Maternal and Perinatal Mortality in South Australia 2023

Government of South Australia

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Dr Vineesh Bhatia	Neonatal paediatrician
Dr Anthony Colby	Obstetric anaesthetist
Dr Megan Cooper	Midwife
Dr Marion Crompton	General practitioner
Dr Jeff Hillen	Obstetrician
Vacant	Aboriginal health representative
Dr Aimee Woods	Obstetrician
Dr Stephen Wills	Pathologist
Dr Jason Bennie	Ex-officio
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A Dr Brian Pridmore Forum was not held in 2025.

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- State Coroner's Office, Courts Administration Authority of South Australia.

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Summary

This is the thirty-eighth Annual Report of the Maternal and Perinatal Mortality Committee, for deaths occurring in 2023.

1. There was one incidental and no direct or indirect maternal deaths in 2023. The maternal mortality ratio for the last five-year period 2019-2023 was 6.3 deaths per 100,000 women who gave birth, which is low by international standards, and lower than the preceding five-year period where there were 7.1 deaths per 100,000 women.

2. The Committee reviewed the 150 adjusted perinatal deaths of babies born in South Australia in 2023. The adjusted perinatal mortality rate (stillbirths of at least 400g or 20 weeks gestation and neonatal deaths of babies born at or after 20 weeks gestation, excluding terminations performed for psychosocial or unknown reasons) was 8.2 per 1,000 births. The adjusted stillbirth rate was 6.4 per 1,000 births, and the adjusted neonatal mortality rate was 1.8 per 1,000 live births. Whilst the adjusted neonatal mortality rate has been steadily declining, the adjusted stillbirth rate has remained stable over the last two decades.

3. One hundred and thirty (86.7%) of the adjusted perinatal deaths occurred in preterm babies (less than 37 weeks gestation). The leading cause of adjusted perinatal death in 2023 was congenital anomalies, which accounted for 32.9% of the deaths. Other leading causes were spontaneous preterm labour or rupture of membranes (20.8%), and placental dysfunction or causative placental pathology (14.1%).

4. Fourteen (43.8%) of the 32 adjusted neonatal deaths occurred in neonates born at less than 24 weeks gestation. Of the 18 deaths in neonates born at or after 24 weeks, 5 (27.8%) were attributed to congenital anomalies.

5. Thirteen babies of Aboriginal mothers died during the perinatal period. The adjusted perinatal mortality rate for Aboriginal women was 15.1 per 1,000 births compared with 7.8 per 1,000 births for non-Aboriginal women. The adjusted perinatal mortality rate for Aboriginal women has increased from 11.8 per 1,000 births in 2022.

6. The Committee's previous recommendations and key learning points have been incorporated into South Australian policies, standards and guidelines. These recommendations and key learning points are available within the previous year's reports available on the Preventive Health SA website.

Data presented in this report should be interpreted with caution as small numbers are prone to fluctuations.

Key Learning Points

- Families affected by the removal of a baby should be offered timely and appropriate mental health support.
- Discharge summaries from the birth admission should include relevant mental health information to support continuation of care.
- Consider offering an induction of labour (or Caesarean section if indicated) by 41 weeks gestation in any ongoing pregnancy.
- Consider admission for stabilisation of diabetes and delivery prior to 39 weeks where diabetes remains unstable in the presence of a large for gestational age fetus.
- A Kleihauer should be performed at the time of discovery of IUFD.
- Pregnancy following bariatric surgery is associated with increased risks of pregnancy-related complications, and management should include multidisciplinary care with attention to nutritional status and fetal growth.

Introduction

This is the thirty-eighth Annual Report of the South Australian Maternal and Perinatal Mortality Committee (the 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, subject to 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. Confidential reports on perinatal death, submitted by doctors, midwives and nurses;
2. Data linkage with Births, Deaths and Marriages, from medical certificates of cause of perinatal death;
3. Data linkage with Births, Deaths and Marriages, from medical certificates of cause of death for maternal deaths; &
4. Supplementary Birth Records.

Further information is obtained from practitioners identified as having overseen 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 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.

Terminology

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. This thirty-eighth report of the Committee incorporates information on maternal deaths in South Australia in the year 2023 and perinatal deaths of babies born to mothers in South Australia in 2023.

Aboriginal is used in this document respectfully as an all-encompassing term for Aboriginal and Torres Strait Islander people, health, and culture. This document respectfully uses the term 'Aboriginal' rather than 'Indigenous' or 'Aboriginal and Torres Strait Islander' to refer to people who identify as Aboriginal, Torres Strait Islander, or both. The SA Government recognises Aboriginal peoples and Torres Strait Islander peoples as two distinct groups. However, Preventive Health SA generally refers to Aboriginal persons in recognition that Aboriginal people are the traditional owners of South Australia.

The SA Government acknowledges that there are people with Torres Strait Islander heritage living in SA and acknowledges the complexity and diversity of the Aboriginal and Torres Strait Islander communities of Australia and recognises that each has its own beliefs and practices.

The terms woman, women and mother are used in this report as most pregnant and birthing people identify with their birth sex. However, the committee acknowledges these terms include people who do not identify as women, including those with a non-binary identity.

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.*

Maternal Mortality

Maternal mortality statistics

Maternal death is defined by The World Health Organization (WHO) as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (obstetric and non-obstetric).[1] 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 four late maternal deaths in South Australia in 2023. Data linkage is used to improve detection and enhance reporting on maternal deaths occurring in the state.

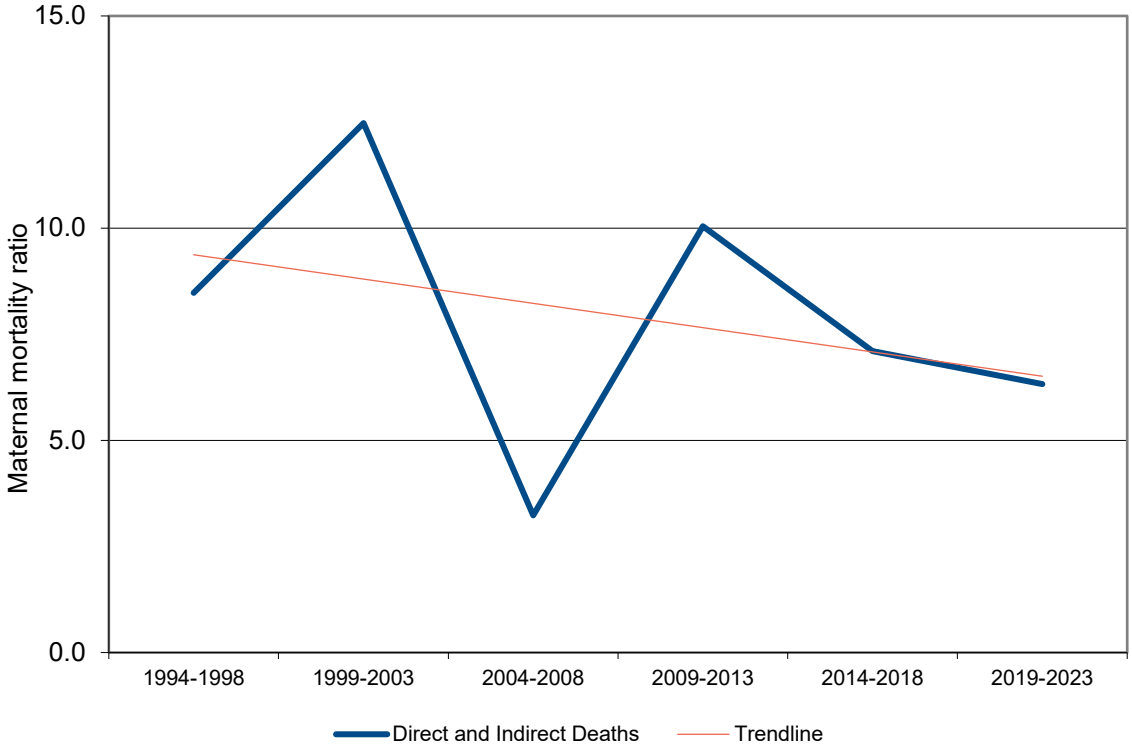
Maternal deaths in South Australia for the three categories of deaths from 1994 to 2023 are presented in Table 1 by five-year periods. Maternal mortality ratios have been calculated for direct and indirect deaths (Table 1 and Figure 1). The maternal mortality ratio for the last five-year period 2019-2023 was 6.3, which was similar to the Australian maternal mortality ratio of 6.0 per 100,000 women for the period 2013-2022[2]. The number of deaths in South Australia is small and has not changed greatly in the last three decades, however a decreasing trend is shown (Figure 1). Of a total of 45 pregnancy-related maternal deaths in the period 1994-2023, 25 were direct deaths, and 20 were indirect deaths.

Table 1: Maternal mortality by category of death, in 5-year periods, South Australia, 1994 – 2023

Years	Direct deaths	Indirect deaths	Incidental deaths	Total deaths	Direct and indirect maternal deaths	
	Number	Number	Number	Number	Number	Maternal mortality ratio*
1994-1998	4	4	6	14	8	8.5
1999-2003	5	6	1	12	11	12.5
2004-2008	3	0	2	5	3	3.2
2009-2013	8	2	3	13	10	10.0
2014-2018	2	5	0	7	7	7.1
2019-2023	3	3	1	7	6	6.3

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

Figure 1: Maternal Mortality Ratio, South Australia 1994-2023



Causes of maternal deaths

The cause of the maternal death in 2023 was:

- One incidental death where the cause of death was unascertained.

The causes of the late maternal deaths in 2023 were:

- One late direct death by suicide;
- One late indirect death by suicide;
- One late incidental death in a motor vehicle accident; &
- One late incidental death due to subarachnoid haemorrhage due to ruptured aneurysm.

Maternal Key Learning Points

- Families affected by the removal of a baby should be offered timely and appropriate mental health support.
- Discharge summaries from the birth admission should include relevant mental health information to support continuation of care.

The Committee's previous recommendations and key learning points have been incorporated into South Australian policies, practices, standards and guidelines. A document containing previously made recommendations and key learning points, together with the relevant code of practice, is available from the Preventive Health SA website.

Perinatal Mortality

Perinatal mortality statistics

In 2023, 18,517 births in South Australia were reported to the Pregnancy Outcome Unit. These included all births of at least 400g birthweight or 20 weeks gestation. There were 271 perinatal deaths, including 239 stillbirths and 32 neonatal deaths. The perinatal mortality rate was 14.6 per 1,000 births, the stillbirth rate was 12.9 per 1,000 births and the neonatal mortality rate was 1.8 per 1,000 live births.

A procedural change in 2022 increased the ascertainment of births and perinatal deaths, particularly for terminations of pregnancy. As the focus of the Committee is to assess avoidable mortality, the following section uses an 'adjusted' perinatal mortality definition from 2022 onwards, where terminations of pregnancy for psychosocial or unknown reasons are excluded. This maintains consistency with previous South Australian reports and allows for comparisons with other jurisdictions both nationally and internationally.

In 2023, there were 18,394 adjusted births including 150 adjusted perinatal deaths, 118 adjusted stillbirths and 32 adjusted neonatal deaths. Table 2 shows the numbers of adjusted stillbirths and adjusted neonatal deaths for specified birthweights or gestations.

The adjusted perinatal mortality rate for all births in 2023 was 8.2 deaths per 1,000 births. The adjusted stillbirth rate was 6.4 per 1,000 births, and the adjusted neonatal mortality rate was 1.8 per 1,000 live births. Fifty-three of the 150 adjusted perinatal deaths (35.3%) were induced terminations of pregnancy, and their exclusion would have resulted in an adjusted perinatal mortality rate of 5.2 deaths per 1,000 births.

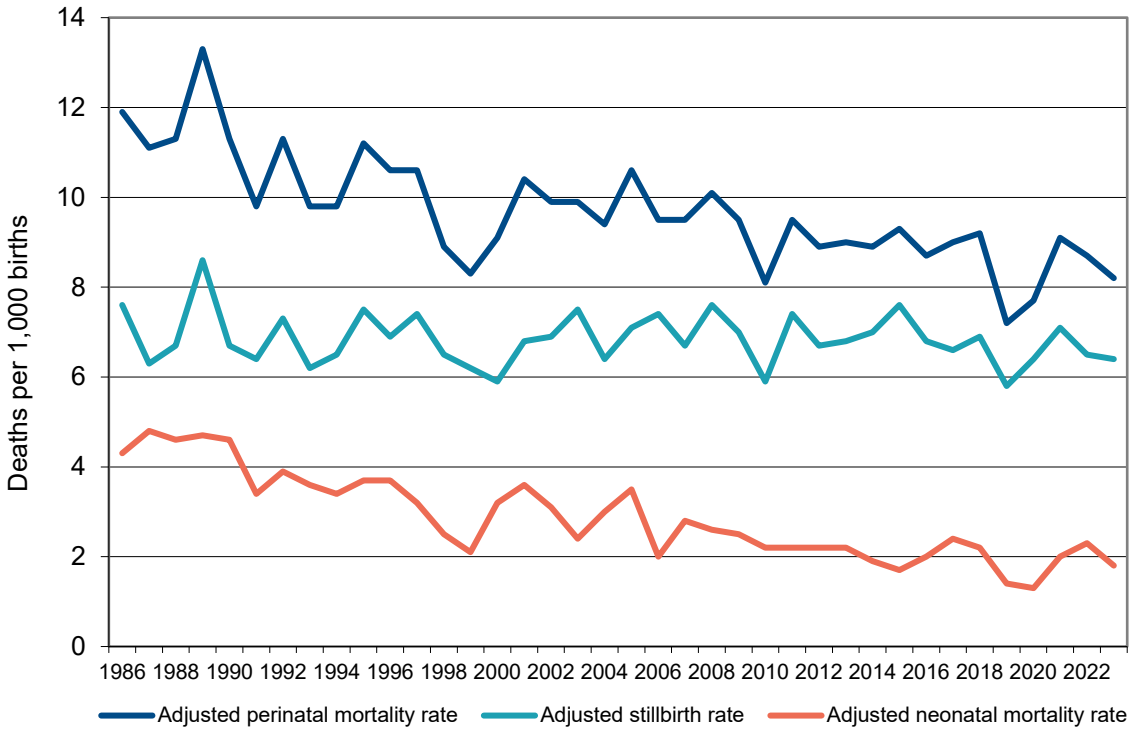
The adjusted perinatal mortality rates for other specified minimum birthweights or gestational ages (where birthweight was unavailable) are provided in Table 2. The WHO recommends that national perinatal mortality statistics should only include fetuses and infants weighing at least 500 grams and/or born at 22 weeks or more gestation[3]. For international comparison, inclusion of only fetuses and infants weighing at least 1,000g and/or born at 28 weeks or more gestation is recommended[3]. Using the WHO classification for international reporting, the adjusted perinatal mortality rate was 3.3 per 1,000 births in South Australia, with an adjusted stillbirth rate of 2.7 per 1,000 births and adjusted neonatal mortality rate of 0.7 per 1,000 live births.

Table 2: Adjusted perinatal mortality, South Australia, 2023 (all births of specified birthweight/gestation)

Specified birthweight/ gestation	Adjusted total births	Live births	Adjusted stillbirths		Adjusted neonatal deaths		Adjusted perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
≥400g/ 20 weeks	18,394	18,276	118	6.4	32	1.8	150	8.2
≥500g/ 22 weeks	18,360	18,269	91	5.0	25	1.4	116	6.3
≥1,000g/ 28 weeks	18,263	18,215	49	2.7	12	0.7	61	3.3

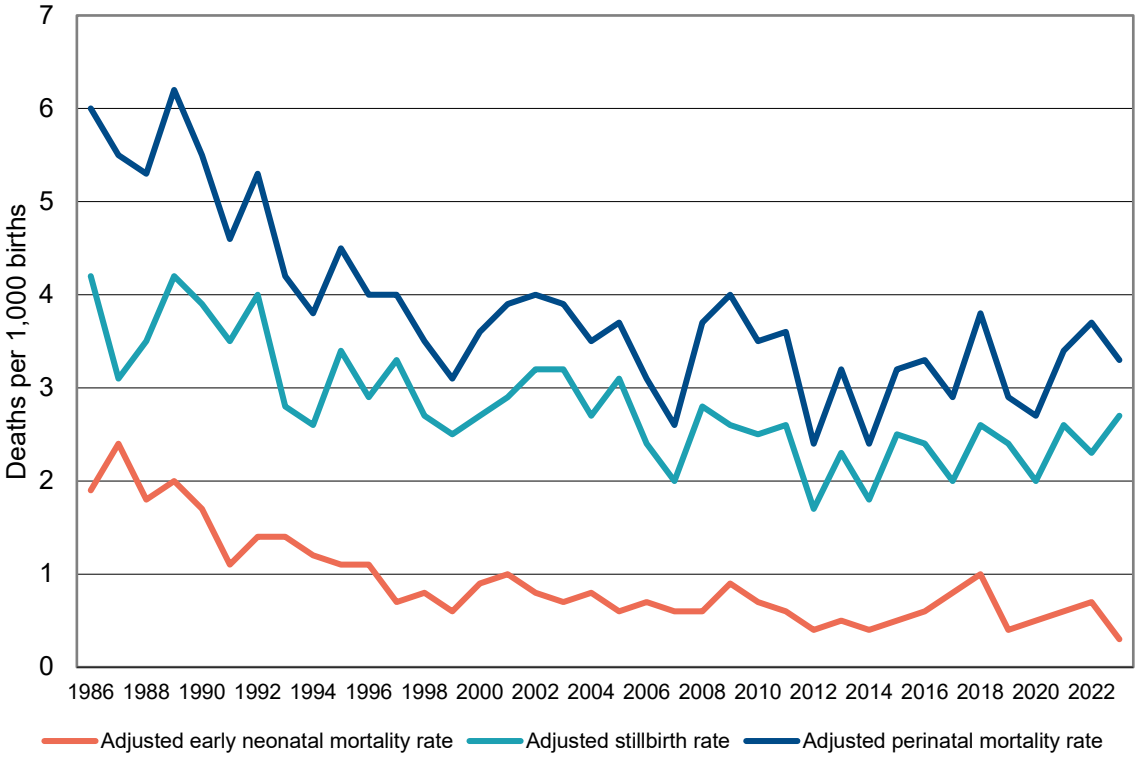
South Australian adjusted perinatal mortality rates, including adjusted stillbirth and adjusted neonatal mortality rates for all births, from 1986 to 2023, are presented in Figure 2. Whilst the adjusted neonatal mortality rate has been steadily declining, the adjusted stillbirth rate has not changed markedly over the last two decades.

Figure 2: Adjusted perinatal mortality rate (births ≥ 400g or 20 weeks gestation), South Australia 1986-2023.



For international comparison, WHO[3] recommends presenting perinatal mortality rates for births of at least 1,000g birthweight (or when birthweight is unavailable, 28 weeks gestation) and early neonatal deaths occurring within the first seven days of life. Adjusted perinatal mortality rate, adjusted stillbirth rate and adjusted early neonatal mortality rate are presented in Figure 3. By these criteria, a decrease in the adjusted stillbirth rate is evident from 4.2 deaths per 1,000 births in 1986 to 2.7 deaths per 1,000 births in 2023. The adjusted early neonatal mortality rate was 0.3 per 1,000 live births.

Figure 3: Adjusted perinatal mortality rate (births ≥1,000g or 28 weeks gestation & early neonatal deaths within the first seven days of life), South Australia 1986-2023.



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 terminations of pregnancy for any reason, including congenital anomalies and medical reasons. The Committee data includes terminations of pregnancy for congenital anomalies and medical reasons. 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, 2013 – 2023.

Year	NSW	VIC	Qld	SA	WA	Tas	NT	ACT	AUSTRALIA
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	11.6	11.4	6.6	7.8
2017	7.1	8.1	9.4	5.7	8.6	9.7	15.1	8.8	8.1
2018	6.8	8.3	7.8	5.5	7.9	9.8	16.8	9.4	7.7
2019	7.4	7.0	10.1	4.9	7.7	8.1	15.4	5.1	7.8
2020	8.1	7.4	10.0	5.1	9.5	9.6	18.8	6.7	8.4
2021	7.7	7.6	10.1	5.1	7.3	8.2	19.0	7.7	8.1
2022	7.0	6.8	11.5	4.6	8.2	10.4	19.9	6.9	8.1
2023	7.1	7.1	11.7	4.7	8.4	9.0	14.6	11.8	8.2

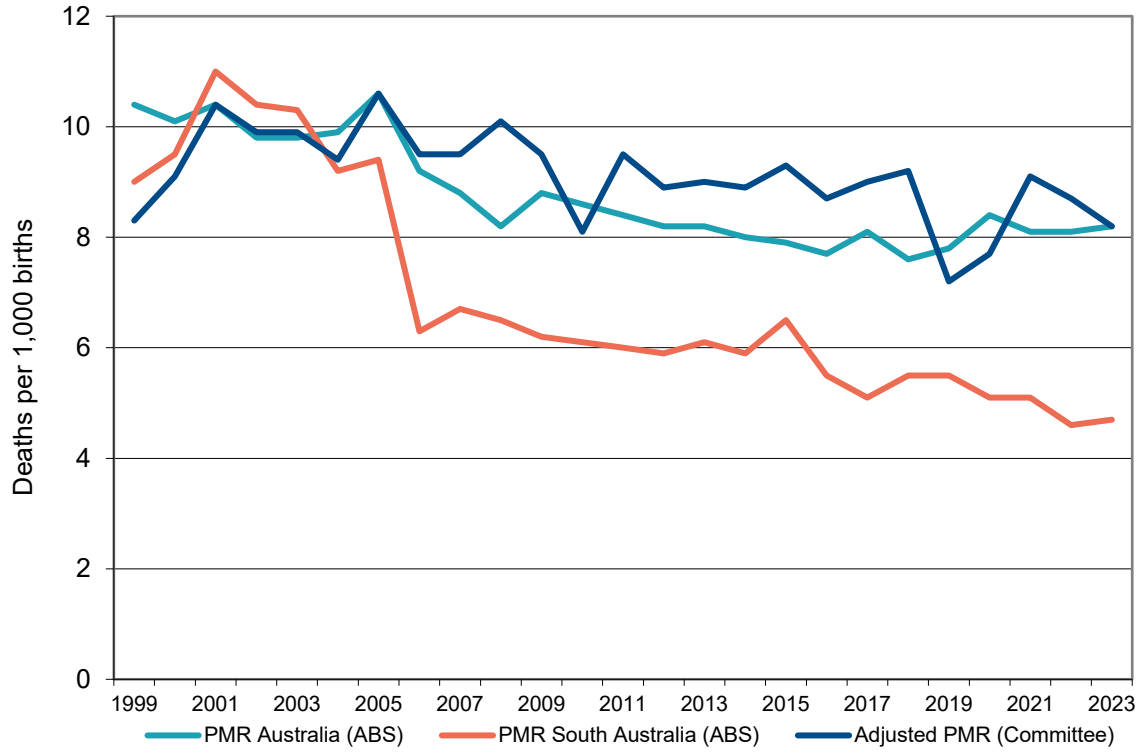
*Rates are expressed as stillbirths and neonatal deaths within the first 28 days of life per 1,000 births for births of at least 400g birthweight (or if birthweight is unavailable, 20 weeks gestation), based on registered births according to the usual residence of the mother.
Source: Australian Bureau of Statistics. (2023). *Causes of Death, Australia*. ABS. https://www.abs.gov.au/statistics/health/causes-death/causes-death-australia/2023.

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 adjusted perinatal deaths of babies born 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 adjusted perinatal deaths of babies born in South Australia in the year in which the birth occurred; &
- The ABS data include all live births of any gestation, whereas since 2012 the Committee rates include only live births of at least 400g birthweight or of at least 20 weeks gestation which resulted in neonatal death.

The ABS perinatal mortality rates (PMR) for South Australia and Australia for 1999-2023 are presented in Figure 4, together with the adjusted 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 adjusted perinatal mortality rates South Australian Maternal and Perinatal Mortality Committee (Committee) 1999-2023 Deaths per 1,000 births.*



Source: Australian Bureau of Statistics. (2023). *Causes of Death, Australia*. ABS. https://www.abs.gov.au/statistics/health/causes-death/causes-death-australia/2023.

*Refer above for definitional differences

Birthweight-specific adjusted perinatal mortality

The birthweight-specific adjusted rates of stillbirths, neonatal deaths and perinatal deaths for 2023 are provided in Table 4. Of the 150 adjusted perinatal deaths, 122 (81.3%) were of low birthweight (<2,500g) and 27 (84.4%) of the 32 adjusted neonatal deaths were low birthweight babies. Thirty-one of the adjusted perinatal deaths (20.7%) were less than 400g birthweight.

Table 4: Adjusted perinatal mortality by birthweight, all births, South Australia, 2023.

Birthweight (grams)	Adjusted total births	Live births	Adjusted stillbirths		Adjusted neonatal deaths		Adjusted perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
<400	32	2	30	937.5	1	31.3	31	968.8
400-499	28	13	15	535.7	11	392.9	26	928.6
500-749	49	26	23	469.4	3	61.2	26	530.6
750-999	38	34	4	105.3	5	131.6	9	236.8
1,000-1,499	96	86	10	104.2	4	41.7	14	145.8
1,500-1,999	251	247	4	15.9	2	8.0	6	23.9
2,000-2,499	826	817	9	10.9	1	1.2	10	12.1
2,500-2,999	2,945	2,939	6	2.0	2	0.7	8	2.7
3,000-3,499	6,892	6,886	6	0.9	2	0.3	8	1.2
3,500-3,999	5,441	5,440	1	0.2	0	0.0	1	0.2
4,000-4,499	1,573	1,573	0	0.0	1	0.6	1	0.6
≥4,500	215	213	2	9.3	0	0.0	2	9.3
Unknown	8	0	8	1000.0	0	0.0	8	1000.0
Total	**18,394**	**18,276**	**117**	**6.4**	**32**	**1.7**	**150**	**8.2**

The time of adjusted perinatal death by birthweight is presented in Table 5. Of the 69 adjusted antepartum deaths, 27 were under 750g birthweight (39.1%). Of the adjusted intrapartum deaths, 42.9% were under 750g birthweight.

Table 5: Time of adjusted perinatal death by birthweight, South Australia, 2023 (≥400g birthweight or 20 weeks gestation).

Birthweight (grams)	Adjusted stillbirths			Adjusted neonatal deaths	Adjusted total
	Antepartum	Intrapartum	Uncertain if antepartum or intrapartum		
<500	13	2	30	12	57
500-749	14	1	8	3	26
750-999	4	0	0	5	9
1,000-1,499	7	1	2	4	14
1,500-1,999	4	0	0	2	6
2,000-2,499	7	1	1	1	10
2,500-2,999	6	0	0	2	8
3,000-3,499	5	0	1	2	8
3,500-3,999	0	1	0	0	1
4,000-4,499	0	0	0	1	1
≥4,500	1	1	0	0	2
Unknown	8	0	0	0	8
Total	**69**	**7**	**42**	**32**	**150**

Gestation-specific adjusted perinatal mortality

The distribution of adjusted perinatal deaths by gestational age is provided in Table 6. There were 130 adjusted preterm births (<37 weeks gestation) that resulted in a perinatal death, accounting for 86.7% of all adjusted perinatal deaths.

Table 6: Adjusted perinatal mortality by gestational age at birth, South Australia, 2023 (≥ 400g or 20 weeks gestation).

Gestation at birth (weeks)	Adjusted total births	Live births	Adjusted stillbirths		Adjusted neonatal deaths		Adjusted perinatal deaths	
			Number	Deaths per 1,000 births	Number	Deaths per 1,000 live births	Number	Deaths per 1,000 births
<24	81	21	60	740.7	14	666.7	74	913.6
24-27	76	54	22	289.5	7	129.6	29	381.6
28-31	123	117	6	48.8	3	25.6	9	73.2
32-36	1,281	1,266	15	11.7	3	2.4	18	14.1
37-41	16,778	16,764	14	0.8	5	0.3	19	1.1
≥42	55	54	1	18.2	0	0.0	1	18.2
Total	**18,394**	**18,276**	**118**	**6.4**	**32**	**1.8**	**150**	**8.2**

Classification of adjusted perinatal deaths

The Perinatal Mortality Subcommittee classified each of the 271 perinatal deaths, which occurred in 2023 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 can only be made between 2019 to 2023 data. Table 7 presents the classification of 149 of the 150 adjusted perinatal deaths in 2023 according to PSANZ-PDC. One case is yet to be classified.

Table 7: Classification of adjusted perinatal deaths, PSANZ-PDC, South Australia, 2023.

	PSANZ-PDC	Number	Percent	Deaths per 1,000 births
1	Congenital anomaly	49	32.7	2.7
2	Perinatal infection	5	3.3	0.3
3	Hypertension	6	4.0	0.3
4	Antepartum haemorrhage (APH)	11	7.3	0.6
5	Maternal conditions	1	0.7	0.1
6	Complications of multiple pregnancy	3	2.0	0.2
7	Specific perinatal conditions	8	5.3	0.4
8	Hypoxic peripartum death	3	2.0	0.2
9	Placental dysfunction or causative placental pathology	21	14.0	1.1
10	Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	31	20.7	1.7
11	Unexplained antepartum fetal death	9	6.0	0.5
12	Neonatal death without obstetric antecedent	2	1.3	0.1
	Total	**149**	**99.3**	**8.1**

Adjusted perinatal deaths in 2023 by PSANZ-PDC subgroups are provided in Appendix 3. PSANZ-PDC by birthweight is presented in Appendix 5.

Congenital anomalies were the leading cause of adjusted perinatal death in 2023, accounting for 32.7% of all deaths. The next highest cause was spontaneous preterm labour or rupture of membranes (20.7%), followed by placental dysfunction or causative placental pathology (14.0%), antepartum haemorrhage (7.3%), unexplained antepartum fetal death (6.0%), and specific perinatal conditions (5.3%).

A brief description of each of the 12 PSANZ-PDC categories follows.

Congenital anomaly – 49 deaths

This group of 49 deaths in 2023 included 42 terminations of pregnancy, at 20 weeks gestation or more, of fetuses with congenital anomalies. The types of anomalies were as follows:

Nervous system – 10 deaths

- Anencephaly: 1 death
- Neural tube defects: 3 deaths
- Schizencephaly: 1 death
- Other anomalies including agenesis of corpus callosum, aqueduct stenosis and pontomedullary malsegmentation: 5 deaths

Cardiovascular – 10 deaths

- Tetralogy of Fallot: 1 death
- Hypoplastic left heart syndrome: 6 deaths
- Other cardiovascular anomalies including ventricular septal defect, double outlet right ventricle, transposition of the great arteries and rhabdomyomatosis: 3 deaths

Genitourinary System – 1 death

- Renal agenesis: 1 death

Gastrointestinal system – 0 deaths

Musculoskeletal – 2 deaths

- Congenital diaphragmatic hernia: 1 death
- Fetal akinesia sequence: 1 death

Respiratory system – 0 deaths

Haematological – 0 deaths

Multiple congenital anomaly – 7 deaths

- Multiple anomalies including VACTERL, pulmonary stenosis, segmental spine abnormality, ventricular septal defect, cleft lip diaphragmatic hernia and hydrops: 7 deaths

Other congenital anomaly – 3 deaths

- Idiopathic hydrops fetalis: 1 death
- Hepatic haemangioma: 1 death
- Cleft lip and palate: 1 death

Chromosomal – 11 deaths

- Trisomy 21: 2 deaths
- Trisomy 18: 4 death
- Other chromosomal deletions and duplications: 5 deaths

Genetic anomaly – 5 deaths

- Genetic anomalies, such as arthrogryposis, Pallister-Killian syndrome, and Williams syndrome: 5 deaths

Perinatal infection – 5 deaths

Bacterial – 4 deaths

- Group B Streptococcal infection: 3 deaths
- Escherichia coli infection: 1 death

Viral – 0 deaths

Fungal – 0 deaths

Other unspecified organism – 1 death

Hypertension – 6 deaths

- Pre-eclampsia: 6 deaths

Antepartum haemorrhage – 11 deaths

- Placenta praevia: 1 death
- Placental abruption: 10 deaths

Maternal conditions – 1 death

- Maternal diabetes: 1 death

Complications of multiple pregnancy – 3 deaths

- Selective fetal growth restriction: 2 deaths
- Other complications of multiple pregnancies: 1 death

Specific perinatal conditions – 8 deaths

- Fetomaternal haemorrhage: 3 deaths
- Cord occlusion: 1 death
- Complications of invasive procedures: 2 deaths
- Terminations of pregnancy for suspected but unconfirmed abnormalities: 2 deaths

Hypoxic peripartum death – 3 deaths

- Complications of breech presentation: 2 deaths
- Other hypoxic peripartum death: 1 death

Placental dysfunction or causative placental pathology – 21 deaths

- Maternal vascular malperfusion: 3 deaths
- Fetal vascular malperfusion: 7 deaths
- Placental hypoplasia: 7 deaths
- Other placental pathology: 4 deaths

Spontaneous preterm labour or rupture of membranes (<37 weeks gestation) – 31 deaths

- Spontaneous preterm labour preceded by premature cervical shortening: 4 deaths
- Spontaneous preterm labour or rupture of membranes with histological chorioamnionitis: 25 deaths
- Spontaneous preterm labour or rupture of membranes without histological chorioamnionitis: 2 deaths

Unexplained antepartum fetal deaths – 9 deaths

- Unexplained despite full investigation: 5 deaths
- Unclassifiable with incomplete investigation: 4 deaths

Neonatal death without obstetric antecedent – 2 deaths

- No obstetric antecedent factors despite full investigation: 2 deaths

One case is unclassified awaiting further information.

Classification of adjusted neonatal deaths

The classification of the 32 adjusted 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 adjusted neonatal deaths by gestational age grouping follows:

20-23 weeks gestation – 14 deaths

- Not resuscitated, or resuscitation was ultimately unsuccessful: 13 deaths
- Intraventricular haemorrhage: 1 death

24-31 weeks gestation – 10 deaths

- Not resuscitated: 1 death
- Congenital anomalies: 1 death
- Cardio-respiratory disorders: 2 deaths
- Gastrointestinal: 2 deaths
- Neurological: 2 deaths
- Multisystem failure: 2 deaths

32-36 weeks gestation – 3 deaths

- Hypoxic ischaemic encephalopathy: 1 death
- Congenital anomaly: 1 death
- Multisystem failure: 1 death

37 weeks and greater gestation – 5 deaths

- Congenital anomalies: 3 deaths
- Sudden unexpected death in infancy: 1 death
- Unclassified awaiting further information: 1 death

Aboriginal adjusted perinatal deaths

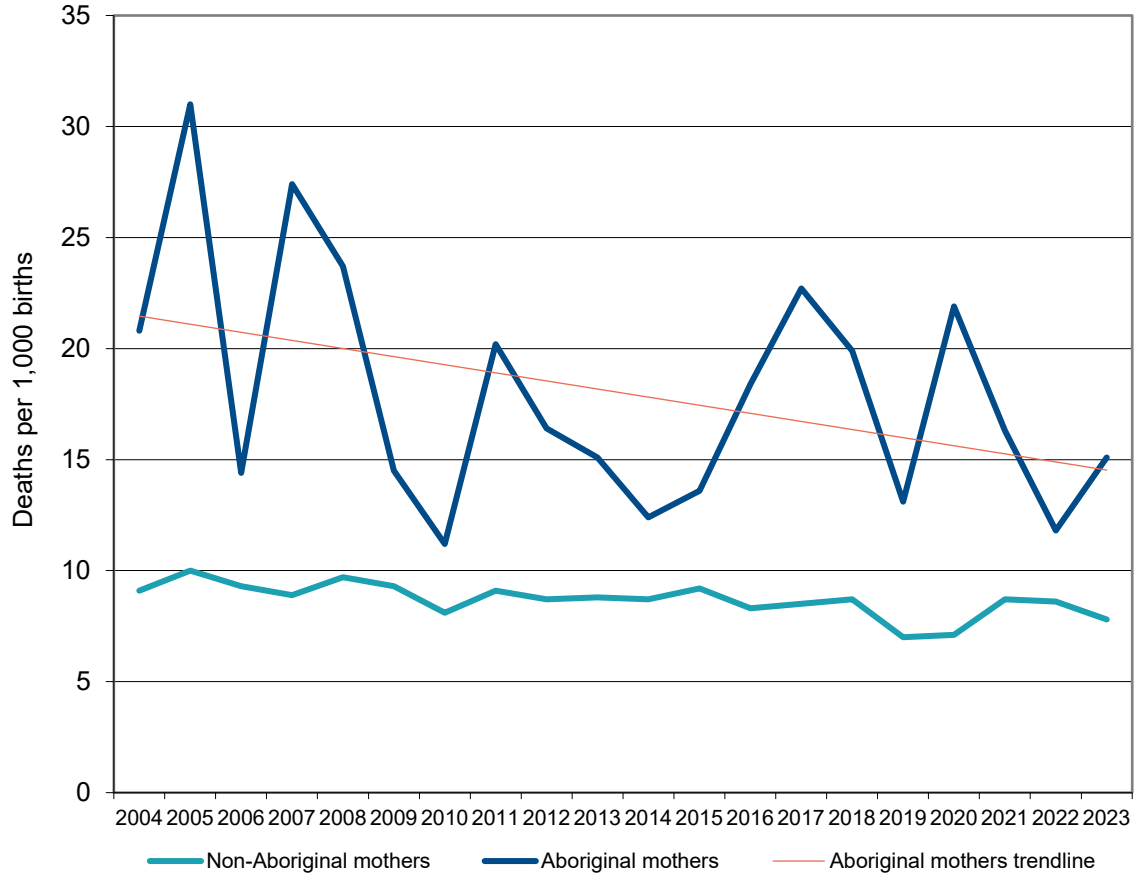
There were 13 adjusted perinatal deaths (7 adjusted stillbirths and 6 adjusted neonatal deaths) among births to 860 Aboriginal women.

In 2023, the adjusted perinatal mortality rate for births to Aboriginal women was 15.1 per 1,000 births, compared to 7.8 per 1,000 births for births to non-Aboriginal women. The adjusted perinatal death rate has increased for Aboriginal women in 2023. Although the adjusted perinatal mortality rate for Aboriginal births fluctuates widely due to the small number of deaths, recent years show a decreasing trend (Figure 5).

All of the 13 infants of Aboriginal mothers were delivered in public metropolitan health services. All of the infants were preterm births, with seven born before 24 weeks gestation. Nine of the 13 mothers were metropolitan residents, and four were country residents.

The causes of the 13 deaths of infants of Aboriginal mothers were attributed to such causes as preterm labour, chorioamnionitis, congenital anomalies and placental abruption.

Figure 5: Adjusted perinatal mortality by maternal Aboriginal status, South Australia, 2004 – 2023.



Autopsies in adjusted 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 66 of the 150 adjusted perinatal deaths (44.0%), including two 'limited' autopsies. The proportion of autopsies undertaken has decreased compared to 2022 (49.1%). The stillbirth investigations algorithm can be found in the PSANZ Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death.

Additionally, 'Other examinations' were performed for 18 (12.0%) of the adjusted perinatal deaths. Placental histological examinations were undertaken for 136 adjusted perinatal deaths (90.7%). Please see Anatomical Pathology 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.

Table 8: Autopsy* status of adjusted perinatal deaths by place of death, South Australia, 2023.

Place of death	Adjusted deaths	Autopsies performed	
	Number	Number	Percent of deaths
Women's & Children's Hospital	77	36	46.8
Lyell McEwin Hospital	16	3	18.8
Flinders Medical Centre	27	12	44.4
Other metropolitan public facilities	9	1	11.1
Metropolitan private hospitals	4	3	75.0
Country hospitals	13	8	61.5
Home	4	3	75.0
Total	**150**	**66**	**44.0**

* Includes 2 autopsies with limited dissection.

The low proportion of autopsies conducted in adjusted perinatal deaths remains a concern. A high-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 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) 8161 6315**.

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 "When a person dies: the hospital post-mortem examination process: information for family and friends." These forms must be used and are available from the SA Perinatal Autopsy Service.

Additional information on perinatal autopsies and resources for families are available on the SA Health website.

Perinatal Key Learning Points

- Consider offering an induction of labour (or Caesarean section if indicated) by 41 weeks gestation in any ongoing pregnancy.
- Consider admission for stabilisation of diabetes and delivery prior to 39 weeks where diabetes remains unstable in the presence of a large for gestational age fetus.
- A Kleihauer should be performed at the time of discovery of IUFD.
- Pregnancy following bariatric surgery is associated with increased risks of pregnancy related complications, and management should include multidisciplinary care with attention to nutritional status and fetal growth.

The Committee's previous recommendations and key learning points have been incorporated into South Australian policies, practices, standards and guidelines.

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
- Stillbirth Investigations Perinatal Practice Guideline: https://www.sahealth.sa.gov.au/wps/wcm/connect/1b6290804ee4e1d88d308dd150ce4f37/Stillbirth+Investigations+PPG_v3_1.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-1b6290804ee4e1d88d308dd150ce4f37-p4ck7wn
- The Child Death and Serious Injury Review Committee reports: http://www.cdsirc.sa.gov.au
- Red Nose Australia 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/
- 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
- Stillbirth CRE and PSANZ Care Around Stillbirth and Neonatal Death Clinical Practice Guideline: https://learn.stillbirthcre.org.au/wp-content/uploads/2024/01/CASaND-Guideline-2024-1.pdf
- SA Health stillbirth resources for parents and families: https://www.sahealth.sa.gov.au/stillbirth
- Stillbirth Investigations and Bereavement Care course: https://launch.sahealth.sa.gov.au/course/details/stillborn-autopsy

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 of at least 20 weeks gestation or with a birthweight of 400g within 27 days of birth, where the day of birth is day zero.

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.

Adjusted neonatal death rate: the number of neonatal deaths, excluding those resulting from a termination of pregnancy performed for psychosocial or unknown reasons, 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.

Adjusted perinatal mortality rate: the number of stillbirths and neonatal deaths, excluding those resulting from a termination of pregnancy performed for psychosocial or unknown reasons, in a

defined time period, divided by the total number of stillbirths 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.

Adjusted stillbirth rate: the number of stillbirths, excluding those resulting from a termination of pregnancy for psychosocial or unknown reasons, 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.

VACTERL: Vertebral defects, anal atresia, cardiac defects, tracheo-esophageal fistula, renal anomalies, and limb abnormalities.

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

PPG: Perinatal Practice Guideline.

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Appendix 1

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

In 2023, 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 key learning points 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 key learning points 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 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 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

Affix patient label here

This form should be forwarded to the
SOUTH AUSTRALIAN MATERNAL AND PERINATAL MORTALITY COMMITTEE
PO BOX 287, Rundle Mall SA 5000
Committee Secretary tel: 7117 9212

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 OACIS*

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

ULTRASOUNDS - *Attach copy of reports where available in lieu of below*
Record gestation, where the scan was performed, and the results of each scan.

Scan No.	Date	Gestation (*weeks*)	Site/location	Results
1st				
2nd				
3rd				
4th				
5th				
6th				
7th				
8th				

Summary

Summary of events

Membranes ruptured – date/time _____

Liquor appearance: Clear ☐ Pink ☐ Blood stained ☐ Green ☐ MSL ☐ Other/describe _____

Signs of maternal or fetal infection? Yes ☐ No ☐ If yes, provide details _____

Were there technical issues with monitoring? Yes ☐ No ☐ If yes, provide details _____

Was this an intrapartum death? Yes ☐ No ☐ Attach all CTG's _____

When was the fetal heart last heard? If intrapartum death _____

Labour length 1st stage *hrs* _____ *mins* _____ 2nd stage *hrs* _____ *mins* _____

Autopsy Yes ☐ No ☐ If no, describe external appearance

Autopsy counselling by senior clinician Yes ☐ No ☐

Placenta to histopathology Yes ☐ No ☐

Was this a termination of pregnancy? Yes ☐ No ☐

Details

A thorough summary of circumstances provided in this space will assist the committee to formulate recommendations to improve the safety and quality of maternity services in South Australia.

Suggested events that may be included in your summary:

- circumstances of discovery ie presentation with decreased fetal movements or at a regular antenatal visit
- any treatments, procedures and complications
- all details of neonatal course
- details of retrievals or transfers

Describe details of events – *this section cannot be left blank*

Name and designation of person completing the form _____ Date _____

Appendix 3

The Committee reviewed all 271 perinatal deaths of South Australian born babies in 2023. The PSANZ Perinatal Death Classification for 149 of the 150 adjusted perinatal deaths are given in the table below. One death is yet to be classified.

Perinatal Society of Australia and New Zealand-Perinatal Death Classification (PSANZ-PDC), South Australian adjusted perinatal deaths, 2023

	Category No	Subcategory No	Category %
1 Congenital Anomaly	**49**		**32.9**
1.1 Structural anomaly	33		22.1
1.11 Nervous system		10	6.7
1.12 Cardiovascular system		10	6.7
1.13 Genitourinary system		1	0.7
1.14 Gastrointestinal system		0	0.0
1.15 Musculoskeletal		1	0.7
1.151 Congenital diaphragmatic hernia		1	0.7
1.152 Gastroschisis/omphalocele		0	0.0
1.16 Respiratory system (include congenital pulmonary airway malformation (CPAM))		0	0.0
1.17 Haematological		0	0.0
1.18 Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)		7	4.7
1.19 Other congenital abnormality		1	0.7
1.192 Idiopathic hydrops fetalis		1	0.7
1.193 Fetal tumour (include sacro-coccygeal teratoma)		1	0.7
1.198 Other specified		0	0.0
1.199 Congenital anomaly, unspecified		0	0.0
1.2 Chromosomal anomaly	11		7.4
1.21 Down syndrome (trisomy 21)		2	1.3
1.22 Edward syndrome and Patau syndrome (trisomy 18, trisomy 13)		4	2.7
1.23 Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)		3	2.0
1.24 Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions e.g. 22q11.2 deletion syndrome (DiGeorge syndrome), Wolff-Hirschorn syndrome, Cri-du-Chat syndrome)		1	0.7
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)		1	0.7
1.29 Unspecified		0	0.0
1.3 Genetic anomaly	5		3.4
1.31 Genetic condition, specified (e.g. Tay-Sachs disease; includes inborn errors of metabolism)		5	3.4
1.32 Syndrome/association with demonstrated chromosomal/gene anomaly.		0	0.0
1.39 Genetic condition, unspecified		0	0.0
2 Perinatal Infection	**5**		**3.4**
2.1 Bacterial	4		2.7
2.11 Group B Streptococcus		3	2.0

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		0	0.0
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	**6**		**4.0**
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	4		2.7
3.6 Pre-eclampsia superimposed on chronic hypertension	2		1.3
3.9 Unspecified hypertension	0		0.0
4 Antepartum Haemorrhage (APH)	**11**		**7.4**
4.1 Placental abruption	9		6.0
4.2 Placenta praevia	1		0.7
4.3 Vasa praevia	0		0.0
4.9 APH of undetermined origin	0		0.0
5 Maternal Conditions	**1**		**0.7**
5.1 Termination of pregnancy for maternal psychosocial indications	0		0.0
5.2 Diabetes	1		0.7
5.21 Gestational diabetes		1	0.7
5.22 Pre-existing diabetes		0	0.0
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	**3**		**2.0**
6.1 Monochorionic twins	2		1.3
6.11 Twin to twin transfusion syndrome (TTTS)		0	0.0
6.12 Selective fetal growth restriction (FGR) (i.e. affecting only one twin)		2	1.3
6.13 Monoamniotic twins (including cord entanglement)		0	0.0
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)		0	0.0
6.22 Selective fetal growth restriction (FGR)		0	0.0

6.28 Other		1	0.7
6.29 Unknown or unspecified		0	0.0
6.3 Complications of higher order multiples (3 or more fetuses)	0		0.0
6.31 Twin to twin transfusion syndrome (TTTS)		0	0.0
6.32 Selective fetal growth restriction (FGR)		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	**8**		**5.4**
7.1 Fetomaternal haemorrhage	3		2.0
7.2 Antepartum cord or fetal vessel complications (excludes monochorionic twins or higher order multiples)	1		0.7
7.21 Cord vessel haemorrhage		0	0.0
7.22 Cord occlusion (True knot with evidence of occlusion or other)		0	0.0
7.28 Other cord complications		1	0.7
7.29 Unspecified cord complications		0	0.0
7.3 Uterine abnormalities	0		0.0
7.31 Developmental anatomical abnormalities (e.g. bicornuate uterus)		0	0.0
7.38 Other		0	0.0
7.39 Unspecified		0	0.0
7.4 Alloimmune disease	0		0.0
7.41 Rhesus isoimmunisation		0	0.0
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	0		0.0
7.51 Subdural haematoma		0	0.0
7.52 Fetal antenatal ischaemic brain injury		0	0.0
7.53 Fetal antenatal haemorrhagic brain injury		0	0.0
7.6 Other specific perinatal conditions	4		2.7
7.61 Complications of antenatal, diagnostic or therapeutic procedures:		0	0.0
7.611 Complications of prenatal diagnostic procedures		0	0.0
7.612 Complications of fetal ultrasound guided needle interventions (e.g. FBS/fetal transfusion, thoracocentesis, vesicocentesis, fetal cardiac valvoplasty, division of amniotic bands, fetal skin biopsy, unipolar/bipolar diathermy, RFA procedures)		1	0.7
7.613 Complications of fetal shunt interventions (e.g. pleuroamniotic shunt, vesicoamniotic shunt)		0	0.0
7.614 Complications of minimally invasive fetoscopic interventions (e.g. fetoscopic laser surgery for TTTS, FETO for CDH, laser ablation of posterior urethral valves)		1	0.7
7.615 Complications of open maternal fetal surgery (e.g. open maternal fetal surgery for spina bifida)		0	0.0
7.618 Other		0	0.0
7.62 Termination of pregnancy for suspected but unconfirmed congenital anomaly.		2	1.3
7.63 Amniotic band		0	0.5
7.68 Other		0	0.0
7.9 Unspecified	0	0	0.0

8 Hypoxic peripartum death	**3**		**2.0**
8.1 With intrapartum complications (sentinel events)	2		1.3
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		2	1.3
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 (excluding other complications)	1		0.7
8.3 No intrapartum complications recognised and no evidence of significant fetal compromise identified	0		0.0
8.9 Unspecified hypoxic peripartum death	0		0.0
9 Placental dysfunction or causative placental pathology	**21**		**14.1**
9.1 Maternal vascular malperfusion	3		1.3
9.2 Fetal vascular malperfusion	7		4.7
9.3 High grade villitis of unknown etiology (VUE)	0		0.0
9.4 Massive perivillous fibrin deposition/maternal floor infarction	0		0.0
9.5 Severe chronic intervillositis (Histiocytic intervillositis)	0		0.0
9.6 Placental hypoplasia	7		4.7
9.7 No causal placental pathology demonstrated, with antenatal evidence of poor placental function identified (such as abnormal fetal umbilical artery Doppler)	0		0.0
9.8 Placental pathological examination was not performed, with antenatal evidence of poor placental function identified (such as abnormal fetal umbilical artery Doppler)	0		0.0
9.9 Other placental pathology (e.g. multiple pathologies with evidence of loss of placental function leading to death)	4		2.7
10 Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	**31**		**20.8**
10.1 Spontaneous preterm	27		18.1
10.11 With histological chorioamnionitis		25	16.8
10.12 Without histological chorioamnionitis		2	1.3
10.13 With clinical evidence of chorioamnionitis, no examination of placenta		0	0.0
10.17 No clinical signs of chorioamnionitis, no examination of placenta		0	0.0
10.19 Unspecified or not known whether placenta examined		0	0.0
10.2 Spontaneous preterm preceded by premature cervical shortening	4		2.7
11 Unexplained antepartum fetal death	**9**		**6.0**
11.1 Unexplained antepartum fetal death despite full investigation	5		3.4
11.2 Unclassifiable antepartum fetal death with incomplete investigation	4		2.7
11.3 Unclassifiable antepartum fetal death due to unknown level of investigation	0		0.0
12 Neonatal death without obstetric antecedent	**2**		**1.3**
12.1 Neonatal death with no obstetric antecedent factors despite full investigation	2		1.3
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	**149**		**100.0**

Appendix 4

The Committee reviewed all 32 neonatal deaths of South Australian born babies in 2023. The PSANZ Perinatal Death Classification for 31 of the 32 adjusted neonatal deaths are given in the table below. One death is yet to be classified.

Perinatal Society of Australia and New Zealand-Neonatal Death Classification (PSANZ-NDC), South Australian adjusted neonatal deaths, 2023

	Category No	Subcategory No	Category %
1 Congenital Anomaly	**5**		**16.1**
1.1 Structural anomaly	2		6.5
1.11 Nervous system		0	0.0
1.12 Cardiovascular system		0	0.0
1.13 Genitourinary system		0	0.0
1.14 Gastrointestinal system		0	0.0
1.15 Musculoskeletal		0	0.0
1.151 Congenital diaphragmatic hernia		1	3.2
1.152 Gastroschisis/omphalocele		0	0.0
1.16 Respiratory system (include congenital pulmonary airway malformation (CPAM))		0	0.0
1.17 Haematological		0	0.0
1.18 Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)		1	3.2
1.19 Other congenital abnormality		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	2		6.5
1.21 Down syndrome (trisomy 21)		0	0.0
1.22 Edward syndrome and Patau syndrome (trisomy 18, trisomy 13)		2	6.5
1.23 Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)		0	0.0
1.24 Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions e.g. 22q11.2 deletion syndrome (DiGeorge syndrome), Wolff-Hirschorn syndrome, Cri-du-Chat syndrome)		0	0.0
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	1		3.2
1.31 Genetic condition, specified (e.g. Tay-Sachs disease; includes inborn errors of metabolism)		1	3.2
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)	**14**		**45.2**
2.1 Not resuscitated (including infants where there is an antenatal plan for no resuscitation at birth or in the circumstance of re-directed care)	13		41.9
2.2 Unsuccessful resuscitation	1		3.2
2.9 Unspecified or not known whether resuscitation attempted	0		0.0
3 Cardio-respiratory disorders	**2**		**6.5**
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	0		0.0
3.4 Pulmonary hypoplasia	2		6.5

3.5 Pulmonary haemorrhage	0		0.0
3.6 Air leak syndromes	0		0.0
3.61 Pneumothorax		0	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	0		0.0
3.91 Neonatal anaemia/hypovolaemia		0	0.0
4 Neonatal Infection	**0**		**0.0**
4.1 Congenital/Perinatal bacterial infection (early onset<48 hrs)	0		0.0
4.11 Blood stream infection/septicaemia		0	0.0
4.111 Positive culture of a pathogen		0	0.0
4.112 Clinical signs of sepsis + ancillary evidence but culture negative		0	0.0
4.12 Bacterial meningitis		0	0.0
4.13 Bacterial pneumonia		0	0.0
4.15 Multiple site bacterial infection		0	0.0
4.18 Other congenital bacterial infection e.g. gastroenteritis, osteomyelitis, cerebral abscess		0	0.0
4.19 Unspecified congenital infection		0	0.0
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).	0		0.0
4.41 Blood stream infection/septicaemia		0	0.0
4.411 Positive culture of a pathogen		0	0.0
4.412 Clinical signs of sepsis + ancillary evidence but culture negative		0	0.0
4.42 Bacterial meningitis		0	0.0
4.43 Bacterial pneumonia		0	0.0
4.48 Other acquired bacterial infection e.g. gastroenteritis, osteomyelitis		0	0.0
4.49 Unspecified acquired infection		0	0.0
4.5 Acquired viral infection	0		0.0
4.6 Acquired fungal, protozoan, parasitic infection	0		0.0
5 Neurological	**4**		**12.9**
5.1 Hypoxic ischaemic encephalopathy/Perinatal asphyxia	1		3.2
5.2 Cranial haemorrhage	2		6.5
5.21 Intraventricular Haemorrhage		2	6.5
5.22 Subgaleal Haemorrhage		0	0.0
5.23 Subarachnoid Haemorrhage		0	0.0
5.24 Subdural Haemorrhage		0	0.0
5.28 Other intracranial haemorrhage		0	0.0
5.3 Post haemorrhagic hydrocephalus	1		3.2
5.4 Periventricular leukomalacia	0		0.0
5.8 Other	0		0.0
6 Gastrointestinal	**2**		**6.5**
6.1 Necrotising enterocolitis (NEC)	1		3.2
6.2 Short gut syndrome	0		0.0
6.3 Gastric or intestinal perforation (excluding NEC)	1		3.2
6.4 Gastrointestinal haemorrhage	0		0.0
6.8 Other	0		0.0
7 Other	**4**		**12.9**
7.1 Sudden unexpected death in infancy (SUDI)	1		3.2
7.11 Sudden Infant Death Syndrome (SIDS)		0	0.0
7.112 SIDS Category IA: Classic features of SIDS present and completely documented.		0	0.0
7.113 SIDS Category IB: Classic features of SIDS present but incompletely documented.		0	0.0
7.114 SIDS Category II: Infant deaths that meet category I except for one or more features.		0	0.0
7.12 Unclassified Sudden Infant Death in the neonatal period		0	0.0
7.121 Bed sharing		1	3.2
7.122 Not bed sharing		0	0.0
7.19 Unknown/Undetermined		0	0.0

7.2 Multisystem failure	3		9.7
7.21 Secondary to intrauterine growth restriction		0	0.0
7.28 Other specified		3	9.7
7.29 Unspecified/undetermined primary cause or trigger event		0	0.0
7.3 Trauma	0		0.0
7.31 Accidental		0	0.0
7.32 Non accidental		0	0.0
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	**31**		**100.0**

Appendix 5

Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC), South Australian adjusted perinatal deaths by birthweight, 2023

	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	22	9	2	4	2	1	9	49	32.9
2	Perinatal infection	0	1	2	0	0	0	2	5	3.4
3	Hypertension	1	1	0	2	0	1	1	6	4.0
4	Antepartum haemorrhage	3	0	1	0	3	3	1	11	7.4
5	Maternal conditions	0	0	0	0	0	0	1	1	0.7
6	Complications of multiple pregnancy	3	0	0	0	0	0	0	3	2.0
7	Specific perinatal conditions	1	1	0	0	0	1	5	8	5.4
8	Hypoxic peripartum death	0	2	0	0	0	0	1	3	2.0
9	Placental dysfunction or causative placental pathology	4	4	1	4	0	3	5	21	14.1
10	Spontaneous preterm labour or rupture of membranes	21	5	3	2	0	0	0	31	20.8
11	Unexplained antepartum death	2	3	0	2	1	1	0	9	6.0
12	Neonatal death without obstetric antecedent	0	0	0	0	0	0	2	2	1.3
	Total	**57**	**26**	**9**	**14**	**6**	**10**	**27**	**149**	**100.0**
	Percent	**38.3**	**17.4**	**6.0**	**9.4**	**4.0**	**6.7**	**18.1**	**100.0**	

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