomes. There is also a time lag between when improvements occur and when data are available to measure those changes.

Given these timing issues, 2014 is the earliest year that data are expected to be available to measure initial changes in Indigenous child mortality resulting from the COAG maternal and child health initiatives, and the full effect of these initiatives may not be evident for a number of years to come.

1 Introduction

In 2008, the Council of Australian Governments (COAG) set 6 targets for reducing the gap between Indigenous and non-Indigenous Australians in the areas of health, education and employment (see Appendix A). Recognising the fact that Indigenous babies and young children had higher death rates than their non-Indigenous counterparts, 1 of the 6 targets was to halve the gap in child mortality (deaths of children under the age of 5) within a decade (by 2018).

To achieve this target, the policy focus has been on improving and expanding access to antenatal, maternal and child health services. State, territory and Commonwealth governments allocated significant funding to improve maternal and child health services for Indigenous families, including New Directions: Mothers and Babies Services, the National Partnership Agreement (NPA) on Closing the Gap in Indigenous Health Outcomes and the Indigenous Early Childhood Development (IECD) NPA (COAG 2008). In addition to improving access to antenatal, maternal and child health services, one of the aims of the IECD NPA was to improve pre-pregnancy and teenage sexual and reproductive health.

When the COAG target was set in 2008, the baseline child mortality rates were 212.5 and 100.6 per 100,000 population for the Indigenous and non-Indigenous populations respectively and the gap was 111.9 deaths per 100,000 population. If the non-Indigenous child mortality rates continue to follow the same trend as between 1998 and 2008, the expected non-Indigenous child mortality rate would be 87.4 per 100,000 in 2018. Thus, for the COAG target to be reached, the mortality rate for Indigenous children under 5 would need to fall by 33%, to around 143 deaths per 100,000 in 2018, and the gap will need to be reduced to 56 deaths per 100,000 population by 2018 (Table 1.1) (CRC 2013). This equates to an average reduction of 2 Indigenous child deaths per year, over the decade, to reach the target (that is, a reduction from 125 Indigenous child deaths in 2008 to 109 Indigenous child deaths in 2018).

Table 1.1: Baseline, COAG target and projections on child mortality of Indigenous and non-Indigenous children (aged 0–4 years)

	Baseline in 2008 ^(a)	COAG Target in 2018
	Mortality rate (per 100,000 children aged 0–4)	Target mortality rate (per 100,000 children aged 0–4)
Indigenous	212.5	143.4
Non-Indigenous ^(b)	100.6	87.4
Gap (Rate difference)	111.9	56.0

(a) Note that the 2008 baseline and target mortality rates were updated in 2012 following the revision of WA mortality data. These updated rates are presented in this report

(b) The non-Indigenous target mortality rate was determined based on the assumption that historical trends in non-Indigenous child mortality observed over the period 1998 to 2008 will continue to 2018.

Source: AIHW analysis of National Mortality Database; CRC 2013 – Statistical Supplement Table Additional.8.

It has now been 5 years since the Closing the Gap targets were set and it is important to examine whether rates are on track to meet the child mortality target. Doing so requires an understanding of several key elements:

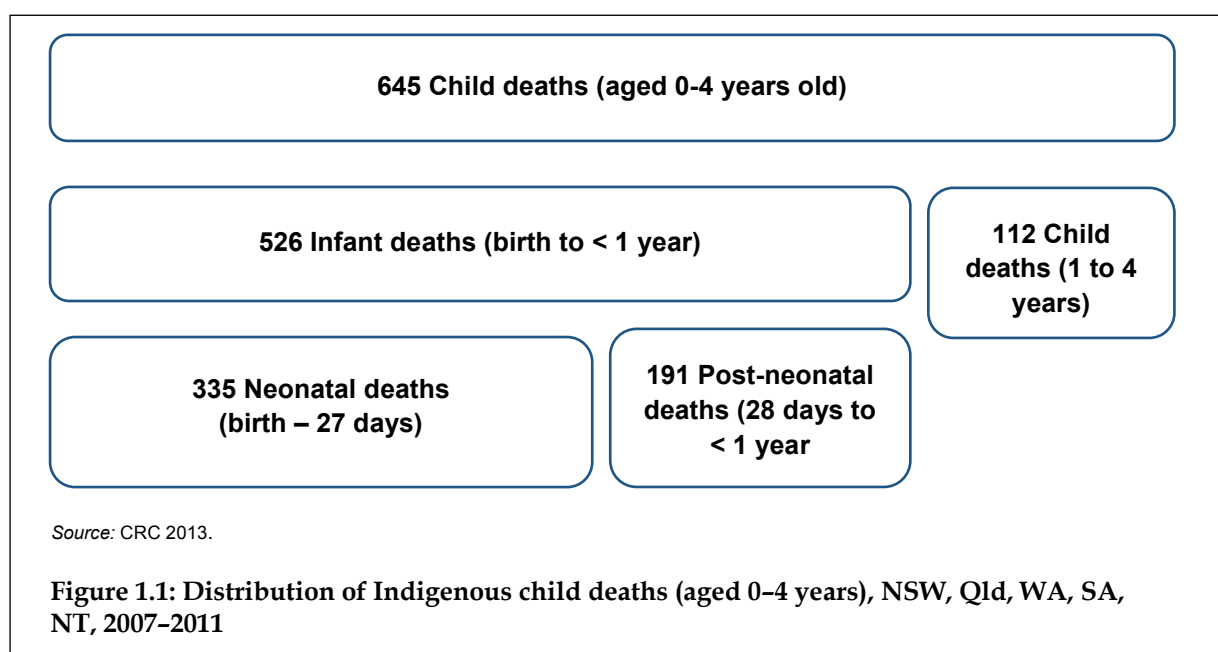
- the determinants of infant and child mortality

- which of these determinants are most responsible for the ‘gap’ between Indigenous and non-Indigenous child mortality
- which risk factors are amenable to policy intervention and the potential size and effectiveness of interventions
- time lags between program implementation, reduction in risk factors, improvements in infant and child mortality rates and the ability to measure whether and where ‘real’ changes have occurred (that is, changes not resulting from improvements in data quality).

The first of these elements is addressed below, while chapters 2, 3 and 4 address the others.

Determinants of infant and child mortality

For the purpose of this report and the COAG target, child deaths are defined as deaths to children under 5 (up to and including, the day before their fifth birthday). However, it is important to note that these deaths are not distributed evenly across children’s first 4 years of life. As shown in Figure 1.1, the majority (83%) of deaths of Indigenous children occur in infancy (before the child’s first birthday) and 73% of those infant deaths occur in the first month. Thus, any discussion of child mortality needs to separate out infant deaths from those of children aged 1–4 years.



The factors underpinning infant and child mortality are complex. Estimating the potential impact of program/policy interventions and the time lags before their impact might be felt requires an understanding of these factors and how they differ for infant and child deaths. Figure 1.2 provides an overview of the key determinants of birth outcomes/infant health and the risk of infant and child death (a literature review on the risk factors is included as Appendix B).

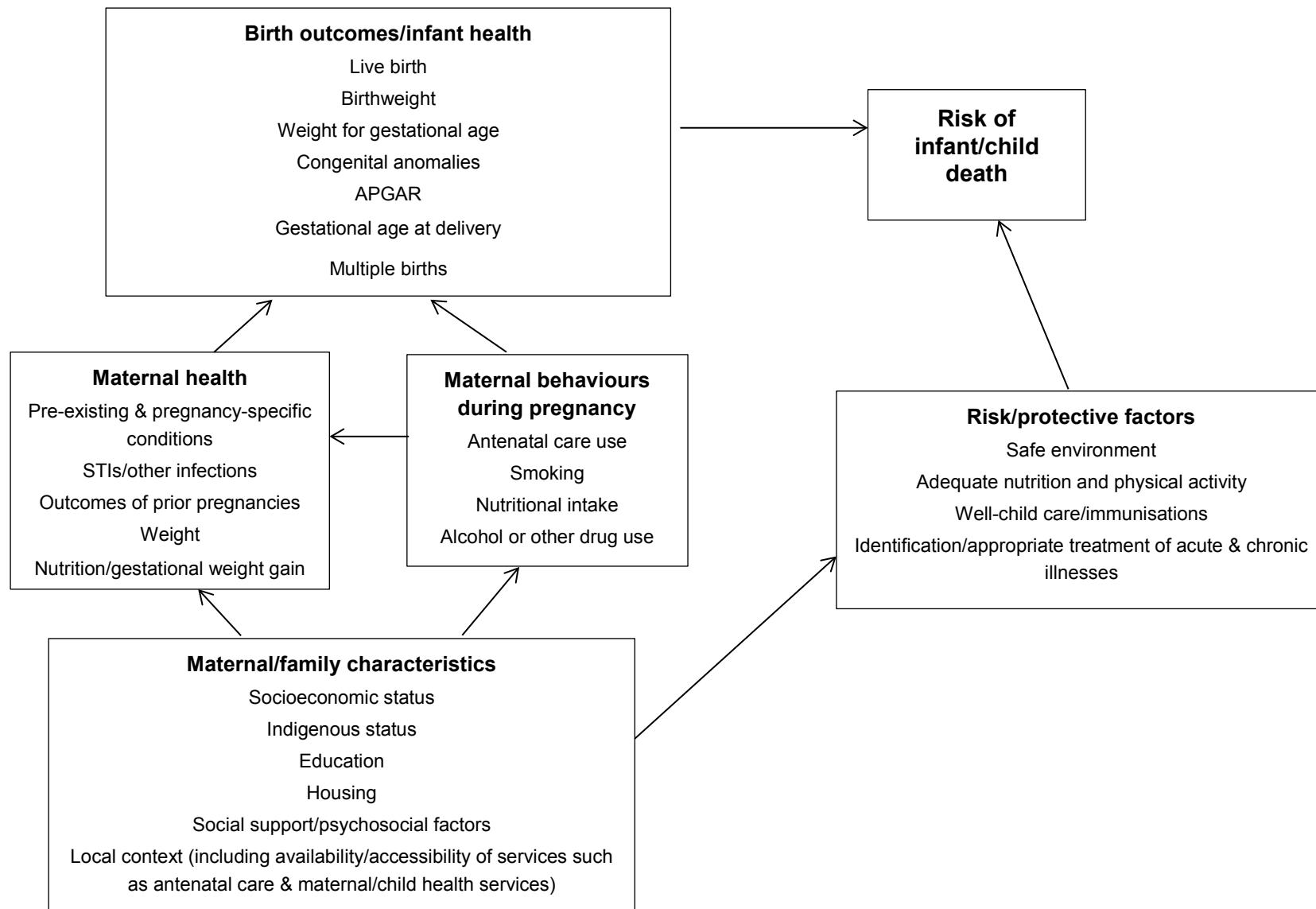


Figure 1.2: Determinants of infant and child mortality

Factors affecting birth outcomes

The likelihood that a child is born healthy is related to maternal characteristics such as age, education, income, residence, Indigenous status and psychosocial factors (Donoghue et al. 2013). Except for maternal age, however, which may have a physiological effect on infant health and development during pregnancy, these characteristics do not have a direct effect on infant health, but operate through other factors such as maternal health and behaviours during pregnancy. Maternal health factors which have been linked to birth outcomes and infant mortality include pre-pregnancy weight, diabetes and pregnancy-induced hypertension. For example, Yao et al. (2014) found a significant association between maternal obesity and the risk of stillbirth.

At a population level, Indigenous women and women with lower socioeconomic status have poorer health, are less likely to attend antenatal care early, are more likely to smoke and may have poorer nutritional intake. Some of the impact of these social determinants can be reduced through culturally appropriate and comprehensive antenatal care, however.

Smoking

For example, one of the strongest risk factors for poor birth outcomes and subsequent infant mortality and child mortality is smoking. Maternal smoking during pregnancy has been linked with intrauterine growth retardation (IUGR), poor lung development, stillbirth, pre-term delivery and placenta abruption. AIHW multivariate analyses of perinatal data for the period 2006–08 have shown that one-third of all low birthweight babies born to Aboriginal and Torres Strait Islander mothers and 13% of all low birthweight babies born to other Australian mothers can be attributed to smoking during pregnancy (AHMAC 2012).

Evidence suggests that maternal exposure to second hand smoke reduces birthweight as well. IUGR and low birthweight can increase the risk of poor perinatal outcomes such as necrotizing enterocolitis and respiratory distress syndrome and have long term effects such as increased risks for short stature, cognitive delay, cerebral palsy and poor cardiovascular health (Reeves & Bernstein 2008). Babies born to mothers who smoke during and after pregnancy are also more likely to die from sudden infant death syndrome (SIDS).

Recognising that Indigenous mothers have much higher rates of smoking during pregnancy (around 50% compared with 12% for non-Indigenous mothers), antenatal care services which not only ask about smoking in sensitive ways but offer culturally appropriate assistance in reducing tobacco intake can have a positive impact on infant health and infant and child mortality.

Protective factors

Once a child is born, there are a number of key determinants that help predict whether they will remain healthy. Protective factors for infant and child mortality include:

- living in a safe environment (smoke-free; low risk of injury/accident/violence; adequate housing)
- risk reduction strategies (for example, safe sleeping environment to reduce the risk of SIDS; age-appropriate child restraints in cars)
- adequate nutrition (breastfeeding, provision of healthy and age-appropriate foods)
- well-child care (immunisations, developmental checks)
- early identification and management/treatment of acute illnesses
- optimal management of chronic and ongoing illnesses.

These determinants are affected by parents' characteristics, their knowledge and capacities for being able to provide these environments and the availability of health and early intervention services. Population health initiatives, health promotion (for example, the 'back to sleep campaign' for SIDS; injury-prevention campaigns) and increased safety regulations (for example, mandatory child restraints for children up to age 7) may also have an effect.

Figure 1.2 shows that ensuring that children are born and remain healthy can be assisted by interventions and supports in numerous areas, from pregnancy through to early childhood. When measuring progress towards the overall target of reducing the gap in childhood mortality, it is important to clearly specify the outcome of interest, the actual ways in which the particular policy or intervention is expected to make a difference (the mechanism), the population being targeted and the short-term process indicators that directly measure whether the policy inputs are achieving their goals. While there are a number of important programs which also achieve the broader goals of improving children's overall wellbeing and development (for example, Lidell et al. 2011), this paper focuses on direct health outcomes.

Risk factors for infant and child mortality, the intermediate or process indicators that they affect and the associated types of mortality on which these factors have an impact are presented in Table 1.2.

Table 1.2: Risk factors for child mortality, areas of impact and associated mortality

Risk factor	Areas of impact	Associated types of mortality
Health service access		
Inadequate antenatal care	Maternal behaviours (for example, smoking during pregnancy); low birthweight; poor birth outcomes	Stillbirth; perinatal mortality; infant mortality; child mortality
Maternal factors		
Maternal nutrition	Low birthweight	Perinatal mortality
Maternal health (pre-pregnancy weight; diabetes; pregnancy-induced hypertension)	Low birthweight	Stillbirth; perinatal mortality
Maternal STIs	Pre-term birth, complications during pregnancy, transfer of viral STIs to baby	Stillbirth
Smoking during pregnancy	Pre-term birth; low birthweight; pre-term labour; ectopic pregnancy; miscarriage; congenital disorders; increased risk of cleft lip and cleft palate; retarded growth and development; childhood health problems such as asthma and obesity	SIDS; fetal death; perinatal mortality
Alcohol use during pregnancy	Low birthweight; FASD; heart defects; intellectual disability	Fetal death; infant mortality
Drug use during pregnancy	Low birthweight; birth defects	Fetal death; infant mortality
Maternal age (teenage and older mothers)	Low birthweight; pre-term birth; perinatal complications; acute lymphoblastic leukaemia; inadequate antenatal care (younger mothers)	Fetal, neonatal, perinatal mortality; infant mortality
Socioeconomic status	Maternal health; behaviours during pregnancy; pre-term birth	Infant mortality
Remoteness	Maternal health; access to health services; availability of nutritious food	Perinatal and infant mortality
Birth outcomes		
Low birthweight (note that lbw may be a result of fetal growth restriction, pre-term delivery or both)	Vulnerability to infections, pulmonary and gastrointestinal diseases	SIDS; stillbirth; perinatal mortality; infant mortality; child mortality (infectious diseases, congenital malformations)
Pre-term birth	Complications relating to immature organ development, such as lung and respiratory conditions.	Perinatal mortality
Post-birth behavioural factors		
Breastfeeding	Diarrhoea, infections and allergies Growth, development and health of infants and young children (e.g. malnutrition)	Infant mortality, diarrhoea mortality
Immunisation	Vaccine-preventable conditions	Infant and child mortality from vaccine-preventable conditions
Child safety	Intentional and unintentional injuries (for example, drowning, transport-related injuries, poisonings)	Infant and child mortality

Source: AIHW literature review (Appendix B).

Figure 1.2 and Table 1.2 provide a link between risk factors and opportunities for interventions/programs designed to improve infant and child health and reduce infant and child mortality and measurable outcomes. For example, if programs are aimed at improving immunisations in areas with currently low rates, or there is the introduction of a new vaccine (for example, for rotavirus), we would expect to see an increase in immunisation rates, a decrease in vaccine-preventable conditions and a subsequent decrease in infant and child mortality from vaccine-preventable conditions.

The rest of this report expands upon this information. Chapter 2 presents data on infant and child mortality trends and causes of death, while Chapter 3 focuses on risk-factor prevalence and interventions designed to improve maternal and child health. Chapter 4 discusses the time lags between program implementation, change in risk factors and measurable change in outcomes and assesses whether rates are currently on track to meet the COAG target.

2 Infant and child mortality

This chapter presents data on infant and child mortality by Indigenous status, including trends over time and causes of death.

Box 1: Mortality data sources and data quality

Deaths data are provided to the AIHW by the registries of births, deaths and marriages and the National Coronial Information System and coded by the ABS. The data are maintained by the AIHW in the National Mortality Database.

Deaths are classified according to the International Classifications of Diseases, 10th revision (ICD-10).

From 2001 onwards, information on Indigenous deaths is reported for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory combined. Other jurisdictions have a small number of Indigenous deaths and identification of Indigenous deaths in their death registration systems is poor, making the data less reliable.

Data for 2010 have been adjusted for the additional deaths arising from additional registrations of deaths in Queensland in 2010. For more details please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS 2012).

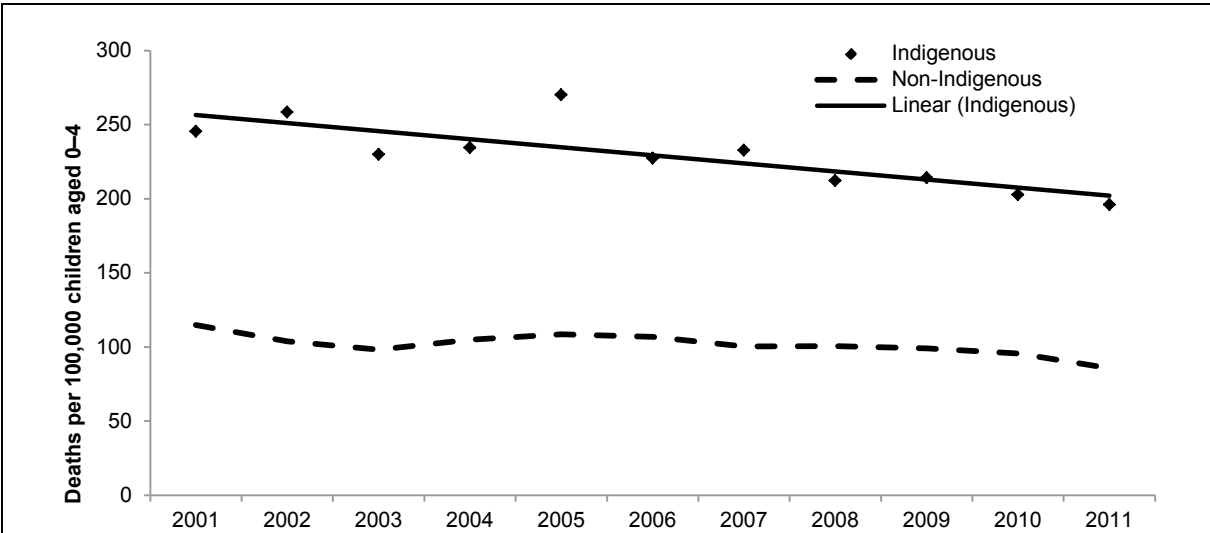
It is important to note that trend data may be affected by improvements in Indigenous identification in mortality data over time. Trend data may also be affected by increases in the estimated Aboriginal and Torres Strait Islander population over time, which are partly due to an increased propensity to identify as Aboriginal and/or Torres Strait Islander in the Census.

Trends in Indigenous child mortality

Available data suggest that Indigenous child mortality rates have fallen over the past decade. Indigenous child under-5 mortality rates declined by 22% between 2001 and 2011 in New South Wales, Queensland, Western Australia, South Australia and the Northern Territory (from 246 deaths to 196 deaths per 100,000 population) (Figure 2.1).

Child under-5 mortality rates for the non-Indigenous population have also shown declines (15% between 2001 and 2011), but these declines were not as great as for the Indigenous population, resulting in a significant reduction in the gap between Indigenous and non-Indigenous child mortality rates over this period.

It should also be noted that the population data used in calculating these rates are Indigenous population projections based on the 2006 Census. At the time of writing this report, revised Indigenous population estimates and projections based on the 2011 Census going back to 2001 (released by the ABS on 30 April 2014) were not available.

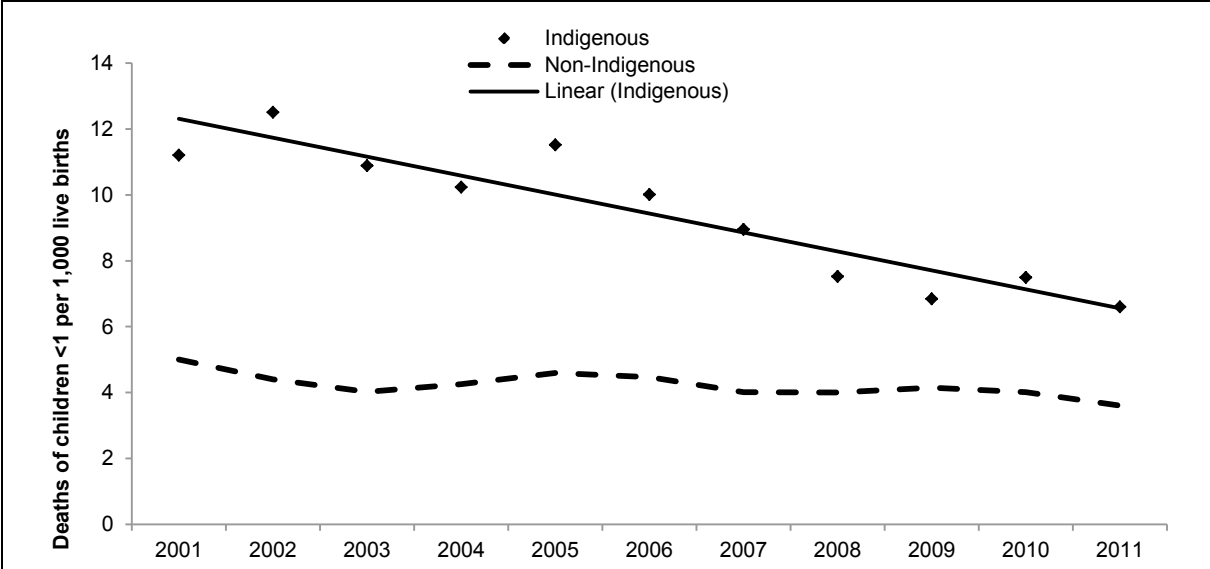


Source: AIHW analysis of National Mortality Database.

Figure 2.1: Mortality rates for children aged 0-4, by Indigenous status, NSW, Qld, WA, SA, NT, 2001-2011

As discussed previously, however, child mortality is made up of two separate components: infant mortality (deaths of children aged under 1 year) and early-childhood mortality (deaths of children aged 1-4). As shown in Figure 1.1, of the 638 Indigenous children under 5 who died between 2007-2011, 526 were infants.

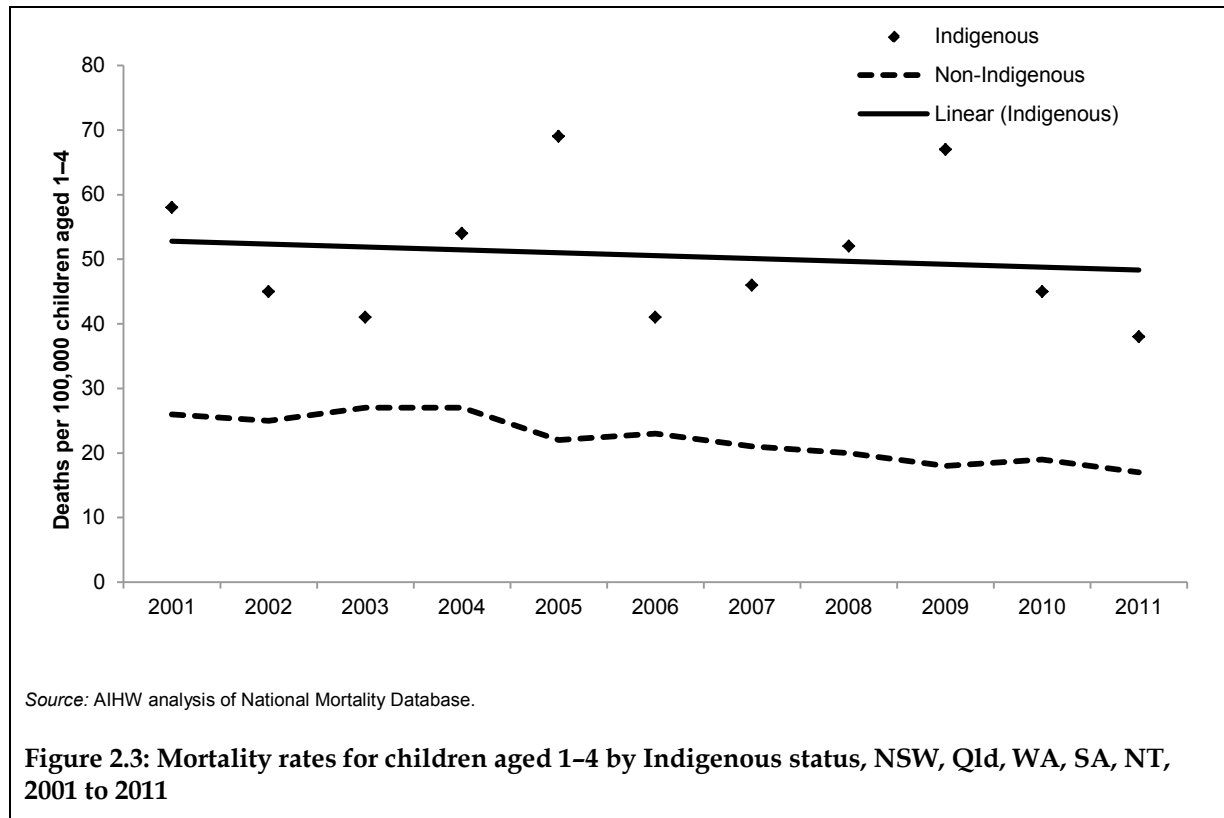
The fall in the Indigenous child under-5 mortality rate and the decrease in the gap between Indigenous and non-Indigenous rates have largely been due to a fall in the Indigenous infant mortality rate. Between 2001 and 2011, the Indigenous infant mortality rate declined by 51% in the 5 jurisdictions combined (Figure 2.2).



Source: AIHW analysis of National Mortality Database; CRC 2013.

Figure 2.2: Infant mortality rates by Indigenous status, NSW, Qld, WA, SA, NT, 2001 to 2011

Figure 2.3 presents trends in child mortality rates (for children aged 1–4) over the same period. Given the small number of deaths to Indigenous children, there are wide yearly fluctuations in Indigenous child mortality rates; therefore, a linear trend line is also included in the figure. When the linear trend for Indigenous children is compared to non-Indigenous rates, the gap is slightly greater at the end of the period than at the beginning (due to a decrease in non-Indigenous child mortality rates).



Overall, these data show that under-5 child mortality rates were declining before the COAG targets were set in 2008 and these declines have been driven by reductions in infant mortality rates.

The next section addresses 2 issues:

- What are the current causes of death patterns for Indigenous and non-Indigenous children, where are the gaps and where are there opportunities for further reductions?
- Have mortality rates declined across the board, or have there been declines in specific causes of death?

Causes of death

Two of the key policy issues in the area of infant and child mortality are the influence of particular causes of death on the Indigenous/non-Indigenous mortality gap and the extent to which the deaths which have occurred may have been preventable.

Infant mortality

Data from 2007–2011 on the distribution of causes of deaths of infants in the 5 jurisdictions with adequate levels of Indigenous identification are presented in Table 2.1.

Table 2.1: Causes of death among infants (< 1 year), by Indigenous status, NSW, Qld, WA, SA, NT, 2007–2011

ICD-10 cause of death codes	Number of deaths		Proportion of deaths	
	Indigenous	Non-Indigenous	Indigenous	Non-Indigenous
Certain conditions originating in the perinatal period (P00–P96)	268	1,928	51.0	49.6
Congenital malformations (Q00–Q99)	82	1,035	15.6	26.6
Signs, symptoms & ill-defined conditions (R00–R99)	80	383	15.2	9.8
<i>SIDS (R95)</i>	35	260	6.7	6.7
Diseases of the respiratory system (J00–J99)	20	82	3.8	2.1
External causes of morbidity and mortality (V01–Y98)	17	99	3.2	2.5
Infectious and parasitic diseases (A00–B99)	17	49	3.2	1.3
Diseases of the circulatory system (I00–I99)	14	70	2.7	1.8
Other causes	28	244	5.3	6.3
All causes	526	3,890	100.0	100.0

Note: Cause-of-death data for 2010 and 2011 are revised and preliminary, respectively, and subject to revision by the ABS.

Source: SCRGSP (forthcoming).

Approximately half of the deaths of both Indigenous and non-Indigenous infants were due to conditions arising in the perinatal period (that is, those conditions that originate during pregnancy and delivery, although death may occur later in the child's life).

Examples of conditions arising in the perinatal period include:

- **maternal factors and complications of pregnancy, labour and delivery** (for example, pre-existing maternal hypertensive disorder, premature rupture of membranes, placenta previa, complications with the umbilical cord, complications of labour and delivery)
- **disorders related to length of gestation and fetal growth** (for example, slow fetal growth/small for gestational age, extremely low and low birthweight, pre-term delivery, long gestation, high birthweight)
- **respiratory and cardiovascular disorders specific to the perinatal period** (for example, intrauterine or birth asphyxia; respiratory distress; congenital pneumonia; cardiovascular disorders originating in the perinatal period [but not congenital malformations of the circulatory system])
- **infections specific to the perinatal period** (for example, congenital rubella; bacterial sepsis of the newborn).

Congenital malformations, deformations and chromosomal abnormalities were the next most common cause of death for both Indigenous (15.6%) and non-Indigenous infants (26.6%), followed by 'signs, symptoms and ill-defined conditions' (which includes conditions where the cause of the problem is unknown, such as SIDS), accounting for 15.2% of deaths of Indigenous infants and 9.8% of deaths of non-Indigenous infants. SIDS on its own was the cause of 6.7% of both Indigenous and non-Indigenous infant deaths.

In recent years attention has also been focused on sudden unexpected deaths in infancy (SUDI). 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 2013a; Spencer & Logan 2004).

The percentage of deaths due to external causes (such as injury and poisoning) were higher for Indigenous than for non-Indigenous infants, but still made up only a small percentage of infant deaths overall: 3.2% of Indigenous infant deaths and 2.5% of non-Indigenous infant deaths.

Cause-specific infant mortality rates are presented in Table 2.2. The patterns echo those from Table 2.1, with the highest infant mortality rates for conditions originating in the perinatal period, congenital malformations and for 'signs, symptoms and ill-defined conditions'.

Table 2.2: Infant mortality rates, rate ratios and rate differences by Indigenous status and cause of death, NSW, Qld, WA, SA, NT, 2007–2011

	Deaths per 1,000 live births				
	Indigenous	Non-Indigenous	Rate Ratio	Rate difference	% Rate difference
Certain conditions originating in the perinatal period (P00–P96)	3.8	1.9	1.9*	1.8*	51.4
Congenital malformations (Q00–Q99)	1.2	1.0	1.1	0.1	2.9
Signs, symptoms & ill-defined conditions (R00–R99)	1.1	0.4	2.9*	0.7*	20.0
<i>SIDS (R95)</i>	0.5	0.3	1.9	0.2	5.7
Diseases of the respiratory system (J00–J99)	0.3	0.1	3.4*	0.2*	5.7
External causes of morbidity and mortality (V01–Y98)	0.2	0.1	2.4*	0.1*	2.9
Infectious and parasitic diseases (A00–B99)	0.2	—	4.8*	0.2*	5.7
Diseases of the circulatory system (I00–I99)	0.2	0.1	2.8	0.1	2.9
Other causes	0.4	0.2	1.6*	0.1*	2.9
All causes	7.4	3.9	1.9*	3.5*	100.0

* Statistically significant differences between mortality rates for Indigenous and non-Indigenous.

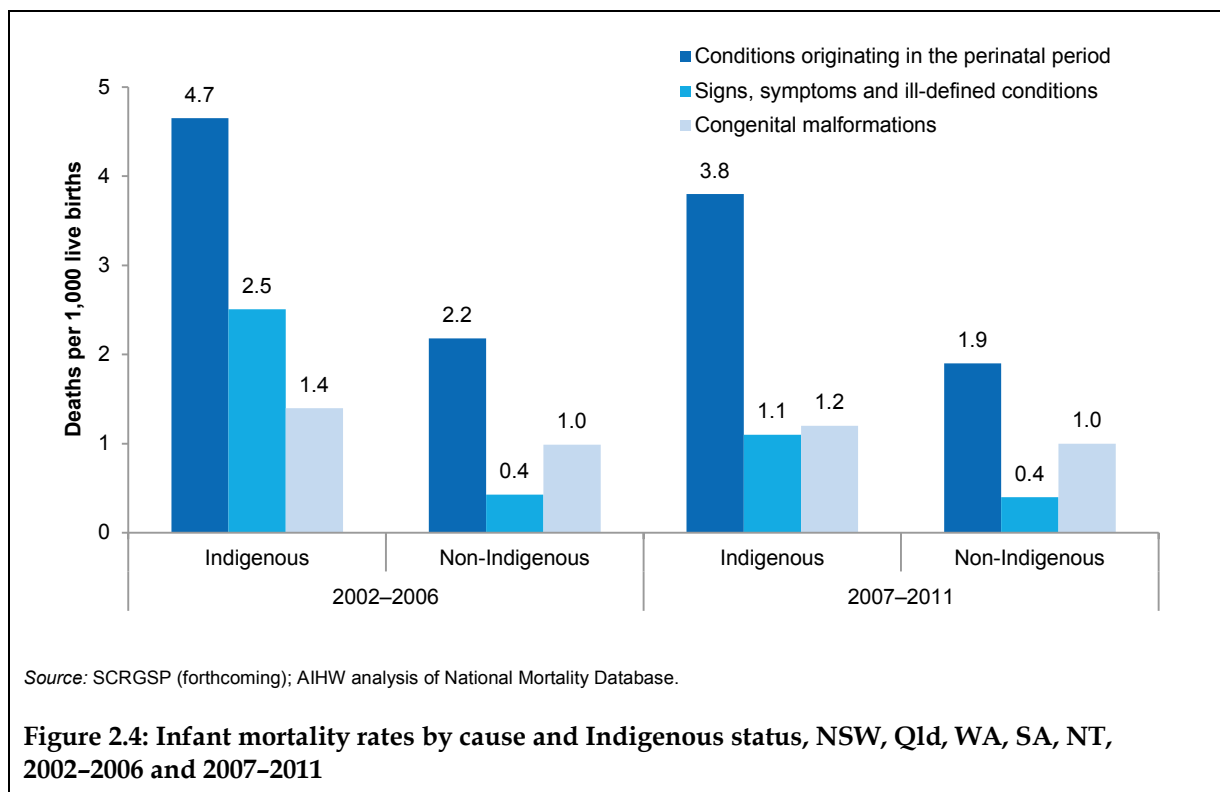
Note: Cause-of-death data for 2010 and 2011 are revised and preliminary, respectively, and subject to revision by the ABS.

Source: SCRGSP (forthcoming).

The rate ratios show that there is no statistically significant difference in mortality rates for congenital malformations between Indigenous and non-Indigenous infants. However, Indigenous mortality rates from conditions originating in the perinatal period are 1.9 times as high as the non-Indigenous rates and the rate for 'signs, symptoms and ill-defined conditions' is 2.9 times as high for Indigenous babies. Indigenous babies are also nearly twice as likely as non-Indigenous babies to die from SIDS.

Together, these three causes of death (conditions arising in the perinatal period; 'signs, symptoms and ill-defined conditions'; and congenital malformations) contribute around three-quarters of the gap (rate difference) between Indigenous and non-Indigenous infant mortality.

Figure 2.4 shows that, of these three causes, infant mortality rates from conditions arising in the perinatal period declined slightly between the two periods (from 4.7 to 3.8) for Indigenous infants, while the rates for 'signs, symptoms and ill-defined conditions' (which includes SIDS), more than halved, from 2.5 to 1.1 deaths per 1000 live births.



The percentage contribution of particular causes of death to the fall in infant mortality rates between 2002-2006 and 2007-2011 are presented in Table 2.3.

Table 2.3: Main causes of death contributing to the fall in Indigenous infant mortality rates, NSW, Qld, WA, SA, NT, 2002-06 and 2007-11

Causes of infant mortality	Deaths per 1,000 live births			% contribution to fall in infant mortality rate
	2002-06	2007-11	Reduction in rate	
Certain conditions originating in the perinatal period (P00-P96)	4.7	3.8	0.9	25.4
Signs, symptoms & ill-defined conditions (R00-R99)	2.5	1.1	1.4	41.9
<i>SIDS (R95)</i>	1.3	0.5	0.8	24.1
Diseases of the respiratory system (J00-J99)	0.7	0.3	0.4	12.7
Congenital malformations (Q00-Q99)	1.4	1.2	0.2	5.9
External causes of morbidity and mortality (V01-Y98)	0.6	0.2	0.4	10.8
Infectious and parasitic diseases (A00-B99)	0.3	0.2	0.1	1.6
Diseases of the circulatory system (I00-I99)	0.1	0.2	-0.1	-1.6
Other causes	0.5	0.4	0.1	3.2
Total	10.8	7.4	3.4	100

Note: Cause-of-death data for 2010 and 2011 are revised and preliminary, respectively, and subject to revision by the ABS.

Source: SCRGSP (forthcoming) and AIHW analysis of National Mortality Database.

The data show that 67.3% of the decline arose from two causes: significant falls in mortality due to 'signs, symptoms and ill-defined conditions' (of which SIDS is a sub-category), which contributed 41.9% of the decline and fall in mortality due to certain conditions arising in the

perinatal period, which contributed 25.4% of the decline. Declines in deaths from SIDS have been attributed to public health campaigns encouraging parents to reduce known risk factors (such as placing babies on their stomachs to sleep, overheating and exposure to tobacco smoke).

Any further falls in deaths from ‘signs, symptoms and ill-defined conditions’ will have a relatively small impact on the overall Indigenous infant mortality rate, however, as from 2007–2011 it accounted for only 15% of deaths of Indigenous infants.

Child mortality (in the age group 1–4)

Cause-of-death patterns vary significantly between infants and young children. While ‘external’ causes of death (for example, injury and poisoning) make up less than 5% of infant deaths, they account for more than half the deaths of Indigenous children aged 1–4 and nearly 40% of deaths of non-Indigenous children in that age group (Table 2.4).

There are also differences in the distribution of causes of death between Indigenous and non-Indigenous children aged 1–4. For example, 10% of deaths of non-Indigenous children aged 1–4 are due to congenital malformation, compared with 5% of deaths of Indigenous children.

Table 2.4: Number and proportion of deaths, by cause, among children aged 1–4 years by Indigenous status, NSW, Qld, WA, SA, NT, 2007–2011

Cause of death (ICD-10 Chapter level)	Number of deaths		Proportion of deaths	
	Indigenous	Non-Indigenous	Indigenous	Non-Indigenous
External causes of morbidity and mortality (V01–Y98)	60	261	53.6	37.6
Diseases of the respiratory system (J00–J99)	10	42	8.9	6.1
Diseases of the circulatory system (I00–I99)	10	30	8.9	4.3
Congenital malformations (Q00–Q99)	8	70	7.1	10.1
Diseases of the nervous system (G00–G99)	5	67	4.5	9.7
Signs, symptoms & ill-defined conditions (R00–R99)	4	31	3.6	4.5
Infectious and parasitic diseases (A00–B99)	4	33	3.6	4.8
Other causes	11	160	9.8	23.1
Total	112	694	100.0	100.0

Note: Cause-of-death data for 2010 and 2011 are revised and preliminary, respectively, and subject to revision by the ABS.

Source: AIHW analysis of National Mortality Database.

Child mortality rates, rate ratios and the percent of rate difference are presented in Table 2.5. The rate ratios for mortality rates show that Indigenous children are 5 times as likely as non-Indigenous children to die from diseases of the circulatory system (although the numbers are small) and almost 4 times as likely to die from diseases of the respiratory system and from external causes such as injuries or poisoning.

Table 2.5: Rates, rate ratios and rate differences, by causes of death, among children aged 1–4 years by Indigenous status, NSW, Qld, WA, SA, NT, 2007–2011

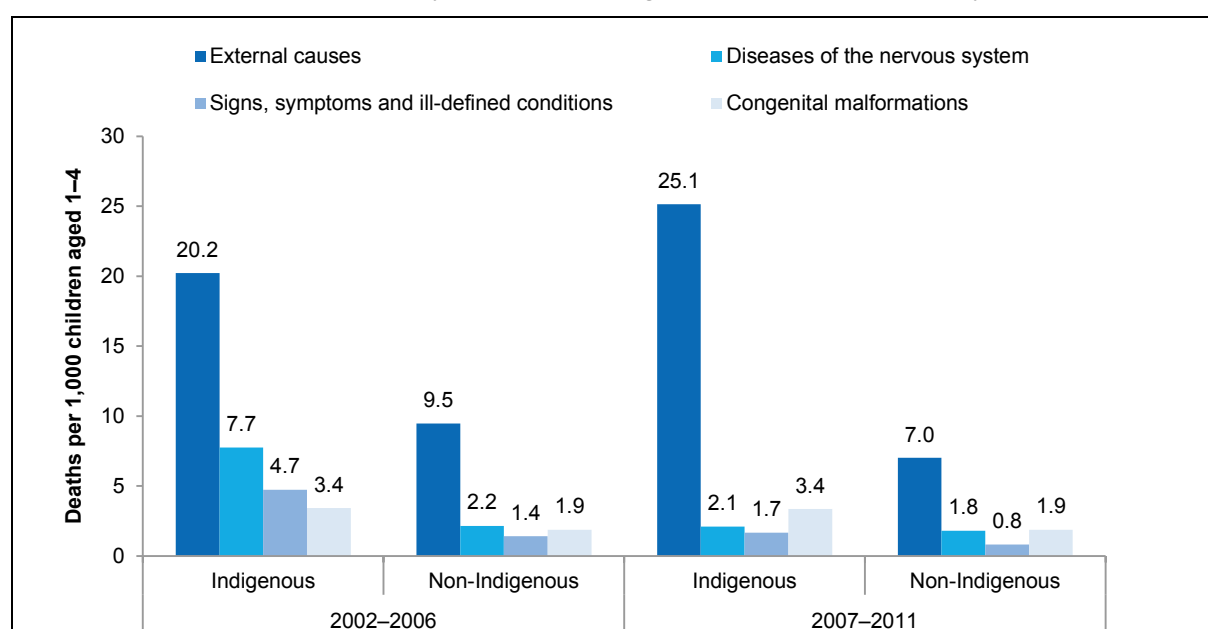
Cause of death (ICD-10 Chapter level)	No. deaths per 100,000		Gap		
	Indigenous	Non-Indigenous	Rate ratio	Rate difference	% of rate difference
External causes of morbidity and mortality (V01–Y98)	25.1	7.0	3.6*	18.1*	64.1
Diseases of the respiratory system (J00–J99)	4.2	1.1	3.7*	3.1*	10.8
Diseases of the circulatory system (I00–I99)	4.2	0.8	5.2*	3.4*	12.0
Congenital malformations (Q00–Q99)	3.4	1.9	1.8	1.5	5.2
Diseases of the nervous system (G00–G99)	2.1	1.8	1.2	0.3	1.0
Signs, symptoms & ill-defined conditions (R00–R99)	1.7	0.8	2.0	0.8	3.0
Infectious and parasitic diseases (A00–B99)	1.7	0.9	1.9	0.8	2.8
Other causes	4.6	4.3	1.1	0.3	1.1
Total	46.9	18.6	2.5*	28.3*	100.0

* Statistically significant differences between mortality rates for Indigenous and non-Indigenous.

Note: Cause-of-death data for 2010 and 2011 are revised and preliminary, respectively, and subject to revision by the ABS.

Source: AIHW analysis of National Mortality Database

Figure 2.5 shows that there was an increase in mortality rates from external causes for Indigenous children aged 1–4 years between 2002–2006 and 2007–2011. There were some declines in mortality rates for diseases of the nervous system and for ‘signs, symptoms and ill-defined conditions’, while mortality rates from congenital malformations stayed the same. For non-Indigenous children, mortality rates from external causes, diseases of the nervous system and ‘signs, symptoms and ill-defined conditions’ significantly declined between the two time periods, while mortality rates from congenital malformations stayed the same.



Source: AIHW analysis of National Mortality Database.

Figure 2.5: Child 1–4 mortality rates by cause and Indigenous status, NSW, Qld, WA, SA, NT, 2002–2006 and 2007–2011

Implications

This chapter has illustrated two key points which have implications for meeting the COAG target in 2018:

- **Infants** (0<1 year): Cause-of-death patterns show that the largest disparity in infant mortality between Indigenous and non-Indigenous infants is due to deaths from conditions arising in the perinatal period.
- **Young children** (1–4 years): Cause-of-death patterns show that while the highest mortality rates for both Indigenous and non-Indigenous children are due to external causes of death (for example, injuries and poisoning), the rates for Indigenous children are 3 times as high.

A number of the deaths of Indigenous children are defined as potentially avoidable, which includes those which were potentially preventable (for example, through reductions in smoking during pregnancy; vaccination; better road safety; pool safety measures) and those which were potentially treatable (for example, asthma; upper respiratory tract infections; some complications of labour and delivery). Reducing the incidence of these causes of death among Indigenous babies and young children thus has the potential to reduce the gap in under-5 child mortality.

Chapter 3 first presents information on population differences in the incidence of risk factors, and then turns to the programs/interventions aimed at improving Indigenous infant and child health and reducing infant and child mortality rates.

3 Interventions and programs aimed to reduce child mortality and its risk factors

There are two complementary approaches for improving maternal and child health. The first is to reduce the incidence/prevalence of the risk factors themselves, and the second is to mitigate the effects of the risk factors when they do exist. In order to reduce risk factors and improve the health of Indigenous mothers, babies and children, Commonwealth, state and territory governments have taken multi-faceted approaches.

Targeted programs and interventions have been funded in order to:

- improve antenatal care
- improve pre-pregnancy health
- improve teenage sexual/reproductive health
- increase access and use of maternal and child health services
- provide child health checks which include prevention of future illnesses (such as through immunisation and parental education) as well as the identification, appropriate management and follow-up of current health and developmental conditions.

Population-based policies have included:

- improving access to primary health care services
- smoking reduction/cessation campaigns and programs
- improving socioeconomic status for Indigenous Australians which is expected to have 'follow-on' effects for Indigenous health and wellbeing
- health promotion and regulatory approaches to injury prevention and improving child safety.

These policies are focused on the identified determinants of infant and child mortality and aim to reduce disparities in the risk factors. This chapter first presents data on risk factors, and then presents selected examples from a review of the literature to identify initiatives, interventions and programs that have resulted in improvements in health outcomes for mothers and/or babies. These include interventions in antenatal care settings; home visits; and population health approaches. Government and non-government interventions for Indigenous Australians, as well as international interventions targeting disadvantaged populations, were the focus of the literature review. A complete list of initiatives examined in this chapter, sorted by corresponding risk factor, can be found in Appendix C, Table A2.1.

The focus of this chapter is on the impact of the interventions on the known risk factors related to infant and child mortality as well as on perinatal and infant mortality itself. Chapter 4 will focus on the lags between program implementation and expected outcomes and on availability of data to measure change.

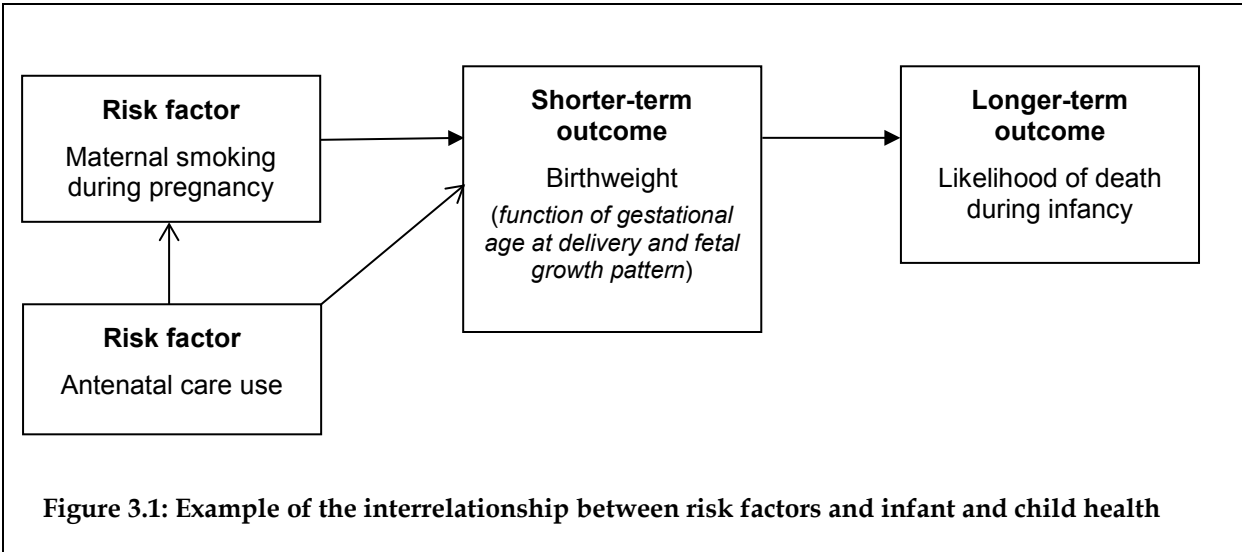
Risk factors

Before turning to interventions which have shown success in improving maternal, infant and child health, it is important to examine differences in risk factors. Chapter 2 demonstrated

the significantly higher rates of deaths of infants from causes arising in the perinatal period. Three of the key determinants of deaths from these causes include:

- inadequate antenatal care
- smoking during pregnancy
- low birthweight.

While each of these can be considered (and measured) as an independent risk factor, they also are interrelated. For example, as shown in Figure 3.1 below, one of the ways maternal smoking affects infant mortality is through birthweight, as women who smoke are more likely to have babies of lower birthweight. Low birthweight babies are more likely to die during the perinatal period and infancy and, as such, low birthweight has a measurable impact on child mortality. However, culturally appropriate, secure and comprehensive antenatal care, if used appropriately, can identify women who smoke and help them reduce their tobacco intake.



Interestingly, data show that Indigenous women who smoke during pregnancy are 1.5 times as likely to have a low birthweight baby compared with non-Indigenous women who smoke during pregnancy. Differences in tobacco consumption may be responsible for this difference, or smoking may be masking other variables which also affect birthweight. AIHW multivariate analyses of perinatal data for the period 2006–08 has shown that, after adjusting for age differences and all other factors (including pre-term delivery, socioeconomic status, remoteness and multiple births), 26% of all low birthweight babies born to Indigenous mothers were attributable to smoking during pregnancy, compared with 9% for other Australian mothers. If the smoking rate during pregnancy among Indigenous mothers fell to the level of other Australian mothers, after accounting for other factors, the proportion of Indigenous babies with low birthweight could be reduced by 19% (AIHW 2013a).

As shown earlier in Figure 1.2, however, the likelihood of smoking during pregnancy is not randomly distributed, but is related to maternal characteristics (including psychosocial factors); contextual factors; and access to services such as antenatal care and smoking cessation/reduction programs.

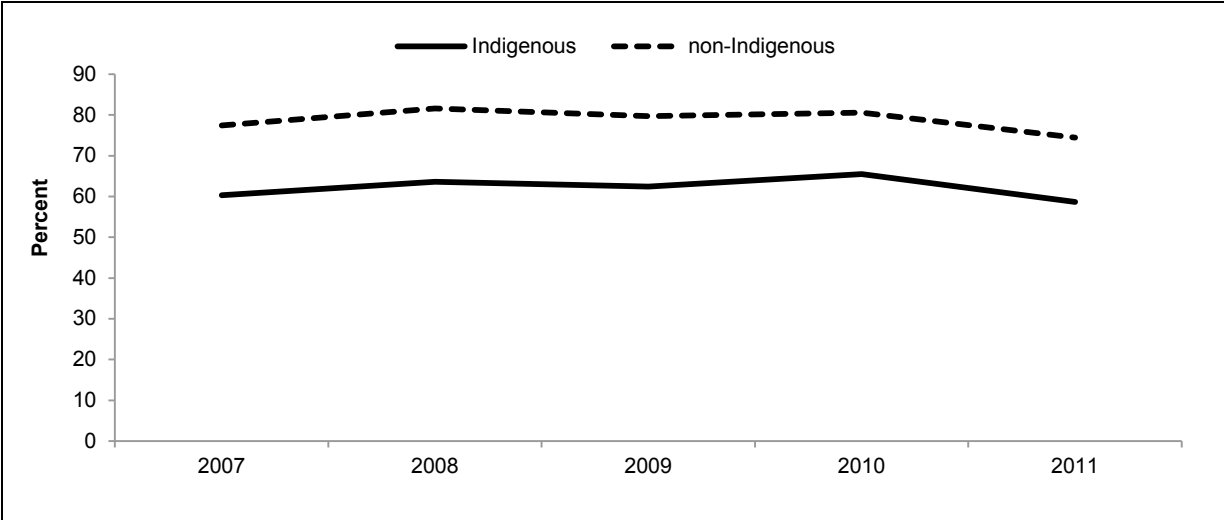
Available data indicates that there is a large disparity or gap between the incidence of risk factors between Indigenous and non-Indigenous mothers and babies. Indigenous mothers, for example, are more likely than non-Indigenous mothers to give birth to low birthweight and pre-term babies, to experience health conditions associated with adverse birth outcomes;

to have infrequent and later access to health services; and to have significantly higher teenage birth rates.

Long-term trend data are not available for many of these risk factors. For example, data on smoking during pregnancy are only available from 2005 onwards (with nationally consistent data only available from 1 July 2010); data on antenatal care are only available from 2007 onwards; data on alcohol use during pregnancy are only available for 2008; and data on breastfeeding is only collected every 6 years. Nationally consistent data on attendance at antenatal care in the first trimester (for example, by gestational age) only began to be collected on 1 July 2010 and were available for reporting in 2013 (for 2011 calendar year data). National level data on the number of antenatal visits were not collected until 1 July 2013 and will not be reported until 2016.

Antenatal care

Figure 3.2 shows that in New South Wales, South Australia and the Northern Territory between 2007 and 2011 there was essentially no change in the gap between the percentage of Indigenous mothers and non-Indigenous mothers who attended at least one antenatal care visit in the first trimester of their pregnancy. However, it should be noted that 2007 to 2011 is too short a time period to detect statistically significant change.



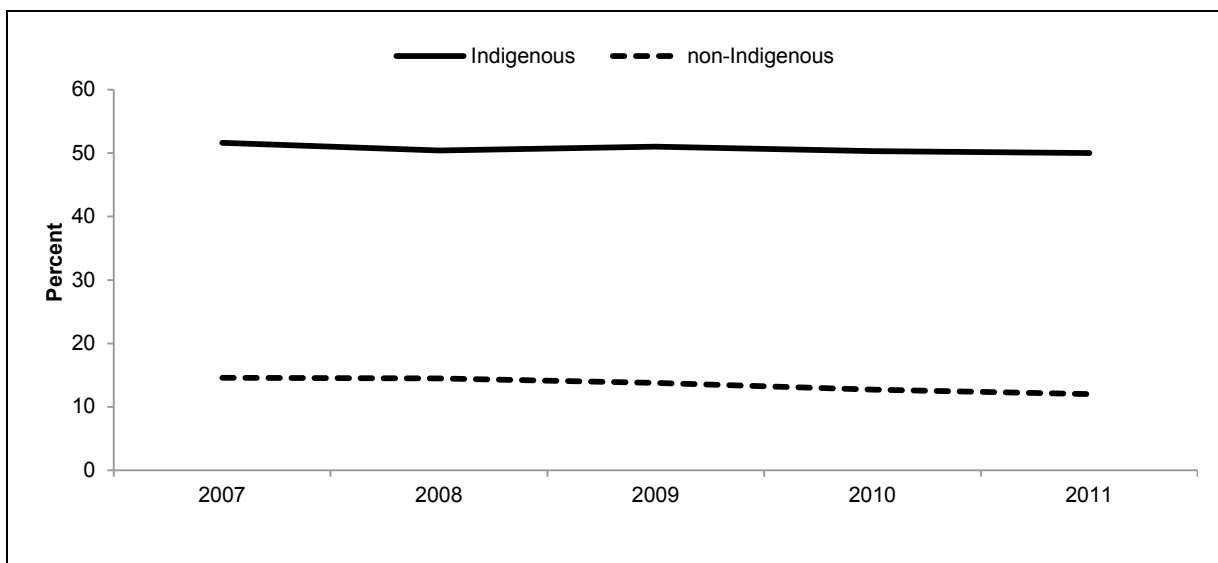
Source: AIHW analysis of National Perinatal Data Collection; SCRGSP (forthcoming).

Figure 3.2: Age-standardised percentage of mothers who gave birth who attended at least one antenatal visit in the first trimester, by Indigenous status of the mother, NSW, SA, NT, 2007-2011

Data are available from 1998 on the proportion of Indigenous mothers who attended at least one antenatal care session during pregnancy for New South Wales, Queensland and South Australia. These data show that there has been a significant increase in the proportion of Indigenous mothers attending at least one antenatal care visit during pregnancy since 1998 and that this rate is currently around 97% (AHMAC 2012). However, more of these antenatal care sessions need to occur during the first trimester if they are to have an impact on maternal health, behaviours and birth outcomes.

Smoking during pregnancy

Similarly, there was little change in the gap in the percentage of mothers who used tobacco during pregnancy between 2007 and 2011 (Figure 3.3).

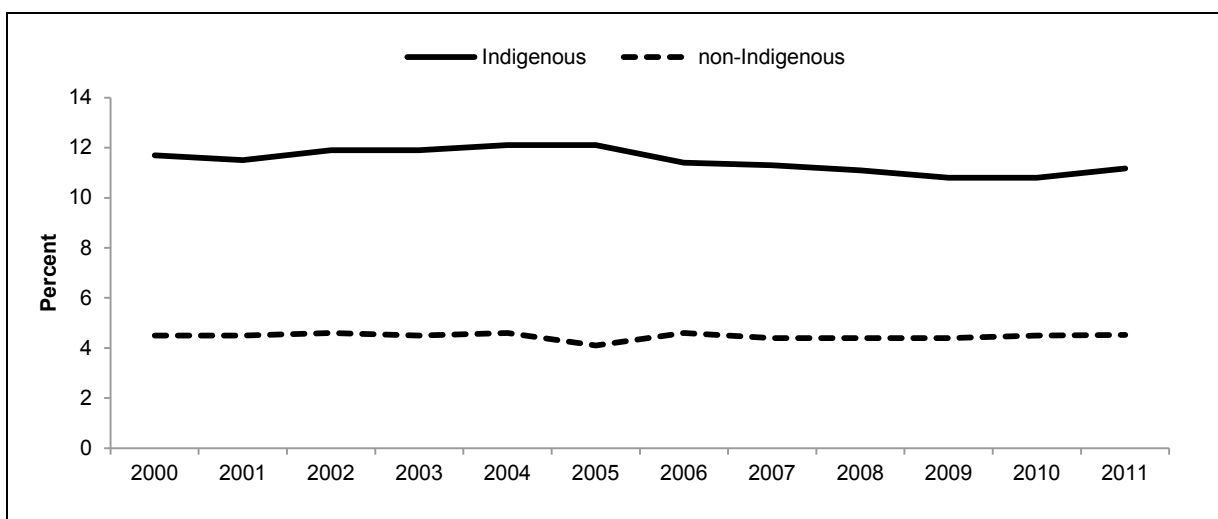


Source: AIHW analysis of National Perinatal Data Collection; SCRGSP (forthcoming).

Figure 3.3: Age-standardised percentage of mothers who smoked during pregnancy, by Indigenous status of the mother, NSW, Qld, WA, SA, Tas, ACT, NT, 2007-2011

Low birthweight

Longer-term trend data are available for low birthweight which has shown a small decline (9%) between 2001 and 2011 (Figure 3.4) in the overall rates as well as the gap between babies born to Indigenous and non-Indigenous mothers. It should be noted that these data are based on babies born to Indigenous mothers only and that there may be different health outcomes for all Indigenous babies, for which national data will be available for the year 2012 onwards.



Source: AIHW analysis of National Perinatal Data Collection; SCRGSP (forthcoming).

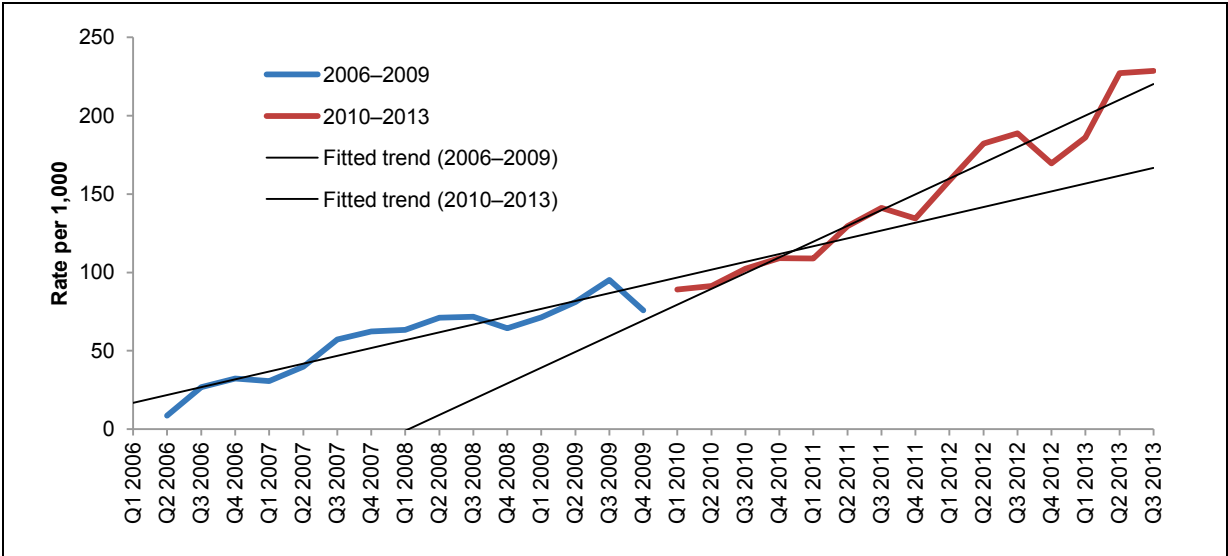
Figure 3.4: Percent of low birthweight babies (live-born singleton), by mother's Indigenous status of the mother, NSW, Vic, Qld, WA, SA, NT, 2000-2011

In summary, these data show that in 2011, Indigenous mothers were less likely to have an antenatal care visit in the first trimester of pregnancy; were 4 times as likely to smoke during

pregnancy and 2.5 times as likely to have a low birthweight baby. All of these risk factors are likely to be reflected in higher infant and child mortality rates for Indigenous children.

Before turning to the risk-factor specific programs and interventions, however, we present data on Indigenous child health checks. MBS-funded annual health checks for Indigenous children (aged 0–14) are an opportunity to identify any current health or developmental issues among Indigenous children and to provide appropriate follow-up services for treatment. They are also a chance for parental education/prevention activities to take place, and can be a chance for parents and children to be linked into other programs focused on developmental and educational outcomes.

The child health checks were initiated in May 2006, prior to the COAG initiatives. Figure 3.5 shows the rate per 1,000 population of MBS Health Assessments for Aboriginal and Torres Strait Islander People (MBS item 715) for children aged 0–14 for each quarter from 2006 to 2013. The average quarterly change in child health checks received per 1,000 population has been calculated for the period prior to the implementation of the COAG initiatives (2006–2009) and for the period after implementation (2010–2013). This indicates that there has been a significant increase in child health checks received during both periods and that this increase was greater for the later period (2010–2013).



Source: AIHW 2013a; AIHW analyses of MBS data.

Figure 3.5: Rates of Aboriginal and Torres Strait Islander Child Health Checks for 0–14 years (rate per 1,000), 2006–2013

It should be noted that the Indigenous health check (MBS item 715) is not a comprehensive representation of all clinical services provided to Aboriginal and Torres Strait Islander people. This is because there are situations where care equivalent or similar to an MBS health check is provided but not billed to Medicare as a 715 health check and some Indigenous children may receive an MBS Healthy Kids Check in addition to, or instead of, MBS item 715 (AIHW 2014a).

Data on national key performance indicators for Indigenous primary health care service providers showed that, on average, 26% of Indigenous children aged 0–4 had a health check during the reporting period ending in June 2013. However, these figures varied significantly: around one-quarter of these health care service providers had provided health assessments for almost 40% of their clients aged 0–4, while 25% had provided assessments for less than 10% of children. The data from Medicare Australia for the calendar year 2012 showed that,

nationally, only 22.5% of Indigenous children aged 0–14 had had health assessments (AIHW 2014b).

Summary of improvements by risk factor for Indigenous-specific programs

Table 3.1 below presents a summary of the findings from the literature review undertaken by the AIHW to identify Indigenous-specific programs which have recorded improvements in child mortality or its key risk factors. The percentage improvement (either an increase or reduction depending on the risk factor/health outcome) observed and the time frame over which the improvement was recorded, are presented in the table as well as the estimated time lag between the program's implementation and the first signs of improvement in the data. The data from the programs are compared with trends from national data, where available, to see if these provide a consistent picture. It should be noted that most of the programs highlighted below which have shown improvements in maternal and child health outcomes are relatively small in scale (that is, one Indigenous health service) and therefore are not likely to have much of an impact on the national data.

The purpose of this review was to highlight the range of programs which have had some success in improving risk factors related to infant and child mortality; variations in the size of those impacts; and the lag times between implementation and improvement – not to recommend one program over another. The reported extent of the improvements needs to be viewed in the context of the size of the individual programs; their funding structures, goals, the time lags; and the length of the interventions.

Taken as a whole, Table 3.1 highlights where programs have the potential to affect key risk factors and illustrate types of interventions which have worked in particular areas. Following the table, the discussion provides more details about individual programs and can be viewed as a starting point for targeting interventions with key risk factors or cause-of-death profiles (for example, areas where a higher-than-average proportion of deaths is due to injuries requires different intervention than those where higher death rates have resulted from perinatal conditions).

Table 3.1: Summary table of Indigenous-specific programs achieving improvements in child mortality and its key risk factors

Intervention/program	Scale of the program ^(a)	Published improvement in outcome ^(b)	Length of intervention	Time lag between implementation and first signs of improvement	What does national data show?
Increase the number of antenatal care visits					
Congress Alukura	Small	42%	10 years	6 years	3% increase over 11 year (1998 and 2009)
Increase the likelihood of attending antenatal care in first trimester					
Healthy for Life	Large	4%	3 years	2+ years	No significant change over 4 year period for which data are available
Aboriginal Maternal Infant Health Strategy	Medium	13%	2 years	2 years	
Congress Alukura	Small	15%	10 years	6 years	
Increase the number of antenatal clients					
Aboriginal Midwifery Access Program	Small	55%	2 years	< 1 year	N/A
Mt Isa Shared Antenatal Care	Small	60%	1 year	< 1 year	
Decrease alcohol use during pregnancy					
Healthy for Life	Large	2%	4 years	2+ years	National data on trends not available
Ord Valley Aboriginal Health Service FASD program	Small	14%	1 year	< 1 year	
Decrease smoking during pregnancy					
Healthy for Life	Large	1%	4 years	2+ years	No significant change over 4 year period for which data are available
Decrease incidence of low birthweight					
Healthy for Life	Large	2%	4 years	2+ years	7% decline over 9 years (2001 to 2009)
Aboriginal Maternal Infant Health Strategy	Small	1%	2 years	2 years	
Aboriginal Midwifery Access Program	Small	19%	2 years	< 1 year	
Strong Women, Strong Babies, Strong Culture	Small	8%	4 years	1–3 years	
Ngnampa Health Council	Small	6%	12 years	1–5 years	
Increase mean birthweight					
Healthy for Life	Large	116g	3 years	2+ years	N/A
Strong Women, Strong Babies, Strong Culture	Medium	171g	4 years	1–3 years	
Ngnampa Health Council	Small	103g	12 years	1–5 years	
Townsville Mums and Babies Program	Small	199g	3 years	1–3 years	
Congress Alukura	Small	100g	10 years	6 years	

(continued)

Table 3.1 (continued): Summary table of Indigenous-specific programs achieving improvements in child mortality and its key risk factors

Intervention/program	Scale of the program ^(a)	Published improvement in outcome ^(b)	Length of intervention	Time lag between implementation and first signs of improvement	What does national data show?
Decrease incidence of pre-term births					
Aboriginal Maternal Infant Health Strategy	Medium	9%	2 years	2 years	N/A
Townsville Mums and Babies Program	Small	8%	3 years	1–3 years	
Decrease perinatal mortality					
Aboriginal Maternal Infant Health Strategy	Medium	13.6 per 1000 reduction	2 years	2 years	6 per 1,000 reduction over 10 years (2001 to 2010)
Ngnampa Health Council	Small	36.6 per 1000 reduction	12 years	1–5 years	
Decrease infant mortality					
Cherbourg	Small	184	30 years	Unknown	3.7 per 1,000 reduction over 10 years (2001 to 2010)

(a) Large-scale programs are programs rolled out nationally; medium-scale programs are offered state-wide; and small-scale programs are locally-based programs within state programs.

(b) Sources of these published estimates for improvement can be found in tables 3.2, 3.3, 3.5.

Antenatal care

Antenatal care programs can have an impact not only on access to antenatal care and on quality of antenatal care, but also on maternal behaviours such as smoking and alcohol use during pregnancy, maternal nutrition and breastfeeding practices. This, in turn, can have an impact on low birthweight, pre-term birth and child mortality.

Australian initiatives for Indigenous mothers

The Australian Government has funded several initiatives which have resulted in improvements in antenatal care for Indigenous mothers and, consequently, improved health outcomes for their babies. Of these government-funded initiatives, two were national programs – New Directions: Mothers and Babies Services and the Healthy for Life program. Other state-wide initiatives were the NSW Aboriginal Maternal and Infant Health Service and the Aboriginal Midwifery Access Program run by an ACCHO (Aboriginal community-controlled health organisation) and partially funded through the New Directions program. These programs are discussed below.

The improvements that these services have made to birthweight and antenatal care are summarised in Table 4.3. This table also contains information on the timeframes over which these improvements were achieved from the time of program commencement, which ranged from between less than 1 year to 2 years. Key characteristics of these programs that may have played a role in their success, in terms of the improvements in child health outcomes shown, include flexible funding models; continuous quality assurance within services; qualified staff; and continuity of care.

New Directions: Mothers and Babies

This Australian Government program was introduced on 1 January 2008 and then subsumed within the NPA on Indigenous Early Childhood Development from November that year. Most of the Department of Health funding of \$90.3m has been provided directly to primary health-care services to expand access to and usage of, Indigenous maternal and child health services, particularly in high-needs areas (ANAO 2012). This funding was allocated for 4 years. A further \$133.8 million has been committed to maintain these services over a further 4 years from 2011–12.

The program provides services across 5 major areas: antenatal and postnatal care; standard information about baby care; practical advice and assistance with breastfeeding, nutrition and parenting; monitoring of developmental milestones, immunisation status and infections; health checks and referrals to treatment for Indigenous children before starting school.

Data from 2009–10 to 2011–12 indicate that there has been increased access to antenatal and postnatal care and to child health and development checks following the introduction of the program in 2008.

Healthy for Life (HfL)

Healthy for Life is an Australian Government program with a budget of \$103 million over 4 years (2007–08 to 2010–11) to improve the health of Aboriginal and Torres Strait Islander mothers, babies and children; to improve the early detection and management of chronic disease; and to reduce the incidence of adult chronic disease. Healthy for Life focuses on primary health-care services providing care to Aboriginal and Torres Strait Islander people. The program uses a quality improvement and population health approach to support the achievement of these objectives. It was established with a set of key objectives to improve the health of Aboriginal and Torres Strait Islander people, focusing on mothers, babies and children; early detection and management of chronic disease; and long-term health outcomes.

There have been improvements in outcomes across the services funded by Healthy for Life. The proportion of babies with normal birthweight rose from 80.0% to 84.2%, while babies with low birthweight dropped from 15.2% to 13.5% between 2008 and 2011 and average birthweight rose from 3,015 grams to 3,131 grams. Alcohol was consumed by 17.9% of women in the third trimester of pregnancy in 2011 – a drop from 21.4% in 2008. Among mothers, between 2008 and 2011 there was a very small drop (from 53.4% to 52.4%) in the proportion who smoked during the third trimester of pregnancy – an aspect where there is scope for considerable further improvement. Between 2008 and 2010, there was an increase from 43% to 47% in the number of women who attended antenatal care in the first trimester.

Improvements in maternal and child health outcomes were first evident within 1 year following the introduction of HfL services as part of Round 2 of the program roll-out.

Aboriginal Maternal and Infant Health Strategy

AMIHS is a government program introduced in New South Wales in 2001 with 7 programs (Murphy & Best 2012). Its objectives were to reduce the high rates of perinatal morbidity of Aboriginal babies and to improve the health of mothers during pregnancy. Midwives work alongside Aboriginal health workers providing expectant mothers with a 'high quality maternity service that is culturally sensitive, woman centred, based on primary health-care principles and provided in partnership with Aboriginal people'. Programs are designed in consultation with the local communities and are linked to both an ACCHO (a recent development) and to mainstream services. Transportation to enable women to access the

service is a key aspect. AMIHS staff are engaged in a comprehensive training and support program. In 2007, additional funding was provided to expand AMIHS from 7 programs, in the former 6 New South Wales Area Health Services, to over 30 programs with many more sites across New South Wales. A service-delivery model and workforce and recruitment strategy underpinned this expansion.

An evaluation of the AMIHS (the 7 original programs) was conducted in 2005 (Health NSW 2005) which found that the program had resulted in a 13 percentage point increase in the number of Aboriginal women having their first antenatal visit before 20 weeks of gestation. The percentage of pre-term births had dropped from 20% to 11% and a lower proportion of women reported smoking in the second half of pregnancy. These improvements in maternal and child health were evident from 2 years following introduction of the AMIHS.

Aboriginal Midwifery Access Program

The Aboriginal Midwifery Access Program (AMAP) was first established by Winnunga Nimmityjah Aboriginal Health Service in 2001 providing antenatal, birth-support and postnatal care to Indigenous clients within the Australian Capital Territory. The program offers culturally secure antenatal programs using a continuity of care model. This program has received funding through the New Directions: Mothers and Babies program detailed above.

From 2004 to 2008 the low birthweight rate was 18% and 187 women were clients (Wong et al. 2011). Between July and December 2010 and January and June 2012 there was a steep decline in the percentage of low birthweight babies, falling from 23% to 4% over this period (ACT Health 2012). Two articles that refer to this service (Wong et al. 2011; Adams & Tongs 2012) contain information that pre-dates the decline as do data for Healthy for Life.

While the program commenced in 2001, the sudden improvements in low birthweight recorded between July and December 2010 and January and June 2012, mentioned above, are likely to be the result of an attachment-based perinatal and infant mental health service which was introduced to complement the AMAP in early 2010 (just before the decline in low birthweight was recorded).

Table 3.2 highlights the long-term investment made by governments in improving access to antenatal care and that while the programs take different approaches, they have all led to significant improvements in access to maternal and child health services, with flow-on effects to improved health outcomes.

Table 3.2: Large-scale government-funded Indigenous-specific initiatives which have aimed to improve antenatal care

Initiative/program	Location	Key improvement(s)	Initiative/ program commenced	Duration of initiative/program	Time lag between implementation & improvement	Timeframe of improvement	Key enablers	Reference
New Directions: Mothers and Babies	National	Increased access to antenatal and postnatal care and to child health and development checks.	2008	4 years	1½ years	2009–10 to 2011–12	Flexible funding model enables responsive service-delivery models e.g. home visiting Qualified staff providing quality care	ANAO 2012; Advice from Health
Healthy for Life	National	Normal birthweight: increased from 80.0% to 84.2% Low birthweight: incidence declined from 15.2% to 13.5% Mean birthweight: increased by 116g+ (from 3,015g to 3,131g) Alcohol consumption during 3rd trimester: declined from 21.4% to 17.9% Maternal smoking: declined from 53.4% to 52.4% First antenatal visit before 13 weeks: increase from 301 to 413 women	Round 1: Dec 05 (27 sites) Round 2: Jun 06 (26 sites) Round 3: Mar 09 (12 sites)	Ongoing	1 year	2007–08 to 2010–11	Continuous quality improvement techniques Population health approach	HfL data; AIHW 2013b
Aboriginal Maternal and Infant Health Strategy	NSW	Low birthweight: incidence declined from 13% to 12% (not significant) Preterm births: declined from 20% to 11% Perinatal mortality rate: declined from 18.6 to 5.4 (per 1,000) (not significant) First antenatal visit before 20 weeks: increased 13 percentage points (65% to 78%)	2001	12 years (ongoing) The improvement was recorded for the 7 programs implemented in 2001 The program expanded to over 30 programs from 2007/2008	2 years	2003–2004	High-quality maternity service Culturally sensitive Woman-centred Provided in partnership with Aboriginal people, including transportation, training and support	Productivity Commission 2007 cited in Middleton et al. 2009; Murphy & Best 2012
Aboriginal Midwifery Access Program (AMAP)	ACT (urban)	Low birthweight: incidence declined from 23% to 4% Antenatal clients: increased from 27 to 42	2001 New service introduced in 2010	12 years (ongoing)	< 1 year	Jul–Dec 2010 to Jan–Jun 2012	Culturally secure midwifery using continuity of care	ACT Health 2012; Adams & Tongs 2012

Other Australian antenatal care initiatives

A large number of non-government antenatal care initiatives have been implemented in community-based settings which target Indigenous mothers and their babies. Many of these initiatives have common approaches and are delivered in contexts similar to those of the national government initiatives previously described.

Table 3.3 provides a summary of these initiatives and information on the timeframes in which these improvements were achieved from the time of program commencement. This varied by program, ranging from less than 1 year to 3 years. The programs which resulted in the fastest increases in access to antenatal care services and subsequent reductions in the incidence of low birthweight, were those that built upon already-existing services or infrastructure, such as programs implemented in community-based primary health care settings; and programs which adopted a culturally-sensitive approach involving Indigenous staff.

Table 3.3: Other initiatives which have aimed to improve antenatal care

Initiative/program	Location	Key improvement(s)	Initiative/ program commenced	Duration of initiative/ program	Time lag between implementation & improvement	Timeframe of improvements	Key enablers	Reference
Strong Women, Strong Babies, Strong Culture	NT (remote)	Low birthweight: incidence declined from 21% to 13% between 1990–91 and 1994–96. Mean birthweight: increased by 171g between 1990–91 and 1994–95. Increase in number of women accessing antenatal visits in first trimester	1993	Unknown	1–3 years.	1990–91 to 1994–95	Improvement in maternal BMI, use of traditional food and trained local workers	Mackerras 1998; Mackerras 2001; d'Espaignet et al. 2003
Nganampa Health Council	SA (remote)	Low birthweight: incidence declined by 6.1% (from 14% to 8%) Mean birthweight: increase of 103g (from 3,080g to 3,183g) Perinatal mortality rate: declined from 45.2 to 8.6 (per 1,000)	1985	28 years (ongoing)	1–5 years	1984–90 to 1991–1996	Use of standard protocols, midwives and female staff	Sloman et al. 1999
Townsville Mums and Babies Program	Qld (major regional, remote)	Mean birthweight: increase of 199g (from 3,045g to 3,244g) Pre-term births: declined from 16.9% to 8.7%	1999	14 years (ongoing)	1–3 years	2000 to 2003	Model of care incorporating 'completion of key clinical activities, together with the brief intervention for risk factors afforded by improved access to care'	Panaretto et al. 2005; Panaretto et al. 2007
Congress Alukura	NT (remote)	Mean birthweight: increase of 100g (from 3,168g to 3,268g – Alice Springs urban only) Antenatal client visits: increased by 42% First antenatal visit before 20 weeks gestation: increased from 23% to 38%	1987	26 years (ongoing)	6 years	1986–90 to 1996–99	Culturally secure, community initiated	Carter et al. 2004

(continued)

Table 3.3 (continued): Other initiatives which have aimed to improve antenatal care

Initiative/ program	Location	Key improvement(s)	Initiative/ program commenced	Duration of initiative/ program	Time lag between implementation & improvement	Timeframe of improvement	Key enablers	Reference
Koori Maternity Program	Vic (urban)	Median birthweight: increase of 55g (from 3,236g to 3,291g) Attendance at antenatal care: increased attendance	2000	13 years (ongoing)	2 years	2002–03 to 2004–05	Shared care; use of AHWs in clinical care; transport to services; antenatal & postnatal classes for mothers and partners	Fletcher 2007
Teenage antenatal clinics	Unknown	Pre-term births: odds ratio of preterm birth was 0.4 compared with teenagers attending general antenatal clinics.	Unknown	Unknown	Unknown	Unknown	Data gained from participants in 3 metropolitan hospital-based clinics. 33% of participants were Indigenous. No further details known.	Quinlivan & Evans 2004
Bourke	NSW (remote)	Infant mortality rate: more than halved	Unknown	Unknown	Unknown	1971 to 1984	Improved usage of health care; access to reticulated water; rise in living standards	Harris 1990 cited in Herceg 2005
Cherbourg	Qld (rural)	Infant mortality rate: declined from 200 to 16 (per 1,000)	Unknown	Unknown	Unknown	1956–60 to 1986–90	Increased health care; access to sewerage & reticulated water;; investigators being in community	Pratt 1992 cited in Herceg 2005; Powell & Dugdale 1999
Mt Isa Shared Antenatal Care	Qld (remote)	Attendance at antenatal care: women receiving no antenatal care declined from 10 women to 2 women.	2002	Unknown	< 1 year	2002	Shared care	Nel & Pashen 2003
Daruk Aboriginal Community Controlled Medical Service (now Aboriginal Medical Service Western Sydney)	NSW (urban)	Mean number of antenatal visits: 10.5 (vs 5.5 to 9.5 for mainstream services) Average gestation at which women first attended: 17.2 weeks (vs 21.2 to 19.9 for mainstream services) Attendance for routine antenatal tests: 94% (vs 71% to 84% for mainstream services)	1988	25 years (ongoing)	3 years	1991 to 1996	Home visits; transport to services; support in labour and post natal care; continuity of care Aboriginal health worker employed Empowerment and family centered care	Jan et al. 2004
Djuli Galban	NSW (rural)	Attendance at postnatal care: increased from 60% to 93%	1992	21 years (ongoing)	Unknown	Unknown	Shared care	Rumbold & Cunningham 2008; Middleton et al. 2009

International antenatal care initiatives

A number of international programs have also been identified that have demonstrated improvements in infant and maternal health outcomes. Examples from a range of countries include:

- A randomised-control study conducted in **Zimbabwe**, which implemented a new model antenatal care program which emphasised fewer, but more objective-orientated, visits and fewer procedures per visit.
- A new 'person-centred maternity model' was trialled in a general practice in **New Zealand** in a low socioeconomic status area, modelled on the UK home visitor program. The program consisted of recording the details of pregnant women in a 'birth book' (see below) at the time of confirmation of the pregnancy; ensuring she had a midwife assigned after confirmation of the pregnancy (independent of the GP practice); contacting the pregnant woman at 36 weeks gestation to renew the relationship with the general practice; and sending a congratulations letter and reminder when the infant is 4 weeks old, inviting the infant for its 6-week check and first immunisation (Hoare et al. 2011).
- The Nurse-Family Partnership program (NFP), is a maternal and early-childhood health program developed in the **USA** over the last 30 years, which fosters long-term success for first-time mothers, their babies and society. The program introduces vulnerable first-time parents to caring maternal and child health nurses. This program allows nurses to deliver the support first-time mothers need to have a healthy pregnancy, become knowledgeable and responsible parents and provide their babies with the best possible start in life.
- The SUCCESS program ('Setting Universal Cessation Counselling Education and Screening Standards) is an evidence-based program used in the **USA and Canada** which aims to educate nurses and other health-care practitioners about smoking cessation interventions; increase the number of practitioners providing smoking cessation interventions; and deliver a smoking-cessation intervention program to childbearing women who smoke (Albrecht et al. 2011).
- Women, Infants and Children (WIC) program of nutritional supplementation which is a group antenatal care program that was rolled out in 1974 in Ohio, **USA**. The program provides nutrition education and counselling; breastfeeding support; nutritious foods (such as milk, fruit juices, eggs, cereals, fruits and vegetables, whole grain foods and peanut butter or beans); and infant formula can also be provided if needed as a supplement to breastfeeding or if breastfeeding is not an option.

The improvements that these services have made to birthweight, child health and child mortality are summarised in Table 3.4. Two of these programs had information on the timeframes in which these improvements were achieved from the time of program commencement. This was less than 1 year for the study conducted in Zimbabwe which reported improvements in pre-term births and less than 1 year for the study conducted in New Zealand, which reported improvements in childhood immunisation.

Table 3.4: International initiatives/programs that have led to improvements in child health and mortality

Initiative/program	Location	Ethnicity	Key improvement(s)	Initiative/program commenced	Duration of initiative/program	Time lag between implementation & improvement	Timeframe of improvement(s)	Key enablers	Reference
Reduced schedule of antenatal care visits	Zimbabwe (urban)	African	Pre-term birth: 10.1% vs. 11.5% for control	1989	2 years	< 1 years	1989 to 1991	Planned and reduced visits	Munjanja 1996
Person-centred maternity services	New Zealand (urban)	All (low-income target group)	Immunisation timeliness and rates: increased to 94–100% consistently every month since December 2009	2009	4 years (ongoing)	< 1 years	2009–2011	Primary medical home model engaging a midwife at the practice, whole team approach to childhood immunisations.	Hoare et al. 2011
Nurse-Family Partnership	USA	All (low-income target group)	Improved prenatal health Decreases in prenatal cigarette smoking Fewer childhood injuries	Unknown	30+ years	Unknown	Unknown	Evidence-based home visitation programs	<www.nursefamilypartnership.org>
SUCCESS	USA & Canada	Unknown	Mean birthweight: increased by 479g (3,562g for smokers who quit vs 3,083g for those who did not)	Unknown	Unknown	Unknown	Unknown	Training of health care workers	Albrect et al. 2011
Women, Infants and Children's (WIC) services	Ohio (urban)	African–American	Infant mortality rate: declined to 9.6 from 21.0 (per 1,000)	1974	41 years (ongoing)	Unknown	2005 to 2008	WIC was first piloted in 1972 & permanently authorised in 1974. Unclear when WIC was established in Ohio County	Khanani et al. 2010

Nurse home-visiting programs in Australia

There have been a number of attempts to develop and implement nurse home-visiting programs for Indigenous families in Australia.

Australian Nurse-Family Partnership Program (ANFPP)

The Australian Nurse-Family Partnership Program (ANFPP), first funded in the 2007 Federal Budget, is based on the North American Nurse Family Partnership program, which is the most rigorously evaluated programme of its kind in the world. The NFP, when targeted to high-need populations, delivers significant benefits such as improved birthweight, reduced child neglect, greater school readiness, mothers more likely to return to education or employment and reduced family involvement with social services and the judicial system.

The ANFPP is a part of the Australian Government's commitment to improve the health of Aboriginal and Torres Strait Islander people. The ANFPP supports pregnant women with an Aboriginal and/or Torres Strait Islander child to improve their own health and the health of their baby. The ANFPP will also help with the baby's development in their early years.

The Program is currently delivered in 3 sites – Wellington/Dubbo (New South Wales), Cairns (Queensland) and Alice Springs (Northern Territory).

A formative evaluation of the Program, conducted in 2011 showed that:

- the program was well received by communities
- organisational capacity was a key element of successful implementation and
- economies of scale were yet to be realised.

Data collected by the sites that would assist in measuring outcomes for babies were not available for evaluation purposes at the time. Preliminary program outcome data are expected to be released on the ANFPP website in the second half of 2014.

Sources: <<http://www.anfpp.com.au/evaluation>> <<http://www.anfpp.com.au>>.

State/territory home visiting programs

In addition to the ANFPP, there are also a number of state-based home visiting programs operating in Australia.

The **South Australian Family Home Visiting Program** commenced in 2004–05. It aimed to link families to available resources/services and to improve mental, physical, social and emotional wellbeing. While there has been no randomised control trial conducted for this program, qualitative data suggests that parents found the program empowering and respectful. Having an Indigenous Cultural Consultant (ICC) involved in the home visits was found to play an important role in recruiting mothers into the program, in communicating appropriately and helping parents with community access (Sivak & et al. 2008)

The **Best Beginnings** home visiting program in Western Australia aimed to promote health and psych-social functioning. Up to 19 home visits could be made until the child's second birthday. An evaluation found that parents were open to new knowledge, but the data did not support the evaluation of long-term outcomes (Clark 2008).

The New South Wales **Miller Early Childhood Sustained Home Visiting** trial involved sustained home visiting over 30 months (between 2008 and 2011). It was the first Australian randomised trial to determine the impact of a comprehensive sustained nurse home visiting

program commencing antenatal in a population group living in an area of known disadvantage. The program involved regular home visits by a nurse focusing on education around immunisation, SIDS, infant nutrition and safety. Kemp and others (2011) found improved outcomes for breast feeding duration, home environment for child development and child cognitive development for children of mothers with psychosocial distress in pregnancy.

Anti-smoking initiatives

This section focuses on maternal smoking programs, however summary information on wider smoking programs which have shown to be effective in reducing smoking rates is also presented given that these may have had some impact on maternal smoking rates as well.

Maternal smoking cessation programs

A small number of maternal anti-smoking initiatives have been implemented in Australia and internationally, either through antenatal programs or through population health approaches. Unfortunately there is limited information available on the evaluation of these initiatives to determine whether they have been effective in reducing maternal smoking rates and the time taken to see improvements following program implementation.

Australian programs

'Quit for you Quit for two'

The '**Quit for you Quit for two**' campaign is the only Australian Government smoking cessation initiative which targets maternal smoking specifically. The campaign aims to provide information about the health harms associated with smoking during pregnancy and the support available to women on their journey to quit smoking. The campaign is being delivered through television, radio, print, out-of-home and online advertising and also includes a smartphone app designed to help women fight the urge to smoke by distracting them using games, providing words of encouragement and baby facts. This is a recent Australian Government initiative and its effectiveness has yet to be evaluated.

Maternal smoking cessation intervention at Aboriginal Community Controlled Health Services (ACCHS)

The only Indigenous-specific intervention found in the literature that was designed to target maternal smoking specifically was a randomised control trial at 3 ACCHSs in Queensland and Western Australia which found that 70% of pregnant Aboriginal and Torres Strait Islander women in the intervention stated that they wanted to quit and 60% turned up to a scheduled follow-up appointment within 3–7 days (Eades et al. 2012). The control group received a brief visit by a GP, while the intervention group's care had the following aspects:

- follow up by AHWs and midwives
- a program that was culturally sensitive and appropriate
- initial discussion with a GP who advised women to quit by going cold turkey
- women deciding to quit were asked to leave their cigarettes at the clinic
- the women were invited to return to the clinic within 3–7 days to have a follow up with an AHW/midwife

- partners and significant others (resident with the mother) were asked (verbally or by mail) to quit as well to support the woman
- health care workers were encouraged to provide the woman with evidence-based information
- support sessions were provided to women with signs of nicotine withdrawal
- those who relapsed were asked to continue to try quitting while pregnant
- nicotine replacement therapy (NRT) offered to women after 2 attempts to quit.

Ultimately, the study found no difference between the intervention and the control. Methodological problems, high attrition rates, high staff turnover and low compliance by AHWs and midwives (perhaps due to staff turnover and the need for constant retraining) may have all contributed to the results. The authors do not state whether the GPs, who were the first to initiate (scripted) quitting discussions with the women, were Indigenous or not, although they do mention that ongoing training of staff was conducted by an Indigenous doctor with GP experience and a behavioural scientist.

International programs

A range of international randomised control trials and other studies which aim to reduce maternal smoking have been examined for effectiveness. Smoking cessation and relapse programs are summarised in Table 3.5. Most programs have been successful in reducing smoking rates over the course of the study period (ranging between 4 weeks and 1 year), but there is little information on long-term outcomes.

The **SUCCESS** (Setting Universal Cessation Counselling Education and Screening Standards) maternal smoking cessation program has been delivered in a number of locations in the USA and Canada (Albrecht et al. 2011). It was developed by the Association of Women's Health, Obstetric and Neonatal Nurses as an evidence-based practice program to educate nurses and other health care practitioners about smoking cessation interventions, to increase the number of practitioners providing smoking cessation interventions and to deliver a smoking cessation intervention program to childbearing women who smoke.

In this intervention, 22 of the 78 current smokers participating in the program were able to abstain for at least part of the evaluation period (taking into account relapses, the program produced an effective quit rate of 21.5%) and another 25 reduced the number of cigarettes smoked each day. Average birthweight was significantly higher in infants born to the 15 women who quit smoking either prior to or during the program when compared to infants born to the 28 women who had not quit smoking during the intervention (an average of 3,562 grams vs. 3,083 grams). A range of studies of maternal smoking and relapse have also been conducted. A literature review of 72 randomised control trials (over 25,000 women) from across the globe found a small, though significant reduction in smoking in late pregnancy following interventions amounting to an additional 6 per 100 women quitting. The interventions offered to promote smoking cessation in pregnancy were generally given to individuals and included cognitive behaviour and motivational interviewing; incentives; interventions based on stages of change; feedback to the mothers on fetal health status or nicotine by-products measurements; and nicotine replacement therapy, bupropion or other medications (Lumley et al. 2009).

Table 3.5: Summary of international maternal smoking cessation/relapse programs which have reduced smoking rates

Program/studies	Number of participants	Countries	Type of program	Quit/relapse rate	Years of studies	Time after program completed	Time lag between implementation & improvement	Key enablers	Reference
Study of quitting during pregnancy	All UK mothers	UK	Maternal smoking cessation	49% quit rate (of 32% who smoke prior to pregnancy)	2004	n.a.	4 weeks		Greenstreet Berman 2010
SUCCESS	193	USA & Canada	Maternal smoking cessation	21.5% quit rate	Unknown	Up to 6 weeks postpartum	Follow-up period varied	Training of health care workers	Albrecht et al. 2011
72 trials (56 RCTs and 9 cluster – randomised) of quitting during pregnancy (over 25,000 women)	>25,000	Multiple (mostly high income)	Maternal smoking cessation	6% quit rate	1975 to 2008	Unknown	Up to 9 months	Providing incentives	Lumley et al. 2009
Study of quitting during pregnancy	All UK mothers	UK	Maternal smoking relapse	30% relapse rate	2004	By child's first birthday			Greenstreet Berman 2010
RCT of motivational interviewing to prevent relapse	302	Boston	Maternal smoking relapse	43% (vs18% control) relapse prevention rates	2008	6 months post-partum	Up to one year	Motivational interviewing	Ruger et al. 2008

General smoking programs

Indigenous anti-smoking programs

A range of activities have been funded under the COAG National Partnership Agreement on Closing the Gap in Indigenous Health Outcomes Indigenous Chronic Disease Package (ICDP) which aim to reduce the incidence of chronic disease in Indigenous communities by reducing smoking and alcohol-related harm and improving nutrition and levels of physical activity. Programs and activities funded to reduce Indigenous smoking rates are listed in Appendix C. These programs/activities are targeted at reducing smoking in general rather than maternal smoking and are yet to be formally evaluated for their effectiveness on reducing Indigenous smoking rates.

In addition to the activities mentioned above, 5 other Indigenous-specific programs have been identified as having aimed to address smoking, 3 of which have been evaluated and have shown reductions in smoking rates. These programs are summarised in Table 3.6. Increases in the quit rates of Indigenous clients who participated in these programs were evident from 3 months following program completion for up to 2 years.

Table 3.6: Summary of general (not maternal) Indigenous smoking cessation programs

Program	State	Location type	Quit rate	Time after program completed	Duration of program	Reference
CBT & pharmaceuticals	Qld & WA	Urban	26%	6 months	10 weeks	Eades et al. 2012
Rumbalara Aboriginal Health Service	Vic	Rural	19%	2 years	3 weeks (followed by on-going support)	Adam et al. 2006
Koori Tobacco Cessation Project	NSW	Rural	6%	3 months	2 months	McLeod & Booker 2004
Indigenous Tobacco Control Initiative	National	National	Unknown	..	4 years	Advice from Health
NSW SmokeCheck Aboriginal Tobacco Prevention Project	NSW	Statewide	Unknown	..	1 year	NSW Department of Health 2010

Population health initiatives

Targeting risk factors for which there is a high prevalence across the community requires a population health approach. While antenatal care can play an important role in identifying where these risk factors are prevalent for pregnant women, successfully addressing them will require broader action. Five key areas are alcohol consumption during pregnancy, STIs, breastfeeding, immunisation and injury prevention.

A summary of key Australian population health initiatives and programs targeting alcohol consumption during pregnancy and STIs is presented in Table 3.7. A summary of key Australian population health initiatives and programs targeting breastfeeding and immunisation is presented in Table 3.8 and Table 3.9.

Alcohol consumption

Programs that have been implemented to address alcohol consumption during pregnancy are described below. The studies examined show a 1–2 year time lag between program announcement and commencement and a further 1–4 year time lag until the programs are fully operational. Improvements in maternal alcohol consumption were recorded within 1 year from the time the programs were fully operational.

Marulu: Overcoming FASD and Early Life Trauma in the Fitzroy Valley

In mid-2007 a group of local women campaigned to ban the sale of take away liquor other than light beer. This initiative followed 13 suicides in as many months and 50 funerals in a year in Fitzroy Crossing (George Institute 2013). There was also growing alarm at the impact alcohol was having on the region's children in the form of FASD.

A number of short-term evaluations have examined the impact of these alcohol restrictions. The improvements have included reduced domestic violence (although more reports of it occurring due to reduced tolerance of it); alcohol abuse; neglect of children; and other anti-social and criminal behaviour (Kinnane et al. 2010). As prevalence rates of FASD have yet to be established, it is not yet possible to identify whether this project has resulted in reduced maternal alcohol consumption and resultant FASD in babies.

Ord Valley Aboriginal Health Service foetal alcohol spectrum disorders program

The Ord Valley Aboriginal Health Service Foetal Alcohol Spectrum Disorders Program was launched in 2009 in response to the incidence of alcohol consumption during pregnancy by women in the Kimberley region of Western Australia. This program is delivered through the Ord Valley Aboriginal Health Service (OVAHS), an Aboriginal community-controlled primary health care facility.

The program delivers culturally appropriate FASD education; alcohol and other drug screening; and individual counselling to antenatal clients. Resources, including posters, pamphlets, a DVD and radio advertisements have been developed in consultation with the local Aboriginal community and aim to increase awareness and knowledge of FASD. Other key features of the program include training OVAHS staff in alcohol awareness, FASD and contraception and delivering health promotion outreach at community events and local centres.

Assessment outcomes in the first year of the program showed that the majority of women reported drinking alcohol at some point during their pregnancy. However over half of these women reported no further alcohol consumption after FASD education (56.4% of the women

reported to have abstained from alcohol use following initial FASD education and 14.1% reported to have cut down). Findings from the evaluation of the program have demonstrated the effectiveness of a consultative, whole-of-community approach as a strategy to address FASD.

Improvements were evident within 1 year of the program's operation and the success of the program to date can be attributed to both community investment and ownership and to the willingness of the Aboriginal community of Kununurra to take control and embrace change (Bridge 2011).

Sexually transmitted infections

Programs that have been implemented to address sexually transmitted infections among Indigenous communities are described below. While these did not specifically target pregnant mothers, they may have had some impact on reducing rates of maternal STIs, especially among teenage mothers.

The studies examined show a 1–2 year time lag between program announcement and commencement and a further 1–4 year time lag until the programs are fully operational. Improvements in maternal alcohol consumption were recorded within 1 year from the time the programs were fully operational.

The Tiwi Sexual Health Program

The Tiwi Sexual Health Program (Su and Skov 2008) has demonstrated that it is possible to significantly reduce rates of STIs by means of a comprehensive sexual health program. The program was run by a dedicated coordinator employed by a primary health care service. Its development was informed by a similar program run by the Nganampa Health Council (also noted above for its successful antenatal program). The program combined much increased testing (particularly opportunistically) of the population with sexual health information and distribution of condoms. The number of condoms handed out increased 4-fold.

After a very sharp rise in the notification rate (due to increased testing), there was a very large overall fall in both notifications and positivity rates. The improvements were not replicated in other nearby communities, indicating that it was the program that was responsible for the health gains. These improvements were first evident within 1 year after the program commenced in 2002 and continued until 2005 after the program was considered fully operational.

STI demonstration projects for improving sexual health of Aboriginal and Torres Strait Islander youth

The Office for Aboriginal and Torres Strait Islander Health (OATSIH) funded 6 demonstration projects aimed at improving the sexual health of Aboriginal and Torres Strait Islander young people over the 3 years 2008–2011. The aims of the projects were to increase the number of Aboriginal and Torres Strait Islander young people accessing services for the testing and treatment of STIs and blood-borne viruses (BBVs); to reduce the level of risk behaviours; and to contribute to the development of best practice approaches.

The AIHW, Kirby Institute and the 6 organisations delivering the projects developed a range of indicators to monitor and evaluate the demonstration projects. Due to limitations with data availability and quality and to the relatively short timeframe of the evaluation, it was not always possible to assess the effectiveness of projects in achieving program objectives

and expected outcomes. The evaluation (AIHW 2013c) did, however, identify a number of key features of a successful sexual health program including:

- appropriate consultation with a broad range of stakeholders
- engagement and developing partnerships with the community, organisations and services
- culturally appropriate project design and implementation
- staff who were respected by the community and engaged well with young people.

Quantitative baseline and follow-up data on rates of STIs are not available from the demonstration projects, so it is not possible to quantify the magnitude of improvements seen or the timing of these following program implementation, however it is expected that some improvements would have occurred soon after the demonstration programs were operational.

Table 3.7: Summary of Australian population-health interventions that have led to reductions in alcohol use during pregnancy or in STIs

Program	State	Location type	Improvement	Rate	Service announced/ planning initiated	Service commenced	Service fully operational	Years over which improvements were recorded	Number of years over which improvements were recorded	Time program was in place	Key enablers/ comments	Reference
Marulu	WA	Remote	FASD	Currently being assessed	2007	2009	2013	N/A	N/A	Ongoing	Community originated research project in partnership with university	George Institute 2013; Kinnane et al. 2010; Elliott 2012
Ord Valley Aboriginal Health Service fetal alcohol spectrum disorders program	WA	Remote	Decrease in alcohol use during pregnancy	56.4% of women reported to have abstained from alcohol use following initial FASD education and 14.1% reported to have cut down	2009	2009	2009	2009–2010	1	Ongoing	Consultative, whole-of-community approach – community investment and ownership Willingness of the Aboriginal community of Kununurra to take control and embrace change	Bridge 2011

(continued)

Table 3.7 (continued): Summary of Australian population-health interventions that have led to reductions in alcohol use during pregnancy or in STIs

Program	State	Location type	Improvement	Rate	Service announced/ planning initiated	Service commenced	Service fully operational	Years over which improvements were recorded	Number of years over which improvements were recorded	Time program was in place	Key enablers/ comments	Reference
Tiwi Sexual Health Program	NT	Remote	Decrease in notification rates for STIs	95% (chlamydia), 60% (gonorrhoea), 89% (syphilis) reductions in notification rates	2000	2002	2004	2002–2005	4	2000–2005	Funding of a dedicated sexual health worker	Su & Skov 2008
			Decrease in positivity rates for STIs	34% (chlamydia), 94% (gonorrhoea) reductions in positivity rates								
STI demonstration projects	NSW, Vic, WA, NT	Remote	Surveys and anecdotal evidence showed Improved knowledge of sexual health issues	Quantitative baseline and follow-up data not available	2007	2008	2008	2008–2010	3	2008–2010	Community consultation and engagement Engagement of staff respected by community	AIHW 2013c

Breastfeeding

Opportunities exist for the promotion of breastfeeding in both educational settings and in the health sector (particularly in antenatal and postnatal care). Programs that have been implemented to promote breastfeeding in Australia and internationally are described below.

The studies examined show lag times between less than 1 year and 4 years from program announcement until the programs are fully operational. Improvements in breastfeeding behaviours were recorded within 1 year from the time the programs were fully operational.

Australian programs

A number of programs that promote breastfeeding in Australia have been implemented in recent years, however many of these have not been evaluated for their impact on breastfeeding levels. These include:

- **Australian National Breastfeeding Strategy 2010–2015** aims to ‘contribute to improving the health, nutrition and wellbeing of infants and young children and the health and wellbeing of mothers, by protecting, promoting, supporting and monitoring breastfeeding’ (AHMC 2010). An evaluation of this strategy has not yet been published.
- The **Binya Gurang program** in New South Wales, currently funded by OATSIH (DoHA 2013a), developed culturally and linguistically appropriate resources to promote breastfeeding among Aboriginal and Torres Strait Islander mothers who accessed the King George V Hospital. The program is run in collaboration with the Parent Education Unit of the hospital and consists of educational programs at antenatal and postnatal classes.
- A number of jurisdiction-based Indigenous-specific programs have targeted breastfeeding. For instance, Victoria funded the **In-Home Support Program** and the **Breastfeeding Education Support Team Program**. The former provided mothers with information on the importance of breastfeeding, immunisation and developmental checks (DEECD 2007); the latter aimed to increase the number of Indigenous women who initiated breastfeeding and to increase the time period for which they are able to breastfeed their infants.

Four Australian-based programs were identified from the literature as having been evaluated for their effectiveness and impact on breastfeeding. These are summarised in Table 3.8 and are discussed below.

Growing strong: feeding you and your baby

The OATSIH-funded Growing Strong project in Queensland provides information about common breastfeeding issues. While it is not primarily focused on promoting breastfeeding as such, it imparts contextual information on many aspects of breastfeeding. The resources include a Growing Strong training manual and an illustrated client book. Growing Strong provides evidence-based information about nutrition for pregnant women and advice on the actual conduct of breastfeeding. An evaluation of this program indicated that participants of the program reported increased knowledge of and confidence in, breastfeeding, however no information was available on how the program affected the levels and duration of breastfeeding (Queensland Health 2006).

Starting Out program

The Starting Out program is a community-based program for mothers under 25. It consisted of individual counselling; in-home support and prenatal classes with young role models breastfeeding; leaflets and videos. A study of the impact of this program on young mothers found that levels of breastfeeding in mothers increased following participation in the program, suggesting that groups with special needs, like young people, were likely to benefit from

interventions that used peer support as part of the intervention package (Greenwood & Littlejohn 2002).

The Toowoomba Infant Feeding Support Service project

The Toowoomba Infant Feeding Support Service project was a postnatal, primarily telephone-based, breastfeeding support service for mothers conducted between 2001 and 2004 in Toowoomba, Queensland. An evaluation of the project found that a significant increase in the length of breastfeeding duration was due to the service; however this effect was only statistically significant in some locations (Fallon et al. 2003).

Baby Friendly Hospital Initiative

The Baby Friendly Hospital Initiative (BFHI) is a World Health Organization (WHO) world-wide program that aims at creating a health care environment that supports mothers and babies to have the best start in life. This initiative is run in most states and territories in Australia.

BFHI accredited services must teach mothers about baby feeding cues, expressing and storing breastmilk and provide them with information about where to get help with feeding their baby. They must also provide all staff with education about infant feeding; ensure that practices are based on the latest evidence; provide a breastfeeding friendly environment for patients and visitors; and support staff who return to work and are breastfeeding (Queensland Health 2006).

A study of the impact of adherence to this program in South Australia on the duration of breastfeeding in first-time mothers found that the length of time mothers were breastfeeding increased by 42 days, however this was not statistically significant (Pincombe et al. 2008).

International programs

Examples of 2 international programs as having had a positive impact on breastfeeding participation or duration are described below.

The **Special Supplemental Nutrition Program for Women, Infants and Children (WIC)** is a group antenatal care program that has been conducted in the USA since 1974. The program provides breastfeeding support as well as nutrition education and counselling. A large evaluation of the program found that participation in the WIC program was associated with a statistically significant increased probability of breastfeeding (Chatterji et al. 2004).

In Canada, a number of Canadian **Community Breastfeeding Centers** have been established. A study undertaken in 2001 on the impact of these centres on clients' breastfeeding behaviour found that access to a local community breastfeeding centre increased breastfeeding duration and maternal satisfaction (Adams et al. 2001).

Table 3.8: Summary of Australian population health interventions that have led to improvements in breastfeeding rates

Program	State	Location type	Improvement	Rate	Service announced/ planning initiated	Service commenced	Service fully operational	Years over which improvements were recorded	Number of years over which improvements were recorded	Time program was in place	Key enablers/ comments	Reference
Toowoomba Infant Feeding Support Service project	Qld	Regional	length of breastfeeding	Significant increase in the length of breastfeeding duration due to the service	2001	2001	2001	2001–2004	3	3 years. Ceased in 2004	Telephone support service for mothers	Fallon et al. 2005
Growing Strong	QLD	Regional	Increased knowledge of and confidence in, breastfeeding	Not published	1998	2002	2002	2002–2012	10	Ceased in 2012	Funding of health workers and educational courses	Queensland Health 2006
Starting Out program	Unknown	n/a	Improved levels of breastfeeding	Not published	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Individual counselling; in-home support; prenatal classes with young role models breastfeeding; leaflets and videos.	Greenwood & Littlejohn 2002
Baby Friendly Hospital Initiative	Most S/T	N/A	length of breastfeeding	Increase of 42 days in length of breastfeeding in SA (not significant)	n.a	n.a.	n.a.	n.a.	n.a.	n.a.	breastfeeding friendly environment Staff educated about breastfeeding	Pincombe at al. 2008

Immunisation

This section provides information on immunisation programs, with a focus on those which have been effective in increasing immunisation rates of infants and children and in reducing the incidence of vaccine-preventable diseases. In the short term, immunisation protects the child from specific infectious diseases and their immediate complications. However, the protective effects of immunisation will stay with the child for life. For example, by preventing infection, immunisation can prevent long-term complications associated with chronic infections such as encephalitis induced by measles, or cirrhosis of the liver associated with hepatitis B or C. Immunisation from certain diseases can also prevent the contraction of viral infections later in life that can lead to certain cancers as cervical cancer (associated with the human papilloma virus) and liver cancer (associated with Hepatitis B) (AAS 2012).

A range of immunisation programs that have been implemented in Australia and internationally are described below. Of these, information on timing of implementation and improvements in child health outcomes have been recorded for 1 program (the Australian Measles Program), for which improvements were evident within the first year and were recorded over 5 years.

There have been recent increases in immunisation rates for Indigenous children aged 1, 2 and 5 years since the first year of funding under the National Partnership Agreement on Closing the Gap in Indigenous Health Outcomes. For 1-year-olds, immunisation rates increased from around 81.5% in 2008 to 85% in 2011; for 2 year olds immunisation rates have increased from 90% to 92%; and for 5 year olds, immunisation rates have increased from 80% to 85.5% (AIHW 2013a).

Australian Initiatives

The Australian Childhood Immunisation Register (ACIR) was established in 1996 in response to a decline in childhood immunisation in Australia and an increase in vaccine-preventable childhood diseases. The Australian Government offers financial incentives to parents to encourage them to immunise their children and to general practices for monitoring, promoting and providing appropriate immunisation services. These initiatives have been very successful – immunisation coverage in Australia is now the highest on record and, as a result, notification rates of vaccine-preventable diseases are low.

Increasing the proportion of Indigenous children who are fully vaccinated is one of the agreed outcomes of the Indigenous Early Childhood Development National Partnership (COAG 2009). The National Partnership Agreement on Essential Vaccines also encourages increases in vaccine coverage for Indigenous Australians through the provision of facilitation incentive payments by the Australian Government to state and territory governments.

Immunise Australia Program

The Immunise Australia Program aims to reduce morbidity and mortality associated with several vaccine-preventable diseases by funding a series of age-specific vaccinations, as outlined in the National Immunisation Program Schedule (DoHA 2010). The National Immunisation Program (NIP) provides free childhood vaccines for Australian children aged 0–7 years. Aboriginal and Torres Strait Islander children living in some states and territories also have access to Hepatitis A vaccine (AHMAC 2012). From October 2012, funding has been provided to Aboriginal and Torres Strait Islander children aged between 12 and 18 months in some states and territories (Queensland, Western Australia, South Australia and the Northern Territory), to receive an additional booster dose of pneumococcal vaccine.

Two vaccination strategies have been considered to prevent severe pertussis morbidity and deaths, particularly in infants aged less than 3 months of age: indirect protection by immunisation of close adult contacts of newborn infants and direct protection by immunisation of the mother during the last trimester of pregnancy. In July 2008, Queensland Health and July 2009, South Australian Health, commenced a promotion of diphtheria-tetanus-acellular pertussis vaccine for prospective parents, new parents, grandparents, childcare workers and health care workers. Data to evaluate the effectiveness of indirect protection to infants is not yet available, however this approach is expected to reduce infection risk to infants from family members (DoHA 2013b).

The Australian rotavirus vaccination program was another program funded under the National Immunisation Program. It aimed to reduce the incidence of rotavirus and all-cause acute gastroenteritis (AGE) incidents and was rolled out across Australia in July 2007. A study was published in 2012 that compared the outcomes of the program in Indigenous and non-Indigenous people, before and after the introduction of the vaccine program. The study found a drastic decline (71%) in rotavirus hospitalisations in children younger than 5 years after the rotavirus vaccination program commenced (261 per 100,000 before the program, compared with 75 per 100,000 after the program started). The research also found a 38% decline in non-rotavirus AGE hospitalisations (a decrease from 1,419 per 100,000 to 880 per 100,000) (Dey et al. 2012).

Vaccines targeting varicella (chickenpox) were available since 2000 as part of the NIP, but were only recommended for children from 2003. In November 2005 the varicella vaccine was added to the NIP schedule as a single dose for children aged 18 months and for children aged 10 to 13. The latter is delivered in schools and is available for children who do not have a reliable history of chickenpox or previous vaccination.

One study (Nelson et al. 2010) found that the percentage of GP visits at which varicella was treated decreased after the program's commencement.

Australian Measles Control Campaign

The Australian Measles Control Campaign was initiated in August 1998 as part of the World Health Organisation's global Measles eradication program and in response to major epidemics in Australia throughout 1994–95. The campaign vaccinated 1.78 million children, making it the largest national vaccination campaign conducted in Australia since the introduction of poliomyelitis vaccination in 1956. The campaign was aimed at improving immunisation coverage among children between 1 and 12 years of age. The campaign was based on school-based vaccinations against measles, mumps and rubella.

There was a marked reduction in the number of measles cases among children in the targeted age groups in the 6 months following the campaign (Gidding & Gilbert 2001) and after 5 years of the campaign's operation there was 96% fall in reported measles cases from 836 in 1997 to 32 in 2001 (Turnbull et al. 2001). The campaign also led to an increase in measles immunity for 1–18 year-olds from 85% to 90% and an increase in rubella immunity in 1–18 year-olds from 83% to 91% (Gilbert et al. 2001). As a result of the program, measles was declared eradicated from Australia in February 2009.

Boab Health Services Immunisation

Boab Health Services (BHS) is a state-based, Department of Health-funded initiative, monitoring and facilitating best practice of storage and transportation of vaccines throughout clinics in the Kimberley. The initiative also provides support in reporting childhood immunisation and aims to increase coverage rates across the Kimberley.

One of the main tasks of BHS is the active support of local clinics which actually conduct the immunisations. The initiative's objective is to ensure the timely, effective reporting of immunisations and, moreover, to ascertain that the proportion of fully immunised children in the Kimberley exceeds 90%. However, in spite of this objective, no figures on actual coverage and changes over time have been published.

International Programs

A large body of primary research literature and review articles exist which examine the impact and outcomes of large scale public health immunisation campaigns aimed at increasing the levels of immunisation in the population following their roll-out in many countries around the globe (Combs-Orme et al. 1985, Ciliska et al. 1996). These are not listed or discussed here given the volume of this research. However one influential study worth noting is a meta-analysis, which incorporated the effect size of 9 separate international studies on the impact of immunisation programs, which found a significant increase in the uptake levels of immunisation through home visiting programs specifically (Kendrik et al. 2000).

Table 3.9: Summary of Australian population health interventions that have led to improvements in immunisation rates

Program	State	Location type	Improvement	Rate	Service announced/ planning initiated	Service commenced	Service fully operational	Years over which improvements were recorded	Number of years over which improvements were recorded	Time program was in place	Key enablers/ comments	Reference
Australian Measles Control Campaign	National	n.a.	Reduction in Measles	96% fall in reported measles cases. Increase in measles immunity from 85% to 90% and rubella immunity from 83% to 91 in 1–18 year-olds	1998	1998	1998	1997 to 2001	1–5 years	Ceased in 2009	School-based vaccinations with catch up program	Gilbert et al. 2001
Immunise Australia program	National	n.a.	Declines in vaccine-preventable diseases	Decrease in pertussis notifications among 5–6 year olds 71% decline in rotavirus hospitalisations in children younger than 5. Decline from 2 to 0.6 per 1,000 GP encounter rates at which varicella was treated.	n.a.	n.a.	n.a.	n.a.	n.a.	Ongoing	National roll-out Funding provided to S/T Govts; funded through Medicare; subsidies provided to individual GPs	Quinn & McIntyre 2007 Dey et al. 2012 Nelson et al. 2010.

Injury prevention

The importance of preventing injuries to all children, as well as Indigenous children in particular, has been formally recognised in both the National Injury Prevention and Safety Promotion Plan 2004–2014 and the companion National Aboriginal and Torres Strait Islander Safety Promotion Strategy (NPHP 2004a, b). Research and practice has identified key areas for effective intervention, including:

- legislation and awareness to reduce speeding and drink driving, and impose requirements for child car restraints
- promotion of smoke alarms
- legal requirements for limited temperatures on hot water delivery systems
- regulating the materials in children's clothing and pyjamas to reduce flammability
- public health campaigns to reduce drownings
- increased regulations for pool fencing (Richard and Leeds 2012; WHO 2005).

While there are examples of Indigenous-specific programs and resources (such as the Safety for Our Little Fellas resources from Kidsafe Vic), there is little information on their statistical impact on reductions in either child mortality rates or risk factors such as hospitalisation rates for children under 5 years of age.

International programs

As noted above, there are few injury prevention programs that have been able to measure an impact on outcome. An exception to this, however, is the New Zealand Waitakere Community Injury Prevention Project (WCIPP) (Coggan et al. 2000). WCIPP placed the WHO Safe Community Model under the umbrella of a local government authority. It took a community-development approach to injury prevention and focused on 7 priority areas which were identified through community consultation: Maori, Pacific, children, young people, older people, alcohol and road safety. Each priority area had its own working group made up of community agencies and community members. Child safety strategies included promoting correct child restraint use; burns and scalds education; safety practices while playing sport; preventing falls; correct use of cycle helmets; reduction of hazards around the home and school; and smoke alarms.

Comparative data showed that Waitakere was the only community with a statistically significant decrease in hospitalisations for injuries for young children following the intervention. Compared with pre-intervention and comparison groups, Waitakere residents were also significantly more likely to acquire the appropriate child restraints, fencing for swimming pools, fire guards, stair gates/guards for children and protective sports equipment.

The findings from a case study indicated that the critical factors for success within the Maori community (which could be applied to other Indigenous communities) was the fact that the Maori coordinator had a strong network of support; the strategies were based on a Maori perspective on injury prevention; and the holistic view of health and wellbeing (Coggan et al. 2000).

4 Lags between program implementation, change and ability to measure

This chapter focuses on the expected lags between the announcement of the COAG target, program implementation, improvements in expected outcomes and the availability of data to measure changes.

With any policy initiative, there are lead times between when the policy commences and the full implementation of the policy and programs on the ground, as well as lag times from when the policy is implemented to when change can be expected in the outcomes and when appropriate data are available to measure the magnitude of changes.

A flow chart showing the key phases and lag times for measuring the potential impact of infant and maternal initiatives on child mortality is shown below (Figure 4.1). It shows that measuring the potential impact of government initiatives on child mortality involves a number of significant lead and lag times:

1. the lead time between policy announcement and implementation
2. the lag time between policy implementation and improvements in health treatment, health education and social determinants (not the same length of time for each)
3. the lag time between improvements in health education and social determinants and reductions in risky health behaviours
4. the lag time between improvements in health treatment and health behaviours and reductions in incidence/severity of conditions
5. the lag time between reductions in incidence/severity of conditions and measurable improvements in maternal and child health
6. the lag time between improvements in maternal health and resultant improvements in child health
7. the lag time between improvements in child health and child mortality.

In addition, there are often significant lag times between outcomes and data availability. For example, mortality data are available 2 years after the reference year for which deaths are recorded.

Some initiatives, particularly large-scale national programs such as the IECD NPA, may not report outcomes or improvements for several years post-implementation, due to time spent planning, recruiting staff and setting up appropriate infrastructure. Initiatives which adapt to and build upon existing infrastructure, such as programs implemented in existing community-based primary health care sites, can often have more immediate outcomes. Programs which are culturally sensitive and employ Indigenous staff will most likely have positive outcomes in a short period of time. These assumptions are largely supported by findings from review of the literature on interventions and programs aimed to reduce child mortality and its risk factors.

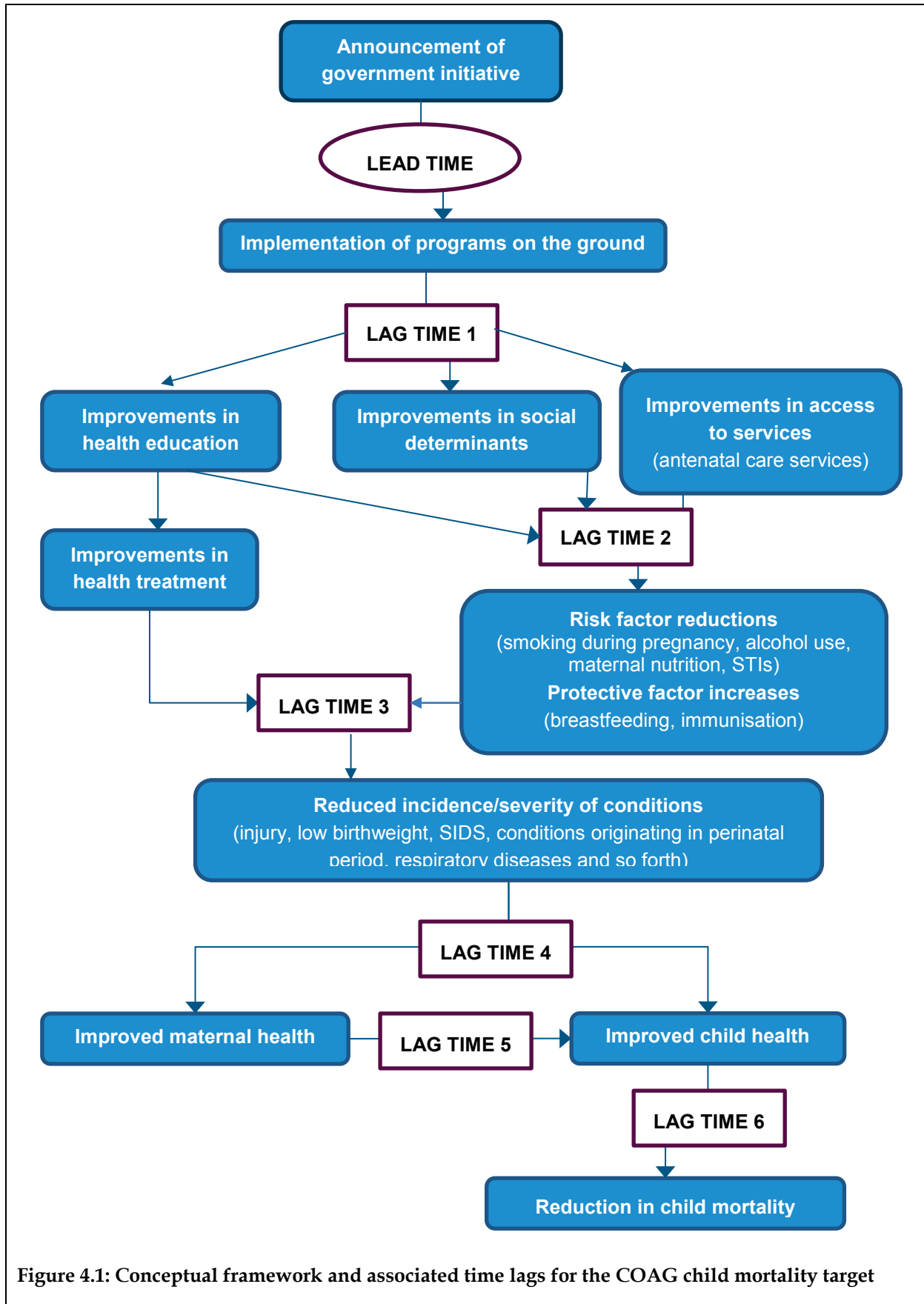
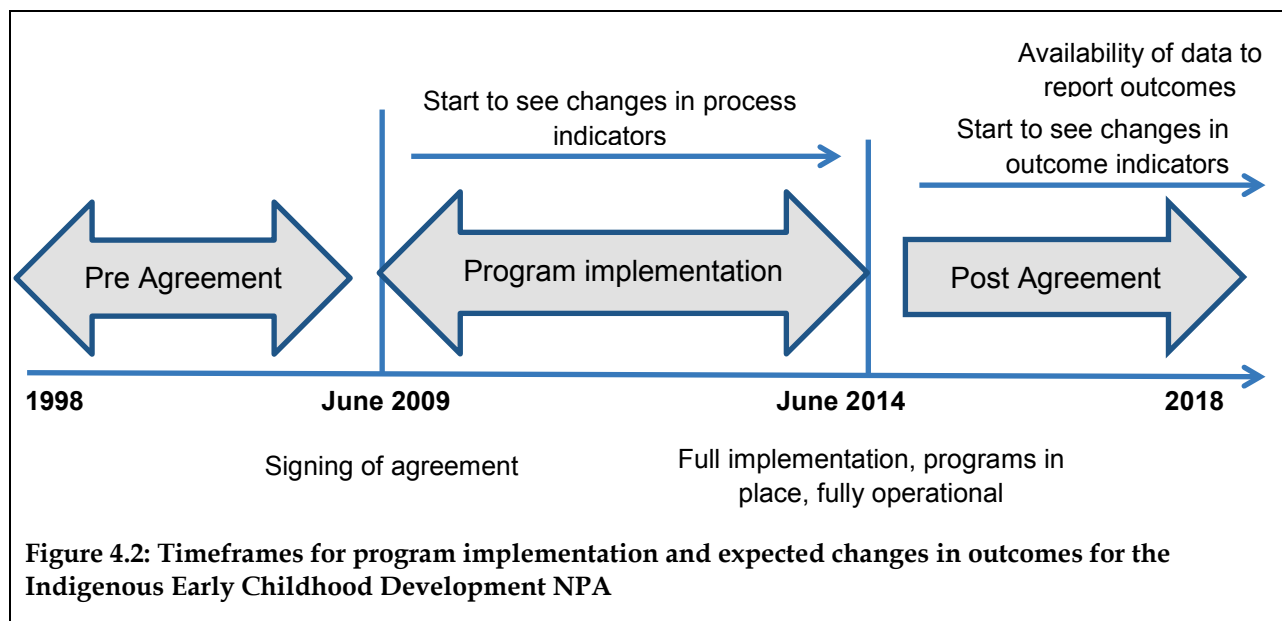


Figure 4.1: Conceptual framework and associated time lags for the COAG child mortality target

Example: Indigenous Early Childhood Development NPA

Figure 4.2 shows the estimated timeframes for program implementation and when changes in outcomes for process and outcome indicators related to child mortality might be expected to be seen, using the Indigenous Early Childhood Development NPA as an example.



The literature review points to a lag time of between 1 and 2 years with regard to program implementation and a lag time of between 2 and 5 years before improvements in health or health behaviours are noted. The differences in the lag times between individual programs' implementation and measurable outcomes may due to multiple factors, including differences in funding or program management models.

The time lags between the maternal risk factors and resulting child health outcomes are relatively short. The aim of antenatal care is to have an almost immediate impact on maternal health behaviours (that is, within the period a mother attends antenatal care sessions during pregnancy). Risk factors relating to these maternal health behaviours during pregnancy (such as smoking and alcohol consumption) will affect the child during the gestation period up until birth (9 months), while breastfeeding and immunisation can have an impact during the first years of life.

Mortality resulting from conditions relating to these risk factors (such as congenital defects, respiratory problems and infectious diseases) can occur during infancy or early childhood. As such, interventions in these areas can potentially have an impact upon child mortality within 5 years. Although the focus of this paper is on child mortality, it should be noted that many improvements in maternal and infant health may provide health benefits throughout a child's lifetime.

In addition to the time lags discussed above, there is also a time lag between changes in health outcomes and when data are available to measure these changes and improvements in child mortality (Tables 4.1 and 4.2). For data on antenatal care, smoking and alcohol use during pregnancy, low birthweight, breastfeeding and child mortality, the time lag between

data collection and reporting is approximately 2 years. Data on immunisation is available 1 year after collection.

Table 4.1: Time lags between data collection and reporting for child mortality risk factors and outcomes

Risk factor/health outcome	Data source	Frequency of collection/reporting	Lag time between data collection and reporting
Antenatal care	AIHW National Perinatal Data Collection (NPDC)	Annual	2 years
Smoking during pregnancy	NPDC	Annual	2 years
Alcohol use during pregnancy	NATSISS	Every 6 years	2 years
STIs	NNDSS	Annual	1½ years
Low birthweight	NPDC	Annual	2 years
Immunisation	ACIR	Annual	1 year
Breastfeeding	NATSIHS	Every 6 years	2 years
Child health checks	MBS	Annual	6 months
Child mortality	National Mortality Database	Annual	1–2 years

Table 4.2: Availability of data on child mortality risk factors and outcomes

Measure	Data source/ frequency	Latest year data currently available	Available for reporting	Pre- or post-NPA IECD full implementation (2013)
Antenatal care	NPDC (annual)	2011	Dec 2013	2 yrs pre
Smoking during pregnancy	NPDC (annual)	2011	Dec 2013	2 yrs pre
Alcohol use during pregnancy	NATSISS (6 yrs)	2008	2010	Pre NPA
STIs	NNDSS (annual)	2012	Aug 2013	1 yr pre
Low birthweight	NPDC (annual)	2011	Dec 2013	2 yrs pre
Child health checks	MBS (continuous)	2013	Dec 2013	2 yrs pre
Child mortality	NMD (annual)	2011	Dec 2012	2 yrs pre

Figure 4.3 presents a more detailed overview of the process and outcome indicators for the IECD NP and when data would be available on the final outcome (child mortality). The IECD NP was announced in 2008. Program implementation began in 2009 and most programs were fully operational by 2012, with funding continuing until June 2014. The earliest time the initial impact of maternal and child health programs implemented under the IECD NP on child mortality is likely to be seen is in the 2012 mortality data. The earliest that the data will be available to measure changes in child mortality will be in 2014 due to the 2 year time lag in mortality data being available for reporting. As it can take between 2 and 4 years after a program is fully operational to see improvements in risk factors and health outcomes for children (particularly reductions in childhood disease), it is likely that the full effect of the COAG child and maternal health initiatives will not show up in mortality data until around 2016.

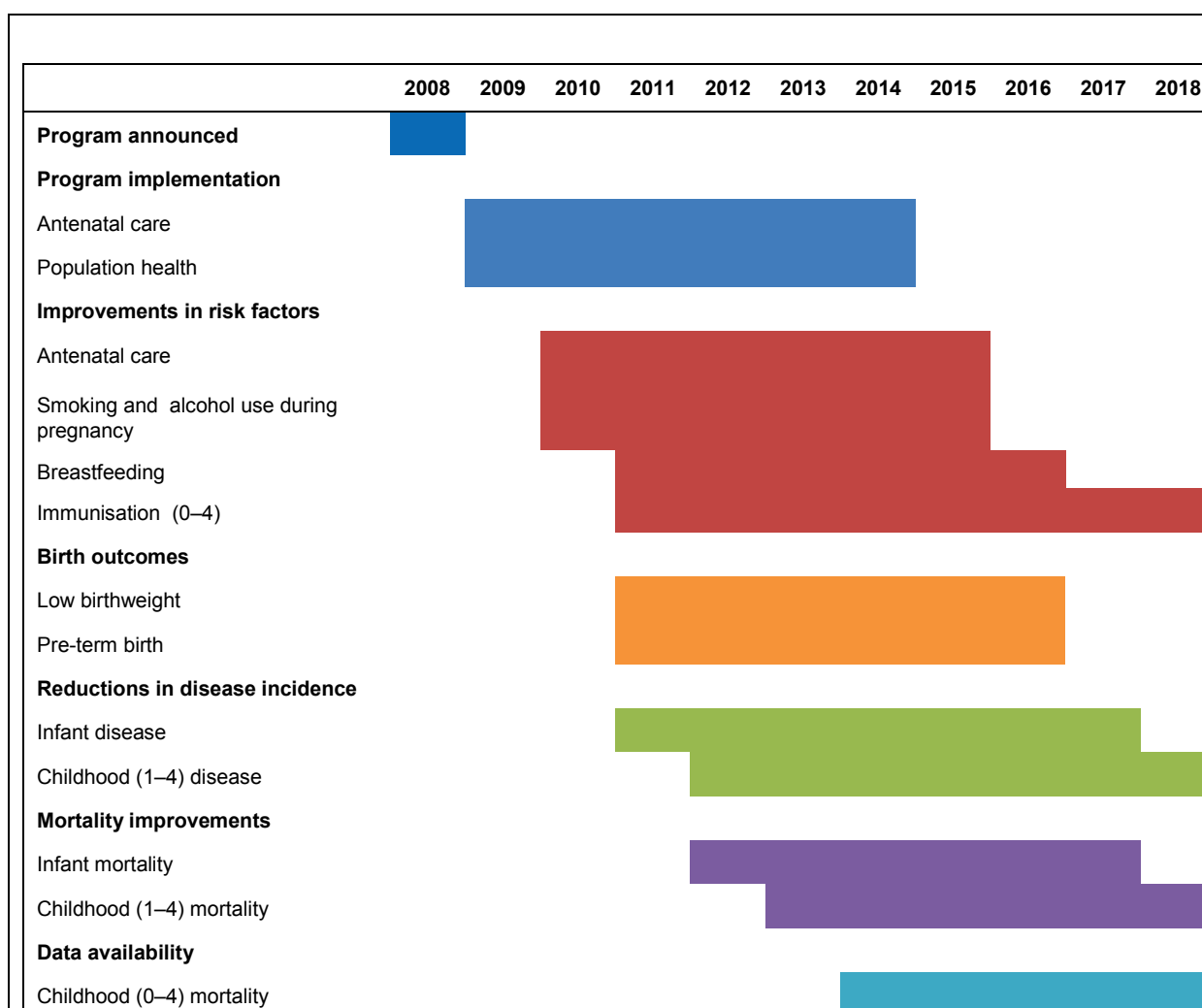


Figure 4.3: Timeframes for program implementation and expected changes in outcomes for child mortality

Progress against the COAG child mortality target

The data presented in Chapter 2 shows that there has been a significant reduction in Indigenous child mortality over the last twenty years, with the gap in child mortality rates between Indigenous and non-Indigenous children narrowing. The question remains, however, as to what will happen to child mortality rates over the next few years and can the COAG target be reached to halve the gap by 2018? This section attempts to answer these questions by plotting current mortality rates against the child mortality trajectory agreed for the National Indigenous Reform Agreement (see CRC 2012 for the national trajectory included in the NIRA for the child mortality target).

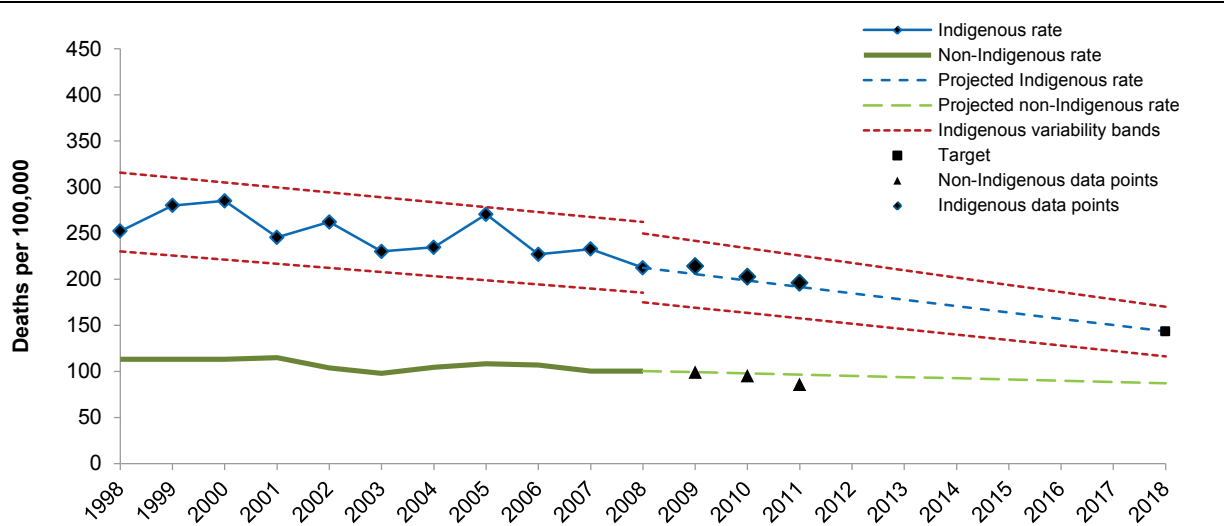
The baseline child mortality rates for 2008 (based on amended data provided by the ABS to the COAG Reform Council in 2012) were 212.5 and 100.6 per 100,000 population for the Indigenous and non-Indigenous populations respectively and the gap was 111.9 deaths per 100,000 population. For the COAG target to be reached, the mortality rate for Indigenous

children under 5 would need to fall by 33% to around 143 deaths per 100,000 in 2018 and the gap will need to be reduced to 56 deaths per 100,000 population by 2018 (Table 1.1).

The actual mortality rates recorded for 2009, 2010 and 2011 are plotted along the NIRA trajectory for the child under-5 mortality target in Figure 4.4 below. This indicates that the Indigenous child mortality rates are very close to the projected rates for these years (they are slightly higher) and well within the variability bands, which indicates that the rates are on track to meet the COAG child mortality halving-the-gap target by 2018. (See Appendix D for a description of the methodology used to calculate variability bands for the NIRA mortality trajectories.)

It should be noted that this trajectory is a straight-line trajectory based on historical trends, which assumes that the factors that have been responsible for past trends will continue into the future and that no additional factors will enhance or slow that trend. Importantly, this straight-line trajectory does not take into account any impacts the COAG Closing the Gap initiatives may have on Indigenous child mortality rates in the future.

Attention will also need to be given to the impact of changes in data quality over time (such as improvements in Indigenous identification in mortality data) and also revised Indigenous population estimates and projections based on the 2011 Census, which will result in the need to recalculate Indigenous child mortality rates and trajectories for the next cycle of NIRA reporting.



Source: AIHW analysis of National Mortality Database for 2011–12 CRC report on the NIRA (see CRC 2011–12 NIRA report statistical supplement).

Figure 4.4: Indigenous and non-Indigenous child 0–4 mortality rates: actual rates for 2009, 2010 and 2011 plotted along the indicative trajectory to meet the target of halving the gap in in child mortality rates, NSW, Qld, WA, SA & NT combined

As discussed in the previous section, while it is too early yet to see any effect of these initiatives on reductions in child mortality – due to the time lags between implementation of programs on the ground, risk factor reductions, improved child health, decreased mortality rates and the availability of child mortality data – some improvements in areas such as access to health assessments and antenatal care services may be expected to be seen soon, which may then result in improvements in infant and child mortality in the coming years. For example, data suggest there has been a sharp increase in Indigenous child health checks as a result of COAG initiatives, as well as increased immunisation rates.

It is evident from the information presented in this paper that there are well-documented and sustained programs that provide robust evidence as to what is required for programs to be effective in improving Indigenous maternal and child health, however, many of these programs are isolated examples or small-scale programs and further analysis of system enablers and of strategies to turn knowledge into effective programs would be useful.

It is also evident that some initiatives, particularly large-scale national programs, may not report outcomes or improvements for several years post-implementation, due to time spent planning, recruiting staff and setting up appropriate infrastructure. Initiatives which adapt to, and build upon, existing infrastructure, such as programs implemented in existing community-based primary health care sites, often have more immediate outcomes. Programs which are culturally sensitive and employ Indigenous staff seem to generally have positive outcomes in a short time.

It must also be noted that programs that directly target mothers and babies, such as antenatal care programs, are expected to have a more immediate impact than more general population health initiatives such as anti-smoking or alcohol consumption programs. Programs aimed directly at mothers during the antenatal period have the potential to change behaviour at a time when the child is most at risk, while there may be a greater lag time with general population health initiatives that may take several years to take effect.

Appendix A: COAG Closing the Gap targets

In 2008, COAG agreed to 6 ambitious targets to address the disadvantage faced by Indigenous Australians in life expectancy, child mortality, education and employment.

These are to:

- close the gap in life expectancy within a generation (by 2031)
- halve the gap in mortality rates for Indigenous children under five by 2018
- ensure access to early childhood education for all Indigenous four year olds in remote communities by 2013
- halve the gap in reading, writing and numeracy achievements for children by 2018
- halve the gap for Indigenous students in Year 12 (or equivalent) attainment rates by 2020
- halve the gap in employment outcomes between Indigenous and other Australians by 2018.

Appendix B: Literature review on risk factors associated with child mortality

This Appendix summarises literature identified by the AIHW on the association between relevant risk factors for child mortality, and the risk of perinatal, infant or child mortality. A number of statistical measures are reported in the studies examined to quantify the strength of the relationship between the risk factor and child mortality which are described in Box B.1 below.

Box B.1: Measures of association which quantify the relationship between an exposure (risk factor) and health outcome

Odds ratio (usually abbreviated “OR”): A relative measure that compares the odds of people in a particular group (e.g. those exposed to a risk factor of interest) experiencing an event (e.g. death) with the odds of people in another group (e.g. those not exposed to the risk factor of interest) experiencing the same event.

- OR=1 Exposure does not affect odds of outcome
- OR>1 Exposure associated with higher odds of outcome
- OR<1 Exposure associated with lower odds of outcome.

Relative risk: the ratio of the probability of a health-related event occurring (e.g. death) in an exposed group (e.g. those exposed to the risk factor or interest), to the probability of the event occurring in a non-exposed group.

- A relative risk (RR) of 1 means there is no difference in risk between the two groups
- An RR of < 1 means the event is less likely to occur in the exposed group than in the non-exposed group
- An RR of > 1 means the event is more likely to occur in the exposed group than in the non-exposed group.

Hazard ratio: A measure of how often a particular event (e.g. death) happens in one group (e.g. those exposed to the risk factor or interest) compared to how often it happens in another group (e.g. those not exposed), over time. Hazard ratios differ from relative risks in that the latter are cumulative over an entire study, using a defined endpoint, while the former represent instantaneous risk over the study time period.

Hazard ratios are often treated as a ratio of death probabilities. For example, a hazard ratio of 2 indicates that the exposed population has twice the chance of dying as the non-exposed population.

Infant mortality

Birth outcomes

Low birthweight and pre-term birth

Babies born underweight as a result of either prematurity or poor intrauterine growth have substantially increased mortality risks at birth, in the perinatal period, in infancy, in childhood and as adults.

In Australia, about a third of perinatal deaths stem from disorders that shorten the length of gestation or impair fetal growth (AHMAC 2012). Data from the ABS Perinatal Deaths registration database for New South Wales, Queensland, South Australia, Western Australia and the Northern Territory for 2006–10 found that 37% of all Indigenous neonatal deaths were attributable to low birthweight and prematurity (ABS 2012a). Indigenous mothers are more likely than non-Indigenous mothers to give birth to low birthweight and pre-term babies. In 2010, 12.0% of babies of Indigenous mothers were low birthweight, which compares with 6.0% of babies of non-Indigenous mothers. Similarly, 13.5% of babies of Indigenous mothers were born pre-term, compared with 8.0% of babies born to non-Indigenous mothers (Li et al. 2012).

Taken together, low birthweight and prematurity are the leading cause of neonatal mortality (from birth to less than 28 days). Johnston and Coory (2005) found that the excess mortality in Indigenous babies in Queensland was due to 2 factors: their birthweight and gestational age. A New South Wales study of all babies born between 1998 and 2002 (Mohsin et al. 2005) found that very low birthweight (< 2,000 g) contributed 75.6% of the population-attributable risks to stillbirths and 59.4% to neonatal deaths. Low gestational age (less than 32 weeks) accounted for 77.7% of stillbirths and 87.9% of neonatal deaths.

Many other studies have linked low birthweight with perinatal mortality and infant and child morbidity (Cogswell & Yip 1995; McIntire et al. 1999; Suresh et al. 2001; Woolbright 2001; Wen et al. 2000; Hagan et al. 1996; Koupilova et al. 1998). A 2010 study found that Indigenous infants of low birthweight were 2.3 times more likely to die than those born with a birthweight above the median (Hoy & Nicol 2010).

Mortality in the first year of life has also been associated with low birthweight. In the Jerusalem Perinatal Study which followed individuals for about 3 decades, the strong negative relationship between birthweight and death was mostly because of infant deaths (Freidlander et al. 2003).

Causes of death

Some of the specific causes of infant deaths associated with low birthweight have been identified. The risk of SIDS, which accounts for a significant proportion of deaths in the first year of life, is increased for lower birthweight as a result of shorter gestation. A Scottish study recorded odds ratios for SIDS of about 2.0 for babies born at 38 weeks gestation with the ratio increasing to about 3.0 for babies born at 37 weeks (Smith et al. 2003). SIDS is also strongly associated with being small for gestational age. A study of all cases of SIDS in Indigenous infants in Western Australia from 1980–1990 found a strong association with being small for gestational age and SIDS in infancy (odds ratio of 3.4, Alessandri et al. 1996).

Other causes of infant mortality have also been linked with low birthweight. Even moderately low birthweight infants have been shown to have markedly increased vulnerability to infections. In the USA, the relative risk of infectious disease mortality associated with low birthweight has been estimated to be 2.5 (Read et al. 1994).

Quantification of the association between low birthweight and cause-specific mortality for Indigenous infants in Australia is highly relevant to this scoping study. In comparison with normal weight infants, hazard ratios for diseases highly likely to be due to infections were found to be significantly higher for low birthweight infants (Hoy & Nicol 2010). Hazard ratios were 2.1 for deaths from pulmonary diseases and 1.5 for deaths from gastrointestinal diseases.

Respiratory disease is one of the most serious problems associated with pre-term birth due to immature lung development. Other complications include feeding difficulties, temperature control, apnoea, brachycardia (heart complication) and jaundice (State Government of Victoria 2013).

Risk factors relating to low birthweight and pre-term birth

Some of the known risk factors associated with pre-term birth include: high blood pressure; diabetes; severe illness; smoking; twin or multiple pregnancy; and previous premature birth (State Government of Victoria 2013). Low birthweight may be influenced by smoking and alcohol consumption during pregnancy; poor nutrition; low maternal BMI; maternal age; and maternal health. Some of these will be discussed in more detail later in this chapter.

Maternal factors

Maternal health

The health of the mother is a risk factor that can directly impact upon infant mortality and can also contribute to adverse birth outcomes such as low birthweight and premature birth. In New South Wales in 2010, 26 perinatal deaths (3.4%) were considered to be due to maternal hypertension and 23 deaths (3.0%) were attributed to maternal disease including diabetes, sepsis and maternal injury (NSW Ministry of Health 2010).

Other studies have shown links between maternal health, low birthweight and pre-term birth. Humphrey and Holzheimer (2001), for example, found that among Aboriginal women, poor maternal nutrition (leading to women with significantly low BMIs) was significantly associated with low birthweight babies. A study undertaken by Sayers and Powers (1997), involving 503 live-born Indigenous children delivered at the Royal Darwin Hospital between 1987 and 1990, showed 28% of low birthweight could be attributed to malnutrition (cited in AMA 2005).

Research has shown that there are strong links between pre-term birth and genito-urinary tract infections (including sexually transmitted infections). A review of premature birth and subclinical infections undertaken by Gibbs and others in 1992 found that 80% of pre-term births were associated with an infection inside the uterus (cited in AMA 2005). Another study estimated that infections of the genital tract contribute to up to 40% of all pre-term births (Romero et al. cited in AMA 2005).

There are a range of indicators that show that Indigenous women are more likely than non-Indigenous women to experience health conditions associated with adverse birth outcomes. For example, the results of the 2004–05 NATSIHS show that Indigenous women have higher rates of reported diabetes/high sugar levels than non-Indigenous women (13% compared with 3% respectively) and that rates are higher among Indigenous women in remote areas than in non-remote areas (18% compared with 11% respectively) (AIHW 2013a).

Indigenous women are also more likely to experience hypertension. In 2004–05, 5% of Indigenous women aged 25–34 and 11% aged 35–34 reported high blood pressure, compared with 2% and 4% of non-Indigenous women respectively. Rates of high blood pressure for Indigenous females are higher in remote areas than non-remote areas (10% compared with 7% in 2004–05) (AHMAC 2012).

Indigenous women have higher rates of sexually transmitted infections than non-Indigenous women. Between 2006 and 2008 Indigenous women were 4.4 times more likely than

non-Indigenous women to have chlamydia, 40.8 times more likely to have syphilis and 93.2 times more likely to have gonorrhoea (AIHW 2013a).

Results from the 2004–05 NATSIHS suggest that Indigenous women may have a poorer dietary intake than non-Indigenous women. Over one-fifth (22%) of Indigenous women in non-remote areas reported eating 1 serve of vegetables or less per day (which is below the recommended daily intake), compared with 17% of non-Indigenous women. Over half (57%) of Indigenous women in non-remote areas reported eating 1 serve of fruit or less per day, compared with 40% of non-Indigenous women (AIHW 2013a).

It must also be noted that fruit and vegetables may be less accessible to Indigenous people in remote areas. One-fifth (20%) of Indigenous people aged 12 years and over in remote areas reported no usual daily fruit intake compared with 12% in non-remote areas. In relation to vegetable intake, 15% in remote areas reported no usually daily intake compared with 2% in non-remote areas (AIHW 2013a).

Maternal age

Maternal age has been shown to be related to birth outcomes. Data from the National Perinatal Data collection, for example, shows that mothers under the age of 20 and over the age of 35 are most likely to give birth to low birthweight babies (Leeds et al. 2007). A study undertaken by Mohsin et al. (2003) showed an association between teenage mothers and low birthweight babies and Laws and Hilder found that teenage mothers have higher rates of perinatal complications, including long and difficult labours, premature and 'small-for-dates' infants and increased fetal, neonatal and perinatal mortality (cited in Mares et al. 2011). A data linkage study conducted in the US found that infant mortality was associated with maternal age, with risk of death being significantly higher for mothers aged under 25 (Barbara & Brown 2007). Mares et al. maintain adverse outcomes for babies of teenage mothers are related to a range of socioeconomic and socio-psychological factors, including that pregnant teenagers are less likely than older women to seek antenatal care, they are more likely to have unplanned pregnancies, smoke, use illicit drugs, have poor nutrition, live in poverty and have lower education levels (Mares et al. 2011:275).

It must be noted, however, that some conditions and health problems experienced in infancy and childhood are associated with older age of parents. As noted above, low birthweight has been associated with older maternal age; and acute lymphoblastic leukaemia, the most common type childhood cancer, has been linked with older age parents (Momber 2010).

Perinatal data show Indigenous mothers have a younger age profile than non-Indigenous mother. In 2010, 20% of Indigenous mother were aged under 20, compared with 3% of non-Indigenous mothers; and 10% were over 34 years of age, compared with 24% of non-Indigenous mothers (Li et al. 2012). In 2011, the teenage birth rate for Indigenous women was nearly 5 times that for all women (78 versus 16 babies per 1,000 women) (ABS 2010).

A multivariate analysis of perinatal data for the period 2006–08 has shown that overall, maternal age, particularly teenage pregnancy, was not a significant contributor to low birthweight among babies born to Indigenous mothers (accounting for 1.2%), however young non-Indigenous mothers were at increased risk of giving birth to a low birthweight baby. These results reflect the higher rates of smoking during pregnancy in the teenage and 20–24 year age groups for non-Indigenous mothers, compared to Indigenous mothers who had consistently high rates of smoking during pregnancy across all age groups (AHMAC 2012).

Smoking during pregnancy

Smoking during pregnancy has been found to be associated with pre-term birth, low birthweight and smaller than average for gestational age babies. A study undertaken by Laws and others (2006) showed that: 'In 2003, the proportion of liveborn low birthweight babies (less than 2,500 grams) of mothers who smoked was 10.6%, twice that of babies of mothers who did not smoke (5.1%). The odds of pre-term birth at less than 37 weeks gestation, was 60% higher in babies of mothers who smoked than in babies of mothers who did not smoke' (2006:x). Between 2006–2008, '33% of all low birthweight babies born to Indigenous mothers were attributable to smoking, compared with 13% for other mothers' (AHMAC 2012).

Smoking during pregnancy has also been linked to a range of other adverse maternal and infant health outcomes, such as pre-term labour; ectopic pregnancy; fetal death and miscarriage; perinatal death; congenital disorders; increased risk of cleft lip and cleft palate; retarded growth and development; SIDS; and childhood health problems such as asthma and obesity (Laws et al. 2006; AHMAC 2012; WHO et al. 2012; State Government of Victoria 2012; Mohsin et al. 2003).

Environmental tobacco smoke (passive smoking) can have serious consequences for pregnant women and young children. Studies have shown, for example, that women who are exposed to tobacco smoke during pregnancy are more likely to give birth to low birthweight babies (Windham et al. 1999; Martinez et al. 1994; Mathai et al. 1992). Children and infants exposed to passive smoke are at an increased risk of SIDS and of developing respiratory conditions such as asthma (MacRae et al. 2012; AMA 1999).

Data from the National Perinatal Data Collection shows that in 2010, 49% of Indigenous mothers smoked during pregnancy, compared with 12% of non-Indigenous mothers (Li et al. 2012).

According to the 2008 NATSISS, 65% of Indigenous children lived in a household with current daily smokers, compared with 32% of non-Indigenous children. Indigenous children in *Remote* and *Very remote* areas were more likely than those living in *Major cities* and regional areas to live in a household with a current daily smoker. Seventy-seven per cent of Indigenous children living in *Very remote* areas were exposed to environmental tobacco smoke, compared with 59% in *Major cities* (AHMAC 2012).

Alcohol consumption and drug use

Alcohol consumption during pregnancy is significantly related to the incidence of fetal death, to infant death and to the birth of low birthweight babies (AMA 2005). Maternal alcohol consumption can also lead to a range of problems over a child's lifetime relating to cognitive, social and emotional wellbeing (NHMRC 2009; O'Leary et al. 2012; Bridge 2011; Humphrey & Holzheimer 2001; AHMAC 2012). Such problems are sometimes referred to as fetal alcohol spectrum disorders. Babies exposed to alcohol before birth may suffer from low birthweight, heart defects, behaviour problems and intellectual disability (State Government of Victoria 2013).

Drug use during pregnancy can cause injury to the mother and result in a range of obstetric, fetal and neonatal problems (AHMAC 2012). A study undertaken in the USA suggests that marijuana and heroin during pregnancy is related to infant birthweight (Visscher et al. cited in AMA 2005). Some drugs may interfere with the normal development of a foetus and cause birth defects (State Government of Victoria 2013).

The 2004–05 NATSIHS showed that 14% of Indigenous women aged over 17 drank at short-term risky/high-risk levels, compared with 5% of non-Indigenous women (AHMAC 2012). According to the 2008 NATSISS, 80% of mothers of Indigenous children age 0–3 years did not drink alcohol during pregnancy, 16% said that they drank less alcohol during pregnancy and 3% said that they drank the same amount or more (AHMAC 2012). In relation to drug use, the NATSISS showed that 5% of mothers of Indigenous children aged 0–3 used illicit substances during pregnancy. The proportion was much higher in the states of Victoria and Western Australia (9% each) (AHMAC 2012).

Breastfeeding

Breastfeeding is important in promoting the healthy growth and development of infants and young children. Infants are born with an immune system that is not fully developed and breastmilk (containing mothers' antibodies) provides the best nutritional start. The World Health Organization (WHO) and the National Health and Medical Research Council (NHMRC) recommend that all infants should be exclusively breastfed up to 6 months of age to achieve optimal growth, development and health (NHMRC 2003; WHO 2003).

Breastfeeding provides many benefits to young children including offering potential protection against SIDS and some types of infections and allergies (for example, diarrhoea, respiratory infections, middle ear infections) (Annamalay et al. 2012). Breast milk may also help protect young children from some health problems, such as eczema, obesity and asthma (Lawrence 2009). Other possible benefits include a reduced risk of Type 1 diabetes and some childhood cancers; however, further research is required.

Strong causal links between breastfeeding and reductions in child mortality is hard to ascertain as there are many different factors that relate to breastfeeding. For example, it is possible that breastfeeding mothers are more in tune with their babies, spend more time with them and watch them more closely. Some research also suggests that the hormones associated with lactation might be responsible in part for more attentive parenting (Barrett 2004). There is also growing evidence that breastfeeding improves mother–infant bonding and secure attachment between mother and child (Allen & Hector 2005). Breastfeeding may therefore be seen as part of a broader parenting package which is protective against childhood illness and mortality.

Few studies have been published that have assessed the effect of not breastfeeding on the risk of infant and child death. However, recently published research in the United States has suggested that infant mortality could be reduced if more mothers breastfed their babies. A case–control study of breastfeeding and its relationship with infant survival conducted in 2004 by Chen & Rogan indicated that prolonged breastfeeding may foster an even greater reduction in infant mortality (Barrett 2004). The researchers drew data from the 1988 National Maternal and the Infant Health Survey conducted by the Centers for Disease Control and Prevention. The study found that breastfed babies were 21% less likely to die between ages 1 month and 1 year and those breastfed for at least 3 months had a 38% reduction in mortality by age 1. Breastfeeding appeared to reduce mortality regardless of cause of death – infection, injury, sudden infant death syndrome, or other/unknown causes. Traumatic injury–related deaths appeared to be the most reduced by breastfeeding, with a 41% reduction.

Another study conducted in the USA systematically reviewed all literature published from 1980 to 2009 to identify studies with data assessing levels of suboptimal breastfeeding as a risk factor for diarrhoea morbidity and mortality outcomes. The study concluded that lack of

exclusive breastfeeding among infants 0–5 months of age and no breastfeeding among children 6–23 months of age were associated with increased diarrhoea morbidity and mortality in developing countries. Specifically, not breastfeeding resulted in an excess risk of diarrhoea mortality in comparison to exclusive breastfeeding among infants 0–5 months of age (RR: 10.52) and to any breastfeeding among children aged 6–23 months (RR: 2.18) (Lamberti et al. 2011).

Environmental factors

Socioeconomic disadvantage

There has been much research to suggest a relationship between birth outcomes and socioeconomic status. A world-wide study on socioeconomic determinants of infant mortality, for example, found that gross national income per capita, young female illiteracy and income inequality predicted 92% of the variation in national infant mortality rates (Schell et al. 2007).

Similar results have been found with regard to national studies. Research undertaken in Australia, involving 195 statistical local areas in each of the mainland capital cities from 1985–1989, showed that ‘standardised infant mortality ratios were significantly higher in areas with greater concentrations of low-income families’ and that ‘this relationship was independent of the effects of low birthweight, Aboriginality, ethnicity and variability between capital cities’ (Turrell & Mengerson 2000). A more recent study, using data from an outer urban Australian hospital in 2002, ‘found that for both Indigenous and non-Indigenous infants, birthweights were associated with socioeconomic status’ (Titmuss et al. 2008:495).

A US study linked a deprivation index (based on factors such as education opportunities, labour force skills and economic and housing conditions) to county vital records data to examine the relationship between infant mortality and socioeconomic disadvantage. The study found that in 1985–87 ‘infants in the most deprived group had, respectively, 36% and 57% higher risks of neonatal and postneonatal mortality than infants in the least deprived group’ and that ‘the corresponding risks increased to 43% and 96% in 1995–2000’ (Singh & Kogan 2007:e928).

A retrospective cohort study undertaken in the UK using data from that country’s largest maternity unit found that ‘deprivation [based on a range of economic, social and housing indicators] had significant impact on pre-term birth rates in low risk women’ (Taylor-Robinson et al. 2011:e23163). It also found that the relationship between low socioeconomic status and pre-term births was related to low maternal weight and smoking in the more deprived groups. A study conducted in Italy in 20 regions across the country in 2006–2008, showed that ‘variations in IM [infant mortality] were strongly associated with relative and absolute income and unemployment rate’ (Dallolio et al. 2012). Links between socioeconomic status and infant mortality have also been found in India (Kumar et al. 2013) and Bangladesh (Chowdhury et al. 2010).

There are a range of indicators that point to the socioeconomic disadvantage of Indigenous Australians. Indigenous people experience higher rates of unemployment than non-Indigenous people (17% compared with 4% in 2008) and lower labour force participation rates (65% compared with 79% in 2008). Indigenous unemployment is higher in regional than non-regional areas (9% in *Remote* areas in 2008 compared with 12% in *Major cities*); as is the proportion of Indigenous people not in the labour force (39% in *Remote* areas compared with 29% in *Major cities*) (AHMAC 2012).

The 2008 NATSISS shows that 49% of Indigenous Australians aged over 17 years are in the lowest income quintile (equivalised gross weekly household income) compared with 20% of non-Indigenous Australians. The disparity is worse in relation to remote areas, with the proportion of Indigenous Australians in the lowest income quintile being 52% in *Remote* areas and 62% in *Very remote* areas. This compares with 23% and 0% respectively for non-Indigenous Australians (AHMAC 2012).

Remoteness

Mortality data from the ABS show that in 2011, the infant mortality for all children was highest in *Very remote* areas (8.2 deaths per 1,000 live births) and lowest in *Major cities* (3.6) (ABS 2012b). Data on Indigenous infant mortality by remoteness is not published, however, a study undertaken in Western Australia revealed higher rates in remote areas. This study examined infant deaths between the period of 1980 and 2002 and showed that the cumulative mortality rate was highest in remote locations for both Aboriginal and non-Aboriginal infants. Rates were significantly higher for Aboriginal infants in all geographic locations (Freemantle et al. 2004:45), with the risk ratio being highest in remote areas (the risk of death for Aboriginal infants in remote areas was 3.5 times higher than that of non-Aboriginal infants in remote areas) (Freemantle et al. 2004:50). This study also found that Aboriginal infants living in remote locations were significantly more likely to die due to birth defects and infection compared with Aboriginal infants in metropolitan locations. (Freemantle et al. 2004:xxvii).

A population-based study using data on 35,240 Indigenous mothers and their babies from the National Perinatal Data Collection found perinatal health disparities relating to geographic location. The study concluded that after 'adjusting for age, parity, smoking and diabetes or hypertension, babies born to mothers in remote areas were less likely to satisfy the study criteria of being a healthy baby (adjusted odds ratio [AOR], 0.87; 95% CI, 0.81–0.93) compared with those born in cities. Babies born to mothers living in remote areas had higher odds of being of low birthweight (AOR, 1.09; 95% CI, 1.01–1.19) and being born with an Apgar score <7 at 5 minutes (AOR, 1.63; 95% CI, 1.39–1.92)' (Graham et al. 2007).

The authors (Graham et al. 2007), however, raise the question as to whether remoteness itself is the risk factor, or a proxy for other factors relating to perinatal outcomes. They raise the point that Indigenous mothers who live in remote areas are less likely to smoke, but more likely to have diabetes or hypertension, to be younger and to have a higher parity than Indigenous mothers in other areas. They conclude, that despite adjusting for these factors, this partially explains why there is a higher prevalence of poorer perinatal outcomes in remote areas compared with other areas.

It must also be noted that remoteness may be related to other factors, such as socioeconomic status, access to health services and availability of nutritional food.

Access and utilisation of antenatal care services

Antenatal care is considered as a risk factor as well as a protective factor for child mortality, as good quality and regular antenatal care has the capacity to improve maternal health and, in so doing, to improve mortality outcomes for both mothers and their offspring. Care may involve medical treatment as well as counselling and referral to other services. Good antenatal care also has the capacity to improve the physical and mental health of mothers as well as to reduce behaviours harmful to health. Inadequate antenatal care such as insufficient antenatal visits (relating to a range of factors including accessibility of services; remoteness;

accesses to transport; and maternal knowledge and awareness); antenatal visits not occurring until late in pregnancy; or poor quality care, can have a negative impact on maternal health and consequently birth outcomes.

Poor maternal health can compromise the intrauterine environment which in turn impacts negatively on fetal growth and health leading to premature birth and/or low birthweight. In international and Australian studies, inadequate antenatal care has been associated with increased mortality risks for offspring through stillbirth and perinatal death (Hollowell et al. 2011). Inadequate antenatal care has also been associated with increased probability of low birthweight which in turn increases the risk of infant and child mortality.

The proportion of Aboriginal and Torres Strait Islander mothers who access antenatal care services at least once during their pregnancy is similar to that of non-Indigenous mothers (97% compared to 99%) (AHMAC 2012). However, data suggest that Indigenous mothers access services later in pregnancy and less frequently than do non-Indigenous mothers. In 2009, in the 4 jurisdictions for which data were available (New South Wales, Queensland, South Australia and the Northern Territory), 56% of Indigenous mothers attended at least 1 antenatal visit in the first trimester of pregnancy compared with 75% of non-Indigenous mothers. On average, 76% of Indigenous mothers had 5 or more antenatal care sessions compared with 94% of non-Indigenous mothers.

Antenatal care and stillbirth

There is some, fairly limited, evidence that inadequate antenatal care is associated with an increased risk of stillbirth. In a recent systematic review and meta-analysis of the major risk factors for stillbirth in high income countries, it was estimated that lack of antenatal care accounted for 9% of the population attributable risk of stillbirth (Flenady et al. 2011).

International studies suggest that a complete lack of antenatal care is associated with a 3-fold increased risk of stillbirth for women (RR 3.3; Flenady et al. 2011). Insufficient antenatal visits have been associated with a smaller but still significantly increased risk of stillbirth. For example, Brazilian women who had fewer than 5 antenatal visits had an odds ratios for stillbirth of 1.8 (Ferraz & Gray 1991). Late commencement of antenatal visits is also associated with increased risk of stillbirth but the magnitude of the effect may be smaller. For example, Australian women who had their first antenatal visit after 20 weeks gestation had an odds ratio of 1.1 for stillbirth compared with those who had their first visit earlier (Mohsin et al. 2006). Overall, in the international literature, the relative risks for stillbirth associated with inadequate antenatal fell within the range of 1.1 to 3.0.

Antenatal care and perinatal deaths

Inadequacy of antenatal care appears to be associated with increased perinatal mortality rates in diverse settings. In Indonesia, perinatal mortality was 3-fold higher for the offspring of women who had fewer than 2 antenatal visits in comparison with those who had adequate antenatal care (Ibrahim et al. 2011). A recent review of studies in high income countries identified only 2 studies deemed to be of sufficient quality which evaluated the risk of perinatal mortality in women not receiving adequate antenatal care (Hollowell et al. 2011). Inadequate antenatal care was considered to be associated with infant death (OR 1.2) in 1 of the 2 studies.

Increased perinatal death rates associated with inadequate antenatal care have also been recorded in Australian studies. De Lange et al. (2008) analysed perinatal deaths in South Australia from 2001 to 2005 and found an odds ratio of 2.9 for fewer than 3 antenatal visits.

The association between inadequate antenatal care and perinatal death may be stronger for Indigenous women. The odds ratio for perinatal mortality was 4.3 for the offspring of Indigenous women who had fewer than 3 antenatal visits in comparison with those who received good antenatal care as part of a community based program (Panaretto et al. 2005 & 2007).

Antenatal care and low birthweight

The offspring of mothers receiving inadequate antenatal care are more likely to be underweight as a result of premature birth and/or impaired fetal growth. Low birthweight, regardless of the cause, has been associated with increased mortality throughout all life stages. Antenatal care provides opportunities for health professionals to offer services to reduce known risk factors. Factors contributing to low birthweight which are amenable to intervention include smoking, nutrition, alcohol consumption, illness, infections and domestic or other kinds of abuse.

The association between inadequate antenatal care and low birthweight has also been quantified in a number of studies. Complete lack of antenatal care has been associated with increased relative risks of low birthweight in Mexico (OR 1.2; Torres-Arreola et al. 2005), Brazil (OR 1.4; Zambonato et al. 2004) and the USA with the effect being greatest in more deprived neighbourhoods (OR 2.1–2.6; O’Campo et al. 1997). Studies in a broad range of countries have also associated inadequate antenatal care with increased likelihood of low birthweight. A review of studies carried out in high income countries found that in about half of the studies inadequate antenatal care was associated with increased risks of low birthweight or pre-term birth with relative risks predominantly falling within the range of 1.3–2.0 with most typically at the lower end of the range (Hollowell et al. 2011).

The proportion of low birthweight babies have been reduced as a result of delivery of better antenatal care, although there has been variation between studies. For example, delivery of antenatal care to low income women in Illinois reduced the odds ratios of low birthweight babies to about 0.9 (Keeton et al. 2004). In other studies in the USA, improvements in the delivery of antenatal care more than halved the proportion of mothers that had low birthweight babies (Olds et al. 2004).

A recent review of the capacity of antenatal care to specifically reduce pre-term birth in disadvantaged women found that although strong evidence was generally lacking, some methods of improving antenatal care appeared promising (Hollowell et al. 2011). These methods included group sessions, targeting a broad range of risk factors in at-risk women, customising programs specifically to the needs of clients and improving clinic quality.

Data in Australia from the National Perinatal Data Collection suggest that there is a correlation between later attendance at antenatal care and higher rates of low birthweight. Data suggest that as the number of antenatal visits increase there is a decreased likelihood of mothers giving birth to low birthweight babies. In 2009, Indigenous mothers attending 5 or more sessions had much lower rates of low birthweight babies (8%) than those who attended 1–4 sessions (20%), or no sessions (37%). The same pattern was evident for non-Indigenous mothers and for pre-term births and perinatal mortality (AHMAC 2012).

Antenatal care and smoking during pregnancy

Analysis of perinatal data suggests that Indigenous mothers who attend antenatal care later during pregnancy and less frequently are more likely to smoke during pregnancy than are Indigenous mothers who attend antenatal care early and more often. In 2009, in the

jurisdictions with available data, approximately 60% of Indigenous mothers who attended antenatal care in the third trimester smoked during pregnancy compared to 48% of Indigenous mothers who attended antenatal care in the first trimester. Similarly, 68% of Indigenous mothers who attended 1 antenatal care session reported smoking during pregnancy, compared to 51% of Indigenous mothers who attended 5 or more sessions. The same pattern was evident for non-Indigenous mothers (AIHW 2013a).

Child mortality (1–4 years)

As discussed previously, causes of death of children aged 1–4 differ from causes of infant mortality. While there are some commonalities, (for example, congenital malformations, ill-defined conditions, external causes and diseases of the respiratory and circulatory systems), there are differences in the patterns. For example, infants are much more likely to die of congenital malformations and ill-defined conditions (including SIDS); while children aged 1–4 are at a higher risk of dying of external causes and diseases of the respiratory and circulatory systems (Figure 2.5). By far, the leading cause of death of children aged 1–4 is external causes (including accident and injury), which accounts for almost 50% of deaths in this age group. As such, some risk factors will be the same (such as smoking, alcohol consumption, remoteness and socioeconomic status), while others will be more relevant to specific age groups. For example, issues relating to family and community safety are particularly pertinent to older aged children, for whom accident and injury is the leading cause of death.

Low birthweight

Research has demonstrated that low birthweight is a risk factor for child mortality as well as for infant mortality. A study conducted in the USA found that for young children (1–4 years), low birthweight was associated with significantly increased risk of all-cause mortality (OR 2.2), with relative risks for mortality from infectious diseases (OR 2.5) and congenital abnormality (OR 6.0) being increased the most (Li et al. 2003). In comparison, for children in the next age group (5–9 years), the odds ratios associated with low birthweight were lower for all-cause mortality, at 1.7 and similar for mortality from infectious diseases (OR 2.7). Other studies in the USA found very similar increased risks of infectious disease mortality associated with low birthweight for children of similar age. One such study was that of Read and others (1994) that recorded an infectious disease mortality risk of 2.5 for moderately low birthweight children aged up to 7 years. Similar effects of low birthweight were seen in the 10–14 age group with an OR of 1.5 for all-cause mortality and 2.7 for infectious disease mortality (Li et al. 2003). Birth weight was not significantly associated with all-cause or cause specific mortality in older children.

A large Norwegian study recoded similar associations between birthweight and causes of childhood mortality although it additionally documented increased mortality as a result of injury (Samuelsen et al. 1998). For 1–5-year-olds, low birthweight was associated with increased mortality from infections (RR 1.7), congenital abnormalities (RR 4.9), other diseases (RR 3.5) and injuries. In comparison with the youngest age group, older children aged 6–10 or 11–15 years had similarly increased risks of mortality from infections. The increased risk of mortality from congenital abnormalities and other diseases associated with low birthweight decreased with age. For injury, low birthweight children in the 6–10 year age group had a RR of 1.8 while those in the oldest group had the same RR as the youngest age group (RR 1.3).

Associations between birthweight and childhood mortality have been documented for Indigenous Australians living on the Tiwi Islands (Hoy & Nicol 2010). Findings were quantitatively similar to those detailed above. For children aged 1–15, the hazard ratio (HR) for those born with a birthweight below the median was 1.78; that is, they were 1.78 times more likely to die than children with a birthweight above the median. The increased risk was related to greater mortality from pulmonary (HR 1.8) and gastrointestinal causes (HR 5.2).

Alcohol, tobacco and other drugs

The risks of smoking during pregnancy and alcohol and drug use have already been discussed in relation to infant mortality. It is important to also note that these activities may have consequences far into childhood. Smoking during pregnancy, as well as exposure to environmental tobacco smoke, may increase the risk of childhood asthma or other respiratory diseases. Foetal alcohol syndrome disorder (FASD) may impact upon a child's health and wellbeing well into adulthood. Parental use of drugs and alcohol may also impact upon the safety and security of the home environment and may compromise the ability of parents to meet the physical and emotional needs of children.

Immunisation

A large part of the reduction in mortality and morbidity among children over the last century was due to an increase in immunisation against infectious diseases. Immunisation has resulted in the worldwide eradication of smallpox, the widespread elimination of poliomyelitis and has the potential to protect children against a multitude of other communicable diseases, such as measles, mumps, rubella, Haemophilus influenzae type b (Hib) and whooping cough (AIHW 2011).

Timeliness of immunisation is particularly important. Australian studies have shown that although immunisation coverage has increased over time, it decreases with the age of the child. Studies have also shown that the timeliness of childhood vaccination has not improved greatly and that Indigenous children are most at risk of delayed vaccination (AIHW 2013a).

Children who do not receive complete and timely immunisations remain at risk of contracting infectious diseases, resulting in short- and long-term health consequences. In some cases, the long-term complications of the disease can be even more severe than the disease itself, such as permanent brain damage arising from complications of the measles virus and Hib bacteria (Andre et al. 2008; Australian Technical Advisory Group on Immunisation 2008).

Since the introduction of childhood vaccination in Australia, deaths from vaccine-preventable diseases have fallen by 99%. Vaccinations have been estimated to have saved around 70,000 Australia lives (Burgess 2003). Poliomyelitis and measles vaccinations have prevented a further 8,000 deaths. The introduction of Hib vaccine in 1993 was followed by an immediate fall in the incidence of the disease and it is estimated that between 1993 and 2000 more than 100 deaths have been prevented in children under the age of 5 years (McIntyre et al. 2002).

Vaccinations have also been effective in reducing disparities in disease prevalence between Indigenous and non-Indigenous populations despite differences in socioeconomic status (Menzies & Singleton 2009). Research undertaken by the National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases has shown that universal vaccination programs with highly effective vaccines (for example, measles, mumps, rubella,

poliomyelitis, diphtheria and tetanus vaccines) have achieved excellent disease control in Indigenous people, similar to that in non-Indigenous people. Findings are similar in other countries with comparable Indigenous populations (Menzies & Singleton 2009).

Many international studies have shown child mortality reductions related to measles vaccinations. For example a study using country-level, longitudinal data from 44 countries over the period 1960–2005 analysed the relationship between measles vaccination coverage and measles mortality, which showed that sustained high levels of vaccination coverage, along with other factors, contributed to dramatic declines in measles deaths among children aged under 5 years (Goldhaber-Fiebert et al. 2010).

Family and community violence

Violence experienced in the home or in the community, while not necessarily leading directly to child mortality (although this can occur in extreme cases), may expose children to physical harm and impact negatively upon health and development. Yount and others (2011), for example, maintain that domestic violence against mothers may ‘impair child growth and nutrition, prenatally and during the first 36 months of life’. A study undertaken by Rath and others found that not only women who had experienced domestic violence, but also their children, used health services 6 to 8 times more often than did controls (cited in Campbell & Lewandowski 1997).

As noted by Willis (2010:ix) ‘issues of violence among Indigenous Australians have been widely discussed through research, government inquires and the media’. Violence in Indigenous communities must be seen in the ‘context of colonisation, post-colonial history and discrimination and subsequent markers of disadvantage such as low income, unemployment, lack of access to traditional lands and substance use’ (AHMAC 2012:93).

An analysis of incidents of domestic assault recorded by New South Wales police between 2001 and 2010 shows that Indigenous Australians are over-represented as both victims and offenders of domestic assault and that this has not changed over the last decade (Grech & Burgess 2011). Hospitalisation data shows that Indigenous children are much more likely than non-Indigenous children to be hospitalised for a principal diagnosis of assault. Between June 2006 to June 2008, Indigenous children aged 0–4 years were hospitalised for assault at a rate of 1.4 per 1,000 population, compared with 0.2 per 1,000 for other Australian children (AIHW 2011).

Indigenous children are more likely than non-Indigenous children to be subjects of substantiated child protection notifications. Substantiations are situations where, after investigation, the relevant authorities concluded that there was reasonable cause to believe that the child had been, was being or was likely to be, abused, neglected or otherwise harmed.

In 2008–09, the rate of substantiations for Indigenous children aged 0–16 was 37 per 1,000, compared with 5 per 1,000 for non-Indigenous children. In the majority of jurisdictions, the highest numbers of Indigenous children who were the subject of a substantiated notification were aged between 1 and 4, whereas, for other Australian children, the highest numbers were for children aged between 10 and 14 (AIHW 2011). Compared with other children, the reason for substantiated child protection notifications for Indigenous children was more likely to be for neglect rather than for sexual, physical or emotional abuse (AHMAC 2012)

The 2008 NATSISS collected information on perceptions of community safety. Twenty six per cent of Indigenous respondents reported that family violence was a problem in their

neighbourhood or community, 23% identified assault as being a problem, 12% identified sexual assault, 14% said that levels of neighbourhood conflict were a problem and 14% were concerned over levels of personal safety during the day or night (AIHW 2013a). In a survey of service providers who work with Aboriginal communities, 70% identified violence within families as a serious or very serious problem, 66% identified children being neglected or not looked after properly, 55% identified emotional abuse of children and 42% identified sexual abuse of children and physical abuse of children as being serious or very serious problems (Willis 2010).

Appendix C: Mortality interventions by risk factor

Table A2.1: Child mortality interventions examined, by risk factors

Risk factor	Risk factors/interventions	Interventions examined
Antenatal care	Low birthweight (Australia)	New Directions: Mothers and Babies
		Healthy for Life
		Aboriginal Maternal and Infant Health Strategy
		Aboriginal Midwifery Access Program (AMAP)
		Australian Nurse–Family Partnership Program (ANFPP)
		Strong Women, Strong Babies, Strong Culture
		Nganampa Health Council
		Mums and Babies
		Congress Alukura
		Koori Maternity Program
Low birthweight (International)	Low birthweight (International)	Reduced schedule of antenatal care visits (Zimbabwe)
		SUCCESS (USA and Canada)
Pre-term birth (Australia)	Pre-term birth (Australia)	Townsville Mums and Babies Program
		Teenage antenatal clinics
Pre-term birth (International)	Pre-term birth (International)	RCT's of antenatal care interventions (USA)
		Women, Infants and Children's (WIC) Services (USA)
Prenatal health (International) Child/infant mortality (Australia)	Prenatal health (International) Child/infant mortality (Australia)	Nurse–Family Partnership
		Bourke
		Cherbourg
		Nganampa Health Council
Antenatal care (Australia)	Antenatal care (Australia)	Daruk AMS (AMS Western Sydney)
		Mt Isa Shared Antenatal Care
		Djuli Galban

(continued)

Table A2.1 (continued): Child mortality interventions examined, by risk factors

Risk factor	Risk factors / interventions	Interventions examined
Smoking	Smoking during pregnancy (Australian)	'Quit for you Quit for two'
	Smoking cessation (Indigenous Australian)	Indigenous Chronic Disease Package (numerous programs) Cognitive behaviour therapy & pharmaceuticals Rumbalara Aboriginal Health Service Koori Tobacco Cessation Project Indigenous Tobacco Control Initiative NSW SmokeCheck Aboriginal Tobacco Prevention Project
	Smoking cessation (International)	Study of quitting during pregnancy (UK) SUCCESS (USA and Canada) Studies of maternal smoking (multiple countries)
	Smoking relapse (International)	Motivational interviewing to prevent relapse (RCT, USA)
Alcohol	Alcohol consumption	Marulu: Overcoming FASD and Early Life Trauma in the Fitzroy Valley Ord Valley Aboriginal Health Service Fetal Alcohol Spectrum Disorders Program
STIs	STI (Indigenous Australian)	Tiwi Sexual Health Program STI demonstration projects for improving sexual health of Aboriginal and Torres Strait Islander youth
Breastfeeding	Breastfeeding (Australian)	Australian National Breastfeeding Strategy Binya Gurang: promotion of breastfeeding to Aboriginal and Torres Strait Islander women Growing strong: feeding you and your baby Starting Out Program The Toowoomba Infant Feeding Support Service project
	Breastfeeding (International)	Baby Friendly Hospital Initiative The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) Canadian Community Breastfeeding Centers
Immunisation	Immunisation (Australian)	Immunise Australia Program Australian Meazles control campaign Boab Health Services Immunisation

Table A2.2: Programs and activities funded to reduce Indigenous smoking rates under the ICDP

Program/activity	Description
Regional Tackling Smoking and Healthy Lifestyle Workforce	The RTSHLW workforce is working with Aboriginal and Torres Strait Islander communities in their region to develop regional and local approaches to reducing smoking rates and improving nutrition and physical activity levels, including through social marketing campaigns and community events
National Coordinator – Tackling Indigenous Smoking	The National Coordinator is contracted to undertake a number of activities including (providing practical leadership and advocacy in the national implementation of smoking reduction measures among Indigenous Australians under the National Partnership Agreement on Closing the Gap on Indigenous Health Outcomes
Regional Tackling Smoking Fund	The Regional Tackling Smoking Fund provides Regional Tackling Smoking teams with funding to promote anti-smoking campaign messages including sponsorship of smaller, local events and to support ways to quit smoking within Indigenous communities.
Tobacco Technical Reference Group	The Tobacco Technical Reference Group provides advice to the Commonwealth on the Tackling Smoking measure.
Break The Chain	This is the first national targeted Indigenous anti-smoking campaign (television, radio, print advertising, posters), which was launched on 29 March 2011.
Brief Intervention Training	Training on how to deliver tobacco brief interventions specifically for Aboriginal and Torres Strait Islander peoples is being made available for health workers, drug and alcohol treatment staff and community youth educators.
Quitline Enhancement	The Quitline Enhancement Project provides funding to Quitlines to enhance their capacity to be more culturally sensitive and to provide accessible and appropriate services to Aboriginal and Torres Strait Islander peoples.
Quitskills	The Cancer Council SA has been funded to deliver the national implementation of the Quitskills Training Program for Aboriginal Workers. Quitskills will contribute to the reduction of smoking rates by directly increasing the number of suitably trained and qualified professionals working with Aboriginal and Torres Strait smokers and their communities. Quitskills will deliver best-practice intervention methods aimed at assisting people to quit smoking.
National conferences and workshops	National workshops for Regional Tackling Smoking and Healthy Lifestyle teams provide training and build networks across the new national workforce.
Smoke Free Aboriginal Hostels Limited	The Department, the National Coordinator, Tackling Indigenous Smoking and AHL have entered into a partnership which will assist the development and implementation of a program of health education and health promotion activities to support the prevention, reduction and cessation of smoking by AHL clients and staff.
Centre for Excellence in Indigenous Tobacco Control	CEITC was established in 2003, in the Onemda VicHealth Koori Health Unit at the University of Melbourne, to increase knowledge about Indigenous tobacco control. It has a focus on Indigenous Tobacco Control Worker training, resource development, networking, assisting with policy development and knowledge exchange.
NACCHO Smoke Free Project	This project aims to assist all ACCHS become smoke free workplaces through the Smoke Free Support Officer position with NACCHO. The Smoke Free Officer is providing leadership and support across all ACCHS as they develop, implement and monitor effective smoke free policies and become smoke free workplaces. The Officer is assisting in developing culturally secure social marketing campaigns that aim to encourage quitting, smoke free environments and encourage healthy lifestyles.
Menzies No Smokes website	The No Smokes website was launched on 31 May 2012. The site includes video clips of smoking-related interviews with celebrities, health experts and the general public, as well as animations, games and health information to provide support to smokers to get quit and stay quit. The No Smokes project also includes resources for teachers and health workers, providing educational material, downloadable tools and interactive activities.
Nicotine Replacement Therapy Guide	The Nicotine Replacement Therapy guide was developed to provide a plain language guide for health workers to help Aboriginal and Torres Strait Islander people to quit smoking. The guide helps people understand nicotine replacement therapy and explains how it and other medicines help people to quit smoking.

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Table A2.2 (continued): Programs and activities funded to reduce Indigenous smoking rates under the ICDP

Program/activity	Description
Rural Health Education Foundation	The Rural Health Education Foundation is producing, broadcasting, webcasting and distributing a range of educational television programs and other resources including DVDs and learning guides, which primarily aims to educate and inform Regional Tackling Smoking and Healthy Lifestyle Teams, Aboriginal Health Workers, Aboriginal Medical Services and other health workers about best practice smoking prevention, reduction and cessation for Indigenous people.
Indigenous Marathon Project	The Indigenous Marathon Project aims to promote and support participation in physical activity and healthy non-smoking lifestyles in Indigenous communities and to complement existing Indigenous community health initiatives, including Regional Tackling Smoking and Healthy Lifestyle Teams.
Murri Rugby League Carnival	The Carnival will promote healthy lifestyles and wellbeing within Aboriginal and Torres Strait Islander communities, with a major focus on smoking and other risk factors for chronic disease.
Healthy, Deadly and Strong Healthy Lifestyle Worker Toolkit	Toolkit developed in 2010–11 by HealthInfoNet as a guide to help Healthy Lifestyle Workers, working in Regional Tackling Smoking and Healthy Lifestyle Teams, to encourage and support Aboriginal and Torres Strait Islander peoples to stay healthy or become healthier.
Remote Active Living Project	The project is working with remote communities (in the Northern Territory and northern Western Australia and South Australia) to develop local strategies and capacity, with the aim of reducing chronic disease risk factors including smoking and encouraging healthy lifestyles.

Appendix D: Methodology for calculating variability bands for the NIRA child mortality trajectory

‘Variability bands’ (also referred to as 95% confidence intervals) can be used to help users determine whether a mortality rate recorded for a future time-point is close enough to the imposed trajectory to permit one to conclude that it is on target. Variability bands presented in this report do not reflect all of the key sources of variability that impact on the number of Indigenous deaths actually recorded in a year (for example, errors in Indigenous identification of deaths and errors in the death registration process), or errors in the estimated number of Indigenous people in the relevant population. They also do not take into account current levels of Indigenous under-identification or changing levels of identification going into the future.

For the NIRA child mortality trajectory, 95% variability bands were calculated around historical data and then applied to projections of mortality rates into the future. The degree of variability in the observed (historical) data is calculated using the standard method for calculating variability bands agreed to by the National Indigenous Reform Agreement Performance Information Management Group (NIRAPIMG) for reporting Indigenous mortality data in the NIRA. It is assumed that a similar pattern of variability (around the imposed trajectory) will continue into the future. Generally, it is assumed that the breadth of the variability band at a future time-point is related to the value of the projected variable at that time-point. The variability bands are therefore not ‘forecast confidence intervals’ of the kind that would result if the projection path were modelled freely, rather than imposed. They only reflect a distribution of error around the assumed trajectory. As such, it is possible for the variability bands to narrow slightly into the future.

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This report outlines the main drivers impacting on the COAG target to halve the gap in child mortality within a decade. These include low birthweight, maternal health and behaviours (smoking and alcohol use during pregnancy) and inadequate or infrequent antenatal care. The report examines interventions that have been shown to be effective in reducing Indigenous child mortality; the time lags between program implementation and expected reductions in child mortality and its risk factors; and data availability to measure outcomes achieved.