

Maternal and Perinatal Mortality in South Australia 2019



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Mortality Committee on maternal and perinatal deaths
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Dr Elinor Atkinson	Obstetrician
Dr Vineesh Bhatia	Neonatal paediatrician
Dr Megan Cooper	Midwife
Dr Marion Crompton	General practitioner
Professor Gustaaf Dekker	Obstetrician
Professor William Hague	Obstetric physician
Professor T. Yee Khong	Pathologist
Ms Toni-Marie Rowe	Midwife, Aboriginal health representative
Dr Tom Vaughan	Obstetric anaesthetist

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- SA Pathology and the Forensic Science Centre for providing autopsy reports
- The staff of the Births, Deaths and Marriages Registration Division
- State Coroner's Office, Courts Administration Authority of South Australia

Summary

This is the thirty-fourth Annual Report of the Maternal and Perinatal Mortality Committee, for deaths occurring in 2019.

1. There were two maternal deaths in 2019. The maternal mortality ratio for the last five-year period 2015-2019 was 8.2 deaths per 100,000 women who gave birth, which is low by international standards, and similar to the preceding five-year period where there were 8.0 deaths per 100,000 women.
2. The Committee reviewed the 138 perinatal deaths of babies born in South Australia in 2019. The perinatal mortality rate for all births (stillbirths of at least 400g or 20 weeks gestation and all live births) was 7.2 per 1,000 births. The stillbirth rate was 5.8 per 1,000 births and the neonatal mortality rate was 1.4 per 1,000 live births.
3. One hundred and twenty-one (87.7%) of the perinatal deaths occurred in preterm babies (less than 37 weeks gestation). The leading cause of perinatal death in 2019 was congenital anomalies, which accounted for 39.9% of the deaths. Other leading causes were spontaneous preterm labour or rupture of membranes (<37 weeks gestation) (11.6%), and unexplained antepartum fetal death (10.9%).
4. Twelve (44.4%) of the 27 neonatal deaths occurred in neonates born at less than 24 weeks gestation. Of the 15 deaths in neonates born at or after 24 weeks, five (33.3%) were associated with congenital anomalies.
5. *Ten babies of Aboriginal mothers died during the perinatal period. The perinatal mortality rate for Aboriginal women was 13.1 per 1,000 births compared with 19.9 in 2018, and compared with 7.0 per 1,000 births for non-Aboriginal women.*
6. The Committee's previous recommendations have been incorporated into South Australian policies, standards or guidelines. These recommendations are available within previous year's reports available on the Pregnancy Outcome Unit [website](#).

Key Learning Points

1. Acute Fatty Liver of Pregnancy is a rare disease of the third trimester which constitutes an obstetric emergency and is associated with maternal mortality. Women who present to their care provider with non-specific abdominal issues such as nausea, vomiting, malaise or a change in stool colour, should be assessed with a high degree of suspicion and be reviewed by an experienced clinician as a matter of urgency.
2. In some cases pregnant women who do not have access to Medicare cover have chosen a model of care that they can afford rather than the most appropriate model of care. All pregnant women accessing care in South Australia, including those not recognised by Medicare, should have access to fully funded obstetric services.

Introduction

This is the Thirty-fourth Annual Report of the South Australian Maternal and Perinatal Mortality Committee, which was established in 1985. An earlier Committee collected maternal death data from 1961 and perinatal death data from 1979. 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:

The Committee with respect to maternal and perinatal mortality will:

- Monitor the pattern and causation of maternal and perinatal deaths in the state.
- Assess 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;
- Assist in the 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 and perinatal morbidity and mortality in the state.
- Act as a Custodian of the mortality data submitted to, and generated by the Committee.
- Obtain data from the Pregnancy Outcome Unit, Local Health Networks and public and private health entities (where required) in a secure and confidential manner.
- Receive relevant clinical information from other statutory or regulatory bodies such as Births, Deaths and Marriages.

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. Data linkage with the Births, Deaths and Marriages Division, from medical certificates of cause of perinatal death
2. Data linkage with the Births, Deaths and Marriages Division, from medical certificates of cause of death for maternal deaths
3. Notification from the Supplementary Birth Record, both electronic and paper
4. The Coroner's Office, from Coroner's findings

Legislation governing the registration of births, deaths and marriages in South Australia requires that the medical certificate of cause of death 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 (Appendix 2), and these are supplemented by autopsy information from the Coroner's Office and hospital pathology services. Case summaries are prepared by the Committee's secretariat 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.

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*:

- 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*

Definitions used by the Committee are provided in the Methods and Terminology section 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 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 Thirty-fourth report of the Committee incorporates information on maternal deaths in South Australia in the year 2019 and perinatal deaths of babies born to mothers in South Australia in 2019.

The term Aboriginal is used respectfully in this report as an all-encompassing term for Aboriginal or Torres Strait Islander people living in South Australia. Data 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 and perinatal health.

Maternal Mortality

Maternal mortality statistics

Maternal death is defined by The World Health Organization (WHO) as the death of a woman from any cause related to or exacerbated by pregnancy, or its management, that occurs during pregnancy and childbirth or within 42 days of the end of pregnancy, regardless of the duration or site of the pregnancy. The definition encompasses direct and indirect maternal deaths. Deaths from accidental and incidental causes are excluded (see Methods and Terminology).

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 Methods and Terminology) 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. 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. There were three late maternal deaths in South Australia in 2019. In 2017, the South Australian Maternal and Perinatal Mortality Committee commenced using data linkage to improve detection and enhance reporting on maternal deaths occurring in the state. This has resulted in an increased number of maternal deaths being reviewed, particularly late maternal deaths.

Maternal deaths in South Australia for the three categories of deaths from 1990 to 2019 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), noting that there is one 2019 case yet to be classified. The maternal mortality ratio for the last five-year period 2015-2019 was 8.2, which was slightly higher than the Australian maternal mortality ratio of 6.7 per 100,000 women for the period 2010-2019. The number of deaths in South Australia is small and has not changed greatly in the last three decades. Of a total of 49 pregnancy-related maternal deaths in the period 1990-2019, 27 were direct deaths and 22 were indirect deaths. *In the five year period from 2015-2019, there have been two indirect deaths of Aboriginal women.*

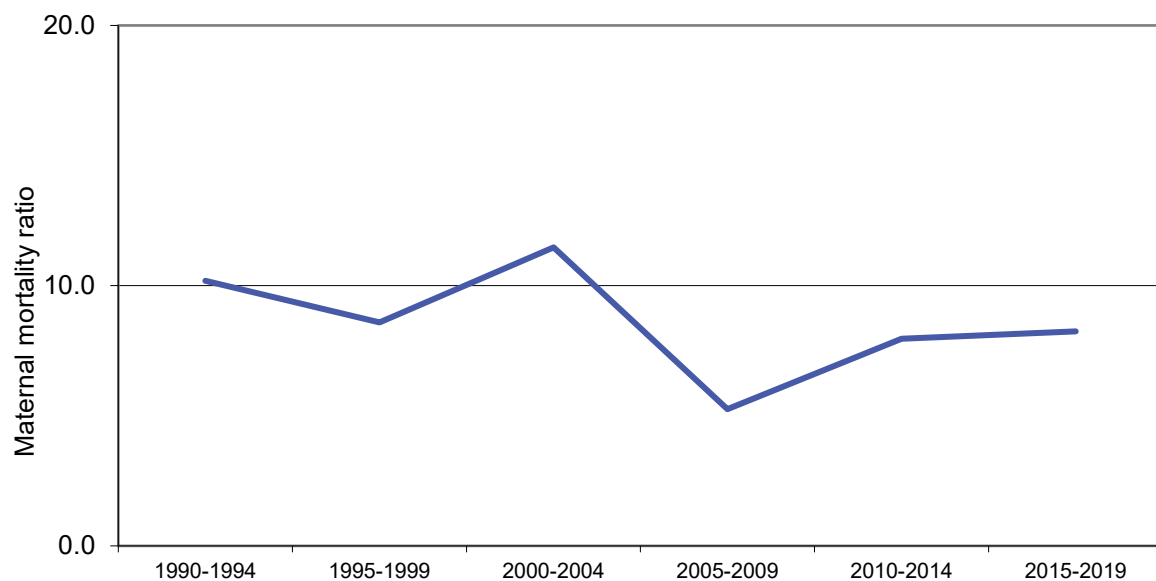
Table 1: Maternal mortality by category of death, in 5-year periods, South Australia, 1990 – 2019

Years	Direct deaths	Indirect deaths	Incidental deaths	Total deaths	Direct and indirect maternal deaths	Maternal mortality ratio*
	Number	Number	Number	Number	Number	
1990-1994	5	5	5	15	10	10.2
1995-1999	3	5	5	13	8	8.6
2000-2004	5	5	0	10	10	11.5
2005-2009	4	1	3	8	5	5.3
2010-2014	7	1	2	10	8	8.0
2015-2019	3	5	0	8**	8	8.2

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

**Excludes one death yet to be classified

Figure 1: Maternal Mortality Ratio, South Australia 1990-2019



Causes of maternal deaths

The causes of the two maternal deaths in 2019 were:

- One direct maternal death was due to acute fatty liver of pregnancy
- One maternal death is yet to be classified

The causes of the three late maternal deaths in 2019 were as follows:

- Two late maternal deaths were attributed to cancer
- The cause of one late maternal death was unascertained

Key Learning Points

1. Acute Fatty Liver of Pregnancy is a rare disease of the third trimester which constitutes an obstetric emergency and is associated with maternal mortality. Women who present to their care provider with non-specific abdominal issues such as nausea, vomiting, malaise or a change in stool colour, should be assessed with a high degree of suspicion and be reviewed by an experienced clinician as a matter of urgency.

Maternal Subcommittee recommendations

The Committee's previous recommendations have been incorporated into South Australian policies, practices, standards or guidelines. A document containing previously-made recommendations, together with the relevant code of practice is available from the SA Health [website](#).

Perinatal Mortality

Perinatal mortality statistics

In 2019 there were 19,173 births in South Australia reported to the Pregnancy Outcome Unit. These included all births of at least 400g birthweight or 20 weeks gestation. There were 111 stillbirths and 19,062 live births. Twenty-seven 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 2019 was 7.2 deaths per 1,000 births. The stillbirth rate was 5.8 per 1,000 births and the neonatal mortality rate 1.4 per 1,000 live births. Forty-five of the 138 perinatal deaths (32.6%) were induced terminations of pregnancy and their exclusion would have resulted in a perinatal mortality rate of 4.9 deaths per 1,000 births.

The perinatal mortality rates for other specified minimum birthweights or gestational ages (where birthweight was unavailable) are provided in Table 2. The WHO recommends that fetuses and infants weighing between 500 grams and 1,000 grams should be included in national perinatal mortality statistics. For international comparison, fetuses and infants weighing at least 1,000g or 28 weeks gestation is recommended. It is recommended that early neonatal deaths include neonatal deaths that occur during the first seven days of life (0-6 days). Using the WHO classification for international reporting, the perinatal mortality rate was 2.9 per 1,000 births in South Australia, with a stillbirth rate of 2.4 per 1,000 births, and neonatal mortality rate of 0.5 per 1,000 live births.

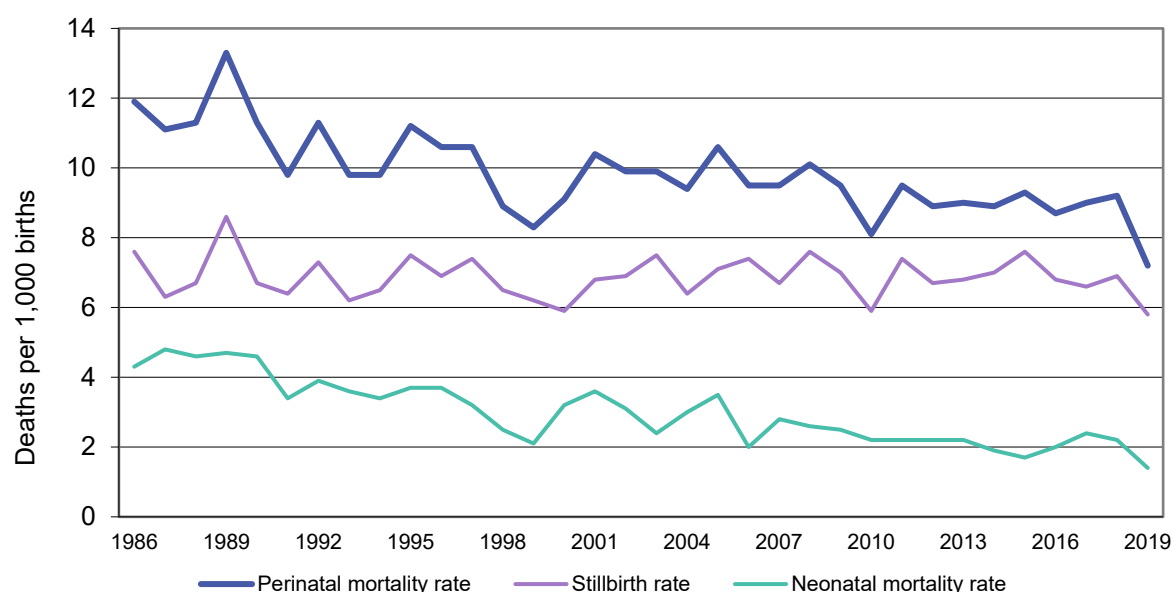
Table 2: Perinatal mortality, South Australia, 2019 (all births of specified birthweight/gestation)*

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	19,173	19,062	111	5.8	27	1.4	138	7.2
≥500g/ 22 weeks	19,137	19,060	77	4.0	25	1.3	102	5.3
≥1,000g/ 28 weeks	19,044	18,999	45	2.4	10	0.5	55	2.9

*Includes 4 cases of unknown birthweight

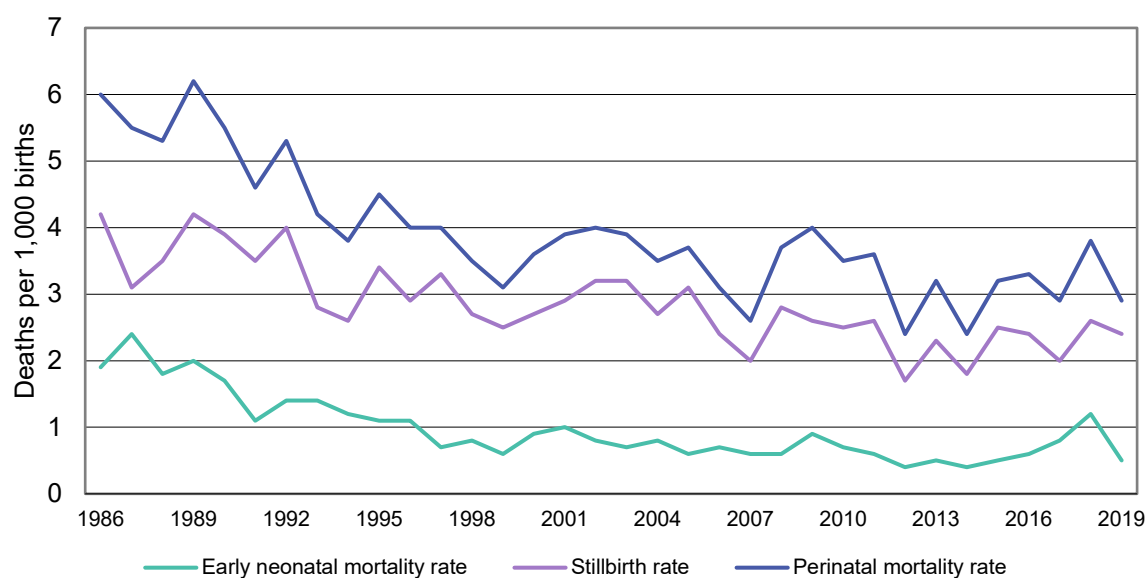
South Australian perinatal mortality rates, including stillbirth and neonatal mortality rates for all births, from 1986-2019 are presented in Figure 2. Whilst the neonatal rate has been steadily declining, the stillbirth rate has not changed markedly over the last two decades.

Figure 2: Perinatal mortality rate (births $\geq 400\text{g}$ or 20 weeks gestation), South Australia 1986-2019



Perinatal mortality 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 stillbirths and early neonatal deaths, occurring within the first seven days of life (WHO recommendation for international statistics). In 2019, the early neonatal mortality rate for infants weighing at least 1,000g or 28 weeks of gestation was 0.5 per 1,000 live births. When births of at least 1,000g birthweight are considered, in line with WHO recommendations, a decrease in the stillbirth rate is evident from 4.2 deaths per 1,000 births in 1986 to 2.4 in 2019 (Figure 3).

Figure 3: Perinatal mortality rate (births $\geq 1,000\text{g}$ or 28 weeks gestation & early neonatal deaths within the first seven days of life), South Australia 1986-2019



National comparisons of perinatal mortality rates

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. For **South Australia, ABS records do not include stillbirths resulting from termination of pregnancy**. This difference most likely accounts for the lower South Australian perinatal mortality rates published by the ABS.

Table 3: Perinatal mortality rate* by State or Territory of usual residence of mother, Australian states, 2009 – 2019

Year	NSW	VIC	Qld	SA	WA	Tas	NT	ACT	AUSTRALIA
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
2016	6.8	7.4	9.5	5.5	8.2	11.5	11.4	6.6	7.7
2017	7.1	8.1	9.4	5.1	8.6	9.6	15.1	8.6	8.1
2018	6.9	8.2	7.8	5.5	7.9	10.2	16.8	9.4	7.6
2019	7.4	7.1	10.1	5.5	7.7	8.1	15.4	5.1	7.8

*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.

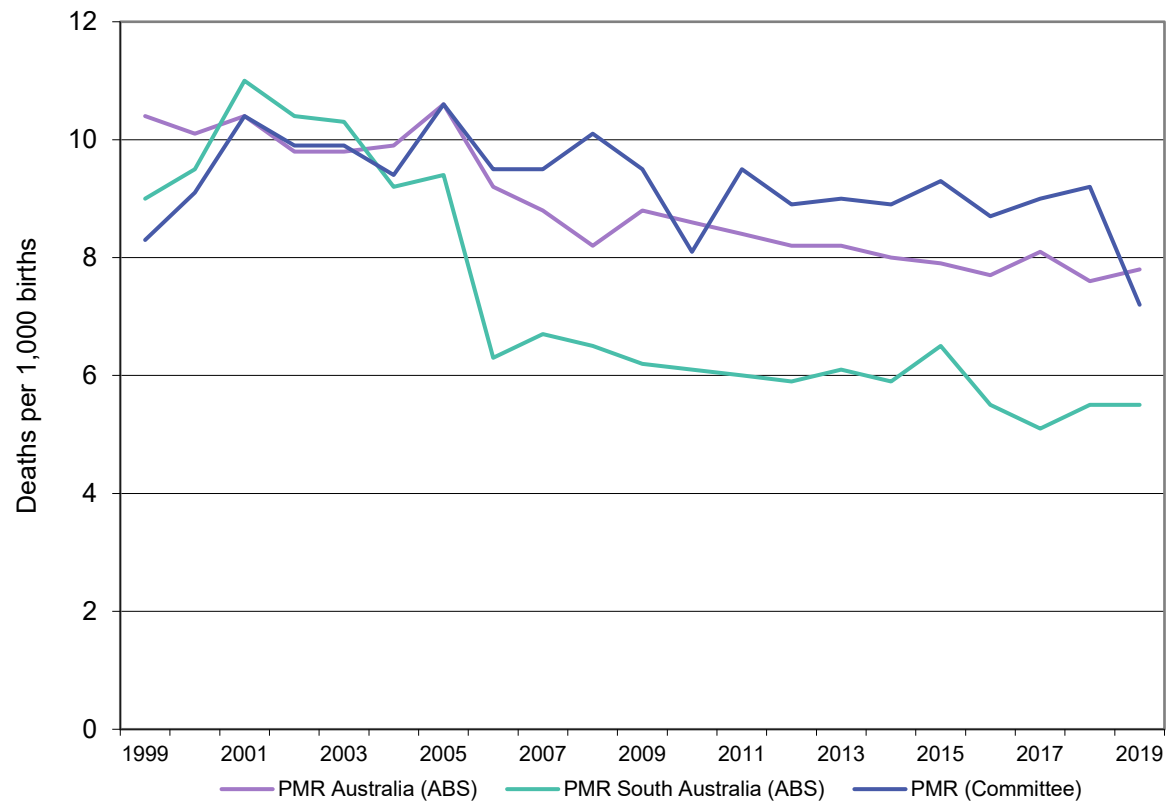
Source: Australian Bureau of Statistics. Catalogue No 3303.0 – Causes of Death, Australia, 20120, 29th September 2021

There are other minor differences between the perinatal deaths that the ABS include, compared with the Committee:

- 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 include all live births 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 live births of at least 400 grams birthweight or 20 weeks gestational age which resulted in neonatal death have been included in the perinatal mortality data.

The ABS perinatal mortality rates (PMR) for South Australia and Australia for 1999-2019 are presented in Figure 4, together with the perinatal mortality rate in South Australia based on notifications to the South Australian Maternal and Perinatal Mortality Committee.

Figure 4: Perinatal Mortality Rates South Australia (ABS), Australia (ABS) and South Australian Maternal and Perinatal Mortality Committee (Committee) 1999-2019 Deaths per 1,000 births



Birthweight-specific perinatal mortality

The birthweight-specific rates of stillbirths, neonatal deaths and perinatal deaths for 2019 are provided in Table 4. Of the 138 perinatal deaths, 110 (79.7%) were of low birthweight (<2,500g) and 21 (77.7%) of the 27 neonatal deaths were low birthweight babies. Thirty-five of the perinatal deaths (25.4%) were less than 400g birthweight.

Table 4: Perinatal mortality by birthweight, all births, South Australia, 2019

Birthweight (grams)	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
<400	35	1	34	971.4	1	28.6	35	1,000.0
400-499	18	4	14	777.8	4	222.2	18	1,000.0
500-749	54	34	20	370.4	9	166.7	29	537.0
750-999	44	39	5	113.6	3	68.2	8	181.8
1,000-1,499	116	112	4	34.5	3	25.9	7	60.3
1,500-1,999	278	275	3	10.8	0	0	3	10.8
2,000-2,499	827	818	9	10.9	1	1.2	10	12.1
2,500-2,999	3,198	3,189	9	2.8	2	0.6	11	3.4
3,000-3,499	7,306	7,302	4	0.5	3	0.4	7	1.0
3,500-3,999	5,593	5,590	3	0.5	1	0.2	4	0.7
4,000-4,499	1,509	1,508	1	0.7	0	0	1	0.7
≥4,500	191	190	1	5.2	0	0	1	5.2
Unknown	4	0	4	1,000	0	0	4	1,000.0
Total	19,173	19,062	111	5.8	27	1.4	138	7.2

The time of perinatal death by birthweight are presented in Table 5. Of the 68 antepartum deaths, 28 were under 750g birthweight (41.2%). Of the intrapartum deaths 95.2% were under 750g birthweight.

Table 5: Time of perinatal death by birthweight, South Australia, 2019 (≥400g birthweight or 20 weeks gestation)

Birthweight (grams)	Stillbirths			Neonatal deaths	Total
	Antepartum	Intrapartum	Uncertain if antepartum or intrapartum		
400-500	21	27	0	5	53
500-749	7	13	0	9	29
750-999	5	0	0	3	8
1,000-1,499	4	0	0	3	7
1,500-1,999	3	0	0	0	3
2,000-2,499	9	0	0	1	10
2,500-2,999	9	0	0	2	11
3,000-3,499	4	0	0	3	7
3,500-3,999	2	1	0	1	4
4,000-4,499	1	0	0	0	1
≥4500	1	0	0	0	1
Unknown	2	1	1	0	4
Total	68	42	1	27	138

Gestation-specific perinatal mortality

The distribution of perinatal deaths by gestational age is provided in Table 6. There were 121 preterm births (<37 weeks gestation) that resulted in a perinatal death, accounting for 87.7% of all perinatal deaths.

Table 6: Perinatal mortality by gestational age at birth, South Australia, 2019 (≥ 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
20-24	77	15	62	805.2	12	800.0	74	961.0
24-27	74	67	7	94.6	5	74.6	12	162.2
28-31	149	141	8	53.7	2	14.2	10	67.1
32-36	1,429	1,407	22	15.4	3	2.1	25	17.5
37-41	17,405	17,393	12	0.7	5	0.3	17	1.0
≥42	36	36	0	0.0	0	0.0	0	0.0
Unknown	3	3	0	0.0	0	0.0	0	0.0
Total	19,173	19,062	111	5.8	27	1.4	138	7.2

Classification of perinatal deaths

The Perinatal Subcommittee classified each of the 138 perinatal deaths, which occurred in 2019 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 and twins), is available on the Stillbirth Centre of Research Excellence (Stillbirth CRE) [website](#). The Committee has used this classification system for deaths from 1999 onward. Prior to 2019 perinatal deaths were coded according to PSANZ Perinatal Death Classification version 2.2. From 1st January 2019 all perinatal deaths have been classified according to version 3.2 of the PSANZ-PDC and PSANZ-NDC codes. Consequently, comparison to previous years is difficult. Table 7 presents the classification of perinatal deaths in 2019 according to PSANZ-PDC.

Table 7: Classification of perinatal deaths, PSANZ-PDC, South Australia, 2019

	PSANZ-PDC	Number	Percent	Deaths per 1,000 births
1	Congenital anomaly	55	39.9	2.9
2	Perinatal infection	10	7.2	0.5
3	Hypertension	1	0.7	0.1
4	Antepartum haemorrhage (APH)	12	8.7	0.6
5	Maternal conditions	4	2.9	0.2
6	Complications of multiple pregnancy	7	5.1	0.4
7	Specific perinatal conditions	6	4.3	0.3
8	Hypoxic peripartum death	1	0.7	0.1
9	Placental dysfunction or causative placental pathology	11	8.0	0.6
10	Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	16	11.6	0.8
11	Unexplained antepartum fetal death	15	10.9	0.8
12	Neonatal death without obstetric antecedent	0	0.0	0.0
	Total	138	100.0	7.2

The PSANZ-PDC for perinatal deaths in 2019 is shown in Table 7 and its breakdown by subgroups in Appendix 3. PSANZ-PDC by birthweight is located in Appendix 5.

Congenital anomalies were the leading cause of perinatal death in 2019, accounting for 39.9% of all deaths. The next leading cause was spontaneous preterm labour or rupture of membranes (<37 weeks gestation) (11.6%), followed by unexplained antepartum fetal death (10.9%).

A brief description of each of the 11 PSANZ-PDC categories follows.

Congenital anomaly – fifty-five deaths

This group of 55 deaths included 41 terminations of pregnancy, at 20 weeks gestation or more, of fetuses with congenital anomalies. The types of anomalies were as follows:

Nervous system – ten deaths

- Two had Chiari II malformation
- Three had ventriculomegaly
- Two had arthrogryposis
- Three others had various other CNS anomalies

Cardiovascular – ten deaths

- Two had hypoplastic left heart syndrome
- One had Tetralogy of Fallot
- One had transposition of the great vessels
- Six had various other cardiovascular anomalies

Genitourinary System – four deaths

- Four had renal agenesis

Gastrointestinal system – one death

- This death was due to a paraduodenal hernia

Musculoskeletal – five deaths

- One had osteogenesis imperfecta
- Two had gastroschisis
- One had thanatophoric dysplasia
- One had multiple limb anomalies

Respiratory system – one death

- This death was due to congenital pulmonary airway malformation

Multiple congenital anomaly – four deaths

- Four had multiple anomalies including Chiari II malformation, neural tube defects, Tetralogy of Fallot and omphalocele

Chromosomal – twelve deaths

- Two had Trisomy 18
- Two had Trisomy 21

- Two had 22q microdeletion syndrome
- Two had triploidy
- Four had other chromosomal deletions and duplications

Genetic anomaly – seven deaths

- Seven had various genetic anomalies such as Apert syndrome, Harel-Yoon syndrome, spinal muscular atrophy and PBX1 mutation

Perinatal infection – ten deaths

Bacterial – nine deaths

- These deaths were attributed to various bacteria including Group B Streptococcal infection, and Escherichia coli amongst others

Viral – zero deaths

Other unspecified organism – one death

- This death was due to infection of an unknown organism

Hypertension – one death

- This death was associated with complications of pre-eclampsia

Antepartum haemorrhage – twelve deaths

- Ten deaths were due to placental abruption
- One death was due to placenta praevia
- One death was attributed to an antepartum haemorrhage of undetermined origin

Maternal Conditions – four deaths

- These deaths were due to maternal diabetes

Complications of multiple pregnancy – seven deaths

- One death was due to twin to twin transfusion syndrome
- Three deaths were due to selective fetal growth restriction
- Two deaths were associated with complications of monoamniotic twins, such as cord entanglement
- One death was an early fetal death (<20 weeks gestation) in a multiple pregnancy

Specific perinatal conditions – six deaths

- One death was attributed to cord occlusion
- Two deaths were associated with uterine abnormalities
- One death was due to rhesus isoimmunisation

- One death was due to fetal antenatal haemorrhagic brain injury
- One death was a termination of pregnancy for suspected but unconfirmed congenital anomaly

Hypoxic peripartum death – one death

- There was one unspecified hypoxic peripartum death

Placental dysfunction or causative placental pathology – eleven deaths

- Four deaths were attributed to maternal vascular malperfusion
- Four deaths were attributed to fetal vascular malperfusion
- Two deaths were attributed to placental hypoplasia
- One death was associated with other placental pathology

Spontaneous preterm labour or rupture of membranes (<37 weeks gestation) – sixteen deaths

- Three deaths were due to spontaneous preterm labour preceded by premature cervical shortening
- Nine deaths were due to spontaneous preterm labour or rupture of membranes with histological chorioamnionitis
- Four deaths were due to spontaneous preterm labour or rupture of membranes without histological chorioamnionitis

Unexplained antepartum fetal deaths – fifteen deaths

- Eight of these deaths were unexplained despite full investigation
- The remaining seven deaths were unexplained with incomplete investigation

Neonatal death without obstetric antecedent – zero deaths

Classification of neonatal deaths

The classification of the 27 neonatal deaths according to the Perinatal Society of Australia and New Zealand – Neonatal Death Classification (PSANZ-NDC) is provided in Appendix 4. This classification is also available, together with PSANZ-PDC, on the Stillbirth CRE [website](#).

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

20-23 weeks gestation – twelve neonatal deaths

- Six neonates had no resuscitation, or resuscitation was ultimately unsuccessful
- Three deaths were attributed to intraventricular or other intracranial haemorrhage
- The others died from complications such as hypoxic ischaemic encephalopathy and congenital anomalies

24-31 weeks gestation – seven neonatal deaths

- Three deaths were attributed to neonatal infection
- Three deaths were attributed to intraventricular or other intracranial haemorrhage
- One death was due to primary persistent pulmonary hypertension

32-37 weeks gestation – three neonatal deaths

- These deaths were due to cardio-respiratory disorders, and congenital anomalies

37 weeks and greater gestation – five neonatal deaths

- Four of these deaths were attributed to congenital anomalies
- One death was due to pneumothorax

Aboriginal perinatal deaths

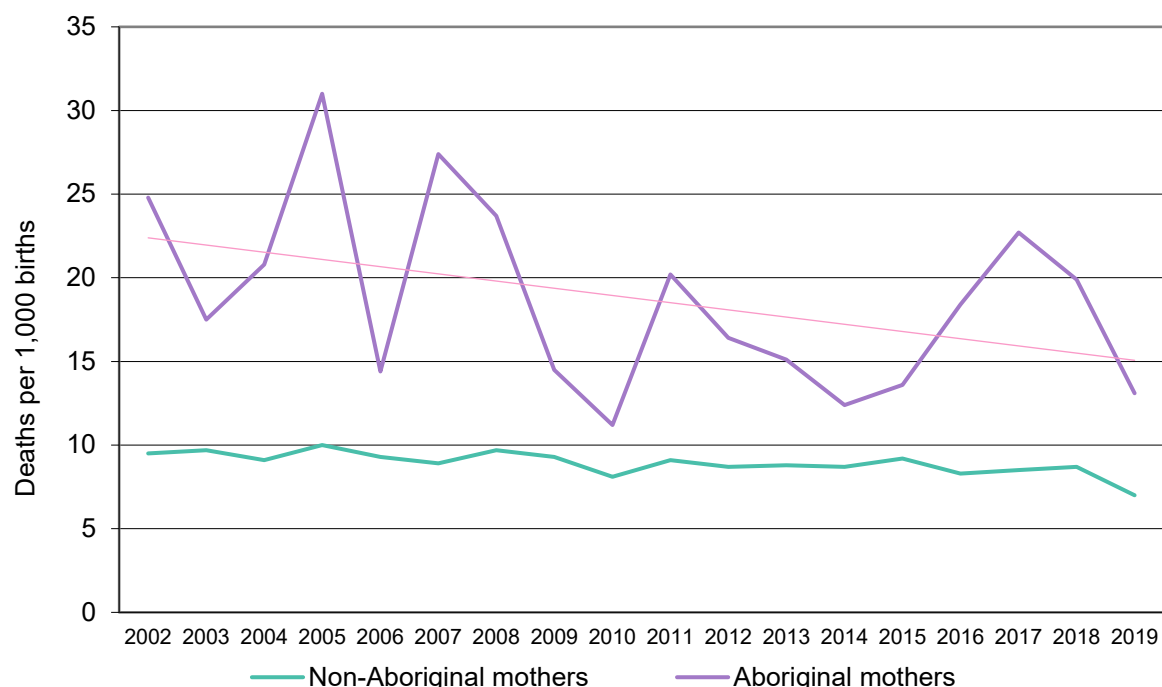
There were ten perinatal deaths (9 stillbirths and 1 neonatal death) among the births to 749 Aboriginal women.

In 2019 the perinatal mortality rate for births to Aboriginal women was 13.1 per 1,000 births, compared to 7.0 per 1,000 births for births to non-Aboriginal women. The perinatal death rate has decreased for Aboriginal women in 2019. Although the perinatal mortality rate for Aboriginal births fluctuates widely due to the small number of deaths, recent years show a decreasing trend (Figure 5).

Nine of the ten infants were born in public metropolitan hospitals and one infant was born in a country hospital. Eight of the infants were preterm births, with three born at or before 23 weeks gestation. Three of the ten mothers were country residents and two were from interstate.

The causes of the ten deaths were attributed to such causes as spontaneous preterm birth, maternal diabetes, complications of twin pregnancies and congenital anomalies.

Figure 5: Perinatal mortality by maternal Aboriginal status, South Australia, 2002 – 2019



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 64 of the 138 perinatal deaths (46.4%), including two 'limited' autopsies. The proportion of autopsies undertaken is similar to 2018 (46.0%). The stillbirth investigations algorithm from the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death is located at Appendix 7.

Additionally, 'Other examinations' were performed for 13 (9.4%) of the perinatal deaths. Placental histological examinations were undertaken for 136 perinatal deaths (98.6%). Please see [Histopathology Management of the Placenta PPG](#) for placental histology guidelines.

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 neonatal services, and Lyell McEwin has a Level 5 neonatal service. Service delineations in South Australia are set out in the Standards for Maternal and Neonatal Services in South Australia document, available from the SA Health website [here](#).

Table 8: Autopsy* status of perinatal deaths by place of death, South Australia, 2019

Place of death	Deaths	Autopsies performed	
	Number	Number	Percent of deaths
Women's & Children's Hospital	83	38	45.8
Lyell McEwin Hospital	24	10	41.7
Flinders Medical Centre	22	10	45.5
Other metropolitan public hospitals	0	0	0.0
Metropolitan private hospitals	2	2	100.0
Country hospitals	7	4	57.1
Home	0	0	0
Total	138	64	46.4

* Includes 2 autopsies with limited dissection

The low proportion of autopsies conducted in perinatal deaths 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. 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 for autopsy should therefore be sought as often as possible by senior staff. 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.

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 on **(08) 81616315**.

All hospitals with maternity services receive information on the State Perinatal Autopsy Service. The Department for Health and Wellbeing 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](#).

Key Learning Points

1. In some cases pregnant women who do not have access to Medicare cover have chosen a model of care that they can afford rather than the most appropriate model of care. All pregnant women accessing care in South Australia, including those not recognised by Medicare, should have access to fully funded obstetric services

Perinatal Subcommittee recommendations

The Committee's previous recommendations have been incorporated into South Australian policies, practices, standards or guidelines (Appendix 6).

Education Subcommittee Report

The twenty-fourth annual educational meeting - 'The Annual Dr Brian Pridmore Perinatal Forum' - was held on the evening of 8th September 2021. This was a welcome return for the forum after being cancelled in 2020 due to the COVID-19 pandemic. The forum is organized by the Education Subcommittee of the Maternal and Perinatal Mortality Committee.

The forum was titled 'From Conception to the Fridge' and included an interactive forum reviewing the life of the placenta. The 2021 forum was held in the Queen Victoria Lecture Theatre at the Women's and Children's Hospital, and for the first time was also streamed online via Microsoft Teams. Although in person attendance was limited due to the ongoing pandemic, streaming online allowed for an increased audience with the forum attracting approximately 85 people.

Dr Aimee Wiltshire introduced the topic, followed by a short presentation by each of the panel members. The evening concluded with a question and answer session. Presenters were as follows:

- Professor Yee Khong – Perinatal Pathologist
- Dr Peter Muller – Clinical Head of Maternal-Fetal Medicine
- Dr Aimee Woods – Maternal-Fetal Medicine Fellow
- Associate Professor Michael Stark – Senior Staff Specialist in Neonatal Medicine
- Ms Cate Fanning – Midwife Educator

The audience was comprised mostly of midwives with a small number of medical practitioners and other health professionals. The majority (58%) attended in person with the remainder viewing the forum via Microsoft Teams. There was a broad representation across the health services with employees of nine LHNs as well as private practices and other organisations in attendance. Feedback received from the audience was positive with the majority attendees agreeing that the subject matter was very useful for their clinical practice. 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 2018, were presented to the audience. These recommendations were published in the 33rd annual report in October 2020. This forum was filmed, and an edited version with transcripts can be viewed on the SA Health [website](#).

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.

Useful links

- The SA Health Pregnancy Information website: <http://www.health.sa.gov.au/pregnancy>
- The South Australian Perinatal Practice Guidelines website: <http://www.sahealth.sa.gov.au/perinatal>
- The Child Death and Serious Injury Review Committee reports: <http://www.cdsirc.sa.gov.au>
- The Sudden Infant Death Syndrome website: <https://rednose.org.au/>
- The South Australian Child and Family Health Service website: <https://www.cafhs.sa.gov.au/>
- The South Australian Safe Infant Sleeping Standards
www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+programs+and+practice+guidelines/womens+and+babies+health/safe+infant+sleeping+standards/safe+infant+sleeping+standards
- The Courts Administration Authority of South Australia, Coroners Findings: <https://www.courts.sa.gov.au/court-decisions/coroners-findings/>
- Gestation Network customised birthweight centile calculator: <http://www.gestation.net>
- Perinatal Society of Australia and New Zealand (PSANZ) website: <http://www.psanz.com.au>
- The Centre of Research Excellence in Stillbirth <https://www.stillbirthcre.org.au>

Methods and terminology

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.

Maternal death: the death of a woman from any cause related to or exacerbated by pregnancy, or its management, that occurs during pregnancy and childbirth or within 42 days of the end of pregnancy, regardless of the duration or site of the pregnancy. Deaths from accidental and incidental causes are excluded.

Maternal deaths are classified as follows:

- **Direct obstetric deaths:** 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.
- **Indirect obstetric deaths:** 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.
- **Incidental deaths in pregnancy:** the pregnancy is unlikely to have contributed significantly to the death, although it may be possible to postulate a remote association. Examples of incidental deaths are drowning and road accidents.

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.

Late maternal deaths: deaths occurring from 43 days postpartum up to and including 365 days postpartum)

Maternal mortality ratio: the number of direct and indirect maternal deaths in a defined time period, divided by the total number of women who gave birth in the same time period, multiplied by 100,000

Neonatal death: death of a live born infant within 28 days of birth

Neonatal death rate: the number of neonatal deaths in a defined time period, divided by the total number of live births in the same time period, multiplied by 1,000

Perinatal death: stillbirths and neonatal deaths combined

Perinatal mortality rate: the number of stillbirths and neonatal deaths in a defined time period, divided by the total number of still births and live births in the same time period, multiplied by 1,000

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

Stillbirth rate: the number of stillbirths in a defined time period, divided by the total number of live births and stillbirths in the same time period, multiplied by 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

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

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Appendix 1

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

In 2020, the Committee's Terms of reference were revised and updated.

Maternal Subcommittee

- To improve maternal outcomes during and after birth and institute systemic safety by providing advice on strategies for system improvement at a statewide level.
- To determine preventable factors involved with deaths associated with pregnancy through further investigation or research into the causes of mortality and morbidity in the state.
- To provide recommendations to the Chief Executive in an annual report through the Maternal and Perinatal Mortality Committee.
- To provide advice to the Chief Executive where requested regarding matters relevant to the safety and quality of health care.
- To support a culture of safety and quality where analysis of adverse events and continuous improvement are central.

Perinatal Subcommittee

- To improve perinatal outcomes during and after birth and institute systemic safety by providing advice on strategies for system improvement at a statewide level.
- To determine preventable factors involved with perinatal deaths associated with pregnancy through further investigation or research into the causes of mortality and morbidity in the state.
- To provide recommendations to the Chief Executive in an annual report through the Maternal and Perinatal Mortality Committee.
- To provide advice to the Chief Executive where requested regarding matters relevant to the safety and quality of health care.
- To support a culture of safety and quality where analysis of adverse events and continuous improvement are central.

Education Subcommittee

- 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.
- 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.
- The membership and chairperson will be nominated by the chairperson of the Maternal and Perinatal Mortality Committee.
- The Subcommittee may co-opt members as required.

Appendix 2

 Government of South Australia	Wellbeing SA	Confidential Report on Perinatal Death This form should be forwarded to the SOUTH AUSTRALIAN MATERNAL AND PERINATAL MORTALITY COMMITTEE PO BOX 388, Rundle Mall, ADELAIDE SA, 5001 Committee Secretary tel: 7117 9212
Affix patient label here		

The Perinatal Subcommittee meet regularly to determine the cause of death and possible contributing factors for stillbirths (including GTOPs) and neonatal deaths with a gestation of at least **20 weeks** or a birthweight of at least **400g** in South Australia. This form complements data from the Medical Certificate of Cause of Perinatal Death and the Supplementary Birth Record.

Where available, provide printed electronic records to supplement details. This may include discharge summaries, ultrasounds and pathology results. This is essential where details are not available through the SA Health data systems.

For multiple gestation, complete a separate form for each baby.

MOTHER DETAILS

Surname _____ Given names _____ Date of birth _____

Clinician(s) responsible for antenatal care _____

Clinician(s) responsible for intra and postpartum care (*if different to above*) _____

BABY DETAILS

Surname (*if different to above*) _____ Date of birth _____

Hospital of birth _____

Intended place of birth (*if different to above*) _____

Clinician responsible for care _____

Multiple birth Yes ☐ No ☐ Birth order 1 ☐ 2 ☐ 3 ☐

Gestation at birth _____ in weeks+days

Date of death _____ Time of death _____

PREVIOUS OBSTETRIC MEDICAL AND SOCIAL HISTORY *If yes, provide all details below*

Pre-existing medical conditions? Yes ☐ No ☐ _____

Previous obstetric complications? Yes ☐ No ☐ _____

Regular antenatal care attendance? Yes ☐ No ☐ _____

Referral to Aboriginal Birthing Clinic? Yes ☐ No ☐ _____

Describe any factors influencing antenatal care (psychosocial/geographic etc) _____

ANTENATAL HISTORY AND IDENTIFIED RISKS

If yes is answered to any question, provide all details below or ensure details are available in OAGIS

Presentations for abnormal fetal movements?	Yes ☐ No ☐	Number of Presentations / Comments
Antenatal CTG's	Yes ☐ No ☐	Results/Comment
GBS screening	Yes ☐ No ☐	Results/Comment
Early OGTT	Yes ☐ No ☐	Results/Comment
Other screening procedures	Yes ☐ No ☐	Comment
Medications taken during this pregnancy	Yes ☐ No ☐	List all medications

Describe other antenatal conditions / complications		Specify

Appendix 3

Perinatal Society of Australia and New Zealand-Perinatal Death Classification (PSANZ-PDC), South Australian perinatal deaths, 2019

	Category No	Subcategory No	Category %
1 Congenital Anomaly	55		39.9
1.1 Structural anomaly	36		26.1
1.11 Nervous system		10	7.2
1.12 Cardiovascular system		10	7.2
1.13 Genitourinary system		4	2.9
1.14 Gastrointestinal system		1	0.7
1.15 Musculoskeletal		3	2.2
1.151 Congenital diaphragmatic hernia		0	0.0
1.152 Gastroschisis/omphalocele		2	1.4
1.16 Respiratory system		1	0.7
1.17 Haematological		0	0.0
1.18 Multiple Congenital anomaly		4	2.9
1.19 Other congenital anomaly		1	0.7
1.192 Idiopathic hydrops fetalis		0	0.0
1.193 Fetal tumour		0	0.0
1.198 Other specified		0	0.0
1.199 Congenital anomaly, unspecified		0	0.0
1.2 Chromosomal anomaly	12		8.7
1.21 Down syndrome		2	1.4
1.22 Edward syndrome and Patau syndrome		2	1.4
1.23 Other trisomies and partial trisomies of the autosomes, not elsewhere classified		0	0.0
1.24 Monosomies and deletions from the autosomes, not elsewhere classified		6	4.3
1.25 Turner syndrome		0	0.0
1.26 Other sex chromosome abnormalities		0	0.0
1.28 Other chromosomal abnormalities, not elsewhere specified		2	1.4
1.29 Unspecified		0	0.0
1.3 Genetic anomaly	7		5.1
1.31 Genetic condition, specified		6	4.3
1.32 Syndrome/association with demonstrated chromosomal/gene anomaly.		1	0.7
1.39 Genetic condition, unspecified		0	0.0
2 Perinatal Infection	10		7.2
2.1 Bacterial	9		6.5
2.11 Group B Streptococcus		4	2.9
2.12 E coli		1	0.7
2.13 Listeria monocytogenes		0	0.0
2.14 Spirochaetal e.g. Syphilis		0	0.0
2.18 Other bacterial		4	2.9
2.19 Unspecified bacterial		0	0.0
2.2 Viral	0		0.0
2.21 Cytomegalovirus		0	0.0
2.22 Parvovirus		0	0.0
2.23 Herpes simplex virus		0	0.0
2.24 Rubella virus		0	0.0
2.25 Zika virus		0	0.0

2.28 Other viral		0	0.0
2.29 Unspecified viral		0	0.0
2.3 Protozoal e.g. Toxoplasma		0	0.0
2.5 Fungal	0		0.0
2.8 Other specified organism	0		0.0
2.9 Other unspecified organism	1		0.7
3 Hypertension	1		0.7
3.1 Chronic hypertension: essential	0		0.0
3.2 Chronic hypertension: secondary, e.g. renal disease	0		0.0
3.3 Chronic hypertension: unspecified	0		0.0
3.4 Gestational hypertension	0		0.0
3.5 Pre-eclampsia	1		0.7
3.6 Pre-eclampsia superimposed on chronic hypertension	0		0.0
3.9 Unspecified hypertension	0		0.0
4 Antepartum Haemorrhage (APH)	12		8.7
4.1 Placental abruption	10		7.2
4.2 Placenta praevia	1		0.7
4.3 Vasa praevia	0		0.0
4.9 APH of undetermined origin	1		0.7
5 Maternal Conditions	4		2.9
5.1 Termination of pregnancy for maternal psychosocial indications	0		0.0
5.2 Diabetes	4		2.9
5.21 Gestational diabetes		0	0.0
5.22 Pre-existing diabetes		4	2.9
5.3 Maternal injury	0		0.0
5.31 Accidental		0	0.0
5.32 Non-accidental		0	0.0
5.4 Maternal sepsis	0		0.0
5.5 Antiphospholipid syndrome	0		0.0
5.6 Obstetric cholestasis	0		0.0
5.8 Other specified maternal conditions	0		0.0
6 Complications of multiple pregnancy	7		5.1
6.1 Monochorionic twins	6		4.3
6.11 Twin to twin transfusion syndrome		1	0.7
6.12 Selective fetal growth restriction		3	2.2
6.13 Monoamniotic twins (including cord entanglement)		2	1.4
6.18 Other		0	0.0
6.19 Unknown or unspecified		0	0.0
6.2 Dichorionic twins	1		0.7
6.21 Early fetal death in a multiple pregnancy (<20 weeks gestation)		1	0.7
6.22 Selective fetal growth restriction (FGR)		0	0.0
6.28 Other		0	0.0
6.29 Unknown or unspecified		0	0.0
6.3 Complications of higher order multiples	0		0.0
6.31 Twin to twin transfusion syndrome		0	0.0
6.32 Selective fetal growth restriction		0	0.0
6.33 Monoamniotic multiples (including cord entanglement)		0	0.0
6.34 Early fetal death in a multiple pregnancy (<20 weeks gestation)		0	0.0
6.38 Other		0	0.0
6.39 Unknown or unspecified		0	0.0
6.4 Complications where chorionicity is unknown	0		0.0
6.8 Other	0		0.0

6.9 Unspecified	0	0.0
7 Specific perinatal conditions	6	4.3
7.1 Fetomaternal haemorrhage	0	0.0
7.2 Antepartum cord or fetal vessel complications	1	0.7
7.21 Cord vessel haemorrhage	0	0.0
7.22 Cord occlusion	1	0.7
7.28 Other cord complications	0	0.0
7.29 Unspecified cord complications	0	0.0
7.3 Uterine abnormalities	2	1.4
7.31 Developmental anatomical abnormalities	0	0.0
7.38 Other	2	1.4
7.39 Unspecified	0	0.0
7.4 Alloimmune disease	1	0.7
7.41 Rhesus isoimmunisation	1	0.7
7.42 Other red cell antibody	0	0.0
7.43 Alloimmune thrombocytopenia	0	0.0
7.48 Other	0	0.0
7.49 Unspecified	0	0.0
7.5 Fetal antenatal intracranial injury	1	0.7
7.51 Subdural haematoma	0	0.0
7.52 Fetal antenatal ischaemic brain injury	0	0.0
7.53 Fetal antenatal haemorrhagic brain injury	1	0.7
7.6 Other specific perinatal conditions	1	0.7
7.61 Complications of antenatal, diagnostic or therapeutic procedures: 7.611 Complications of prenatal diagnostic procedures	0	0.0
7.612 Complications of fetal ultrasound guided needle interventions	0	0.0
7.613 Complications of fetal shunt interventions	0	0.0
7.614 Complications of minimally invasive fetoscopic interventions	0	0.0
7.615 Complications of open maternal fetal surgery	0	0.0
7.618 Other	0	0.0
7.62 Termination of pregnancy for suspected but unconfirmed congenital anomaly.	1	0.7
7.63 Amniotic band	0	0.0
7.68 Other	0	0.0
7.9 Unspecified	0	0.0
8 Hypoxic peripartum death	1	0.7
8.1 With intrapartum complications (sentinel events)	0	0.0
8.11 Uterine rupture	0	0.0
8.12 Cord prolapse	0	0.0
8.13 Shoulder dystocia	0	0.0
8.14 Complications of breech presentation	0	0.0
8.15 Birth trauma	0	0.0
8.16 Intrapartum haemorrhage	0	0.0
8.18 Other	0	0.0
8.2 Evidence of significant fetal compromise	0	0.0
8.3 No intrapartum complications recognised and no evidence of significant fetal compromise identified	0	0.0
8.9 Unspecified hypoxic peripartum death	1	0.7
9 Placental dysfunction or causative placental pathology	11	8.0
9.1 Maternal vascular malperfusion	4	2.9
9.2 Fetal vascular malperfusion	4	2.9
9.3 High grade villitis of unknown etiology	0	0.0
9.4 Massive perivillous fibrin deposition/maternal floor infarction	0	0.0
9.5 Severe chronic intervillitis (Histiocytic intervillitis)	0	0.0

9.6 Placental hypoplasia	2	1.4
9.7 No causal placental pathology demonstrated, with antenatal evidence of poor placental function identified	0	0.0
9.8 Placental pathological examination was not performed, with antenatal evidence of poor placental function identified	0	0.0
9.9 Other placental pathology	1	0.7
10 Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	16	11.6
10.1 Spontaneous preterm	13	9.4
10.11 With histological chorioamnionitis		9
10.12 Without histological chorioamnionitis		4
10.13 With clinical evidence of chorioamnionitis, no examination of placenta		0
10.17 No clinical signs of chorioamnionitis, no examination of placenta		0
10.19 Unspecified or not known whether placenta examined		0
10.2 Spontaneous preterm preceded by premature cervical shortening	3	2.2
11 Unexplained antepartum fetal death	15	10.9
11.1 Unexplained antepartum fetal death despite full investigation	8	5.8
11.2 Unclassifiable antepartum fetal death with incomplete investigation	7	5.1
11.3 Unclassifiable antepartum fetal death due to unknown level of investigation	0	0.0
12 Neonatal death without obstetric antecedent	0	0.0
12.1 Neonatal death with no obstetric antecedent factors despite full investigation	0	0.0
12.2 Neonatal death unclassifiable as to obstetric antecedent with incomplete investigation	0	0.0
12.3 Neonatal death unclassifiable as to obstetric antecedent due to unknown level of investigation	0	0.0
Total	138	100.0

Appendix 4

Perinatal Society of Australia and New Zealand-Neonatal Death Classification (PSANZ-NDC), South Australian neonatal deaths, 2019

	Category No	Subcategory No	Category %
1 Congenital Anomaly	6		22.2
1.1 Structural anomaly	2		7.4
1.11 Nervous system		0	0.0
1.12 Cardiovascular system		0	0.0
1.13 Genitourinary system		1	3.7
1.14 Gastrointestinal system		0	0.0
1.15 Musculoskeletal		1	3.7
1.151 Congenital diaphragmatic hernia		0	0.0
1.152 Gastroschisis/omphalocele		0	0.0
1.16 Respiratory system (include congenital pulmonary airway malformation		0	0.0
1.17 Haematological		0	0.0
1.18 Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)		0	0.0
1.19 Other congenital anomaly		0	0.0
1.192 Idiopathic hydrops fetalis		0	0.0
1.193 Fetal tumour (include sacro-coccygeal teratoma)		0	0.0
1.198 Other specified		0	0.0
1.199 Congenital anomaly, unspecified		0	0.0
1.2 Chromosomal anomaly	1		3.7
1.21 Down syndrome (trisomy 21)		0	0.0
1.22 Edward syndrome and Patau syndrome (trisomy 18, trisomy 13)		0	0.0
1.23 Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced		0	0.0
1.24 Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions e.g. 22q11.2 deletion)		1	3.7
1.25 Turner syndrome (monosomy X)		0	0.0
1.26 Other sex chromosome abnormalities (e.g. Klinefelter syndrome)		0	0.0
1.28 Other chromosomal abnormalities, not elsewhere specified (includes Fragile X syndrome, imprinting syndromes, triploidy)		0	0.0
1.29 Unspecified		0	0.0
1.3 Genetic anomaly	3		11.1
1.31 Genetic condition, specified (e.g. Tay-Sachs disease; includes inborn errors of metabolism)		3	11.1
1.32 Syndrome/association with demonstrated chromosomal/gene anomaly.		0	0.0
1.39 Genetic condition, unspecified		0	0.0
2 Periviable infants (typically <24 weeks)	6		22.2
2.1 Not resuscitated (including infants where there is an antenatal plan for no resuscitation at birth or in the circumstances)	5		18.5
2.2 Unsuccessful resuscitation	1		3.7
2.9 Unspecified or not known whether resuscitation attempted	0		0.0
3 Cardio-respiratory disorders	4		14.8
3.1 Hyaline membrane disease / Respiratory distress syndrome (RDS)	0		0.0
3.2 Meconium aspiration syndrome	0		0.0
3.3 Primary persistent pulmonary hypertension	1		3.7
3.4 Pulmonary hypoplasia	0	0	0.0
3.5 Pulmonary haemorrhage	0	0	0.0
3.6 Air leak syndromes	1		3.7
3.61 Pneumothorax		1	0.0
3.62 Pulmonary interstitial emphysema		0	0.0
3.68 Other		0	0.0
3.7 Patent ductus arteriosus	0		0.0
3.8 Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)	0		0.0
3.9 Other	2		3.7
3.91 Neonatal anaemia/hypovolaemia		1	3.7

4 Neonatal Infection	3	11.1
4.1 Congenital/Perinatal bacterial infection (early onset<48 hrs)	2	7.4
4.11 Blood stream infection/septicaemia		0.0
4.111 Positive culture of a pathogen		2
4.112 Clinical signs of sepsis + ancillary evidence but culture negative		0
4.12 Bacterial meningitis		0
4.13 Bacterial pneumonia		0
4.15 Multiple site bacterial infection		0
4.18 Other congenital bacterial infection e.g. gastroenteritis, osteomyelitis, cerebral abscess		0
4.19 Unspecified congenital infection		0
4.2 Congenital/Perinatal viral infection	0	0.0
4.3 Congenital fungal, protozoan, parasitic infection	0	0.0
4.4 Acquired bacterial infection (late onset>48hrs).	1	3.7
4.41 Blood stream infection/septicaemia		0
4.411 Positive culture of a pathogen		1
4.412 Clinical signs of sepsis + ancillary evidence but culture negative		0
4.42 Bacterial meningitis		0
4.43 Bacterial pneumonia		0
4.48 Other acquired bacterial infection e.g. gastroenteritis, osteomyelitis		0
4.49 Unspecified acquired infection		0
4.5 Acquired viral infection	0	0.0
4.6 Acquired fungal, protozoan, parasitic infection	0	0.0
5 Neurological	8	29.6
5.1 Hypoxic ischaemic encephalopathy/Perinatal asphyxia	2	7.4
5.2 Cranial haemorrhage	6	22.2
5.21 Intraventricular Haemorrhage		4
5.22 Subgaleal Haemorrhage		0
5.23 Subarachnoid Haemorrhage		0
5.24 Subdural Haemorrhage		0
5.28 Other intracranial haemorrhage		2
5.3 Post haemorrhagic hydrocephalus	0	0.0
5.4 Periventricular leukomalacia	0	0.0
5.8 Other	0	0.0
6 Gastrointestinal	0	0.0
6.1 Necrotising enterocolitis (NEC)	0	0.0
6.2 Short gut syndrome	0	0.0
6.3 Gastric or intestinal perforation (excluding NEC)	0	0.0
6.4 Gastrointestinal haemorrhage	0	0.0
6.8 Other	0	0.0
7 Other	0	0.0
7.1 Sudden unexpected death in infancy (SUDI)	0	0.0
7.11 Sudden Infant Death Syndrome (SIDS)		0
7.112 SIDS Category IA: Classic features of SIDS present and completely documented.		0
7.113 SIDS Category IB: Classic features of SIDS present but incompletely documented.		0
7.114 SIDS Category II: Infant deaths that meet category I except for one or more features.		0
7.12 Unclassified Sudden Infant Death in the neonatal period		0
7.121 Bed sharing		0
7.122 Not bed sharing		0
7.19 Unknown/Undetermined		0
7.2 Multisystem failure	0	0.0
7.21 Secondary to intrauterine growth restriction		0
7.28 Other specified		0
7.29 Unspecified/undetermined primary cause or trigger event		0
7.3 Trauma	0	0.0
7.31 Accidental		0
7.32 Non accidental		0

7.39 Unspecified		0	0.0
7.4 Treatment complications	0		0.0
7.41 Surgical		0	0.0
7.42 Medical		0	0.0
7.5 Unsuccessful resuscitation in infants of 28 weeks gestation or more without an obvious sentinel event	0		0.0
7.8 Other specified	0		0.0
Total	27		100.0

Appendix 5

Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC), South Australian perinatal deaths by birthweight, 2019

PSANZ-PDC		Birthweight (g)							Total	
		<500	500-749	750-999	1000-1,499	1500-1,999	2,000-2,499	≥2,500	No	%
1	Congenital anomaly	29	12	0	1	3	1	9	55	39.9
2	Perinatal infection	4	1	0	0	0	1	4	10	7.2
3	Hypertension	0	0	0	0	0	1	0	1	0.7
4	Antepartum haemorrhage	3	6	0	1	0	1	1	12	8.7
5	Maternal conditions	0	0	0	0	0	1	3	4	2.9
6	Specific perinatal conditions (multiple births)	6	0	0	1	0	0	0	7	5.1
7	Specific perinatal conditions	2	2	0	0	0	1	1	6	4.3
8	Hypoxic peripartum death	0	0	0	0	0	0	1	1	0.7
9	Fetal growth restriction	2	1	2	1	0	2	3	11	8.0
10	Spontaneous preterm	4	7	3	1	0	0	1	16	11.6
11	Unexplained antepartum death	3	0	3	2	0	2	5	15	10.9
12	No obstetric antecedent	0	0	0	0	0	0	0	0	0.0
Total		53	29	8	7	3	10	28	138	100.0
Percent		38.4	21.0	5.8	5.1	2.2	7.2	20.3	100.0	

Appendix 6

Archived recommendations

Many Committee recommendations have been incorporated into South Australian policies, standards or guidelines. For a complete list of recommendations made by the Committee in previous years, please see the Archived Recommendations document on the SA Health [website](#).

Appendix 7

Stillbirth Investigations

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Introduction

This guideline is adapted with permission from the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death, Chapter 5 – Investigations for Stillbirth.¹

Approximately 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.

Previously several investigations were recommended for all cases of stillbirth, however a number of these are now recommended as selective investigations only. The 'Stillbirth investigations algorithm' summarises the recommended core investigations for all stillbirths, and further selective investigations to be undertaken based on the findings from the core investigations. All women, but in particular, Aboriginal women should be consulted about any decisions in the first instance.

Aboriginal people experience very high levels of Grief and Loss in their communities. Stillbirth demands ceremonial acknowledgement. Discuss with the Aboriginal Health Professional.

Core Investigations to be performed in All Cases of Stillbirth

The following outlines the current investigations recommended routinely for the majority of stillbirths (core investigations) in South Australia (unless the cause of death has been unequivocally determined in pregnancy).

Maternal History

- Medical
- Pregnancy
- Family
- Social

Maternal blood

Kleihauer-Betke test at SA Pathology (preferably prior to birth). If positive, Fluorescence-Activated Cell Sorting (FACS, a type of flow cytometry) to quantify the fetomaternal haemorrhage should also be undertaken.

External examination of the baby

External examination of the baby by the attending clinician should be undertaken as soon as possible after birth and documented in the medical record.

*Appendix D – Clinical Examination of Baby Checklist of the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death*¹ available at URL <https://sanda.psanz.com.au/clinical-practice/clinical-guidelines/> is a useful guide that can be printed and used by clinicians.

Where consent for autopsy has been given, the information gained along with maternal history should be forwarded to the State Perinatal Autopsy Service.

Autopsy

Clinicians should discuss the value of a full autopsy with parents unless the cause of death is already known. With parental consent, autopsy should be conducted by the State Perinatal Autopsy Service.

Please refer to the *Perinatal Loss PPG* available at www.sahealth.sa.gov.au/perinatal for further details relating to autopsy, including purpose of autopsy, gaining consent, forms to complete and transport requirements.

The booklet, *When a person dies: The Hospital Autopsy Process. Information for family and friends* should be given to the parents to read before any request for autopsy consent from the medical officer.

*Appendix N – Information for Health Professionals Seeking Consent of the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death*¹ available at URL <https://sanda.psanz.com.au/clinical-practice/clinical-guidelines/> provides useful information on how to approach obtaining consent for autopsy.

If the parents decline a full autopsy:

- A non-invasive autopsy (NIA) or minimally-invasive autopsy (MIA) should be offered:
 - Please contact the SA Perinatal Autopsy Service for detail of available options to discuss with parents
- Parents should be asked for their consent to have a detailed external examination by a perinatal pathologist. If this is not possible, a neonatologist, paediatrician or clinical geneticist should conduct the examination and take clinical photographs.¹
- Clinical photographs (in addition to mementos) should also be undertaken with consent. *Appendix H – Instructions on Taking Clinical Photographs of the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death*¹ available at URL <https://sanda.psanz.com.au/clinical-practice/clinical-guidelines/> provides further guidance.
- X-ray if skeletal dysplasia suspected
- Magnetic resonance imaging (MRI) where available

Placental and Cord Investigations

Examination of the placenta and cord by the attending clinician should be undertaken and documented in the medical record. Intramembranous placental swabs should be undertaken for microbiology testing.

Whether or not parents' consent to autopsy, the placenta, membranes and cord should be forwarded to the State Perinatal Autopsy Service following maternal consent. They should be placed in a dry sterile container (no formalin or saline) with the container surrounded in ice for transport.

See *Histopathology Management of the Placenta PPG* available at www.sahealth.sa.gov.au/perinatal for details of gross placental examination, placental swabbing and standardised clinical information to include.

If consent for histopathology of the placenta is declined, sampling of placental and cord tissue for karyotyping should be undertaken by the attending clinician following maternal consent, regardless of whether a prenatal karyotype was obtained.¹

Cytogenetic Investigations

Chromosome microarray (CMA) is superior to standard culture karyotyping and should be undertaken for all stillbirths where the cause is unknown, even if standard karyotyping was undertaken prenatally.

Both fetal and placental tissue should undergo CMA.

Where a specific phenotype is suspected based on family history or examination of the fetus, women should be referred to a clinical geneticist with consideration for additional targeted / extended genetic testing.

Storage of samples

Storage of placental and fetal DNA, blood and amniotic fluid allows for future testing for other potential factors that are not currently identified. ^{1(p12)}

Consent is required for storage of human samples. Consideration should also be given to an agreed and documented timeframe for storage (e.g. until end of woman's anticipated reproductive age where future testing results may affect pregnancy management).

Selective Investigations based on findings of Core Investigations

The need for additional selective investigations may only become apparent following initial assessment of the stillborn baby and/or at autopsy. Clinicians should use their judgement so that all investigations are undertaken around the time of the birth wherever possible, to avoid the need for multiple follow-up appointments.

Congenital Infections

Routine testing of all stillbirths for infection is no longer recommended. Specific testing to be performed as indicated below:

Cytomegalovirus (CMV)

Consider maternal CMV serology in the presence of the following:

- Placental histopathology shows evidence of infection

- Baby is small for gestational age (SGA)
- Ultrasound shows features suggestive of CMV

Toxoplasmosis

Consider maternal toxoplasmosis serology for women who experienced symptoms of acute toxoplasmosis infection (malaise, fever, lymphadenopathy) during pregnancy.

Parvovirus

Maternal parvovirus serology is recommended when antenatal ultrasound or autopsy finds:

- Severe fetal anaemia
- Non-immune hydrops fetalis
- Fetal cardiomyopathy

Rubella

Testing is usually undertaken as part of routine antenatal screening. Only undertake maternal serology for rubella in the following circumstances:

- Antenatal screening indicated the woman is non-immune or was not undertaken AND the woman experienced clinical features of rubella infection during pregnancy (e.g. fever, transient erythematous rash, lymphadenopathy, arthralgia)
- Autopsy finds features consistent with rubella infection (e.g. IUGR, short stature, cardiac anomalies, inflammatory lesions of the brain, lungs, liver and/or bone marrow)

Syphilis

Testing is usually undertaken as part of routine antenatal screening, with additional screening for women in high risk communities. Only undertake maternal serology for syphilis if there was inadequate antenatal screening. See *Syphilis in Pregnancy* PPG for screening requirements (available at www.sahealth.sa.gov.au/perinatal).

Maternal Blood – Other Investigations

Blood group and antibody screen

If baby is:

- Anaemic
- Jaundiced
- Hydropic

Thrombophilia testing

- Antiphospholipid Syndrome (anticardiolipin, lupus anticoagulant and anti-B2 glycoprotein-1 antibodies) if one or more of the following:
 - Family history of thrombosis
 - Personal history of venous thrombosis
 - Fetal growth restriction

- Placental abruption
- Placental infarction
- Prothrombin G20210A mutation and Factor V Leiden mutation if:
 - There are multiple factors from the list above or other clinical suspicion that thrombophilia may have been a factor in the stillbirth

Haemoglobin A1c (HbA1c)

If baby is:

- Small for gestational age (< 10th centile)
- Intrauterine growth restricted
- Large for gestational age (> 90 th centile)
- Polyhydramnios is an unexplained feature of the pregnancy

Thyroid function test

Is not recommended in clinically euthyroid women.

Liver function tests and non-fasting bile acids

Recommended if there is a clinical suspicion of intrahepatic cholestasis of pregnancy and/or history of maternal pruritus.

Drug screen

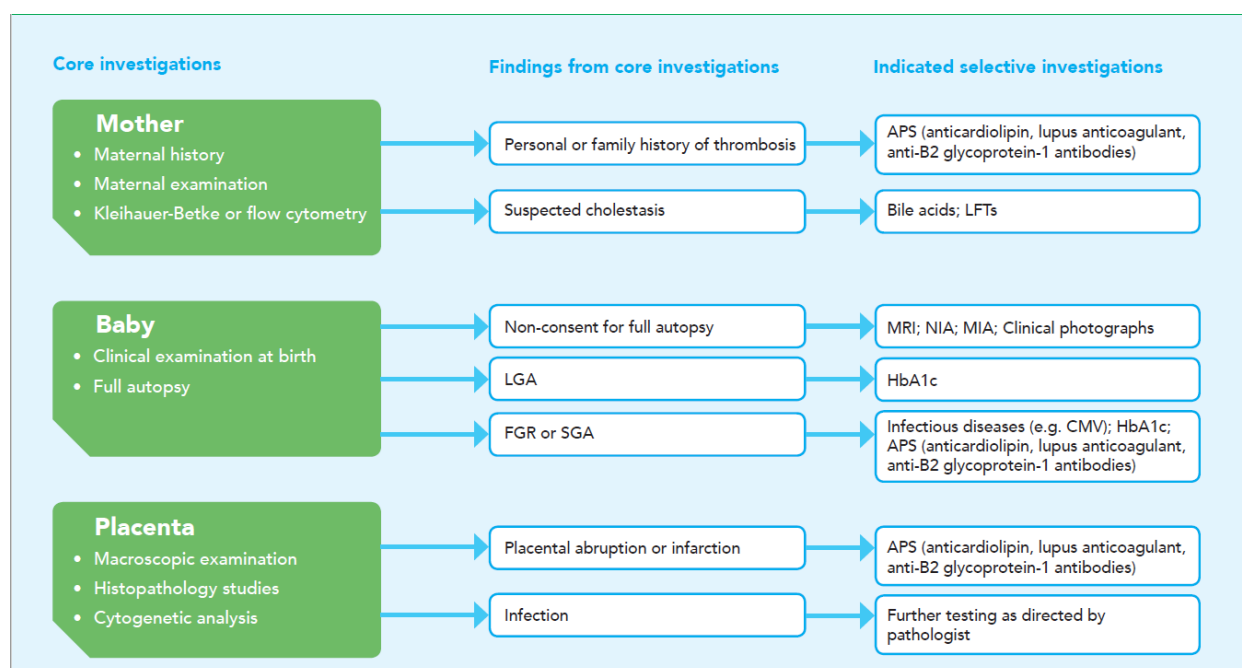
Recommended if there is a suspicion of or known maternal drug use

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 anomalies.

1. Flenady V, Oats J, Gardener G, Masson Vicki, McCowan Lesley, Kent A, Tudehope David, Middleton P, Donnalley N, Boyle F, Horey D, Ellwood D, Gordon A, Sinclair L, Humphrey M, Zuccollo J, Dahlstrom J, Mahomed K, Henry S, Khong Y for the PSANZ Care around the time of stillbirth and neonatal death guidelines group. Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death. Version 3.2, Section 5 – Investigations for Stillbirth. NHMRC Centre of Research Excellence in Stillbirth. Brisbane, Australia, December 2019. Available at <https://sanda.psanzenz.com.au/clinical-practice/clinical-guidelines/>

PSANZ Stillbirth Investigations Algorithm



Perinatal Society of Australia and New Zealand Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death, Third Edition, March 2018.

For more information

Pregnancy Outcome Unit
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Call (08) 71179210 or Email
WellbeingSAPregnancyStats@sa.gov.au
www.wellbeingsa.sa.gov.au
Confidentiality-I1-A1