Maternal and Perinatal Mortality in South Australia 2015

September 2017

Pregnancy Outcome Unit,
SA Health

Government of South Australia
SA Health

September 2017

Thirtieth Report of the Maternal and Perinatal Mortality Committee on maternal and perinatal deaths, including the South Australian Protocol for investigation of Stillbirths

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Professor Jodie Dodd	Obstetrician, Chair
Dr Elinor Atkinson	Obstetrician
Dr Vineesh Bhatia	Neonatal paediatrician
Professor Gustaaf Dekker	Obstetrician
Dr Roz Donellan-Fernandez	Midwife
Professor William Hague	Obstetric physician
Professor T. Yee Khong	Pathologist
Dr Tim Porter	Obstetric anaesthetist
Dr Mojgan Vatani	Obstetrician
Dr Kenan Wanguhu	General Practitioner
Dr Wendy Scheil	Public health physician, Medical Secretary

Maternal Subcommittee

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Dr Elinor Atkinson	Obstetrician
Professor Gustaaf Dekker	Obstetrician
Professor Jodie Dodd	Obstetrician
Dr Roz Donellan-Fernandez	Midwife
Professor T. Yee Khong	Pathologist
Dr Tim Porter	Obstetric anaesthetist
Dr Kenan Wanguhu	General Practitioner
Dr Wendy Scheil	Public health physician, Medical Secretary

Perinatal Subcommittee

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Dr Elinor Atkinson	Obstetrician
Dr Vanessa Ellison	Neonatal paediatrician
Dr Jenni Goold	General Practitioner
Professor T Yee Khong	Pathologist
Dr Anu Kochar	Neonatal paediatrician
Dr Dee McCormack	Obstetrician
Dr Linda McKendrick	Obstetrician
Dr Nicholas Manton	Pathologist
Dr Tim Porter	Obstetric anaesthetist
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Ms Deanna Stuart-Butler	Midwife
Mrs Liz Schloithe	Neonatal nurse
Dr Lizelle Weber	Neonatal paediatrician
Dr Wendy Scheil	Public health physician, Medical Secretary

Education Subcommittee

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Dr Aimee Whiltshire	Obstetrician
Dr Kenan Wanguhu	General Practitioner
Ms Sally Halton	Midwife
Dr Brian Wheatley	Mentor
Dr Wendy Scheil	Public health physician, Medical Secretary

Committee staff

Ms Robyn Kennare	Midwife / Secretary

Acknowledgements

We would like to express our sincere thanks to Mrs Roz Donnellan-Fernandez who resigned from the main Committee and the Maternal Mortality Subcommittee at the end of 2016 to move interstate, and to Dr Lizelle Weber who resigned from the Perinatal Mortality Subcommittee in 2016, also to move interstate. Our sincere thanks also go to Mrs Patricia Viergever who completed her six year term on the Perinatal Mortality Subcommittee in 2016 and also retired from work as a neonatal nurse.

In 2016 Dr Kenan Wanguhu and Ms Sally Halton were welcomed to the Education Subcommittee and Ms Deanna Stuart-Butler to the Perinatal Mortality Subcommittee. Ms Liz Schloithe was welcomed to the Perinatal Mortality Subcommittee but had to resign due to work commitments at the end of 2016.

We gratefully acknowledge the valuable assistance of the following:

> Medical practitioners who completed confidential reports on maternal, perinatal or post-neonatal deaths and submitted autopsy reports

> SA Pathology and the Forensic Science Centre for providing autopsy reports

> The staff of the Births, Deaths and Marriages Registration Division

> Mr Mark Johns, State Coroner, and the staff of the Coroner's Office especially Ms Annemarie Van Putten

> Ms Robyn Kennare for preparing the graphs and tables.

Summary

This is the thirtieth Annual Report of the Maternal and Perinatal Mortality Committee, for the year 2015.

1. There were three maternal deaths in 2015. The maternal mortality ratio for the last five-year period 2011-2015 was 8.9 deaths per 100,000 women who gave birth, which is low by international standards, but higher than in the preceding five-year period where there were 6.2 deaths per 100,000 women. The overall number of deaths was small (nine in five years compared with six in the previous five years). The Australian maternal mortality ratio for the period 2008-2012 (the most recent available) was 7.1 per 100,000 women.

2. The Committee reviewed the 188 perinatal deaths of babies born in South Australia in 2015. The perinatal mortality rate for all births (stillbirths of at least 400g or 20 weeks gestation and all live births) was 9.3 per 1,000 births. The stillbirth rate was 7.6 per 1,000 births and the neonatal mortality rate was 1.7 per 1,000 live births. There has not been much change in the stillbirth rate in the past two decades (7.4 per 1,000 births in 1997). The neonatal mortality rate was the lowest recorded (down from 3.2 per 1,000 live births in 1997), which has resulted in a small reduction in the perinatal mortality rate in that period. There has also not been much change in the past two decades in the perinatal mortality rate used for international comparison, (i.e. stillbirth and death within the first seven days of life for babies weighing at least 1,000g).

3. Eighty-three percent (83%) of the perinatal deaths occurred in preterm babies (less than 37 weeks gestation). The leading cause of perinatal death in 2015 was again congenital abnormalities, which accounted for 33.2% of the deaths. Other leading causes were specific perinatal conditions (14.4%), which included conditions such as cervical incompetence, twin-twin transfusion and idiopathic hydrops. This was followed by antepartum haemorrhage (13.8%), fetal growth restriction (9.6%), and perinatal infection (8.5%), including four deaths attributed to group B Streptococcus. The proportion of unexplained antepartum deaths (8.0%) was similar to 2014 (7.1%). There were 15 stillbirths of undetermined cause, a rate of 0.7 per 1,000 births in 2015. This rate has fallen in recent years, compared with 2.0 per 1,000 births in 1995-1998. In 2012 the Committee revised its protocol for the investigation of stillbirths (Appendix 8).

4. Seventeen (48.6%) of the 35 neonatal deaths occurred in neonates born between 20 to 23 weeks gestation. Of the 18 deaths in neonates born at or after 24 weeks, seven (39%) were associated with congenital abnormalities. Three (37.5%)of the eight term infants died of congenitally acquired infections; one due to group B Streptococcus and two due to Herpes Simplex Type 1.

5. *Ten babies of Aboriginal mothers died during the perinatal period. The perinatal mortality rate was 13.7 per 1,000 births compared with 12.5 in 2014, and compared with 9.2 per 1,000 births for non-Aboriginal women. The rates of preterm, small-for-gestational-age and low birthweight live births for Aboriginal mothers also remained higher. Where smoking status was known, the proportion of Aboriginal women who smoked at the first antenatal visit continues to decline slowly (43.3%) and was the lowest recorded since records began. However, it remains considerably higher than the smoking status of non-Aboriginal women (8.7%).*

6. The Committee's previous recommendations have been incorporated into South Australian policies, standards or guidelines. These recommendations, together with the relevant code of practice are listed in Appendix 7. From the review of maternal and perinatal deaths in 2015, the Committee makes the following new recommendations:

NEW

1. Clinicians are reminded that asthma is a serious condition, which is potentially fatal.
2. Where severe fetal growth restriction (estimated fetal weight <3rd percentile) is suspected in the second trimester, the case should be discussed with a Maternal Fetal Medicine specialist.
3. All neonates who are drowsy, irritable and feeding poorly should be considered seriously ill until proven otherwise, as neonates may not show classical signs of infection. Please seek specialist medical advice urgently.

Recommendations from previous years highlighted by deaths in 2015:

1. All placentas associated with perinatal deaths should be examined by the Department of Surgical Pathology, Women's and Children's Hospital (2003). They should be accompanied with all relevant clinical information (2006). Placentas that are not sent for pathological examination should be refrigerated for one week in individually labelled plastic bags (2011).

The Committee would like to draw attention to websites that offer important information:

- The South Australian Pregnancy Information website of the Department of Health: www.health.sa.gov.au/pregnancy
- The South Australian Perinatal Practice Guidelines website: www.health.sa.gov.au/ppg
- The Child Death and Serious Injury Review Committee reports: www.cdsirc.sa.gov.au.
- The SIDS website is www.sidsandkids.org which provides print information in different languages.
- The South Australian Parenting and Child Health website www.cyh.com.au of Child and Youth Health, which also incorporates the South Australian Safe Infant Sleeping Standards http://www.sahealth.sa.gov.au/wps/south+australian+safe+infant+sleeping+standards
- The Courts Administration Authority of South Australia, Coroners Findings, www.courts.sa.gov.au/CoronersFindings/Pages/default.aspx
- A customised birthweight centile calculator for Australia is available from Gestation Network at: www.gestation.net/cc/about.htm. Gestation Network can be contacted at info@gestation.net.

The Committee draws attention once again to the importance of autopsy in eliciting the cause of death:

There have been several cases in which an autopsy has identified a previously unsuspected cause of death. This is most valuable in the management of future pregnancies and counselling of parents, including grief counselling.

Reporting of deaths to the State Coroner

The following are some categories of death which must be reported to the State Coroner under The Coroner's Act 2003 (www.legislation.sa.gov.au):

- a death by unusual, unexpected, unnatural, violent or unknown cause
- a death during, as a result of or within 24 hours of a surgical, invasive or diagnostic procedure including the administration of an anaesthetic for the carrying out of the procedure
- a death within 24 hours of being discharged from a hospital or having sought emergency treatment at a hospital
- a death in a hospital or treatment facility for the treatment for a drug addiction
- a death of a child subject to a custody or guardianship order under the Children's Protection Act 1993
- a patient death in an approved treatment centre under the Mental Health Act 1993.

I. Introduction

This is the Thirtieth Annual Report of the South Australian Maternal and Perinatal Mortality Committee, which was established in 1985. A Special Medical Committee on Maternal Mortality appointed by the Minister of Health conducted confidential enquiries into all maternal deaths in South Australia since 1961, publishing ad hoc reports between 1964 and 1984. A Perinatal Mortality Subcommittee was established in 1978, publishing reports annually or biennially until 1984.

The South Australian Maternal and Perinatal Mortality Committee is an authorised quality improvement body established under Part 7 of the South Australian Health Care Act 2008. Its terms of reference are as follows:

To advise the Chief Executive of SA Health on:

1. the pattern and causation of maternal, perinatal deaths in the state
2. the avoidability of any factors associated with such deaths and any measures which could be taken to assist with the prevention of such deaths, including improvements in health services in the state
3. education and training for members of the medical, midwifery and nursing professions and for the community generally in order to assist in the reduction of maternal, perinatal morbidity and mortality in the state.

The terms of reference of the Subcommittees (Maternal, Perinatal and Education) are provided in Appendix 1. Under the provisions of the Health Care Act 2008, members of the Committee and its Subcommittees are authorised, under strict confidentiality rules, to conduct research into the causes of mortality and morbidity in the state, and legal protection is given to notifiers who provide information.

The Subcommittees receive notifications of deaths from the following sources:

1. The Births, Deaths and Marriages Registration Division, from medical certificates of cause of perinatal death (Appendix 2a) and death certificates of children under 1 year of age and pregnancy-related deaths (Appendix 2b)
2. The Coroner's Office, from Coroner's findings
3. Hospitals and medical practitioners, in cases of maternal death.

Legislation governing the registration of births, deaths and marriages in South Australia requires that the medical certificate of cause of death (Appendix 2b) identifies pregnancy within three months before death and *whether the deceased was of Aboriginal or Torres Strait Islander origin*.

Further information is obtained from practitioners identified as having been in charge of clinical care through the completion of confidential medical reports, and these are supplemented by autopsy information from the Coroner's Office and hospital pathology services. Case summaries are prepared by the Committee's midwife secretary and the medical secretary for discussion by the Subcommittees. These do not contain any identifying information but the members are made aware of the type of health services available in each case, for example, location (metropolitan or country) and hospital category. Where certain aspects of a case require clarification, a member of the Subcommittee may seek clarification from the practitioner concerned. The discussions aim to identify the factors associated with the death, and to assign a cause or causes of death in each case. Comments or recommendations made by the Subcommittees are included in the Committee Report.

Definitions used by the Committee are provided in Appendix 3 of this Report. The Committee receives notifications of maternal and perinatal deaths occurring in South Australia. However, statistics presented for perinatal deaths relate only to those occurring in babies born in South Australia. Deaths of South Australian born babies occurring in other states are also included in the statistics where information is available for them. This Thirtieth Report of the Committee incorporates information on maternal deaths in South Australia in the year 2015 and perinatal deaths of babies born to mothers in South Australia i*n 2015.*

Findings relating to Aboriginal mothers and babies have been italicised for easy identification in response to the request of the Aboriginal Health Council of South Australia. The Aboriginal Health Division of SA Health has a nominee on the Committee to address areas of concern in relation to Aboriginal maternal, perinatal health.

II. Maternal Mortality 2015

1. Maternal mortality statistics 2015

The World Health Organization (WHO) defines maternal death as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.[1] This definition includes both direct and indirect maternal deaths (see Appendix 3).

The Australian Institute of Health and Welfare National Advisory Committee on Maternal Mortality complies with international reporting protocols and reports a maternal mortality ratio (see Appendix 3) which only includes pregnancy-related deaths, that is, direct and indirect maternal deaths, per 100,000 women who gave birth. The South Australian Maternal and Perinatal Mortality Committee will continue to review incidental deaths to ensure that indirect deaths are not missed. It will, however, report only maternal mortality ratios for pregnancy-related deaths, to be consistent with national and international protocols. Pregnancy-related deaths of women occurring from 42 days to within a year of the end of pregnancy ('late maternal deaths') are also reviewed, but these are not included in the South Australian statistics on maternal deaths or maternal mortality ratios.

1 World Health Organization. International Statistical Classification of Diseases and Related Health Problems. Tenth Revision. Volume 2. Geneva: WHO, 1993.

2. Australian Institute of Health and Welfare: Johnson S, Bonello MR, Li Z, Hilder L, Sullivan EA. Maternal deaths in Australia 2006-2010, Maternal Death Series Number 4, Canberra, Cat.no. PER 61

There were three maternal deaths in South Australia in 2015. Maternal deaths in South Australia for the three categories of deaths from 1961 to 2015 are presented in Table 1 by five-year periods. Maternal mortality ratios have been calculated for direct and indirect deaths (Table 1 and Figure 1). The maternal mortality ratio for the last five-year period 2011-2015 was 8.9, which was higher than the Australian maternal mortality ratio of 7.1 per 100,000 women for the period 2008-2012[2]. The number of deaths in South Australia is small and has not changed greatly in the last three decades.

Of a total of 51 pregnancy-related maternal deaths in the period 1986-2015, 25 were direct deaths and 26 were indirect deaths. *Three of the 25 direct deaths and two of the 26 indirect deaths were of Aboriginal women, including one in 2015.*

Table 1: Maternal mortality by category of death, in 5-year periods, South Australia, 1961 – 2015

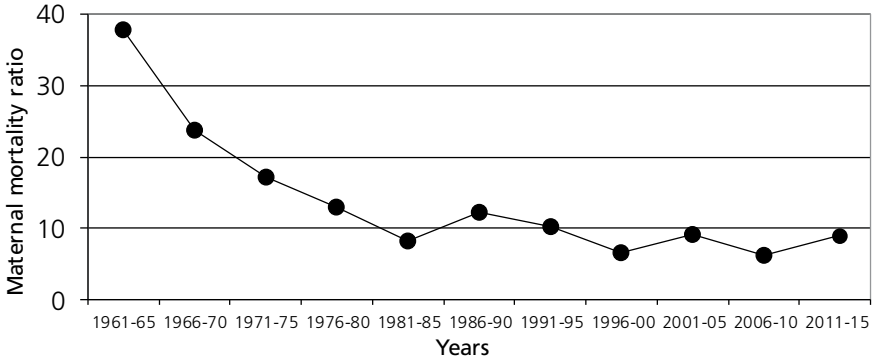
	Direct deaths	Indirect deaths	Incidental deaths	Total deaths	Direct and indirect maternal deaths	
Years	Number	Number	Number	Number	Number	Maternal mortality ratio*
1961 – 1965	34	6	13	53	40	37.8
1966 – 1970	21	4	8	33	25	23.7
1971 – 1975	17	1	6	24	18	17.2
1976 – 1980	6	6	2	14	12	12.9
1981 – 1985	3	5	3	11	8	8.3
1986 – 1990	4	8	4	16	12	12.3
1991 – 1995	4	6	5	15	10	10.2
1996 - 2000	2	4	5	11	6	6.6
2001 – 2005	4	4	2	10	8	9.1
2006 – 2010	5	1	2	8	6	6.2
2011 – 2015	6	3	3	12	9	8.9

*Expressed as deaths per 100,000 women who gave birth

2 Australian Institute of Health and Welfare: Humphrey MD, Bonello MR, Chughtai A, Macaldowie A, Harris K, Chambers GM. Maternal deaths in Australia 2008-2012. Maternal Death Series Number 5. Cat.no. PER 70. Canberra: AIHW

Figure 1: Maternal Mortality Ratio, South Australia 1961-2015

Direct and Indirect Deaths per 100,000 women who gave birth



Confidential enquiries into all maternal deaths in South Australia have been conducted since 1961 with the Minister of Health appointing a Special Medical Committee on Maternal Mortality. Reports published since this time show that between 1961 and 1969 there were 15 maternal deaths related to induced abortion.[3,4] Following the 1970 legislative amendment requiring induced abortions to be conducted under medical supervision, there were 4 deaths due to induced abortion in the following decade 1970 to 1979.[5,6] Over the past 35 years, since 1980, there was one maternal death in 2003 associated with an induced abortion.

3 South Australian Special Medical Committee. First report on Maternal Mortality covering the period June 1961 to December 1963. Medical Journal of Australia 1964; 2:254-257.
4 Miller JM. Second report of South Australian Special Medical Committee on Maternal Mortality for the period January 1964 to December 1969. Medical Journal of Australia 1973; 1: 121-125.
5 Martin MR. Maternal deaths in South Australia 1970 to 1975, South Australian Health Commission. Medical Journal of Australia 1979; 1: 310-313.
6 South Australian Health Commission. Maternal Mortality Committee 1983 Report, incorporting Report on Maternal Deaths 1976-1980 and Synopsis of Second Annual Report on Perinatal Deaths, August 1983.

2. Causes of maternal deaths 2015

The causes of the three maternal deaths were as follows:

> One indirect maternal death was attributed to pulmonary hypertension, possibly secondary to pulmonary capillary haemangiomatosis. The fetus was delivered at 21 weeks gestation in an attempt to save the mother's life. However, despite intensive care her condition deteriorated on post-operative Day 10 and she was unable to be resuscitated.

> One indirect maternal death occurred at 21 weeks gestation at home and was attributed to acute respiratory failure, secondary to asthma and pneumonia.

> The late incidental death occurred five months postpartum and was attributed to acute myocardial infarction on a background of poorly controlled Type 2 diabetes, essential hypertension, obesity, polycystic ovarian syndrome and smoking.

3. Maternal Subcommittee recommendations

New Recommendations

1. Clinicians are reminded that asthma is a serious condition, which is potentially fatal.

Recommendations from earlier years

Recommendations made in earlier years have been incorporated into South Australian policies, standards or guidelines. These recommendations, together with the relevant code of practice, are listed in Appendix 7.

III. Perinatal mortality 2015

1. Perinatal mortality statistics

In 2015 there were 20,154 births in South Australia reported to SA Health. These included all births of at least 400g birthweight or 20 weeks gestation. There were 153 stillbirths and 20,001 live births. Thirty-five live born infants died within 28 days of birth (neonatal deaths). Table 2 shows the numbers of stillbirths and neonatal deaths for specified birthweights or gestations.

The perinatal mortality rate for all births in 2015 was 9.3 deaths per 1,000 births. The stillbirth rate was 7.6 per 1,000 births and the neonatal mortality rate 1.7 per 1,000 live births. Forty-six of the 188 perinatal deaths (24.5%) were induced terminations of pregnancy and their exclusion would have resulted in a perinatal mortality rate of 7.1 deaths per 1,000 births.

Perinatal mortality for international comparison includes only stillbirths and early neonatal deaths within the first seven days of life for births of at least 1,000g birthweight (or 28 weeks gestation if birthweight unavailable). This perinatal mortality rate was 3.2 deaths per 1,000 births, with a stillbirth rate of 2.5 per 1,000 births and an early neonatal mortality rate of 0.5 per 1,000 live births.

Table 2: Perinatal mortality, South Australia, 2015

Specified birthweight/ gestation	Total births	Live births	Stillbirths		Neonatal deaths		Perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
≥400g/20 weeks	20,154	20,001	153	7.6	35	1.7	188	9.3
≥500g/22 weeks*	20,065	19,984	81	4.0	23	1.2	104	5.2
					18	**0.9	99	** 4.9
≥1,000g/28 weeks*	19,952	19,902	50	2.5	13	0.7	63	3.2
					9	**0.5	59	** 3.0

* For national statistics as recommended by WHO, only fetuses and infants of at least 500g birthweight, or, when birthweight is unavailable, the corresponding gestational age (22 weeks) or body length (25cm crown-heel), are included. For international comparison, only fetuses and infants of at least 1,000g birthweight, or when birthweight is unavailable, the corresponding gestational age (28 weeks) or body length (35cm crown-heel) are included.

** This number includes only neonatal deaths occurring within the first 7 days of life, as recommended by WHO for national and international comparison. All other numbers for neonatal deaths refer to deaths within the first 28 days of life. Rates for neonatal deaths are expressed as deaths per 1,000 live births.

South Australian perinatal mortality rates, including stillbirth and neonatal mortality rates for all births, for 1986-2015 from Committee data are presented in Figure 2. This graph demonstrates that the fall in the perinatal mortality rate has received a greater contribution from the fall in the neonatal mortality rate than from changes in the stillbirth rate. The stillbirth rate for all births has not changed markedly over the last two decades.

Rates for births of at least 1,000g birthweight (or when birthweight was unavailable, 28 weeks gestation) are presented in Figure 3. Figure 3 includes only early neonatal deaths, i.e. occurring within the first seven days of life (WHO recommendation for international statistics). If only births of at least 1,000g birthweight are considered, a decrease in the stillbirth rate is evident from 4.2 deaths per 1,000 births in 1986 to 2.5 in 2015 (Figure 3).

Figure 2: Perinatal mortality rate (births >= least 400g or 20 weeks gestation), South Australia 1986-2015

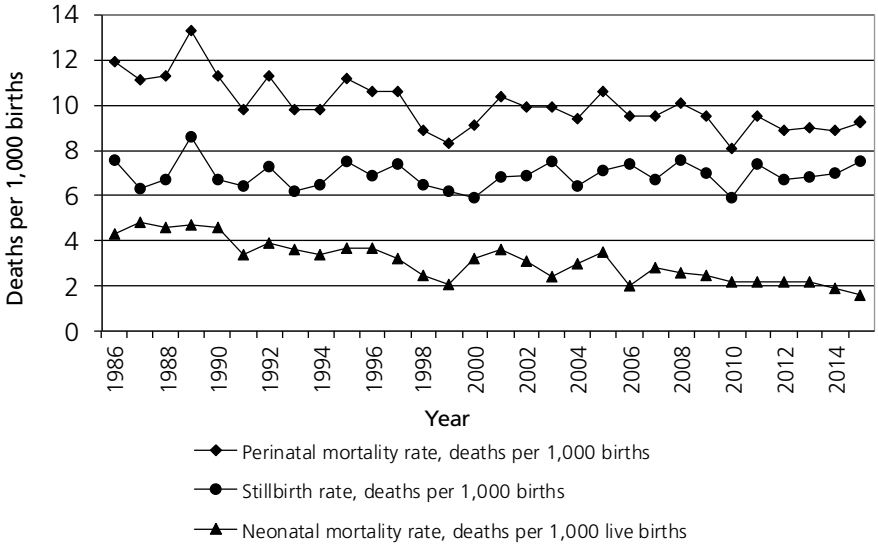
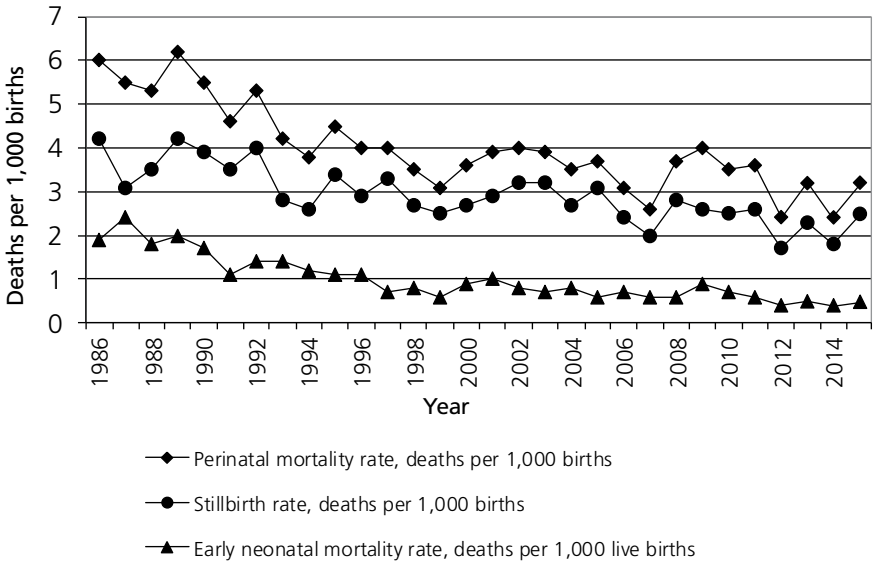


Figure 3: Perinatal mortality rate (births >=1,000g or 28 weeks gestation & early neonatal deaths within the first seven days of life), South Australia 1986-2015



* Births of at least 1,000g birthweight or 28 weeks gestation if birthweight is unknown and early neonatal deaths (within the first 7 days of life), as recommended by WHO for international comparison

National comparisons of perinatal mortality rates among Australian states

Perinatal mortality rates for Australian States and Territories from the Australian Bureau of Statistics (ABS) are shown in Table 3. The ABS derives this information from the State and Territory Births, Deaths and Marriages Registry data. In **South Australia these records do not include stillbirths resulting from induced termination of pregnancy**. This difference most likely accounts for the lower South Australian perinatal mortality rates published by the ABS. The ABS rates for South Australia and Australia for 1999-2015 are presented in Figure 4, together with the perinatal mortality rate in South Australia based on notifications to the Committee.

There are other minor differences between the perinatal deaths that the ABS include, compared with the Committee. These differences are outlined in the following paragraphs.

The ABS rates report State and Territory perinatal deaths according to the usual residence of the mother, whereas the Committee rates include all perinatal deaths occurring in South Australia, irrespective of the mother's usual State or Territory of residence.

The ABS rates are based on deaths registered in Australia in the year in which they are registered, whereas the Committee rates include all perinatal deaths which occurred in South Australia in the year in which the birth occurred.

The South Australian ABS data includes all livebirths of any gestation and since 2006 has only included fetal deaths of at least 400 grams birthweight or at least 20 weeks gestation. Prior to 2011, the Committee's perinatal mortality rate also included all live births which resulted in a neonatal death, irrespective of birthweight or gestation. From 2012 and onwards, only livebirths of at least 400 grams birthweight or 20 weeks gestational age which resulted in neonatal death have been included in the perinatal mortality data.

Table 3: Perinatal mortality rate* by State or Territory of usual residence of mother, Australian states, 1999 – 2015

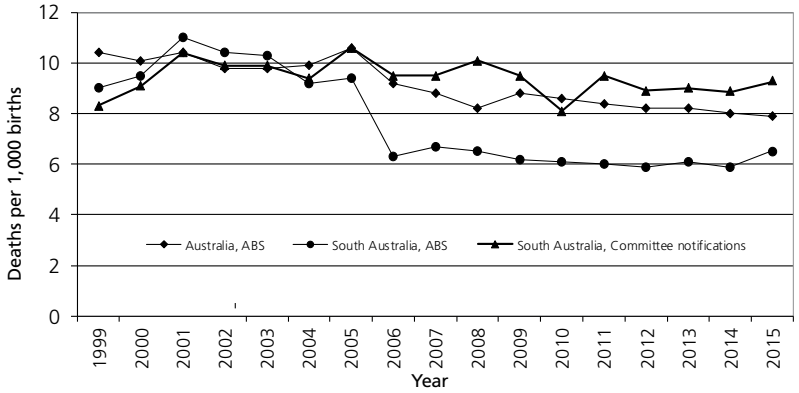
Year	NSW	VIC	Qld	SA	WA	Tas	NT	ACT	AUSTRALIA
1999	9.4	11.5	10.1	9.0	10.4	12.5	18.5	13.3	10.4
2000	9.0	10.0	10.9	9.5	11.2	13.2	17.7	9.5	10.1
2001	9.6	10.7	11.5	11.0	10.0	7.3	14.0	9.3	10.4
2002	8.7	10.5	10.7	10.4	8.5	14.5	13.1	7.5	9.8
2003	8.1	11.2	9.4	10.3	10.4	14.3	18.0	11.3	9.8
2004	8.6	11.3	10.4	9.2	9.9	10.1	13.1	11.9	9.9
2005	9.2	12.0	11.1	9.4	10.1	10.4	17.0	13.2	10.6
2006	9.3	8.4	10.3	6.3	9.2	9.1	15.8	12.4	9.2
2007	8.7	8.6	10.6	6.7	6.9	9.2	12.7	9.4	8.8
2008	7.8	7.9	9.9	6.5	8.1	9.1	7.8	6.4	8.2
2009	7.9	8.9	10.4	6.2	8.8	10.6	14.8	7.0	8.8
2010	7.6	8.0	10.5	6.1	8.0	10.9	12.5	16.7	8.6
2011	8.0	8.1	9.1	6.0	9.7	10.1	12.8	7.2	8.4
2012	7.5	7.7	10.0	5.9	8.4	10.1	9.4	10.0	8.2
2013	8.1	8.2	9.1	6.1	7.5	9.5	14.4	7.0	8.2
2014	7.0	7.4	9.8	5.9	8.1	15.5	11.3	9.7	8.0
2015	7.8	6.4	9.5	6.5	8.4	9.6	14.1	7.5	7.9

* Rates are expressed as stillbirths and neonatal deaths within the first 28 days of life per 1,000 births for births of at least 400g birthweight (or if birthweight is unavailable, 20 weeks gestation), based on registered births according to the usual residence of the mother.

Source: Australian Bureau of Statistics. Catalogue No 3303.0 – Causes of Death, Australia, 2015, 28th September 2016.

Figure 4: Perinatal Mortality Rates, South Australia ABS, Australia ABS and South Australia Committee notifications 1999-2015

Deaths per 1,000 births (of at least 400g birthweight or 20 weeks gestation)



Source: Australian Bureau of Statistics, Cat. No. 3303.0 – Causes of Death, Australia, 2015, 28th September 2016

(2) Birthweight-specific perinatal mortality

The birthweight-specific rates of stillbirths, neonatal deaths and perinatal deaths for 2015 are provided in Table 4. Of the 188 perinatal deaths, 155 (82.4%) were of low birthweight (<2,500g) and 28 (80%) of the 35 neonatal deaths were low birthweight babies. Fifty-six of the perinatal deaths (29.8%) were less than 400g birthweight.

Table 4: Perinatal mortality by birthweight, South Australia, 2015, (all births of at least 400g or 20 weeks gestation)

			Stillbirths		Neonatal deaths		Perinatal deaths	
Birthweight (grams)	Total births	Live births	Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
<400	58	10	48	827.6	8	800.0	56	965.5
400-499	31	7	24	774.2	4	571.4	28	903.2
500-749	64	37	27	421.9	6	162.2	33	515.6
750-999	49	45	4	81.6	4	88.9	8	163.3
1,000-1,499	130	121	9	69.2	1	8.3	10	76.9
1,500-1,999	285	277	8	28.1	3	10.8	11	38.6
2,000-2,499	925	918	7	7.6	2	2.2	9	9.7
2,500-2,999	3261	3253	8	2.5	3	0.9	11	3.4
3,000-3,499	7296	7286	10	1.4	1	0.1	11	1.5
3,500-3,999	6067	6063	4	0.7	3	0.5	7	1.2
4,000-4,499	1739	1739	0	0.0	0	0.0	0	0.0
≥4500	248	245	3	12.1	0	0.0	3	12.1
Unknown	1	0	1	Na	0	Na	1	Na
Total	20,154	20,001	153	7.6	35	1.7	188	9.3

na: not applicable

There were 153 stillbirths, accounting for 81.4% of the perinatal deaths in 2015. Of the 66 intrapartum deaths, 60 were under 750g birthweight (Table 5).

Table 5: Time of perinatal death by birthweight, South Australia, 2015 (all births of at least 400g birthweight or 20 weeks gestation)

Birthweight (grams)	Stillbirths			Neonatal deaths	Total
	Antepartum	Intrapartum	Uncertain if antepartum or intrapartum		
<500	25	47	0	12	84
500-749	14	13	0	6	33
750-999	4	0	0	4	8
1,000-1,499	8	1	0	1	10
1,500-1,999	8	0	0	3	11
2,000-2,499	7	0	0	2	9
2,500-2,999	7	1	0	3	11
3,000-3,499	7	3	0	1	11
3,500-3,999	3	0	1	3	7
4,000-4,499	0	0	0	0	0
≥4,500	2	1	0	0	3
Unknown	1	0	1	0	1
Total	86	66	1	35	188

(3) Gestation-specific perinatal mortality

The distribution of perinatal deaths by gestational age is provided in Table 6. There were 156 preterm births (<37 weeks gestation), accounting for 83% of the perinatal deaths.

Table 6: Perinatal mortality by gestational age at birth, South Australia, 2015 (all births of at least 400g or 20 weeks gestation)

Gestational age at birth (weeks)	Total births	Live births	Stillbirths		Neonatal deaths		Perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
<24	103	23	80	776.7	17	739.1	97	941.7
24-27	95	76	19	200.0	4	52.6	23	242.1
28-31	168	158	10	59.5	1	6.3	11	65.5
32-36	1,575	1,555	20	12.7	5	3.2	25	15.9
37-41	18,173	18,149	24	1.3	8	0.4	32	1.8
≥42	37	37	0	0.0	0	0.0	0	0.0
Unknown	3	3	0	0.0	0	0.0	0	0.0
Total	20,154	20,001	153	7.6	35	1.7	188	9.3

2. Causes of perinatal deaths 2015

(1) Classification of perinatal deaths

The Perinatal Subcommittee classified each of the 188 perinatal deaths, which occurred in 2015, according to the Perinatal Society of Australia and New Zealand – Perinatal Death Classification (PSANZ-PDC). This hierarchical classification, together with the Australian birthweight/gestation percentile charts (for singletons as well as twins), is available on the PSANZ website (www.psanz.org.au) and is updated regularly by the PSANZ Perinatal Mortality Special Interest Group. The Committee has used this classification system for deaths from 1999 onward. The classification of perinatal deaths in 2015 according to PSANZ-PDC is as follows (Table 7):

Table 7: Classification of perinatal deaths, PSANZ-PDC, South Australia, 2015

	PSANZ-PDC	Number	Percent	Deaths per 1,000 births
1.	Congenital abnormality	62	33.0	3.1
2.	Perinatal infection	16	8.5	0.8
3.	Hypertension	3	1.6	0.1
4.	Antepartum haemorrhage (APH)	26	13.8	1.3
5.	Maternal conditions	6	3.2	0.3
6.	Specific perinatal conditions	27	14.4	1.3
7.	Hypoxic peripartum death	3	1.6	0.1
8.	Fetal growth restriction	18	9.6	0.9
9.	Spontaneous preterm	12	6.4	0.6
10.	Unexplained antepartum death	15	8.0	0.7
11.	No obstetric antecedent	0	0	0
	Total	188	100.0	9.3

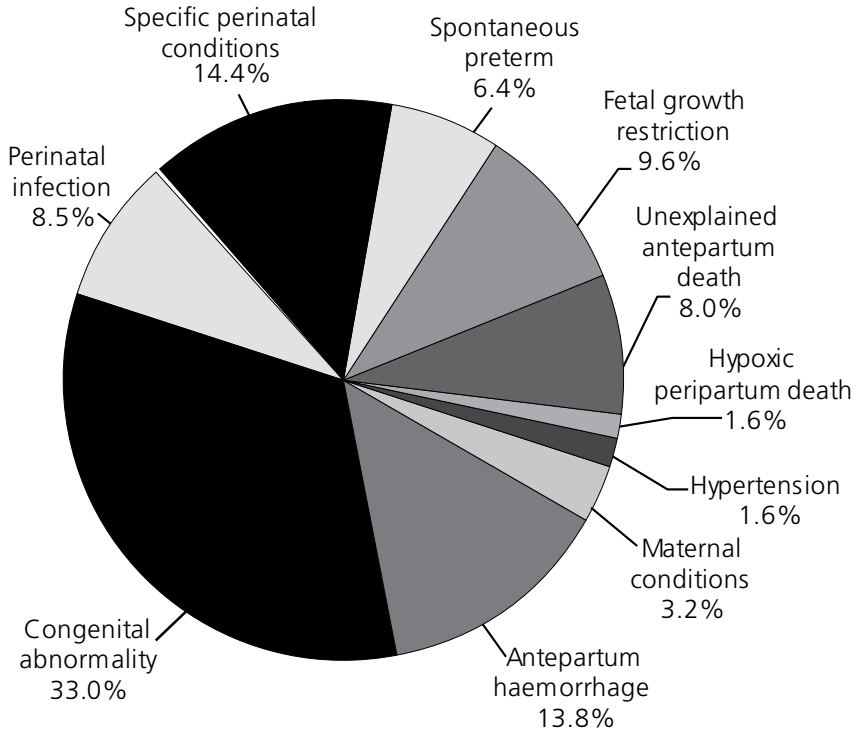
The PSANZ-PDC for perinatal deaths in 2015 is shown in Figure 5 and its breakdown by subgroups and birthweight groups is provided in Appendix 4 and Appendix 5.

Congenital abnormalities were the leading cause of perinatal death in 2015, accounting for 33% of all deaths. The next leading cause was specific perinatal conditions (14.4%); the predominant conditions were cervical incompetence, twin-twin transfusion and idiopathic hydrops. This was followed by antepartum haemorrhage (13.8%), fetal growth restriction (9.6%), and perinatal infection (8.5%), including four deaths attributed to Group B Streptococcus. The proportion of unexplained antepartum deaths (8%) was similar to 2014 (7.1%).

The death rate of unexplained stillbirths (0.7 per 1,000 births) compares with 0.6 per 1,000 births in 2014 and 2.0 per 1,000 births in 1995-1998.

The contribution of spontaneous preterm birth (6.4%) has decreased in recent years; 2014 (10.3%), 2013 (9.8%) and 2012 (15.2%). The contribution of fetal growth restriction (9.6%) is within the range of the last 10 years, with the lowest in 2009 (7.4%) and peaking in 2007 (11.2%).

Figure 5: Perinatal deaths in South Australia 2015, by PSANZ-PDC (N=188)



Associated secondary conditions were classified for 32 (17.0%) perinatal deaths in 2015. There were no deaths with two associated conditions. The major associated conditions were spontaneous preterm birth, perinatal infection, fetal growth restriction and specific perinatal conditions (all 3.2%), followed by antepartum haemorrhage (2.1%), congenital abnormality (1.1%), hypertension (0.5%) and maternal conditions (0.5%).

A brief description of each of the 11 groups follows.

1. Congenital abnormality – 62 deaths

This group of 62 deaths included 46 terminations of pregnancy, at 20 weeks gestation or more, of fetuses with congenital abnormalities. The types of abnormalities were as follows:

Central nervous system	14
Cardiovascular	9
Urinary system	4
Gastrointestinal	3
Chromosomal	16
Metabolic	0
Multiple	12
Other	4
Total	62

Central nervous system – fourteen infants had central nervous system abnormalities:

> six had abnormalities of the corpus callosum
> five had neural tube defects - one with anencephaly and four with spina bifida
> one had abnormalities of the cerebellum
> one had bilateral ventriculomegaly
> one had intraventricular haemorrhage, suspected due to underlying abnormalities.

Cardiovascular – nine infants had cardiovascular abnormalities:

> four had hypoplastic left heart syndrome
> one had a VSD
> one had tricuspid valve atresia
> one had hypoplastic right ventricle with atretric pulmonary valve
> one had premature closure of the foramen ovale
> one had aortic artery abnormalities.

Urinary system – **four deaths** from renal and urological abnormalities:

> two had unilateral renal agenesis with cystic disease in the remaining kidney
> one had bilateral renal agenesis
> one had posterior urethral valves and bladder abnormalities.

Gastrointestinal system – three deaths:

> two had gastroschisis
> one had atresia of the small intestine
> one had congenital torsion of the terminal ileum, resulting in intestinal necrosis and perforation.

Chromosomal – sixteen infants had chromosomal abnormalities:

> two had gastroschisis
> one had atresia of the small intestine
> one had congenital intestinal malrotation.

Chromosomal – nine infants had chromosomal abnormalities:

> five had Trisomy 18
> four had Trisomy 13
> two had Trisomy 21
> two had multiple congenital abnormalities, attributed to chromosome 2 abnormalities
> one had Trisomy 22
> one had XXY Triploidy
> one had Chromosome 22q deletion resulting in cardiac abnormalities.

Multiple – there were twelve infants with multiple abnormalities.

Other – four infants had 'other' fetal abnormalities, including three with musculoskeletal abnormalities

> one had severe skeletal dysplasia (hypochondrogenesis) and pulmonary hypoplasia
> one had osteogenesis imperfecta
> one had bilateral talipes equino varus
> one had an absent diaphragm.

2. Perinatal infection – sixteen deaths

Bacterial – eleven deaths:

> four deaths were attributed to Group B Streptococcal infection
> two deaths were due to infection with Escherichia coli
> five deaths were attributed to other specified bacteria, including *Haemophilus influenza, Mycoplasma, Ureaplasma ureolyticum, Pseudomonas and Acinetobacter species*.

Viral – three death

> two deaths were due to infection with *Herpes simplex virus*

> one death was due to infection with Cytomegalovirus

Toxoplasma perinatal infection – one death

Other unspecified organisms – one death

3. Hypertension – three deaths

All these deaths were attributed to pre-eclampsia, which was superimposed on chronic hypertension in one of these women.

4. Antepartum haemorrhage – 26 deaths

> twenty-two deaths were due to placental abruption, two with evidence of thrombophilia

> two deaths were associated with placenta praevia

> one death was associated with vasa praevia

> one death was due to recurrent antepartum haemorrhage and subchorionic haematoma.

5. Maternal conditions - six deaths

> four deaths were due to maternal diabetes

> one death was attributed to intrahepatic cholestasis of pregnancy

> one infant death followed termination of pregnancy for a woman with pulmonary capillary haemangiomatosis and severe pulmonary hypertension.

6. Specific perinatal conditions – 27 deaths

These deaths were due to the following:

> thirteen deaths were associated with cervical incompetence

> five deaths were due to twin to twin transfusion

> three deaths were due to idiopathic hydrops

> two deaths were associated with preterm rupture of the membranes

> one death was due to feto-maternal haemorrhage

> one death was due to alloimmune disease

> one death resulted from later complications following selective feticide in a twin pregnancy

> one intrauterine death was associated with a thrombosed umbilical artery also resulting in fetal growth restriction.

7. Hypoxic peripartum death – three death

> two deaths were associated with uterine rupture, with each woman having had one previous caesarean section

> one death followed non-reassuring fetal cardiotocography during labour.

8. Fetal growth restriction – 18 stillbirths

All but two had placental pathology noted, including:

> eight deaths where a small placenta (<10th percentile) was noted, including four deaths with additional pathology

> six deaths with fetal thrombotic vasculopathy

> one death with retroplacental clot and evidence of chronic decidualitis

> one death with markedly hypercoiled cord and marginal haemorrhage.

9. Spontaneous preterm (<37 weeks gestation) – 12 deaths

Gestation at birth ranged from 20 to 25 weeks gestation, with one at 30 weeks gestation:

> nine of these deaths had placental evidence of chorioamnionitis

> in seven deaths, the membranes had been ruptured 24 hours or more before birth

> in five deaths the membranes were intact, or the membranes were ruptured less than 24 hours before birth

10. Unexplained antepartum death – 15 deaths

Thirteen were associated with placental pathology:

> in four deaths there was a small placenta (<10th percentile), including one with fetal thrombotic vasculopathy

> the remaining nine had varied pathology including intervillous haemorrhage, circumvallate placenta, monochorionic diamniotic twin placenta with superficial venous to venous communications, two vessel umbilical cord and some with thrombosed vessels.

No placental pathology was noted in one death, and the placenta was not examined for one stillbirth.

11. No obstetric antecedent – no deaths

(2) Perinatal Society of Australia and New Zealand – Neonatal Death Classification

The classification of the 35 neonatal deaths according to the Perinatal Society of Australia and New Zealand – Neonatal Death Classification (PSANZ-NDC) is provided in Appendix 6. This classification is also available, together with PSANZ-PDC, on the PSANZ website.

A brief description of these neonatal deaths by gestational age grouping follows:

20 to 23 weeks gestation - 17 neonatal deaths

All these infants were born extremely preterm and succumbed shortly after birth.

> Five infants had underlying contributory congenital abnormalities.

> No resuscitation was attempted for 11 infants. Three of these preterm births were associated with placental abruption, three with cervical incompetence, one with perinatal infection and three with evidence of chorioamnionitis and funisits. One infant was delivered early in an attempt to save the mother's life. Four of these eleven preterm births were associated with either substance use, alcohol use, smoking and or domestic violence.

> One infant was born in good condition at 23 weeks gestation but died at 42 hours of age due to bilateral Grade IV intraventricular haemorrhage.

24 to 31 weeks gestation - five neonatal deaths

> Two deaths were attributed to Grade IV intraventricular haemorrhage.

> One death was attributed to pseudomonas sepsis and Grade IV intraventricular haemorrhage.

> One death was attributed to pulmonary haemorrhage and persistent pulmonary hypertension.

> One death occurred following birth at 25 weeks gestation in a remote clinic, with a retrieval team present. Resuscitation was unsuccessful. Placental histology showed chorioamnionitis and funisitis.

32 to 36 weeks gestation - five neonatal deaths

> Four deaths were associated with congenital abnormalities

> One death was attributed to Enterococcal sepsis and necrotising enterocolitis.

37 and greater weeks gestation – eight neonatal deaths

> Three deaths were attributed to congenital abnormalities.

> Two deaths were attributed to hypoxic ischaemic encephalopathy consequent to obstetric haemorrhage; one placental abruption and one vasa praevia

> One death was attributed to group B Streptococcus infection

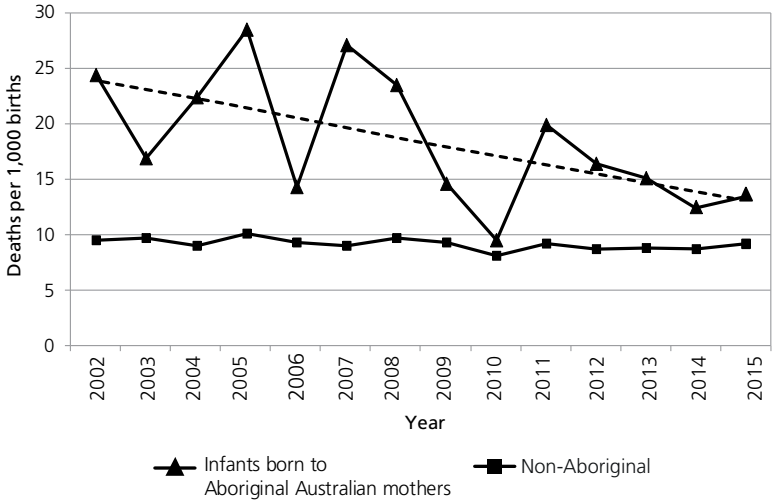
> Two deaths were attributed to congenitally acquired Herpes Simplex Type 1 infection.

(3) Aboriginal perinatal deaths

There were ten perinatal deaths (six stillbirths and four neonatal deaths) among the births to 718 Aboriginal women.

In 2015 the perinatal mortality rate for births to Aboriginal women was 13.7 per 1,000 births, compared to 9.2 per 1,000 births for births to non-Aboriginal women. Both rates increased slightly from 2014. Although the perinatal mortality rate for Aboriginal births fluctuates widely due to the small number of deaths, recent years show a downward trend (Figure 6).

Figure 6: Perinatal mortality by maternal Aboriginal status 2002 -2015



Eight of the ten infants were born in public metropolitan hospitals, one infant was born in a country hospital and one was born in a remote clinic. Nine of the infants were preterm births, with four born at or before 23 weeks gestation. Six of the ten mothers were country residents (three of whom resided in the Anangu Pitjantjatjara Yankunytjatjara Lands) and one mother resided in another state. The causes of the nine deaths were as follows:

> *congenital abnormality – four deaths*

> *antepartum haemorrhage – two deaths*

> *maternal conditions – two deaths*

> *fetal growth restriction – one death*
> *spontaneous preterm birth – one death.*

Where smoking status in pregnancy was known, the proportion of Aboriginal women who smoked during pregnancy in 2015 (43.3%) is continuing to decline slowly (45% in 2014, 46.2% in 2013, 50.5% in 2012 and 54.8% in 2011). However, this proportion remains much higher than among non-Aboriginal women in 2015 (8.7%).

The proportions of preterm live births and small-for-gestational-age live births for Aboriginal mothers were also considerably higher than for non-Aboriginal mothers (16.3% v 8.8% and 14.3% v 8.3% respectively). The proportion of low birthweight live born infants to Aboriginal mothers has not changed greatly since 2012 and remains higher than that for non-Aboriginal mothers (14.3% v 6.8%).

(4) Autopsies in perinatal deaths

Pathological examinations were undertaken at the State Perinatal Autopsy Service, provided by SA Pathology at the Women's and Children's Hospital. The different types of pathological examinations were categorised as follows:

> full autopsy – examination of all cavities and dissection of all organs
> limited autopsy – examination of one or more cavities (such as chest and/or abdomen) and dissection of one or more organs, but not the whole body
> other examination – external examination of the body and growth parameters in conjunction with any other relevant investigations such as radiological survey, genetic testing, placental histology, virology and microbiology.

Autopsies were performed for 104 of the 188 perinatal deaths (55.3%), including three 'limited' autopsies. This proportion has improved slightly from 2014 (53.3%).

Additionally, 'Other examinations' were performed for 17 (9.0%) of perinatal deaths. Placental histological examination was undertaken for 177 perinatal deaths (94.1%).

The distribution of autopsies by place of death is presented in Table 8. Both Women's and Children's and Flinders Medical Centre hospitals have Level 6 perinatal services, and Lyell McEwin has a Level 5 perinatal service.

Table 8: Autopsy status of perinatal deaths by place of death, South Australia, 2015

Place of death	Deaths	Autopsies performed	
	Number	Number	Percent of deaths
Women's and Children's Hospital	100	*46	46.0
Lyell McEwin Hospital	24	15	62.5
Flinders Medical Centre	31	18	58.1
Other metropolitan public hospitals	4	4	100.0
Metropolitan private hospitals	15	12	80.0
Country hospitals	13	8	61.5
Home	1	1	100.0
Total	188	*104	55.3

* Includes 3 autopsies with limited dissection

Placental histological examination was undertaken for 177 perinatal deaths (94.1%) in 2015.

The low proportion of autopsies in perinatal deaths (55.3%) remains a concern. A good quality autopsy is invaluable in confirming antenatal diagnoses, eliciting other findings of clinical significance, particularly significant negative findings, and determining the time course of events leading to death.[7, 8] It may thus be invaluable in alleviating parental guilt, helping with the grieving process and parental counselling, and gaining understanding of the patterns and evaluation of fetal and neonatal disease. Parental permission should therefore be sought as often as possible by senior staff.

Medical practitioners are advised that the **State Perinatal Autopsy Service** is available at no cost to the parents and this includes transportation and return of the body from the place of death, including country regions. This Service may be contacted by telephone. The number is **(08) 8161 6315**.

All hospitals with maternity services will have received a folder with information on the Service. The Department of Health has produced an Autopsy Request and Authority form for use for all non-coronial autopsy examinations together with a booklet entitled "The Hospital Autopsy Process. When a person dies - information for family and friends." These forms must be used and are available from the State Perinatal Autopsy Service (Phone (08) 8161 6315).

7 Gordijn SJ, Erwich JJ, Khong TY. Value of the perinatal autopsy: critique. Pediatr Dev Pathol 2002;5: 480-488.
8 Becher JC, Laing IA, Keeling JW, McIntosh N. Restoring high neonatal autopsy rates. Lancet 2004;364: 2019-2020.

2. Perinatal Subcommittee recommendations

The Committee's previous recommendations have been incorporated into South Australian policies, practices, standards or guidelines. These recommendations, together with the relevant code of practice are listed in Appendix 7. From the review of perinatal deaths in 2015, the Committee makes the following new recommendations:

Recommendations from previous years highlighted by deaths in 2015

1. All placentas associated with perinatal deaths should be examined by the Department of Surgical Pathology, Women's and Children's Hospital (2003). They should be accompanied with all relevant clinical information (2006). Placentas that are not sent for pathological examination should be refrigerated for one week in individually labelled plastic bags (2011).

New recommendations

1. Where severe fetal growth restriction (estimated fetal weight <3rd percentile) is suspected in the second trimester, the case should be discussed with a Maternal Fetal Medicine specialist.
2. All neonates who are drowsy, irritable and feeding poorly should be considered seriously ill until proven otherwise as they may not be showing classical signs of infection. Please seek specialist medical advice urgently.

IV. Education Subcommittee Report

The twentieth annual educational meeting (titled 'The Annual Dr Brian Pridmore Perinatal Forum' since 2007), was held on the evening of 3rd August 2016. The forum is organized by the Education Subcommittee of the Maternal and Perinatal Mortality Committee.

The twentieth forum was titled 'GOING VIRAL' and included viral infections and vaccinations in pregnancy and the neonatal period.

The 2016 forum was held in Room 102 in the Napier Building at the University of Adelaide, attracting approximately 160 people.

Dr Aimee Wiltshire introduced the topic, followed by Dr Mojgan Vatani who presented two case scenarios, which were addressed by each of the panel members with a short presentation. Major topics were as follows:

> Dr Celia Cooper – Congenital cytomegalovirus infection (CMV) symptoms, screening, diagnosis, secondary sensory neural hearing loss, CMV Hyperimmune Globulin, neonatal treatment with IV Ganciclovir

> Dr Peter Muller – Zika virus, origins, incidence, transmission, symptoms, preconception screening and counselling following exposure, Zika virus in semen, microcephaly

> Dr Vineesh Bhatia – Herpes simplex virus, means of inoculation, clinical syndromes, asymptomatic infection, ruptured membranes, method of birth, acyclovir, intrapartum transmission to newborns, management of newborns, neonatal disease

> Ms Lyn Langley (midwife) – Pertussis, incidence in Australia, mortality rate due to pertussis in babies, transmission, incubation period, symptoms, vaccination in pregnancy, trans-placental transfer of maternal antibodies to the fetus, vaccination of adult close contacts

> Associate Professor Michael Gold – History of immunisation, decline in neonatal tetanus, influenza and vaccination in pregnancy, state of relative immunosuppression in pregnancy, H1N1 influenza A, protocols to evaluate the safety of drugs and vaccines in pregnancy women.

The forum was well received by the audience both at the time and from formal feedback, although everyone agreed more time for questions would have been an improvement. The audience included midwives, obstetricians, trainee medical officers and staff working in the areas of birth defects data collection. The feedback is used by the Subcommittee to guide future topic choices and improve the event.

New recommendations made by the Maternal and Perinatal Mortality Committee, following review of the deaths in 2014, were presented to the audience. These recommendations were published in the 29th Annual Report in September 2016.

This forum was filmed. An edited version with transcripts can be viewed on the SA Health online website by visiting www.sahealth.sa.gov.au/perinatal

The Subcommittee wishes to thank the panel and participants for their continued support and will endeavour to ensure that the event continues to be an important part of perinatal services within South Australia.

Appendices

Appendix 1

Terms of reference, Subcommittees of the Maternal and Perinatal Mortality Committee

Maternal Subcommittee

1. To review the causes of death associated with pregnancy and childbirth; to determine whether these may have been preventable, and to establish what were the avoidable factors, if any, presented in the case history.
2. To report to the Maternal and Perinatal Mortality Committee.
3. To undertake review, educational and advisory roles as appropriate from time to time, by initiation or by invitation.

Perinatal Subcommittee

1. To review each perinatal death from an obstetric, paediatric and pathological perspective and to collate this information.
2. To determine and monitor the epidemiology of perinatal deaths in South Australia.
3. To identify avoidable factors and confidentially provide feedback information to clinicians.
4. To identify areas which need special study and/or action.
5. To liaise with other national and international perinatal mortality study groups.
6. To report to the Maternal and Perinatal Mortality Committee.

Education Subcommittee

1. To provide an annual interactive forum for the continuing education of midwives and medical practitioners involved in the provision of perinatal services within the metropolitan and regional South Australia.
2. To act as an additional means of communication to the above providers, other health professionals and the community generally from the other subcommittees of the Maternal and Perinatal Mortality Committee.
3. The membership and chairperson will be nominated by the chairperson of the Maternal and Perinatal Mortality Committee.

4. The membership shall consist of the Chair and:
   - an obstetrician involved in metropolitan private hospital practice
   - a neonatal paediatrician
   - a midwife from the metropolitan private hospital services
   - an epidemiologist / medical secretary from the Pregnancy Outcome Unit.
5. The Subcommittee may co-opt members as required.

Appendix 2A
Medical Certificate of Cause of Perinatal Death

COUNTERFOIL

(For the use of the medical attendant, who should in all cases fill in the particulars for the purposes of record.)

Name of deceased .....

.....

If live born:

Date of death .....

Place of death .....

Age at death .....

If not born alive:

Born ..... a.m. or ..... p.m.

on .....

Attended child before death ☐

Viewed body after death ☐

P.M. Carried out ☐

To be carried out ☐

Not to be carried out ☐

CAUSE OF DEATH

.....

.....

.....

Signed .....

Date .....

Date of delivery of Notice to Registrar of Births, Deaths and Marriages:

...../...../ 20.....

Funeral Director to whom Medical Certificate of Cause of Perinatal Death is given:

.....

.....

0323

To be completed by a Medical Practitioner

Births, Deaths and Marriages Registration Act, 1996

MEDICAL CERTIFICATE OF CAUSE OF PERINATAL DEATH

Medical Certificate of cause of Perinatal Death to be completed in respect of:
(i) a child not born alive, of at least twenty weeks gestation or 400 grams weight
(ii) a live born child dying within twenty-eight days after birth
Note: Please ✓ in relevant boxes thus ☑

A. Particulars Relating to the Mother

1. Mother's full name (Surname in BLOCK letters) .....
2. Mother's address of usual residence ..... Postcode .....
3. Mother's age in years ..... AND date of birth ...../...../.....
4. Mother: Aboriginal ☐ Torres Strait Islander ☐ Both ☐ Neither ☐

B. Details of Previous Pregnancies

1. If no previous pregnancy, tick this box ☐ and go to Section C.
2. Where a previous pregnancy, please indicate:

(a) Number of previous pregnancies ..... If not known, tick box ☐

(b) Number of previous pregnancies known to have resulted in

	(number)
single births	☐
surviving livebirths	☐
stillbirths (at least 20 weeks)	☐
neonatal deaths (within 20 days)	☐
multiple birth	☐
surviving livebirths only	☐
stillbirth only	☐
neonatal deaths only	☐
abortion (spontan/induced)	☐☐

(c) Outcome of LAST pregnancy (select category)

	(number)
single births	☐
surviving livebirths	☐
stillbirths	☐
neonatal death	☐
multiple birth	☐
surviving livebirths only	☐
stillbirths only	☐
neonatal deaths only	☐
a combination	☐
abortion (spontan/induced)	☐☐
not known	☐

3. Date of outcome of LAST pregnancy ...../...../ 20.....

C. Details of Present Pregnancy

1. Estimated period of gestation at outcome was ..... completed weeks from first day of L.M.P.
2. First day of last menstrual period ...../...../ 20.....
3. Approximate number of antenatal visits ..... AND estimated month of gestation at first visit .....
4. Delivery: Normal spontaneous vertex ☐ Other ☐ Specify .....
5. Most senior attendant present at birth: Specialist Obstetrician ☐ GP ☐ Registered Midwife ☐ Not Known ☐ RMO ☐ Registrar ☐ None ☐ Other ☐ —(Specify) .....

CONTINUE ON REVERSE

0323

Births, Deaths and Marriages Registration Act, 1996

NOTICE OF PERINATAL DEATH

I hereby give notice that I have this day signed a medical certificate of the cause of perinatal death

concerning the death of .....

.....

who died at .....

.....

on the ..... day of ..... 20.....

.....

Signature of Medical Practitioner

Surname of Medical Practitioner

.....

Address .....

.....

Date ...../...../ 20.....

THIS NOTICE MUST BE FORWARDED TO:

The Registrar of Births, Deaths and Marriages
GPO Box 1351
ADELAIDE 5000

Level 2, Chesser House
91 Grenfell Street
ADELAIDE 5000

WITHIN 48 HOURS AFTER THE DEATH

D. Particulars Relating to the Child

1. Name (if given) .....
2. Place of birth ..... AND place of death .....
3. Sex: Male ☐ Female ☐ Indeterminate ☐
4. Plurality: Single ☐ First Twin ☐ Second Twin ☐ Other multiple ☐
   (Specify) .....
5. Birthweight ..... grams
6. Date of birth ...../...../ 20..... AND time of birth ..... am/pm
7. Did heartbeat cease:
   (a) Before labour commenced ☐ —Estimate how long before ..... hours/days
   (b) During labour and before delivery ☐
   (c) Before delivery but not known if before or during labour ☐
   (d) After delivery ☐ —Indicate date ...../...../ 20..... AND time ..... am/pm
   (e) Not known whether before or after delivery ☐
8. Did the child breathe spontaneously? Yes ☐ No ☐ Not known ☐

E. Cause of Death in Infant or Foetus (complete all items as applicable)

1. Main disease/condition in foetus or infant leading to death .....
2. Other disease(s)/condition(s) in foetus or infant .....
3. Main maternal disease/condition relating to the death .....
4. Other maternal disease(s)/condition(s) relating to the death .....
5. Other relevant information .....

F. Post-Mortem Status

(a) Post-mortem confirmed cause of death ☐
(b) Post-mortem information may be available later ☐
(c) Post-mortem not to be carried out ☐

I certify that, to the best of my knowledge, the particulars hereby reported are true.

Signature ..... Date ...../...../ 20.....

Surname (BLOCK letters) ..... Address .....

.....

Qualifications .....

This certificate is to be given to the funeral director or other person arranging for the disposal of human remains; that person will in due course give it to the Registrar of Births, Deaths and Marriages.

Appendix 2B
Doctor's Certificate of Cause of Death

27251

Births, Deaths and Marriages Registration Act 1996 (Section 36)

Doctor's Certificate of Cause of Death

(not to be issued if the State Coroner or a police officer is required to be notified of the death under the *Coroners Act 2003*)

Details of deceased

Surname (BLOCK LETTERS)

Given name(s)

Sex ☐ Female ☐ Male

Is the deceased of Aboriginal or Torres Strait Islander origin?

Yes, please specify origin: ☐ Aboriginal ☐ Torres Strait Islander ☐ Both ☐ No

Date of death / /

Age at death

Place of death

Was a *post mortem* conducted? ☐ Yes ☐ No

Does the body contain a cardiac pacemaker, cardiovascular defibrillator, drug infusion pump or similar device, or radio-active injectable solutions?

☐ Yes ☐ No If Yes, please specify

Cause of death

Part 1 – Conditions leading to the death and duration between onset and death: (show direct cause first followed by antecedent causes, stating the underlying condition last. PLEASE USE BLOCK LETTERS AND DO NOT ABBREVIATE).

	Disease	Duration
A		
B		
C		
D		
E		

Part 2 – Other significant conditions and duration:

Other details

Was an operation performed on the deceased within four weeks before death? ☐ Yes ☐ No If Yes, state the date of operation and condition for which performed:

Was deceased pregnant within three months before death? ☐ Yes ☐ No

Was deceased pregnant within twelve months before death? ☐ Yes ☐ No

If an injury was involved in the death, please answer the following questions:

Date of injury / /

Injury at work ☐ Yes ☐ No

Place where injury occurred

Description of injury

Certification

I certify that -

* I was responsible for the deceased's medical care immediately before death
* I examined the body of the deceased after death
* I have made a *post mortem* examination of the remains of the deceased

and that the particulars and cause of death written above are true to the best of my knowledge and belief.

(* strike out those which are not applicable)

Name

Phone (business hours)

Address

Signature

Date / /

Appendix 3

Definitions

Live birth: the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which after such separation breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached.

This report does not include live births less than 20 weeks gestation and less than 400g birthweight.

Stillbirth: birth of a fetus at or after 20 weeks gestation and/or with a birthweight of 400g or more, with no signs of life at birth.

Women who gave birth: women who gave birth after a pregnancy ending with the birth of one or more live births and/or stillbirths.

Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.[9]

Maternal deaths are classified as follows:

1. Direct obstetric deaths - those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.
2. Indirect obstetric deaths - those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy.
3. Incidental deaths in pregnancy - examples of incidental deaths are deaths from drowning and road accidents, where the pregnancy is unlikely to have contributed significantly to the death, although it may be possible to postulate a remote association.

In order to avoid missing indirect deaths which may be difficult to distinguish from incidental deaths occurring in pregnant women, the Maternal and Perinatal Mortality Committee reviews all deaths in pregnancy and within 42 days of the end of pregnancy. However, only direct and indirect deaths (pregnancy-related deaths) are included in the calculation of the maternal mortality ratio.

9 World Health Organization. International Statistical Classification of Diseases and Related Health Problems. Tenth Revision. Volume 2. Geneva: WHO, 1993.

Maternal mortality ratio:

$$= \frac{\text{Number of direct and indirect maternal deaths in a year}}{\text{Number of women who gave birth in the same year}} \times 100{,}000$$

Stillbirth rate:

$$= \frac{\text{Number of stillbirths in a year}}{\text{Number of livebirths and stillbirths in the same year}} \times 1{,}000$$

Neonatal death: death of a liveborn infant within 28 days of birth

Neonatal death rate:

$$= \frac{\text{Number of neonatal death in a year}}{\text{Number of livebirths in the same year}} \times 1{,}000$$

Perinatal death: includes stillbirth and neonatal death.

Perinatal mortality rate:

$$= \frac{\text{Number of stillbirths + neonatal deaths in a year}}{\text{Number of stillbirths + livebirths in the same year}} \times 1{,}000$$

Post-neonatal death: death of a liveborn infant occurring between 28 days and the first birthday

Post-neonatal death rate:

$$= \frac{\text{Number of post-neonatal deaths in a year}}{\text{Number of livebirths in the same year}} \times 1{,}000$$

Infant death: death of a liveborn infant within the first year of life
Infant deaths include neonatal and post-neonatal deaths.

Infant mortality rate:

$$= \frac{\text{Number of infant deaths in a year}}{\text{Number of livebirths in the same year}} \times 1{,}000$$

Sudden Infant Death Syndrome (SIDS): The sudden unexpected death of an infant less than one year of age, with onset of the fatal episode apparently occurring during sleep, that remains unexplained after a thorough investigation, including performance of a complete autopsy and review of the circumstances of death and the clinical history.[10]

10 Krous HF, Beckwith JB, Byard RW, Rognum TO, Bajanowski T, Corey T et al. Sudden infant death syndrome and unclassified sudden infant deaths: a definitional and diagnostic approach. Paediatrics 2004;114(1):234-8.

Appendix 4

Perinatal Society of Australia and New Zealand-Perinatal Death Classification (PSANZ-PDC), SA perinatal deaths, 2015

		Cat. No.	Subcat. No.	Cat. %
1.	**CONGENITAL ABNORMALITY** (including terminations for congenital abnormalities)	**62**		**33.2**
	1.1 Central nervous system	14		7.4
	1.2 Cardiovascular system	9		4.8
	1.3 Urinary tract	4		2.1
	1.4 Gastrointestinal tract	3		1.6
	1.5 Chromosomal	16		8.5
	1.6 Metabolic	0		0.0
	1.7 Multiple/ non chromosomal syndromes	12		6.4
	1.8 Other	4		2.1
	1.81 Musculoskeletal		3	
	1.82 Respiratory		0	
	1.83 Diaphragmatic hernia		0	
	1.84 Haematological		0	
	1.85 Tumours		1	
	1.88 Other specified congenital abnormality		0	
	1.9 Unspecified	0		0.0
2.	**PERINATAL INFECTION**	**16**		**8.5**
	2.1 Bacterial	11		5.9
	2.11 Group B streptococcus		4	
	2.12 E coli		2	
	2.13 Listeria monocytogenes		0	
	2.14 Spirochaetal, e.g. Syphilis		0	
	2.18 Other bacterial		5	
	2.19 Unspecified bacterial		0	
	2.2 Viral	3		1.6
	2.21 Cytomegalovirus		1	
	2.22 Parvovirus			
	2.23 Herpes simplex virus		2	
	2.24 Rubella virus			
	2.28 Other viral			
	2.29 Unspecified viral			
	2.3 Protozoal e.g. Toxoplasma	1		0.5
	2.5 Fungal	0		0
	2.8 Other specified organism	0		0
	2.9 Other unspecified organism	1		0.5

		Cat. No.	Subcat. No.	Cat. %
3.	HYPERTENSION	3		1.6
	3.1 Chronic hypertension: essential	0		0
	3.2 Chronic hypertension: secondary, e.g. renal disease	0		0
	3.3 Chronic hypertension: unspecified	0		0
	3.4 Gestational hypertension	0		0
	3.5 Pre-eclampsia	1		0.5
	3.51 With laboratory evidence of thrombophilia	1		0.5
	3.6 Pre-eclampsia superimposed on chronic hypertension	0		0
	3.61 With laboratory evidence of thrombophilia	1		0.5
	3.9 Unspecified hypertension	0		0
4.	ANTEPARTUM HAEMORRHAGE (APH)	26		13.8
	4.1 Placental abruption	22		11.7
	4.11 With laboratory evidence of thrombophilia		2	
	4.2 Placenta praevia	2		1.1
	4.3 Vasa praevia	1		0.5
	4.8 Other APH	1		0.5
	4.9 APH of undetermined origin	0		0
5.	MATERNAL CONDITIONS	6		3.2
	5.1 Termination of pregnancy (other than for congenital fetal abnormality)	0		0
	5.2 Diabetes / Gestational diabetes	4		2.1
	5.3 Maternal injury	0		0
	5.31 Maternal injury			
	5.32 Non-Accidental			
	5.4 Maternal sepsis	0		0
	5.5 Antiphospholipid syndrome	0		0
	5.6 Obstetric cholestasis	1		0.5
	5.8 Other specified maternal conditions	1		0.5
6.	SPECIFIC PERINATAL CONDITIONS	27		14.4
	6.1 Twin-twin transfusion	5		2.7
	6.2 Feto-maternal haemorrhage	1		0.5
	6.3 Antepartum cord complications	1		0.5
	6.31 Cord haemorrhage			
	6.32 True knot with evidence of occlusion			
	6.38 Other		1	
	6.69 Unspecified			
	6.4 Uterine abnormalities, e.g. bicornuate uterus, cervical incompetence	15		8.0
	6.5 Birth trauma (typically infants of >24 weeks gestation or >600g birthweight)	0		0

		Cat. No.	Subcat. No.	Cat. %
6.6	Alloimmune disease	1		0.5
	6.61 Rhesus			
	6.62 ABO			
	6.63 Kell			
	6.64 Alloimmune thrombocytopenia			
	6.68 Other		1	
	6.69 Unspecified			
6.7	Idiopathic hydrops	3		1.6
6.8	Other specific perinatal conditions	1		0.5
	6.81 Rupture of membranes after amniocentesis			
	6.82 Termination of pregnancy for suspected but unconfirmed congenital abnormality			
	6.83 Fetal subdural haematoma			
	6.88 Other		1	
	6.89 Unspecified			
7.	**HYPOXIC PERIPARTUM DEATH (typically infants of >24 weeks gestation or > 600g birthweight)**	**3**		**1.6**
7.1	With intrapartum complications	2		1.1
	7.11 Uterine rupture		2	
	7.12 Cord prolapse		1	
	7.13 Shoulder dystocia			
	7.18 Other			
7.2	Evidence of non-reassuring fetal status in a normally grown infant (e.g. abnormal fetal heart rate, fetal scalp pH/lactate, fetal pulse oximetry without intrapartum complications)	1		0.5
7.3	No intrapartum complications and no evidence of non-reassuring fetal status	0		0
7.9	Unspecified hypoxic peripartum death	0		0
8.	**FETAL GROWTH RESTRICTION (FGR)**	**18**		**9.6**
8.1	With evidence of reduced vascular perfusion on Doppler studies and/or placental histopathology (e.g. significant infarction, acute atherosis, maternal and or fetal vascular thrombosis or maternal floor infarction	11		5.9
	8.11 With placental or laboratory evidence of thrombophilia		2	
	8.12 With smoking			
	8.13 With substance abuse		1	
	8.14 With alcohol abuse			
	8.15 With diabetes / gestational diabetes		1	
8.2	With chronic villitis	0		
8.3	No placental pathology	1		0.5

		Cat. No.	Subcat. No.	Cat. %
8.4	No examination of placenta 8.41	0		0
8.8	Other specified placental pathology 8.81	6		3.2
8.9	Unspecified or not known whether placenta examined	0		0
9.	**SPONTANEOUS PRETERM (<37 weeks gestation)**	**12**		**6.4**
9.1	Spontaneous preterm with intact membranes, or membrane rupture <24 hours before delivery	5		2.7
	9.11 With chorioamnionitis on placental histopathology		3	
	9.12 Without chorioamnionitis on placental histopathology		2	
	9.13 With clinical evidence of chorioamnionitis, no examination of placenta			
	9.17 No clinical signs of chorioamnionitis, no examination of placenta			
	9.19 Unspecified or not known whether placenta examined			
9.2	Spontaneous preterm with membrane rupture ≥24 hours before delivery	7		3.7
	9.21 With chorioamnionitis on placental histology		6	
	9.22 Without chorioamnionitis on placental histology		1	
	9.23 With clinical evidence of chorioamnionitis, no examination of placenta			
	9.27 No clinical signs of chorioamnionitis, no examination of placenta			
	9.29 Unspecified or not known whether placenta examined			
9.3	Spontaneous preterm with membrane rupture of unknown duration before delivery	0		0
	9.31 With chorioamnionitis on placental histology		1	
	9.32 Without chorioamnionitis on placental histology			
	9.33 With clinical evidence of chorioamnionitis, no examination of placenta			
	9.37 No clinical signs of chorioamnionitis, no examination of placenta			
	9.39 Unspecified or not known whether placenta examined			

		Cat. No.	Subcat. No.	Cat. %
10.	UNEXPLAINED ANTEPARTUM DEATH	15		8.0
	10.1 With evidence of reduced vascular perfusion on Doppler studies and/or placental histopathology (e.g. significant infarction, acute atherosis, maternal and/or fetal vascular thrombosis or maternal floor infarction)	4		2.1
	10.11 and thrombophilia		1	
	10.12 and smoking			
	10.13 and substance abuse			
	10.14 and alcohol abuse			
	10.15 and diabetes / gestational diabetes			
	10.2 With chronic villitis	0		0
	10.3 No placental pathology	1		0.5
	10.4 No examination of placenta	1		0.5
	10.8 Other specified placental pathology	9		4.8
	10.9 Unspecified unexplained antepartum death or not known whether placenta examined	0		0
11.	NO OBSTETRIC ANTECEDENT	0		0
	11.1 SIDS	0		0
	11.11 SIDS Category IA: Classic features of SIDS present and completely documented.			
	11.12 SIDS Category IB: Classic features of SIDS present but incompletely documented.			
	11.13 SIDS Category II: Infant deaths that meet Category I except for one or more features.			
	11.2 Postnatally acquired infection	0		0
	11.3 Accidental asphyxiation	0		0
	11.4 Other accident, poisoning or violence (postnatal)	0		0
	11.8 Other specified	0		0
	11.9 Unknown / Unexplained	0		0
	11.91 Unclassified Sudden Infant Death			
	11.92 Other Unknown / Undetermined			
	TOTAL	188		100.0

Appendix 5

Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC), SA perinatal deaths by birthweight, 2015

PSANZ-PDC		Birthweight (g)							Total	
		<500	500 -749	750 -999	1,000 -1,499	1,500 -1,999	2,000 -2,499	2,500+	No.	%
1	Congenital abnormality	33	13	1	3	6	2	3	*62	33.0
2	Perinatal infection	4	0	1	1	1	1	8	16	8.5
3	Hypertension	2	0	0	0	0	1	0	3	1.6
4	Antepartum haemorrhage	12	3	2	1	2	2	4	26	13.8
5	Maternal conditions	2	0	0	0	0	0	4	6	3.2
6	Specific perinatal conditions	17	6	1	0	1	1	1	27	14.4
7	Hypoxic peripartum death	0	0	0	0	0	0	3	3	1.6
8	Fetal growth restriction	7	6	0	0	1	2	2	18	9.6
9	Spontaneous preterm	6	3	2	1	0	0	0	12	6.4
10	Unexplained antepartum death	1	2	1	4	0	0	7	15	8.0
11	No obstetric antecedent	0	0	0	0	0	0	0	0	0.0
	Total	**84**	**33**	**8**	**10**	**11**	**9**	**32**	***188**	**100**
	%	44.7	17.6	403	5.3	5.9	4.8	17.0	100	%

*Includes 1 infant of unknown birth weight

Appendix 6

Perinatal Society of Australia and New Zealand-Neonatal Death Classification (PSANZ-NDC), SA neonatal deaths, 2015

	Cat. No.	Subcat. No.	%
1. CONGENITAL ABNORMALITY	**12**		**34.3**
1.1 Central nervous system	3		8.6
1.2 Cardiovascular system	0		0
1.3 Urinary tract	0		0
1.4 Gastrointestinal tract	2		5.7
1.5 Chromosomal	4		11.4
1.6 Metabolic	0		0
1.7 Multiple/ non chromosomal syndromes	2		5.7
1.8 Other congenital abnormality	1		2.9
1.81 Musculoskeletal		1	
1.82 Respiratory			
1.83 Diaphragmatic hernia			
1.84 Haematological			
1.85 Tumours			
1.88 Other specified congenital abnormality			
1.9 Unspecified congenital abnormality	0		0
2. EXTREME PREMATURITY	**12**		**34.3**
(typically infants of <=24 weeks gestation or <=600g birthweight)			
2.1 Not resuscitated	11		31.4
2.2 Unsuccessful resuscitation	1		2.9
2.9 Unspecified or not known whether resuscitation attempted	0		0
3.3. CARDIO-RESPIRATORY DISORDERS	**1**		**2.9**
3.1 Hyaline membrane disease / Respiratory distress syndrome (RDS)	0		0
3.2 Meconium aspiration syndrome	0		0
3.3 Primary persistent pulmonary hypertension	0		0
3.4 Pulmonary hypoplasia	0		0
3.5 Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)	0		0
3.6 Pulmonary haemorrhage	1		2.9
3.7 Pneumothorax	0		0
3.8 Other	0		0

	No.	Subcat. No.	%
4. INFECTION	**5**		**14.3**
4.1 Bacterial	1		2.9
4.11 Congenital bacterial		1	
4.111 Group B streptococcus			
4.112 E coli			
4.113 Lysteria monocytogenes			
4.114 Spirochaetal, eg syphilis			
4.118 Other bacterial			
4.119 Unspecified bacterial			
4.12 Acquired bacterial	2		5.7
4.121 Group B streptococcus			
4.122 E coli			
4.125 Other Gram negative bacilli (other than E coli)		1	
4.126 Staphylococcus aureus			
4.127 Coagulase negative Staphylococcus			
4.128 Other specified bacterial		1	
4.129 Unspecified bacterial			
4.2 Viral	2		5.7
4.21 Congenital viral			
4.211 Cytomegalovirus		2	
4.213 Herpes simplex virus			
4.214 Rubella virus			
4.218 Other specified viral			
4.219 Unspecified viral			
4.22 Acquired viral	0		0
4.221 Cytomegalovirus			
4.223 Herpes simplex virus			
4.224 Rubella virus			
4.228 Other specified viral			
4.229 Unspecified viral			
4.3 Protozoal e.g. Toxoplasma	0		0
4.5 Fungal	0		0
4.8 Other specified organism	0		0
4.9 Unspecified organism	0		0
5. NEUROLOGICAL	**5**		**14.3**
5.1 Hypoxic ischaemic encephalopathy / Perinatal asphyxia (typically infants of >24 weeks gestation or >600g birthweight)	2		5.7

	No.	Subcat. No.	%
5.2 Intracranial haemorrhage	3		8.6
5.21 Intraventricular haemorrhage		3	
5.22 Subgaleal haemorrhage			
5.23 Subarachnoid haemorrhage			
5.24 Subdural haemorrhage			
5.28 Other intracranial haemorrhage			
5.8 Other	0		0
6. GASTROINTESTINAL	**0**		**0**
6.1 Necrotising enterocolitis	0		0
6.8 Other	0		0
7. OTHER	**0**		**0**
7.1 Sudden Infant Death Syndrome (SIDS)	0		0
7.11 SIDS Category IA: Classic features of SIDS present and completely documented.			
7.12 SIDS Category IB: Classic features of SIDS present but incompletely documented.	0		0
7.13 SIDS Category II: Infant deaths that meet category I except for one or more features.	0		0
7.2 Multi-system failure	0		0
7.21 Secondary to intrauterine growth restriction			
7.28 Other specified			
7.29 Unspecified/undetermined primary cause or trigger event			
7.3 Trauma	0		0
7.31 Accidental			
7.32 Non-accidental			
7.39 Unspecified			
7.4 Treatment complications	0		0
7.41 Surgical			
7.42 Medical			
7.8 Other specified	0		0
7.9 Undetermined / Unknown	0		0
7.91 Unclassified Sudden Infant Death			
7.92 Other Unknown / Undetermined			
TOTAL	35		100.0

Appendix 7

Archived recommendations

Many Committee recommendations have been incorporated into South Australian policies, standards or guidelines and are listed below, with the relevant code of practice. The year in which the recommendation was first made is provided in parentheses, together with the Subcommittee that made the recommendation, with (M) designating the Maternal Subcommittee, (P) the Perinatal Subcommittee and (PNN) designating the Post-neonatal Subcommittee.

Recommendation	Relevant code of practice
General	
All direct maternal deaths and indirect maternal deaths, should be investigated formally using a process such as Root Cause Analysis. Determining the cause of death is greatly assisted by autopsy findings (2013)(M).	Maternal deaths classified as Safety Assessment Code Score (SAC) 1, guiding incident investigation.
IV drug users (pregnant and non-pregnant) with febrile or inflammatory conditions should be investigated for endocarditis (2013)(M).	SA Perinatal Practice Guidelines: 'Sepsis in pregnancy'.
All maternity birthing services must have protocols for massive transfusion, which incorporate site specific recommendations for the use of other transfusion products in addition to red blood cells. All sites must have intravenous tranexamic acid readily available. As soon as major blood loss is recognised, blood should be cross matched, and the blood and platelets be made readily available to theatre and recovery (2012)(M).	Sites have, or are implementing massive transfusion protocols in accordance with the Perinatal Practice Guidelines 'Massive blood transfusion' & 'Postpartum haemorrhage'
Clinicians are reminded that tachypnoea may be an important indicator of a deteriorating patient (2012)(M).	Rapid Detection and Response Maternal Observation Chart [11]
To reduce the risk of confusion about the urgency of caesarean section, all hospitals must use the terminology in the 'Standards for the Management of Category One Caesarean Section in South Australia 2011' (2012)(M).	Standards for the Management of Category One Caesarean Section in South Australia [12]
There should be further development and evaluation of culturally appropriate programs to enhance access to, and uptake of antenatal, birthing and postnatal care in Aboriginal communities (2009)(P).	*Aboriginal Family Birthing Program*

11 MR59G State wide standardised 'Rapid Detection and Response Maternal Observation Chart' http://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/safety+and+quality/recognising+and+responding+to+clinical+deterioration

12 South Australia, Dept. of Health. Standards for the Management of Category One Caesarean Section in South Australia / Government of South Australia, Department of Health, 2011

The care of women with current or previous serious conditions during pregnancy should only be undertaken in settings which are equipped to deal appropriately with such situations (2002)(M).Women with serious maternal conditions should be cared for in hospitals with adequate comprehensive adult services. It is important to care for pregnant women in a setting that is appropriate for the level of risk the pregnancy presents for the mother and/or the baby (2006)(P).	Standards for Maternal and Neonatal Services in South Australia 2010 ;[13] SA Perinatal Practice Guidelines
Autopsy is strongly recommended (1992)(P), and the clinical appearance should always be documented (2004) (P). If parents decline autopsy, photographic and X-ray documentation should be obtained (2003)(P). The State Perinatal Autopsy Service is available at no cost to parents, including parents in country areas and may be contacted on (08) 8161-7333 (2006)(P).	Appendix 8; SA Perinatal Practice Guidelines: 'Perinatal loss'; and 'IMPROVE' workshop
All placentas associated with perinatal deaths should be examined by the Department of Surgical Pathology, Women's and Children's Hospital (2003)(P). They should be accompanied with all relevant clinical information. (2006) (P). Placentas that are not sent for pathological examination should be refrigerated for one week in individually labelled plastic bags (2011)(P).	Appendix 9; SA Perinatal Practice Guidelines: 'Perinatal loss'; and 'IMPROVE' workshop. Suitable facilities and processes are being implemented at sites.
The South Australian protocol for investigating stillbirths, including a systematic approach to investigate the potential involvement of thrombophilias should be followed (2002) (P).	Appendix 8; SA Perinatal Practice Guidelines: ' Investigation of stillbirths'; and 'IMPROVE' workshop
Pregnant women travelling in motor vehicles need to wear seat belts at all times for safety (1991)(M). The South Australian Department of Transport, Energy and Infrastructure recommends that the lap part of the seat belt should be worn as low as possible, below the unborn child. It should be over the upper thighs and across the pelvis. The sash part of the seat belt passes above the stomach and between the breasts. The seat belt should be worn at all times when the vehicle is in motion (updated 2001)(M).	The Australian Road Rules require every adult (including pregnant women) travelling in a motor vehicle to use a seat belt, where one is available, properly fastened and adjusted (see Transport SA brochure 'Seatbelts & pregnant women').

13 Department of Health, South Australia. Standards for Maternal and Neonatal Services in South Australia 2010: www.health.sa.gov.au/PPG

14 Chapter 4, Cardiopulmonary resuscitation in the non-pregnant and pregnant patient. Replacement for Pages 18-29 of the MOET Book (ILCOR Update January 2011)

15 Bujold E, Morency A, Roberge S. Acetylsalicylic Acid for the Prevention of Preeclampsia and Intra-uterine Growth Restriction in Women with Abnormal Uterine Artery Doppler: A Systematic Review and Meta-analysis. JOGC, September 2009.

Ongoing development and implementation of the statewide Perinatal Practice Guidelines is recommended (www.health.sa.gov.au/ppg) (2000)(P).	SA Perinatal Practice Guidelines: See under "What's new"
Antenatal	
Fetal growth restriction associated with maternal hypertension, should be recognised as pre-eclampsia and labour induced by 37 weeks gestation (2013)(M).	SA Perinatal Practice Guidelines 'Hypertensive disorders in pregnancy'.
In cases of pulseless maternal collapse at 20 or more weeks gestation consideration should be given to early emptying of the pregnant uterus by caesarean section to facilitate resuscitation, in accordance with the International Liaison Committee on Resuscitation (ILCOR) guidelines 2011 for resuscitation of the pregnant woman (2011)(M) [14]	SA Perinatal Practice Guidelines: 'Collapse (maternal)', updated 2011
Pregnant women with suspected obstetric cholestasis should have appropriate investigations, including serum bile acids. If the diagnosis is confirmed, ongoing care should be conducted in consultation with an obstetrician (2009).	SA Perinatal Practice Guidelines: 'Obstetric cholestasis'
When fetal macrosomia (large for gestational age) is suspected, the place, mode and timing of birth should be carefully considered (2009)(P).	SA Perinatal Practice Guidelines: 'Fetal growth (accelerated)'
Women at increased risk of pre-eclampsia should be treated from early in pregnancy (< 16 week's gestation) with aspirin 100 mg daily to reduce the risk of early-onset pre-eclampsia and intra-uterine growth restriction (2012, 2009)(P).[15]	SA Perinatal Practice Guidelines: 'Hypertensive disorders in pregnancy'
Planned home birth for twins, breech presentations and post-term infants is associated with unacceptably high risks (2004)(P). A previous caesarean section is a contraindication for home birth (2007)(P).	Policy for Planned Birth at Home in South Australia July 2007 [16]
Rhesus D negative women must have antibody status tested before the administration of Anti-D. A measurable titre of Anti-D antibodies is an indicator of potential alloimmunisation and always requires investigation and a specialist opinion (2006)(P).	SA Perinatal Practice Guidelines: 'Anti-D prophylaxis', 'Antenatal prophylaxis at weeks 28 and 34 of gestation'
Pregnant women with a Body Mass Index (BMI) greater than 35 kg/m^2 are at higher risk from anaesthesia. A timely referral for an anaesthetic consultation should be considered for women with a high BMI (2005)(P).	Standards for the management of the obese obstetric woman in South Australia [17]

16 Department of Health, South Australia. Policy for Planned Birth at Home in South Australia, 4 July 2007: www.health.sa.gov.au/PPG

17 Department of Health and Ageing, South Australia. Standards for the Management of the Obese Obstetric Woman in South Australia 2016: www.health.sa.gov.au/PPG

Twin pregnancies should have early ultrasound determination, followed by further surveillance, for twin-twin transfusion in monochorionic pregnancies (2005)(P).	SA Perinatal Practice Guidelines: 'Twin pregnancy '
Continued support of strategies to reduce smoking in pregnancy remains important (2002)(P), *with a focus on culturally appropriate smoking cessation interventions for Aboriginal wome*n (2004)(P).	SA Perinatal Practice Guidelines: 'Substance use in pregnancy' – 'Smoke-free Pregnancy Assessment and Intervention information sheet'; Quit SA smoke free pregnancy project; Aboriginal Family Birthing Program; *Aboriginal Health Council of SA 'Stickin' up the smokes' program*
Pregnant women with current or previous serious medical conditions should be reviewed by a physician early in the pregnancy (2003)(M).	SA Perinatal Practice Guidelines
The Subcommittee recommends the use of the birthweight for gestational age percentile charts for singletons [18] and twins [19] prepared using national perinatal data, which are available on the PSANZ website with the PSANZ perinatal death classifications (www.psanz.org.au) (1998, updated 2012)(P). The singleton charts have been reproduced in Appendix 10 with the permission of the Medical Journal of Australia.	SA Perinatal Practice Guidelines: 'Fetal growth (accelerated)'; 'Fetal growth (restricted)'
Missed diagnosis of fetal growth restriction requires vigilance by clinicians during the antenatal period (2002)(P). The use of customised growth charts and plotting during all antenatal visits from 24 weeks onwards improves the antenatal detection of growth restriction [20] (updated 2012) (P).	SA Perinatal Practice Guidelines: 'Fetal growth (restricted)'
In Labour and Birth	
Operative vaginal deliveries with an anticipated increased risk of failure should be conducted in an Operating Theatre with the capacity to proceed to a caesarean section as soon as possible, if required (2011) (P).	SA Perinatal Practice Guidelines: 'Operative vaginal deliveries'
Once a decision to perform an emergency caesarean section has been made, fetal heart rate monitoring should continue until the commencement of surgery (2007)(P).	SA Perinatal Practice Guidelines: 'Caesarean section'

18 Dobbins T, Sullivan E, Roberts C & Simpson J. Australian national birthweight percentiles by sex and gestational age, 1998-2007. MJA 2012; 197: 291-294.18.

19 Roberts C, Lancaster P. National birthweight percentiles by gestational age for twins born in Australia. J Paediatr Child Health 1999; 35:278-282.

20 Roex A, Nikpoor P, van Eerd P, Hodyl N, Dekker G. Serial plotting on customised fundal height charts results in doubling of the antenatal detection of small for gestational age fetuses in nulliparous women. ANZJOG 2012:52(1);78-82

When feto-maternal haemorrhage is suspected, flow cytometry should be considered to estimate the volume as it is more precise than the Kleihauer test (2007)(P).	SA Pathology Standard
When induction of labour is deemed necessary in the presence of uterine scar and unripe cervix, careful consideration should be given to alternative options, such as postponing the induction or caesarean section (2005)(P).	SA Perinatal Practice Guidelines: 'Birth options after caesarean section'
Carriers of group B streptococcus and women with risk factors, such as prolonged rupture of membranes, should be provided appropriate antibiotic treatment (2004)(P).	SA Perinatal Practice Guidelines: 'Prevention and treatment of neonatal sepsis (including maternal group B streptococcal colonisation)'; 'Prelabour rupture of the membranes (PROM) ≥ 37 weeks'; 'Preterm labour management'
Postnatal	
Where a women presents with serious medical complications early in the post-partum period, she should be reviewed by an obstetric physician, if available, as well as by a consultant obstetrician, together with other medical specialists as appropriate (2009)(M).	Individual circumstances under relevant sections of SA Perinatal Practice Guidelines
Non-steroidal anti-inflammatory drugs should be avoided post-partum and post-operatively in women with pre-eclampsia (2007)(M).	SA Perinatal Practice Guidelines: 'Hypertensive disorders in pregnancy (Anaesthetic considerations in hypertensive disorders of pregnancy)'
If a diagnosis of pre-eclampsia has been made, blood pressure must be monitored after birth until it has settled and any abnormalities of renal or liver function or blood counts have been appropriately managed (2007)(M).	SA Perinatal Practice Guidelines: 'Hypertensive disorders in pregnancy'
Infant	
Community nurses require a system to facilitate referral of high risk children to paediatricians or tertiary hospitals for urgent appointments (2006).	Pathways specific for metropolitan and rural areas are being developed and co-ordinated by the Child Health Network.
Hospitals with high levels of paediatric throughput need provision of 24-hour paediatric expertise. Appropriate protocols regarding detection and management of potentially life-threatening paediatric conditions need to be developed, reviewed, distributed to and supported by all hospitals treating children (2004).	The Child Health Network is developing appropriate protocols with health services.

Urgent medical advice should be sought for all infants who are excessively drowsy, irritable and/or are feeding poorly. These infants, who may not be showing the classical signs of infection, should be considered seriously ill until proven otherwise (2011)(PNN). Small infants also become dehydrated very rapidly (1992). Health professionals are reminded that intravenous fluids are lifesaving for any sick infant. Infants with cyanotic heart disease are more prone to the complications of dehydration and specialist advice should be sought (2004). Urgent retrieval may be necessary for any infant who is thought to be suffering from a significant bacterial infection (2003).	The Child Health Network has been developing strategies with Child and Family Health Services to improve the detection and management of at risk infants. Incorporated into 2017 GPlearning active learning module 'Recognising the seriously ill child'.
Families with known risk factors for adverse child outcome, such as parental substance abuse, parental psychiatric illness, household violence, maternal age less than 20 years and poor social circumstances, need ongoing support, supervision and referral as identified. This should be continued at least throughout the first year of life, if not for a longer period of time (1997).	Targeted services addressing these needs include the Family Home Visiting Service and Early Child Parent Services.
Infants in all-in-one fitted baby sleeping bags do not require additional bed clothes covering the infant (2011)(PNN).	2011 'South Australian Safe Infant Sleeping Standards': www.healthpromotion.cywhs.sa.gov.au/library/Safe_Sleeping_Standards.pdf An E-learning website is also available.
Parents with infants and young children should take the opportunity to sleep when their children are asleep and should be aware of the risk of sleep deprivation associated with prolonged use of small screen entertainment. Extreme parental fatigue is a recognised risk factor for sudden unexpected deaths in infancy associated with co-sleeping. In some cases this fatigue is avoidable (2010)(PNN).	
Care should be taken when placing infants to sleep on mattresses on the floor as infants may roll off and become wedged (2006)(PNN).	
Health professionals providing care both in the antenatal and postnatal period should ensure that all parents and carers are provided with information about safe infant sleeping practices and prevention of sudden unexpected deaths in infancy (1996)(PNN).	
Babies should be placed on their backs to sleep. Sleeping supine is not contraindicated in babies with gastro-oesophageal reflux (1998)(PNN).	

Falling asleep with the infant at the breast may be hazardous (1996)(P). Other forms of co-sleeping or bed sharing may be hazardous, particularly if the adults are intoxicated or sedated (see Appendix 11) (1993)(PNN).	2011 'South Australian Safe Infant Sleeping Standards': www.healthpromotion.cywhs.sa.gov.au/library/Safe_Sleeping_Standards.pdf An E-learning website is also available.
Potential hazards must be removed from the infant's sleeping environment. Babies must not be placed in cots with pillows, U-pillows, cot bumpers, large soft toys, thick blankets or quilts or any other items which may overheat or suffocate the infant (1993)(PNN).	
Infants should not be left to sleep unattended in stroller-prams or bouncinettes (1993)(PNN).	
Ensure that all new cots meet Australian Standards and only use old ones which do. Mattresses which do not fit cots properly should not be used, especially in cots that have unsupported webbing. Do not use very soft mattresses or inflatable mattresses which may vary in their firmness and present spaces in which an infant's head or face may be trapped (1993)(PNN).	
To record the child's weight and chart the weight on the percentile growth charts to identify children who are not thriving. It is important to investigate why a child is not thriving (2001). Any child who is not thriving should be referred to a medical practitioner (2003)(PNN).	Child and Youth Health's 'My Health Record' – 'Growth'; 'My first year'; 'Now I am 1'; 'Now I am 2'; 'Now I am 3'; and 'Now I am 4';
To record and monitor immunisation. Immunisation is important to prevent infectious disease in children (2001) (PNN). There is some evidence that there is a reduced rate of SIDS in immunised compared with non-immunised children.[21]	
To provide essential information to remove potential hazards in the home from the infant's environment. These include long hanging curtain cords, which may catch around the neck, and water in containers or baths in which an infant may drown (1998)(PNN). Infants should never be left unattended in a bath or near water, even for a minute (1993)(PNN). This applies also to water features in gardens (2005)(PNN). Parents should not be reassured by the presence of an older sibling in the bath with the infant (2004)(PNN). This warning also applies to infants placed in devices such as ring bath seats (2002)(PNN). These devices have been banned in some Australian states due to deaths from drowning associated with their use.	

21 Mitchell EA, Stewart AW, Clements M, Ford RPK, on behalf the New Zealand Cot Death Study Group. Immunisation and the sudden infant death syndrome. Arch Dis Child 1995;73:498-501.

Children with serious illnesses need to be easily identifiable to clinicians with a Medic Alert bracelet (2005)(PNN).	Medic Alert systems
The Subcommittee recommends that further research be undertaken on the incidence of community acquired Methicillin Resistant Staphylococcus aureus (MRSA) infections to help guide clinical practice in terms of antibiotic choice in sick children. This may include setting up systems to make hospital and community acquired MRSA infection a notifiable communicable disease (2005) (PNN).	Australian Commission on Safety and Quality in Health Care: Australian Guidelines for thePrevention and Control of Infection in Healthcare
Professional	
Clinicians should refer to the South Australian Perinatal Practice Guidelines (www.health.sa.gov.au/PPG). Hospitals should provide easy access to the South Australian Perinatal Practice Guidelines for their staff (2011) (P).	Available online at www.health.sa.gov.au/PPG, and as mobile device application 'Practice Guidelines Reader'
All clinicians involved with clinical care for perinatal deaths or mortality review should attend an 'IMPROVE' workshop. 'IMPROVE' (Improving Perinatal Mortality Review and Outcomes via Education) workshops were designed by the Perinatal Society of Australia and New Zealand (PSANZ) and The Australian and New Zealand Stillbirth Alliance (ANZSA)	Four IMPROVE workshops have been conducted in SA 2012 to 2014, training 110 SA staff. Three future workshops are planned, including two in rural regions.
Appropriate training and maintenance of competence in cardiotocograph (CTG) interpretation for all levels of medical and midwifery staff (2000)(P).	SA Perinatal Practice Guidelines: 'Cardiotocography'

Appendix 8
South Australian Protocol for investigation of stillbirths

Working party members (August 2012):

Professor G Dekker (Chair)
Professor TY Khong
Professor W Hague
Dr Linda McKendrick

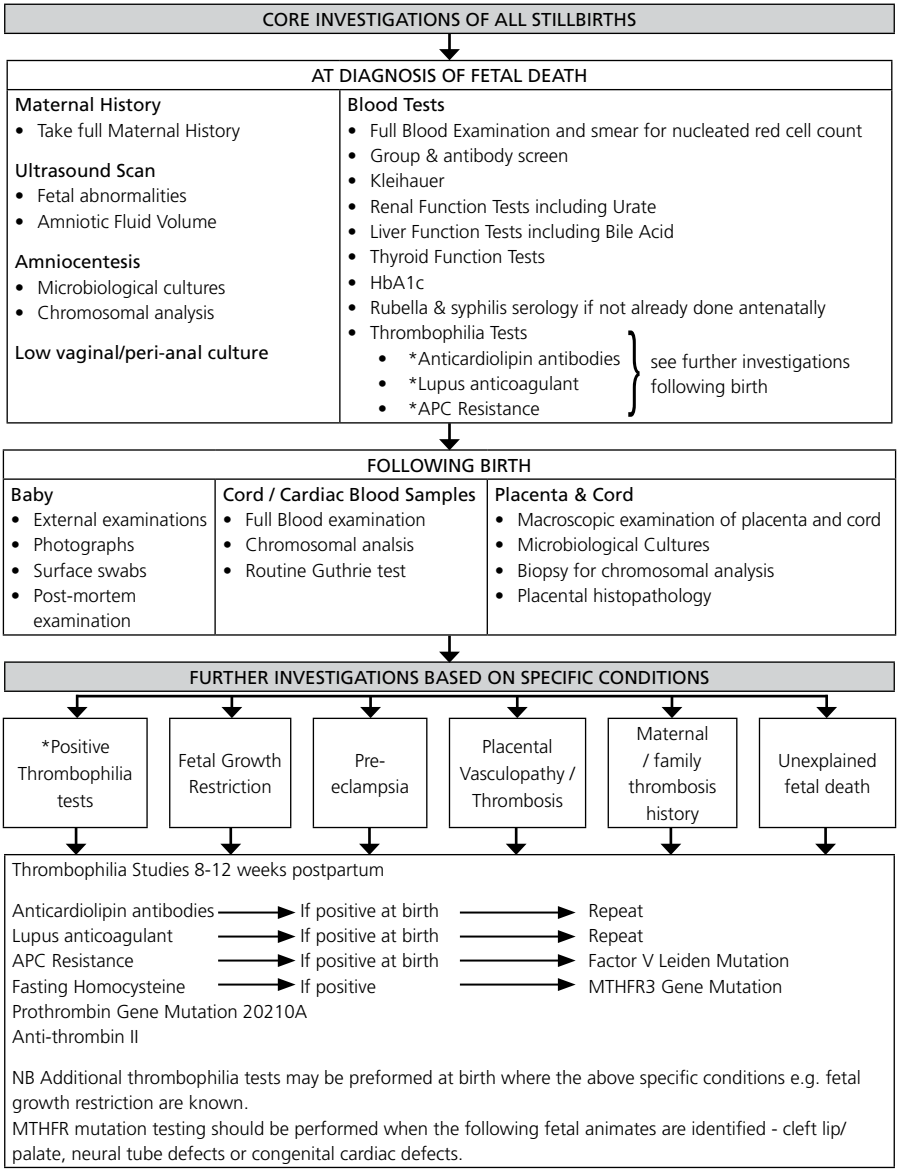
Introduction

About 75% of the overall perinatal mortality in South Australia is related to stillbirths. Over the past several years approximately 11% of stillbirths had no cause identified, possibly, in part due to the lack of a systematic and up-to-date approach to the investigation of stillbirths for which there is no immediate obvious cause. Currently protocols for investigating such cases vary markedly between hospitals and generally have not kept pace with advances in obstetric knowledge, particularly in the area of vasculopathy.

The 'Stillbirth investigations algorithm' of the Perinatal Society of Australia and New Zealand (PSANZ) on the following page summarises the recommended core investigations for all stillbirths, and further investigations to be undertaken based on specific conditions.

It is important that clinicians initiate a comprehensive approach to all cases of stillbirth; however, as in all aspects of clinical medicine **common sense should prevail**. In order to adequately assess causative and contributing factors in cases of stillbirth, certain core investigations will be required in all cases as outlined in the 'Core Investigations of All Stillbirths' section in the 'Stillbirth investigations algorithm' on the following page. South Australian specific considerations are summarised in the pages following the 'Stillbirth investigations algorithm'. Some investigations are best suited to those cases in which no cause of death is apparent.

Stillbirth investigations algorithm



Perinatal Society of Australia and New Zealand Perinatal Mortality Audit Guideline; Second Edition, Version 2.2, April 2009. Section 5: Investigation of Stillbirths; Appendix 1
http://www.psanz.com.au/special-interest/perinatal-mortality-group/psanzcpg

South Australian Core investigations (to be performed in all cases of stillbirth):

The following outlines the current South Australian recommended core investigations into stillbirth.

- A detailed history and examination of the mother and careful review of the antenatal record – This can often provide clues to intercurrent infection, previously undiagnosed pre-eclampsia, drug use, obstetric cholestasis or missed intrauterine growth restriction.
- Maternal blood - In addition to the blood tests listed in the core investigations section of the 'Stillbirth investigation algorithm', a blood glucose test should be done. Testing for fetomaternal haemorrhage involves a Kleihauer test at SA Pathology and, if positive, Fluorescence-Activated Cell Sorting (FACS, a type of flow cytometry) to quantify the fetomaternal haemorrhage.
- Autopsy of the stillbirth - With parental consent, an autopsy should be conducted by the State Perinatal Autopsy Service. In those cases where parents give full consent with regard to autopsy, the perinatal pathologists will take appropriate samples for genetic testing, and there is no need for the obstetrician to take separate fetal samples.
- External examination of the baby - In cases where parental consent for autopsy cannot be obtained, where possible, external examination of the baby by a pathologist experienced in this area should be sought. If this is not possible an X-ray of the baby and/or a clinical photograph should be taken and sent to a major centre for review.
- Histopathology of placenta - Whether or not an autopsy is performed the placenta should be placed in a dry sterile container (no formalin or saline), the container surrounded in ice and forwarded to the State Perinatal Autopsy Service. Histopathological examination combined with other investigations may provide a diagnosis and information that can be helpful in planning another pregnancy.
- Guthrie card - Where permission for an autopsy has been declined, parents should be asked if blood can be taken for the Newborn Screening Guthrie Card that is requested for all babies in Australia. This blood can be drawn from a heel prick or from the cut end of the umbilical cord of the placenta in the case of a fresh stillbirth (<7 days between intrauterine death and birth).

Termination of pregnancy for fetal abnormalities

In cases where a termination of pregnancy has been carried out for fetal malformation, an autopsy may still be desirable to confirm the diagnosis or discover unexpected associated malformations.

Congenital abnormality

Investigations to be performed when an intrauterine fetal death occurs in conjunction with a known fetal abnormality:

> Genetic testing - preferably on amniotic fluid obtained by amniocentesis since this provides the least contaminated sample, but if maternal consent for this cannot be obtained then on cord blood (if obtainable) or fetal skin.

> Maternal serology for syphilis, cytomegalovirus, toxoplasma, herpes and parvovirus. Serum should be taken and forwarded with the baby. Investigation for congenital infection should be pursued if abnormalities indicative of infection are found (for example, hydrocephalus, hepatomegaly, cataracts, fetal hydrops, calcification of brain or placenta).

> Maternal screen for blood group antibodies – forward serum with baby for later investigation if hydrops is evident at autopsy.

Vasculopathies

Pre-eclampsia, placental abruption and intrauterine growth restriction.

All should have a thrombophilia screen comprising –

1. At time of delivery:
   > Anti-cardiolipin antibody
   > Lupus anticoagulant

   (Diagnosis of antiphospholipid antibody syndrome requires a least two positive tests of moderate to high titre)

   > Factor V Leiden gene mutation, prothrombin gene mutation
2. At three months post-partum:
   > Homocysteine - may be done earlier if follow-up uncertain
   > Protein S *(a formal diagnosis of protein S deficiency requires 2 abnormal results at least six weeks apart outside of pregnancy)*

(Note: MTHFR testing, as listed in the 'Thrombophilia studies 8-12 weeks postpartum' section of the 'Stillbirth investigations algorithm', is no longer routinely performed in South Australia)

Pre-eclampsia: Those with early onset pre-eclampsia (<28 weeks) should also have

> Anti-nuclear antibody

> Fetal genetic testing (see "Congenital abnormality")

Placental abruption: In cases of placental abruption

> A history of trauma, including domestic or other violence, should be sought.
> Testing for fetomaternal haemorrhage and D-dimers is indicated if the diagnosis is in doubt.

Intrauterine growth restriction (IUGR):

Where intrauterine growth restriction is evident, without further evidence of a vasculopathy, the following should be performed in addition to the thrombophilia screen:

> maternal serology for cytomegalovirus, toxoplasma and rubella (if not immune) on held maternal serum
> fetal genetic testing (see "Congenital abnormality")
> maternal urinary drug screen as well as a drug-related history.

Intrapartum stillbirths

> If associated with pre-eclampsia, intrauterine growth restriction and/or abruption follow the placental vasculopathy protocol.
> In the absence of obvious causes, test for fetomaternal haemorrhage and cord (or heart) blood for haemoglobin, platelets and nucleated red blood cells.

Unexplained stillbirths

In the absence of discernible factors pertaining to fetal demise, or any obvious congenital abnormality, in addition to the "Core investigations" the following should be conducted:

> cord blood bile acids if possible
> maternal thyroid stimulating hormone
> maternal serology for syphilis, cytomegalovirus, toxoplasma herpes, parvovirus and rubella (if not immune) on held maternal serum
> microbiology - fetal throat swab, placental intermembranous swab
> drug history and urine drug screen
> dord or heart blood - haemoglobin, platelets, nucleated red blood cells, blood group (for anti-D if mother is Rhesus negative)
> maternal antibody screen
> fetomaternal haemorrhage testing
> check the mother's history for the possibility of tropical infectious disorders. Where there is a history of a recent visit to a tropical area, contact an infectious disease specialist with regard to required investigations.

Appendix 9
Placental histology guidelines

Histological examination of the placenta provides additional information about perinatal deaths and placentas should be sent for examination where possible.

As a guide, placentas and **all relevant clinical information** should be sent to Pathology from **all**:

> stillborn infants, early neonatal deaths and mid-trimester miscarriages

> multiple pregnancies with same sex infants

> triplet and higher order multiple pregnancies

> cases of discordant twin growth with greater than 20% weight difference

> cases of prolonged rupture of membranes or suspected chorioamnionitis or maternal fever (any cause)

> preterm births

> cases where birthweight is less than the 10th percentile or greater than the 95th percentile for gestational age

> cases of fetal malformation

> cases of pregnancy complicated by oligohydramnios, polyhydramnios or placental abnormalities detected prenatally (vascular channels, chorioangioma, etc)

> cases with a physical abnormality in the placenta (eg. a mass, abnormal colour, malodour)

> cases subjected to chorion villus sampling or amniocentesis, if complications occur

> cases of pre-existing diabetes, pre-eclampsia, systemic lupus erythematosus and documented thrombophilias known to be associated with fetal hazard

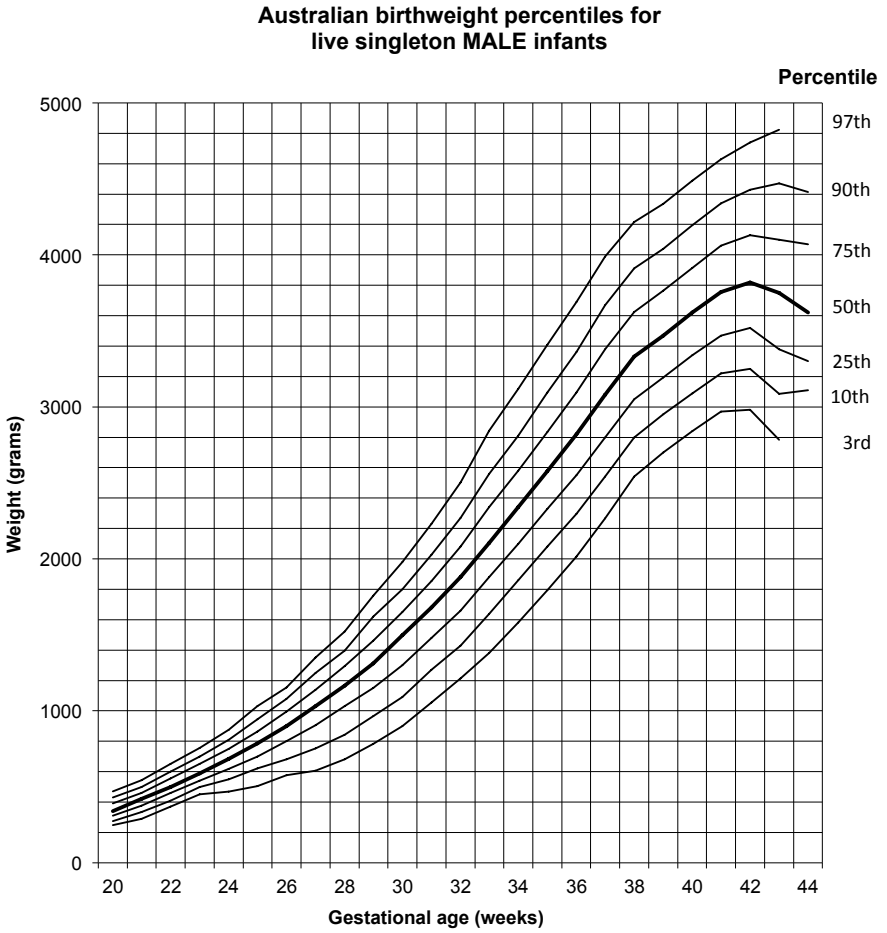
> cases of placental abruption

> cases where the infant is transferred to a Level 6 nursery or the infant is severely depressed at birth (Apgar score <5 at five minutes)

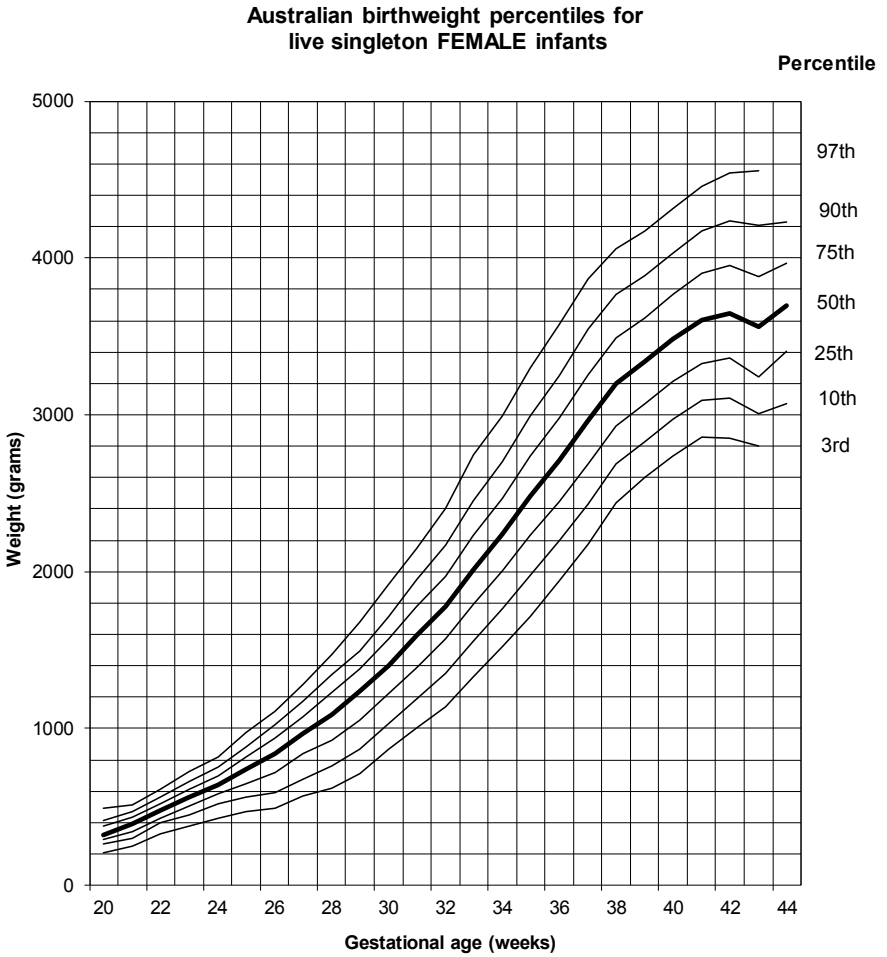
> instances where either mother or baby is retrieved shortly after birth

> cases of maternal death.

Appendix 10
Australian birthweight percentiles



From: Roberts CL & Lancaster PAL. Australian national birthweight percentiles by gestational age. MJA 2012; 197: 291-294.



From: Roberts CL & Lancaster PAL. Australian national birthweight percentiles by gestational age. MJA 2012; 197: 291-294.

Table 9: Birthweight percentile values (g) for live singleton males, Australia, 1998-2007

Gestation (weeks)	No. births	Mean (gm)	Standard Deviation	Percentile (gm)										
				1st	3rd	5th	10th	25th	50th	75th	90th	95th	97th	99th
20	230	349	60	210	248	254	273	310	340	390	430	450	470	500
21	335	418	66	270	290	300	335	375	420	460	500	540	542	575
22	401	505	76	350	370	390	410	460	500	554	600	630	650	690
23	395	595	82	390	450	470	500	540	588	650	700	730	756	800
24	640	681	105	426	470	500	550	618	684	750	810	850	875	970
25	715	783	131	440	505	530	620	700	785	865	944	995	1030	1100
26	937	894	152	500	576	621	680	802	900	996	1078	1130	1155	1210
27	1069	1016	194	510	605	660	752	904	1030	1138	1250	1320	1352	1440
28	1345	1146	217	591	680	735	844	1030	1165	1295	1395	1470	1522	1640
29	1524	1301	252	662	782	860	964	1150	1311	1463	1620	1700	1757	1860
30	2105	1474	283	774	900	984	1091	1300	1498	1650	1800	1920	1980	2182
31	2576	1666	304	915	1055	1126	1270	1480	1680	1855	2028	2142	2230	2435
32	3895	1867	331	1075	1214	1294	1430	1659	1880	2080	2270	2405	2503	2710
33	5599	2106	371	1200	1381	1473	1638	1880	2106	2340	2560	2710	2845	3070
34	9824	2340	385	1400	1580	1690	1860	2005	2340	2580	2810	2990	3120	3343
35	16054	2585	408	1600	1795	1920	2080	2330	2578	2835	3095	3275	3410	3665
36	32747	2826	428	1805	2015	2120	2295	2550	2820	3095	3360	3550	3690	3930
37	73986	3093	449	2050	2265	2372	2540	2800	3080	3378	3670	3865	3990	4235
38	230003	3344	439	2340	2540	2640	2800	3050	3330	3625	3910	4090	4215	4445
39	293109	3486	430	2510	2700	2800	2950	3195	3470	3765	4040	4220	4335	4560
40	409976	3632	434	2650	2840	2940	3090	3340	3620	3915	4195	4370	4490	4708
41	192154	3769	438	2780	2970	3070	3220	3470	3755	4060	4340	4515	4630	4850
42	19804	3832	462	2760	2980	3095	3250	3520	3820	4130	4430	4615	4740	4970
43	797	3761	540	2615	2785	2935	3085	3380	3750	4100	4470	4670	4825	5180
44	53	3715	563				3110	3300	3620	4070	4415			

From: Dobbins TA, Sullivan EA, Roberts CL & Simpson JM. Australian national birthweight percentiles by sex and gestational age, 1998-2007. MJA 2012; 197: 291-294.

Table 10: Birthweight percentile values (g) for live singleton females, Australia, 1998-2007

Gestation (weeks)	No. births	Mean (gm)	Standard Deviation	Percentile (gm)										
				1st	3rd	5th	10th	25th	50th	75th	90th	95th	97th	99th
20	197	333	65	190	210	230	265	290	320	374	410	450	490	525
21	256	386	66	210	250	270	300	340	390	433	470	510	515	530
22	333	474	76	260	325	355	400	425	480	520	560	589	610	620
23	376	558	82	320	375	400	445	506	560	615	660	700	725	800
24	528	637	105	380	430	480	520	580	641	700	754	793	815	860
25	599	730	131	410	470	498	559	645	740	817	884	940	975	992
26	809	825	152	428	490	520	594	717	840	940	1026	1072	1106	1186
27	879	949	194	500	568	598	675	840	965	1077	1175	1240	1280	1390
28	1136	1073	217	495	622	675	764	928	1090	1230	1347	1410	1470	1610
29	1188	1215	252	572	712	790	870	1055	1240	1380	1494	1595	1680	1840
30	1656	1394	283	725	870	918	1030	1220	1400	1571	1715	1840	1920	2130
31	2052	1582	304	880	1000	1060	1190	1385	1590	1780	1948	2065	2146	2338
32	3119	1772	331	970	1140	1230	1348	1570	1780	1970	2170	2290	2400	2620
33	4421	2014	371	1180	1330	1424	1560	1790	2011	2235	2450	2616	2746	2970
34	8108	2242	385	1331	1525	1615	1764	2005	2240	2470	2705	2870	2995	3220
35	13104	2486	408	1525	1710	1820	1980	2230	2480	2735	2995	3175	3300	3516
36	28386	2720	428	1750	1940	2040	2198	2445	2710	2980	3250	3450	3575	3810
37	66928	2979	449	1970	2175	2275	2430	2690	2965	3255	3545	3735	3865	4100
38	214002	3215	439	2256	2440	2540	2690	2930	3200	3490	3770	3945	4062	4290
39	282046	3315	430	2420	2600	2690	2830	3070	3340	3620	3890	4060	4175	4390
40	398257	3493	434	2566	2740	2830	2975	3210	3480	3765	4030	4200	4316	4525
41	181434	3619	438	2680	2855	2945	3090	3330	3605	3900	4170	4340	4455	4670
42	17701	3665	462	2670	2850	2950	3110	3360	3650	3955	4240	4420	4545	4760
43	801	3579	540	2660	2800	2865	3010	3240	3560	3880	4210	4385	4560	4760
44	52	3705	563				3070	3403	3695	3965	4230			

From: Dobbins TA, Sullivan EA, Roberts CL & Simpson JM. Australian national birthweight percentiles by sex and gestational age, 1998-2007. MJA 2012; 197: 291-294.

For more information

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