

## 12. PERINATAL DEATHS

### Review of perinatal deaths 2006

This chapter presents the results of perinatal death reviews carried out by the NSW Maternal and Perinatal Committee, which is a quality assurance committee established under the *NSW Health Administration Act 1982*. The Committee is privileged under the Act to carry out confidential reviews of maternal and perinatal deaths.

NSW Department of Health Policy Directive No. 2006\_006 describes hospital procedures for review and reporting of perinatal deaths.<sup>1</sup> In 2006, the Maternal and Perinatal Committee carried out reviews of perinatal deaths occurring among fetuses or infants of at least 20 weeks gestation or at least 400 grams birth weight, bringing the Committee's review process in line with the criteria used by the NSW Midwives Data Collection (MDC) for reporting of births.

Perinatal deaths in 2006 were reviewed by the Committee's Perinatal Outcomes Working Party. Both stillbirths and neonatal deaths were classified according to an obstetric cause-specific classification, the Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC). Neonatal deaths were also classified by

neonatal cause according to the Perinatal Society of Australia and New Zealand Neonatal Death Classification (PSANZ-NDC).<sup>2</sup>

There were 821 perinatal deaths of at least 20 weeks gestation or at least 400 grams birth weight reported to the MDC in 2006. Confidential reports on 838 deaths were reviewed. Of the 592 stillbirths reported to the MDC, reviews were carried out on 584 (98.6 per cent). The MDC was notified of 229 neonatal deaths. Reviews were carried out on 254 neonatal deaths, which include neonatal deaths that occurred after discharge or transfer from the hospital of birth.

### Causes of perinatal death 2006

Perinatal deaths were classified according to the PSANZ-PDC, which identifies the single most important factor which led to the chain of events which resulted in the death.

#### 1. Congenital abnormality

In 2006, congenital abnormalities were the underlying cause for 186 deaths (Table 154). The most common abnormalities were chromosomal ( $n=50$ , 26.9 per cent). Of these, 17 were trisomy 18, 12 were trisomy 21, 7 were trisomy 13, and 3 were Turner syndrome.

**TABLE 154**

**PERINATAL DEATHS BY PSANZ-PDC CLASSIFICATION AND PERINATAL OUTCOME, NSW 2006**

PSANZ perinatal death classification	Stillbirth		Perinatal outcome Neonatal death		TOTAL	
	No.	%	No.	%	No.	%
<b>Fetal abnormality</b>						
Central nervous system	29	5.0	5	2.0	34	4.1
Cardiovascular system	25	4.3	7	2.8	32	3.8
Urinary system	11	1.9	7	2.8	18	2.1
Gastrointestinal system	4	0.7	5	2.0	9	1.1
Chromosomal	33	5.7	17	6.7	50	6.0
Metabolic	1	0.2	1	0.4	2	0.2
Multiple	16	2.7	13	5.1	29	3.5
Musculoskeletal	3	0.5	2	0.8	5	0.6
Diaphragmatic hernia	1	0.2	0	0.0	1	0.1
Tumours	2	0.3	1	0.4	3	0.4
Other specified	0	0.0	1	0.4	1	0.1
Unspecified	2	0.3	0	0.0	2	0.2
<b>Total</b>	<b>127</b>	<b>21.7</b>	<b>59</b>	<b>23.2</b>	<b>186</b>	<b>22.2</b>
<b>Perinatal infection</b>						
Group B Streptococcus	4	0.7	1	0.4	5	0.6
E Coli	5	0.9	4	1.6	9	1.1
Listeria Monocytogenes	1	0.2	0	0.0	1	0.1
Spirochaetal	1	0.2	3	1.2	4	0.5
Other bacterial	1	0.2	3	1.2	4	0.5
Unspecified bacterial	1	0.2	5	2.0	6	0.7
Cytomegalovirus	0	0.0	2	0.8	2	0.2
Other viral	0	0.0	1	0.4	1	0.1
Unspecified viral	1	0.2	0	0.0	1	0.1
Protozoal eg Toxoplasma	1	0.2	0	0.0	1	0.1
Other unspecified organism	11	1.9	3	1.2	14	1.7
<b>Total</b>	<b>26</b>	<b>4.5</b>	<b>22</b>	<b>8.7</b>	<b>48</b>	<b>5.7</b>

**TABLE 154 (continued)**
**PERINATAL DEATHS BY PSANZ-PDC CLASSIFICATION AND PERINATAL OUTCOME, NSW 2006**

PSANZ perinatal death classification	Stillbirth		Perinatal outcome Neonatal death		TOTAL	
	No.	%	No.	%	No.	%
<b>Hypertension</b>						
Chronic – Essential	4	0.7	0	0.0	4	0.5
Gestational	2	0.3	1	0.4	3	0.4
Pre-eclampsia	13	2.2	3	1.2	16	1.9
Pre-eclampsia superimposed on chronic hypertension	1	0.2	0	0.0	1	0.1
Unspecified hypertension	1	0.2	0	0.0	1	0.1
Total	21	3.6	4	1.6	25	3.0
<b>Antepartum haemorrhage</b>						
Placental abruption	40	6.8	10	3.9	50	6.0
Placenta praevia	1	0.2	3	1.2	4	0.5
Vasa praevia	1	0.2	1	0.4	2	0.2
Other	1	0.2	1	0.4	2	0.2
Undetermined origin	5	0.9	6	2.4	11	1.3
Total	48	8.2	21	8.3	69	8.2
<b>Maternal disease</b>						
Termination of pregnancy for maternal psychosocial indications	2	0.3	0	0.0	2	0.2
Diabetes/gestational diabetes	8	1.4	0	0.0	8	1.0
Maternal Injury	1	0.2	0	0.0	1	0.1
Maternal injury: Accidental	2	0.3	1	0.4	3	0.4
Sepsis	1	0.2	0	0.0	1	0.1
Lupus obstetric syndrome	2	0.3	1	0.4	3	0.4
Other specified	2	0.3	2	0.8	4	0.5
Total	18	3.1	4	1.6	22	2.6
<b>Specific perinatal conditions</b>						
Twin-to-twin transfusion	15	2.6	7	2.8	22	2.6
Fetomaternal haemorrhage	4	0.7	0	0.0	4	0.5
Antepartum cord complications	19	3.3	0	0.0	19	2.3
Uterine abnormality	3	0.5	11	4.3	14	1.7
Birth trauma	0	0.0	1	0.4	1	0.1
Alloimmune disease – Rhesus	0	0.0	1	0.4	1	0.1
Alloimmune disease – Thrombocytopenia	1	0.2	0	0.0	1	0.1
Idiopathic hydrops	9	1.5	2	0.8	11	1.3
Total	51	8.7	22	8.7	73	8.7
<b>Hypoxic peripartum death</b>						
Intrapartum complication – Uterine rupture	2	0.3	1	0.4	3	0.4
Intrapartum complication – Cord prolapse	0	0.0	1	0.4	1	0.1
Intrapartum complication – Shoulder dystocia	1	0.2	0	0.0	1	0.1
Intrapartum complication – Other	1	0.2	1	0.4	2	0.2
Evidence of non-re-assuring fetal status in a normally grown infant	1	0.2	4	1.6	5	0.6
No intrapartum complications and no evidence of non-reassuring fetal status	2	0.3	0	0.0	2	0.2
Unspecified	2	0.3	11	4.3	13	1.6
Total	9	1.5	18	7.1	27	3.2
<b>Fetal growth restriction</b>						
With evidence of reduced vascular perfusion on Doppler studies and/or placental histopathology	26	4.5	4	1.6	30	3.6
With chronic villitis	1	0.2	0	0.0	1	0.1
No placental pathology	7	1.2	1	0.4	8	1.0
No examination of placenta	3	0.5	3	1.2	6	0.7
Other specified placental pathology	5	0.9	1	0.4	6	0.7
Unspecified or not known whether placental examined	2	0.3	0	0.0	2	0.2
Total	44	7.5	9	3.5	53	6.3
<b>Spontaneous preterm</b>						
Intact membranes or membrane rupture less than 24 hours: with chorioamnionitis on placental histopathology	14	2.4	38	15.0	52	6.2
Intact membranes or membrane rupture less than 24 hours: without chorioamnionitis on placental histopathology	23	3.9	11	4.3	34	4.1
Intact membranes or membrane rupture less than 24 hours: with clinical evidence of chorioamnionitis, no examination of placenta	0	0.0	1	0.4	1	0.1
Intact membranes or membrane rupture less than 24 hours: no clinical signs of chorioamnionitis, no examination of placenta	3	0.5	8	3.1	11	1.3

**TABLE 154 (continued)**

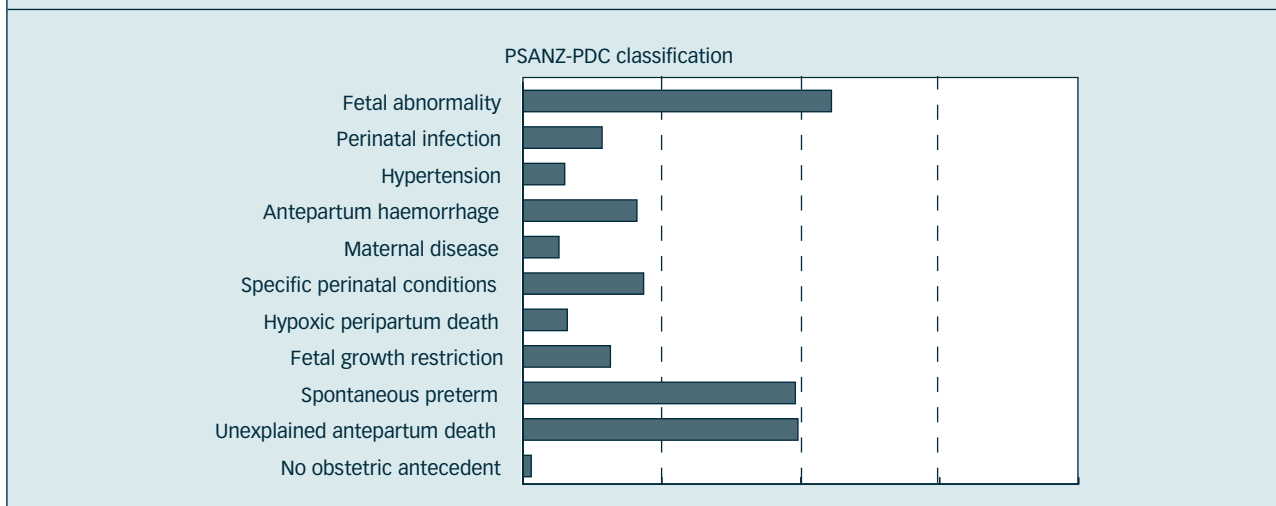
**PERINATAL DEATHS BY PSANZ-PDC CLASSIFICATION AND PERINATAL OUTCOME, NSW 2006**

PSANZ perinatal death classification	Stillbirth		Perinatal outcome Neonatal death		TOTAL	
	No.	%	No.	%	No.	%
Intact membranes or membrane rupture less than 24 hours: unspecified/ unknown placental examination	2	0.3	1	0.4	3	0.4
Membrane rupture 24 hours or more: with chorioamnionitis on placental histopathology	16	2.7	11	4.3	27	3.2
Membrane rupture 24 hours or more: without chorioamnionitis on placental histopathology	3	0.5	4	1.6	7	0.8
Membrane rupture 24 hours or more: no clinical signs of chorioamnionitis, no examination of placenta	0	0.0	3	1.2	3	0.4
Membrane rupture 24 hours or more: unspecified/unknown placental examination	0	0.0	1	0.4	1	0.1
Membrane rupture unknown duration: with chorioamnionitis on placental histopathology	10	1.7	7	2.8	17	2.0
Membrane rupture unknown duration: without chorioamnionitis on placental histopathology	0	0.0	2	0.8	2	0.2
Membrane rupture unknown duration: with clinical evidence of chorioamnionitis, no examination of placenta	0	0.0	1	0.4	1	0.1
Membrane rupture unknown duration: no clinical signs of chorioamnionitis, no examination of placenta	3	0.5	0	0.0	3	0.4
Membrane rupture unknown duration: unspecified/unknown placental examination	0	0.0	2	0.8	2	0.2
<b>Total</b>	<b>74</b>	<b>12.7</b>	<b>90</b>	<b>35.4</b>	<b>164</b>	<b>19.6</b>
<b>Unexplained antepartum death</b>						
With evidence of reduced vascular perfusion on Doppler studies and / or placental histopathology	27	4.6	0	0.0	27	3.2
With chronic villitis	1	0.2	0	0.0	1	0.1
No placental pathology	104	17.8	0	0.0	104	12.4
No examination of placenta	11	1.9	0	0.0	11	1.3
Other specified placental pathology	17	2.9	0	0.0	17	2.0
Unspecified or not known whether placenta examined	6	1.0	0	0.0	6	0.7
<b>Total</b>	<b>166</b>	<b>28.4</b>	<b>0</b>	<b>0.0</b>	<b>166</b>	<b>19.8</b>
<b>No obstetric antecedent</b>						
Sudden Infant Death Syndrome (SIDS)	0	0.0	1	0.4	1	0.1
Postnatally acquired infection	0	0.0	1	0.4	1	0.1
Unknown/unexplained	0	0.0	3	1.2	3	0.4
<b>Total</b>	<b>0</b>	<b>0.0</b>	<b>5</b>	<b>2.0</b>	<b>5</b>	<b>0.6</b>
<b>TOTAL</b>	<b>584</b>	<b>100.0</b>	<b>254</b>	<b>100.0</b>	<b>838</b>	<b>100.0</b>

Source: NSW Maternal and Perinatal Committee, NSW Department of Health.

**FIGURE 18**

**PERINATAL DEATHS BY PSANZ-PDC CLASSIFICATION AND HOSPITAL SERVICE LEVEL, NSW 2006**



Source: NSW Maternal and Perinatal Committee, NSW Department of Health

Thirty-four deaths were associated with abnormalities of the central nervous system (18.3 per cent) and included 13 deaths due to neural tube defects and 8 deaths associated with congenital hydrocephalus. Thirty-two deaths were associated with abnormalities of the cardiovascular system, which included 11 cases of hypoplastic left heart syndrome, 5 cases of transposition of the great vessels, 3 cases of hypoplastic left ventricle and 2 cases of coarctation of the aorta.

Two deaths were associated with arthrogryposis multiplex congenita, and 1 death was associated with congenital diaphragmatic hernia, while 29 deaths were due to multiple abnormalities not associated with a chromosomal abnormality.

## 2. Perinatal infection

Forty-eight deaths (5.7 per cent) were found to be due to infection, of which 26 were stillbirths and 22 were neonatal deaths. For 31 deaths there was an associated chorioamnionitis. The most common infective organism was *Escherichia coli*, which was considered responsible for 9 deaths. Five deaths were caused by group B streptococcus infection. Two perinatal deaths followed congenital cytomegalovirus infection.

## 3. Hypertension

Twenty-five deaths (3.0 per cent) were considered to be due to maternal hypertension. There were 21 stillbirths and 4 neonatal deaths. The majority ( $n=16$ ) occurred in mothers with pre-eclampsia. There were 4 deaths attributed to chronic hypertension, 3 to gestational hypertension, 1 to pre-eclampsia superimposed on pre-existing hypertension, and in 1 case the type of hypertension was not specified.

## 4. Antepartum haemorrhage

Sixty-nine deaths were due to antepartum haemorrhage, of which 50 were due to placental abruption, 4 were due to placenta praevia, and 2 due to vasa praevia. Of the 49 deaths due to placental abruption, 10 were associated with maternal hypertension.

## 5. Maternal disease

Twenty-two deaths were attributed to other maternal conditions including: diabetes ( $n=8$ ), maternal injury ( $n=4$ ), maternal death ( $n=2$ ), and termination of pregnancy ( $n=2$ ).

## 6. Specific perinatal conditions

Twin-to-twin transfusion accounted for 22 of the 73 deaths in this group, followed by antepartum cord complications ( $n=19$ ), uterine abnormality ( $n=14$ ), idiopathic hydrops ( $n=11$ ) and fetomaternal haemorrhage ( $n=4$ ).

## 7. Hypoxic peripartum death

There were 27 deaths associated with peripartum hypoxia. Three deaths followed uterine rupture and one death followed cord prolapse. Five deaths occurred before the onset of labour, 4 during labour and 3 at an unspecified time prior to birth. The remaining 15 deaths occurred in the neonatal period.

## 8. Fetal growth restriction

In 53 cases, the main cause of death was considered to be fetal growth restriction (FGR). Of these, 44 were stillbirths and 9 were neonatal deaths. FGR is defined as less than the tenth percentile of birth weight for gestational age with no major congenital abnormalities. If a maternal or fetal cause of FGR was known then the cause of death was classified to the underlying cause of the FGR. Stillbirths with evidence of maceration were not classified as FGR unless there was evidence of growth restriction on serial ultrasound during pregnancy.

## 9. Spontaneous preterm

There were 164 (19.6 per cent) perinatal deaths associated with spontaneous preterm birth, which comprises normally formed and appropriately grown babies born before 37 weeks gestation. Of these, 74 (45.1 per cent) were stillbirths and 90 (54.9 per cent) were neonatal deaths.

Eighty-one deaths (49.4 per cent) were at less than 23 weeks gestation, 55 (33.5 per cent) were at 23–25 weeks gestation, and 28 (17.1 per cent) occurred between 26 and 36 weeks gestation. Thirty-eight deaths (23.2 per cent) were associated with membrane rupture of 24 hours or more.

## 10. Unexplained antepartum death

Of the 166 unexplained stillbirths, 112 (67.5 per cent) were low birth weight babies and 111 (66.9 per cent) were premature. A variety of associated maternal conditions were reported in this group including: multiple pregnancy (10 deaths), maternal hypertension (6), diabetes (5), and cholestasis (2). Post-mortem examination was carried out in 76 cases (45.8 per cent). Placental histopathology results were provided for 144 unexplained antepartum deaths (86.8 per cent) and evidence of reduced vascular perfusion was found in 27 cases.

## 11. No obstetric antecedent

No obstetric cause of death was identified for 5 neonatal deaths. There was one death due to Sudden Infant Death Syndrome, one death due to postnatally acquired infection and three deaths were unexplained.

## Cause of perinatal death by maternity service level 2005

Maternity service levels are described in the Explanatory Notes of the Methods section (page 17). The majority of perinatal deaths occurred in level 6 hospitals (50.7 per cent, Table 155). The proportion of unexplained intrauterine deaths was substantially lower in level 6 hospitals than other hospitals, possibly due to better access to perinatal post-mortem services. The proportion of deaths associated with congenital abnormalities was highest in level 6 hospitals, reflecting patterns of referral for diagnosis and treatment.

### Time of death 2006

Of the 838 perinatal deaths reviewed for 2006, 372 (44.4 per cent) occurred before the onset of labour, 82 (9.8 per cent) occurred during labour, 138 (16.5 per cent) occurred at an unknown time before birth, and 246 (29.4 per cent) were neonatal deaths.

Of the 82 deaths that occurred during labour, 49 (59.8 per cent) occurred at less than 23 weeks gestation, 18 (22.0 per cent) occurred at 23 to 25 weeks gestation, and 15 (18.3 per cent) occurred at 26 weeks or more.

### Neonatal causes of death

In 2006 extreme prematurity (26 weeks gestation or less) was the most common cause of neonatal death, accounting for over 40 per cent of all neonatal deaths in 2006 (Table 156). Congenital abnormalities were the next most common cause of neonatal death, accounting for about one in five deaths.

### Perinatal deaths associated with maternal drug dependency–abuse 2006

No perinatal deaths were directly attributed to maternal drug dependency or drug abuse. Thirteen deaths occurred among mothers who had a history of drug dependency or abuse, but drug use was not considered to be the main cause of death.

### Post-mortem examination 2006

Post-mortem examination is valuable in ascertaining or confirming the cause of death, identifying additional factors that may have contributed to the death, and counselling parents about the cause of death. Post-mortem examinations were carried out for 284 (33.9 per cent) deaths: 235 stillborn infants (40.2 per cent of all reported stillbirths) and 49 neonatal deaths (19.3 per cent of all reported neonatal deaths). Placental histopathology was carried out in 687 perinatal deaths (82.0 per cent).

### References

1. NSW Department of Health. *Hospital procedures for Review and Reporting of Perinatal Deaths*. Available at [www.health.nsw.gov.au/policies/pd/2006/PD2006\\_006.html](http://www.health.nsw.gov.au/policies/pd/2006/PD2006_006.html).
2. *Perinatal Society of Australia and New Zealand. Clinical Practice Guideline for Perinatal Mortality Audit*. PSANZ, 2005.

**TABLE 155**

**PERINATAL DEATHS BY PSANZ-PDC CLASSIFICATION AND MATERNITY SERVICE LEVEL, NSW 2006#**

PSANZ perinatal death classification	Hospital service level															
	Level 1		Level 2		Level 3		Level 4		Level 5		Level 6		Private		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Fetal abnormality	0	0.0	0	0.0	5	10.0	16	13.3	27	17.6	128	30.1	10	12.0	186	22.2
Perinatal infection	0	0.0	0	0.0	1	2.0	11	9.2	6	3.9	24	5.6	6	7.2	48	5.7
Hypertension	0	0.0	1	16.7	0	0.0	4	3.3	3	2.0	15	3.5	2	2.4	25	3.0
Antepartum haemorrhage	0	0.0	0	0.0	6	12.0	15	12.5	13	8.5	29	6.8	6	7.2	69	8.2
Maternal disease	0	0.0	0	0.0	1	2.0	4	3.3	5	3.3	11	2.6	1	1.2	22	2.6
Specific perinatal conditions	0	0.0	0	0.0	5	10.0	7	5.8	10	6.5	42	9.9	9	10.8	73	8.7
Hypoxic peripartum death	0	0.0	0	0.0	3	6.0	5	4.2	5	3.3	13	3.1	1	1.2	27	3.2
Fetal growth restriction	0	0.0	2	33.3	4	8.0	6	5.0	6	3.9	28	6.6	7	8.4	53	6.3
Spontaneous preterm	0	0.0	2	33.3	4	8.0	22	18.3	31	20.3	88	20.7	17	20.5	164	19.6
Unexplained antepartum death	1	1	16.7	20	40.0	29	24.2	47	30.7	45	10.6	23	27.7	166	19.8	100.0
No obstetric antecedent	0	0.0	0	0.0	1	2.0	1	0.8	0	0.0	2	0.5	1	1.2	5	0.6
<b>TOTAL</b>	<b>1</b>	<b>100.0</b>	<b>6</b>	<b>100.0</b>	<b>50</b>	<b>100.0</b>	<b>120</b>	<b>100.0</b>	<b>153</b>	<b>100.0</b>	<b>425</b>	<b>100.0</b>	<b>83</b>	<b>100.0</b>	<b>838</b>	<b>100.0</b>

Source: NSW Maternal and Perinatal Committee, NSW Department of Health.

# The maternity service level is the service level of the hospital of death.

**TABLE 156****NEONATAL DEATHS BY PSANZ-NDC CLASSIFICATION AND GESTATIONAL AGE, NSW 2006**

PSANZ neonatal death classification	Gestational age (weeks)					
	Less than 37		37 +		TOTAL	
	No.	%	No.	%	No.	%
<b>Congenital abnormality</b>						
Central nervous system	4	2.0	0	0.0	4	1.6
Cardiovascular system	2	1.0	4	7.8	6	2.4
Urinary tract	5	2.5	2	3.9	7	2.8
Gastrointestinal tract	2	1.0	3	5.9	5	2.0
Chromosomal	13	6.4	3	5.9	16	6.3
Metabolic	0	0.0	2	3.9	2	0.8
Multiple	7	3.4	5	9.8	12	4.7
Musculoskeletal	3	1.5	0	0.0	3	1.2
Respiratory	1	0.5	0	0.0	1	0.4
Tumours	1	0.5	0	0.0	1	0.4
Other specified congenital abnormality	0	0.0	1	2.0	1	0.4
Unspecified	1	0.5	0	0.0	1	0.4
Total	39	19.2	20	39.2	59	23.2
<b>Extreme prematurity</b>						
Not resuscitated	69	34.0	0	0.0	69	27.2
Unsuccessful resuscitation	10	4.9	0	0.0	10	3.9
Resuscitation unspecified or unknown	24	11.8	0	0.0	24	9.4
Total	103	50.7	0	0.0	103	40.6
<b>Cardio-respiratory disorders</b>						
Hyaline membrane disease / Respiratory distress syndrome	18	8.9	0	0.0	18	7.1
Meconium aspiration syndrome	0	0.0	4	7.8	4	1.6
Primary persistent pulmonary hypertension	1	0.5	0	0.0	1	0.4
Pulmonary hypoplasia	3	1.5	0	0.0	3	1.2
Other	3	1.5	0	0.0	3	1.2
Total	25	12.3	4	7.8	29	11.4
<b>Infection</b>						
Congenital bacterial	3	1.5	2	3.9	5	2.0
Acquired bacterial	5	2.5	0	0.0	5	2.0
Congenital viral	2	1.0	0	0.0	2	0.8
Unspecified organism	4	2.0	1	2.0	5	2.0
Total	14	6.9	3	5.9	17	6.7
Neurological						
Hypoxic ischaemic encephalopathy / perinatal asphyxia	8	3.9	18	35.3	26	10.2
Intracranial haemorrhage	8	3.9	0	0.0	8	3.1
Total	16	7.9	18	35.3	34	13.4
<b>Gastrointestinal</b>						
Necrotising enterocolitis	3	1.5	0	0.0	3	1.2
Total	3	1.5	0	0.0	3	1.2
<b>Other</b>						
Consistent with SIDS	0	0.0	1	2.0	1	0.4
Trauma	0	0.0	1	2.0	1	0.4
Other specified	3	1.5	0	0.0	3	1.2
Other Unknown/Undetermined	0	0.0	4	7.8	4	1.6
Total	3	1.5	6	11.8	9	3.5
<b>TOTAL</b>	<b>203</b>	<b>100.0</b>	<b>51</b>	<b>100.0</b>	<b>254</b>	<b>100.0</b>

Source: NSW Maternal and Perinatal Committee, NSW Department of Health.