ACT Government
Health

## Report of the
## ACT Perinatal Mortality Committee

# Perinatal Mortality in the ACT 2006-2010

## Health Series
## Number 61


**Epidemiology Section**
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**Population Health Division**



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Thanks also to the midwives who provided information for this report by completing the ACT Perinatal Death Forms.

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## CHAIRPERSON'S REPORT

We are pleased to produce the second report from the ACT Perinatal Mortality Committee (ACT PMC), and I would like to thank the members for their ongoing participation and enthusiasm. The Committee meets two to three times per year and now reports to the ACT Health Quality and Safety Committee each year, previously the ACT Clinical Audit Committee.

The ACT PMC developed from a few enthusiastic clinicians in 2002 who recognised the importance of collecting perinatal mortality data to allow accurate reporting and comparisons of perinatal deaths within the ACT and nationally. The committee now consists of a maternal-fetal medicine specialist, pathologist, neonatologist, representative midwives from each hospital in the Territory and a representative from the Epidemiology Section, Health Improvement Branch.

The ACT PMC classifies all perinatal deaths in the ACT using the Perinatal Society of Australia and New Zealand - Perinatal Death Classification (PSANZ-PDC) and the Perinatal Society of Australia and New Zealand - Neonatal Death Classification (PSANZ-NDC) (APPENDIX C). The majority of members are active in the Perinatal Society of Australia and New Zealand (PSANZ) Perinatal Mortality Special Interest Group, which continues to refine these classifications and implement their use throughout Australia.

As the ACT is a small territory, the ACT PMC has the ability to review all perinatal deaths within the ACT and classify them according to the PSANZ classification systems. Due to the small number of deaths, a five-year report is felt to be the most appropriate timeframe to examine perinatal deaths in the Territory.

I would like to acknowledge and thank the staff of the ACT Health's Epidemiology Section for their ongoing support in producing this report and assistance in maintaining the perinatal mortality database.

Associate Professor Alison Kent
Chairperson, ACT Perinatal Mortality Committee

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| | |
|---|---|
| ABS | Australian Bureau of Statistics |
| ACT | Australian Capital Territory |
| ACT CAC | ACT Clinical Audit Committee |
| ACT MPDC | ACT Maternal and Perinatal Data Collection |
| ACT PMC | ACT Perinatal Mortality Committee |
| AIHW | Australian Institute of Health and Welfare |
| ANU | Australian National University |
| ANZ | Australian and New Zealand |
| CI | Confidence Interval |
| Dept | Department |
| ICD-10-AM | International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian modification |
| NSW | New South Wales |
| PSANZ | Perinatal Society of Australia and New Zealand |
| PSANZ-NDC | Perinatal Society of Australia and New Zealand - Neonatal Death Classification |
| PSANZ-PDC | Perinatal Society of Australia and New Zealand - Perinatal Death Classification |
| PSANZ-PMC | Perinatal Society of Australia and New Zealand - Perinatal Mortality Classification |
| RM | Registered midwife |
| SPSS | Statistical Program for Social Scientists |
| TOP | Terminations of Pregnancy |
| WHO | World Health Organization |

# 1. EXECUTIVE SUMMARY

During the period 2006 to 2010, there were 377 perinatal deaths, of which 250 (66.3%) were for ACT residents. The ACT resident perinatal mortality rate was 10.5 per 1,000 total births. The ACT resident fetal death rate was 7.9 per 1,000 total births and the ACT resident neonatal mortality rate 2.6 per 1,000 live births.

It is important to note that perinatal mortality rates in the ACT fluctuate from year to year due to the small number of these deaths each year. With such small numbers a single event, for example the fetal or neonatal death of triplets, can substantially elevate mortality rates.

The main cause of perinatal death was congenital abnormality (21.6%). Spontaneous preterm birth was the next most common cause accounting for 17.6% of perinatal deaths. Specific perinatal conditions accounted for 16% of perinatal deaths. Fetal growth restriction and unexplained antepartum death each accounted for 14% of perinatal deaths.

The most common cause of fetal death was congenital abnormality (20.2%). Unexplained antepartum death accounted for 18.6% of fetal deaths and specific perinatal conditions accounted for 18.1% of fetal deaths. The most common causes of neonatal death were spontaneous preterm birth (38.7%) and congenital abnormality (25.8%).

Preterm delivery (less than 37 weeks gestation) occurred in 7.0% of all births, and 76.8% of perinatal deaths. Extreme prematurity (less than 28 weeks gestation) occurred in 57.6% of perinatal deaths, but only 0.8% of all births.

Multiple births accounted for 10.8% of all perinatal deaths. The perinatal mortality rate for multiple births was 33.6 per 1,000 births in comparison to 9.7 per 1,000 singleton births. The number of perinatal deaths associated with Twin to Twin Transfusion Syndrome has reduced from 12 cases in the 2001-2005 report to a single case in this report.

Perinatal mortality and fetal death rates for women aged 40 years or more were significantly higher than the rates for women aged 20 to 39 years.

The rate of perinatal autopsy for the ACT for 2006-2010 was 53.5%. Although this rate compares favourably with other states of Australia, it continues to be lower than the 75% recommended by the Royal College of Obstetricians and Gynaecologists and the Royal College of Pathologists.

There were no significant differences between fetal death rates and perinatal mortality rates for the ACT and Australia between 2006 and 2010 for either the annual rates or for the five-year combined rates. However, statistical testing between the main causes of perinatal deaths between Australia and the ACT showed that the ACT rate for maternal conditions was significantly lower than the Australian rate and the ACT rate for specific perinatal conditions and fetal growth restriction were significantly higher than the Australian rate.

# 2. RECOMMENDATIONS

## 2.1 Congenital abnormalities

The ACT continues to maintain data on congenital abnormalities as a cause of perinatal death, and supports the development of a nation-wide register and epidemiological investigation of congenital anomalies to enable state and territory comparisons.

## 2.2 Unexplained antepartum death and fetal growth restriction

Unexplained antepartum death causes significant anguish to families, and the ACT should continue to encourage research into the causes of unexplained antepartum death.

Unidentified fetal growth restriction continues to be a significant factor in perinatal deaths. The rate of perinatal deaths due to fetal growth restriction was significantly higher in the ACT compared with Australia, this may be a reflection of more accurate post-event reporting. However, improved clinical education and research into reducing unidentified fetal growth restriction has the potential to reduce perinatal deaths.

## 2.3 Perinatal autopsy

A high perinatal autopsy rate improves the accuracy of classification of causes of perinatal deaths, as well as the information provided to parents. All parents should be offered the option of an autopsy following a perinatal death. Adequate explanations and written material should be available to assist them with this decision.

All clinical staff involved in perinatal care should be aware of the value of perinatal autopsy.

Clinical practice guidelines for perinatal autopsy and audit should be available for all perinatal clinical care providers. Access to educational material such as the IMPROVE (Improving Perinatal Mortality Review & Outcomes Via Education) course should be encouraged for all staff involved in perinatal care.

ACT Health must ensure that a high standard of perinatal autopsy is always available and should strive to achieve high autopsy rates with results being available within six to eight weeks. This enables appropriate counselling to be provided to parents and a high standard of perinatal audit conducted. An audit of the time to provide autopsy results may be useful to indicate service improvement or provision required in this area.

## 2.4 General recommendations

ACT Health is encouraged to provide data administration support to the ACT PMC and to incorporate collection of perinatal data electronically in order to improve data quality.

# 3. INTRODUCTION

This is the second report of the ACT Perinatal Mortality Committee (ACT PMC), which was established in 2002. This report reviews data on perinatal mortality in the ACT for the years 2006 to 2010.

Perinatal mortality rates are an indicator of the health status of a given population. The rate of perinatal deaths reflects the risk in the population of a fetus being stillborn or not surviving beyond 28 days of life.

## 3.1 Purpose of the ACT Perinatal Mortality Committee

To provide advice to ACT Health, through the ACT Health Quality and Safety Committee (previously the ACT Clinical Audit Committee), on matters that relate to perinatal mortality in the ACT each year.

## 3.2 Terms of reference

This committee is a sub-committee of the ACT Maternal Perinatal Information Network Committee.

The membership should consist of:

- An obstetrician with involvement in high-risk pregnancy and fetal medicine;
- A pathologist with involvement in perinatal pathology;
- A neonatologist;
- Midwifery representatives from all delivery campuses;
- Epidemiology Section representative; and
- Any other members the committee feels are appropriate.

The role of the committee is to:

- Review all perinatal deaths within the ACT;
- Classify all deaths according to the PSANZ classification system;
- Provide an annual report to ACT Health Quality and Safety Committee; and
- Provide a five-year public health report for the ACT on perinatal mortality.

## 3.3 Provision of data for statistical and research purposes

The ACT PMC has collected information on all perinatal deaths in the ACT from 20 weeks gestation since 2001. The Committee is able to release information from the database provided that it does not endanger the confidentiality of families.

ACT Health generally does not publish tables with less than five individuals in each category. However, due to the small number of perinatal deaths each year in the ACT, permission was sought and granted from the ACT Chief Health Officer to publish tables with small numbers in this report.

The Committee reviews all requests for information. Formal research projects must conform to the National Health and Medical Research Council Guidelines, and be approved by the ACT Human Research Ethics Committee.

## 3.4 Membership

**Membership of the ACT Perinatal Mortality Committee**

| | |
|---|---|
| Assoc. Professor Alison Kent (Chairperson) | Dept of Neonatology, Canberra Hospital, Australian National University |
| Ms Louise Freebairn | Epidemiology Section, ACT Health |
| Professor Jane Dahlstrom | Dept of Anatomical Pathology, Canberra Hospital, Australian National University |
| Professor David Ellwood | Professor of Obstetrics and Gynaecology, Canberra Hospital, Australian National University |
| RM Dianne Deer | Clinical Nurse Consultant, Calvary John James Hospital |
| RM Diana Wing | Clinical Nurse Consultant, Canberra Hospital |
| RM Elizabeth Bishop | Clinical Nurse Consultant, Calvary Hospital Bruce |

# 4. METHODS

## 4.1 Scope

There are four hospitals (two public and two private) in the ACT providing maternity services to ACT residents and residents of the surrounding regions of NSW. During 2006-10, 16.3% of babies born in the ACT were not usual residents of the ACT. Many of these babies were those of women who were referred to ACT hospitals for tertiary level maternal and neonatal care at the Canberra Hospital during high-risk pregnancies and births.

This is reflected in the percentage of perinatal deaths for babies of women who are not ACT residents. During 2006 to 2010, one third (33.7%) of perinatal deaths that occurred in the ACT were for non-ACT residents (Table 1).

Perinatal deaths for both ACT and non-ACT residents are routinely monitored and reviewed. Each hospital performs their own morbidity and mortality review of perinatal deaths. A confidential form is completed on each perinatal death in the ACT and forwarded to the ACT Perinatal Mortality Committee (ACT PMC). An annual presentation is made to ACT Health Quality and Safety Committee of perinatal deaths and recommendations are implemented as required.

**Table 1: Perinatal deaths by state of residence, ACT, 2001-10**

| | | Fetal death | | Neonatal death | | Perinatal death | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % |
| 2001 to 2005 | ACT residents | 154 | 75.5 | 63 | 53.8 | 217 | 67.6 |
| | Non ACT residents | 50 | 24.5 | 54 | 46.2 | 104 | 32.4 |
| | **Total** | **204** | **100.0** | **117** | **100.0** | **321** | **100.0** |
| 2006 to 2010 | ACT residents | 188 | 72.3 | 62 | 53.0 | 250 | 66.3 |
| | Non ACT residents | 72 | 27.7 | 55 | 47.0 | 127 | 33.7 |
| | **Total** | **260** | **100.0** | **117** | **100.0** | **377** | **100.0** |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Note: Annual data are presented in Table 20.

This report includes perinatal deaths for babies of ACT residents where the birth occurred in the ACT. It does not include ACT residents who gave birth outside the ACT; however this number is small each year. For example, during 2010 only 69 of the 4,969 ACT resident women who gave birth did so in other jurisdictions (1.4%).[1]

Residents from other jurisdictions have been excluded to allow population based analysis.

## 4.2 Clinical classification

All perinatal deaths are classified according to the primary cause of death using the Perinatal Society of Australia and New Zealand - Perinatal Death Classification (PSANZ-PDC)[1] and the Perinatal Society of Australia and New Zealand - Neonatal Death Classification (PSANZ-NDC). The use of this system allows comparison of perinatal deaths across Australia, ensuring that the aetiology of perinatal deaths is considered, identification of potential preventable factors occurs, and possible areas of research in perinatal mortality are identified.

## 4.3 Data collection

The major source of data is the ACT Confidential Report on Perinatal Death Forms (Appendix B), which includes placental pathology and autopsy details. Data is cross-referenced with that from the ACT Maternal Perinatal Data Collection, the ACT Admitted Patient Care data collection and the ACT Australian Bureau of Statistics (ABS) deaths data when available.

All perinatal deaths occurring at The Canberra Hospital have forms completed by the Chairperson of the ACT Perinatal Mortality Committee. For perinatal deaths occurring at the other ACT hospitals, the forms are completed by the midwifery representatives or a designated person and sent to the Chairperson of the Perinatal Mortality Committee. The committee meets twice yearly to review and classify all cases.

The ACT Maternal and Perinatal Data Collection (ACT MPDC) collects information and reports on live births and fetal deaths of at least 20 weeks gestation or at least 400 grams in birthweight in the ACT. Data are collected on births that occur in hospitals, birth centres and in the community. These data are validated against the ACT Admitted Patient Care Data Collection and ABS Deaths data to ensure quality and completeness. The ACT MPDC is provided to the National Perinatal Data Collection for national reporting.

The ABS perinatal death data includes perinatal deaths registered with Birth, Deaths and Marriages in each of the states and territories in Australia. These data are reported annually by the ABS by the mother's usual state of residence. The ABS no longer publishes perinatal deaths separately for the ACT.

## 4.4 Statistical analysis

The analysis for this report was conducted using an SPSS 18.0 syntax file. Mortality rates and confidence intervals were calculated in Excel 2007.

Results described as statistically significant are significant at the $p<0.05$ level and where appropriate, confidence intervals are included in the report. A confidence interval is a computed interval with a given probability (95% in this report) that the true value of a statistic, such as a rate, mean or proportion is contained within the interval. When the confidence intervals of two estimated values do not overlap, the values are statistically different.

Differences between means (averages) were assessed using t-tests. The t-test assesses whether the means of two groups are statistically different from each other. Results were evaluated at the $p<0.05$ level.

Due to the rounding of percentages some percentage totals may not add up to 100%. However, the total is still displayed in the table as 100.

## 4.5 Definitions

### Fetal death

Also known as stillbirth, fetal death is defined in the Registrar of Births, Deaths and Marriages Act, 1962 as:

> *"a child whose heart has not beaten after it has been completely expelled or extracted from its mother and who is either of not less than 20 weeks gestation or of not less than 400g by weight at birth".*

### Fetal death rate

The number of fetal deaths per 1,000 total births.

### Live birth

A live birth is defined in the Registration of Births, Deaths and Marriages Act, 1962 as:

> *"a child whose heart has beaten after it has been completely expelled or extracted from its mother".*

### Neonatal death

The death of an infant within 28 days of birth.

### Neonatal mortality rate

The number of deaths of live born infants under 28 days of age per 10,000 live births.

### Infant death

The death of a live born infant under one year of age and includes neonatal deaths and post-neonatal deaths up to 1 year.

### Infant mortality rate

The number of deaths of infants under 1 year of age per 1,000 live births.

### Perinatal death

Refers to a fetal death or a neonatal death.

### Perinatal mortality rate

The number of fetal and neonatal deaths per 1,000 total births.

# 5. PERINATAL MORTALITY RATES AND TRENDS

## 5.1 Perinatal mortality rates

The perinatal mortality rate for the ACT over the five-year period from 2006 to 2010 was 10.5 per 1,000 total births. This comprised a fetal death rate of 7.9 per 1,000 total births and a neonatal mortality rate of 2.6 per 1,000 live births.

The mortality rates in Table 2 include babies born with a birthweight of less than 400 grams who were born at 20 weeks gestation or more, as these are included in the Perinatal National Minimum Dataset. However, these babies have a high risk of death and during this time period none survived. When these cases are excluded, the perinatal mortality rate decreases to 7.5 per 1,000 total births (see Section 6).

**Table 2: Fetal, neonatal and perinatal deaths, ACT residents, 2006-10**

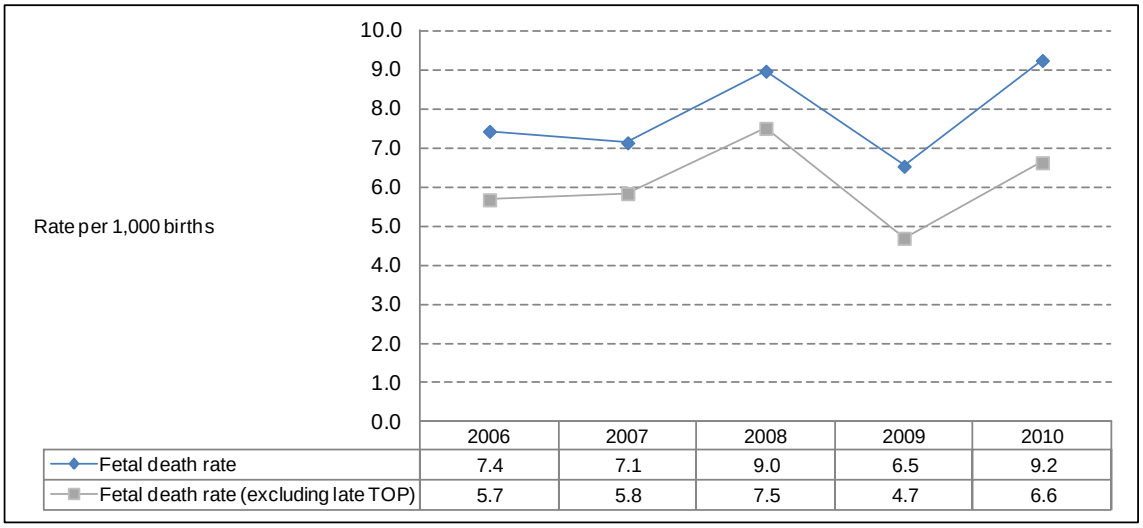
| Birth | Total | Live | Fetal deaths | | | Neonatal deaths | | | Perinatal deaths | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| year | births | births | No. | Rate | 95% CI | No. | Rate | 95% CI | No. | Rate | 95% CI |
| 2006 | 4,576 | 4,542 | 34 | 7.4 | (5.0 - 10.0) | 17 | 3.7 | (2.0 - 5.5) | 51 | 11.2 | (8.1 - 14.2) |
| 2007 | 4,623 | 4,590 | 33 | 7.1 | (4.7 - 9.6) | 14 | 3.1 | (1.5 - 4.7) | 47 | 10.2 | (7.3 - 13.1) |
| 2008 | 4,796 | 4,753 | 43 | 9.0 | (6.3 - 11.6) | 15 | 3.2 | (1.6 - 4.8) | 58 | 12.1 | (9.0 - 15.2) |
| 2009 | 4,895 | 4,863 | 32 | 6.5 | (4.3 - 8.8) | 4 | 0.8 | (0.0 - 1.6) | 36 | 7.4 | (5.0 - 9.8) |
| 2010 | 4,978 | 4,932 | 46 | 9.2 | (6.6 - 11.9) | 12 | 2.4 | (1.1 - 3.8) | 58 | 11.7 | (8.7 - 14.7) |
| **Total** | **23,868** | **23,680** | **188** | **7.9** | **(6.8 - 9.0)** | **62** | **2.6** | **(2.0 - 3.3)** | **250** | **10.5** | **(9.2 - 11.8)** |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health and ACT Perinatal Deaths Data Collection, ACT Health
Notes: Fetal death rates and perinatal death rates are per 1,000 births. Neonatal death rates are per 1,000 live births.

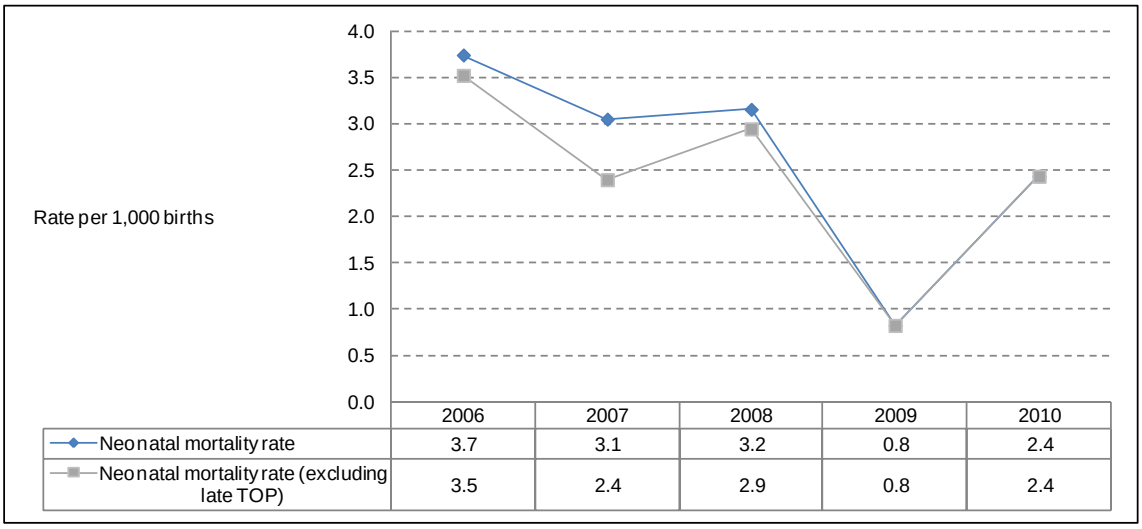
Late terminations of pregnancy (terminations at 20 weeks gestation or more) for congenital abnormalities contribute to the perinatal mortality rate. There were 48 late terminations in the ACT between 2006 and 2010. The Canberra Hospital is currently the only hospital that performs late terminations for congenital abnormalities in the ACT.

When late terminations of pregnancy are removed, the perinatal death rate decreases to 8.5 per 1,000 births. Figure 1 compares the fetal, neonatal and perinatal mortality rates for ACT residents from 2006 to 2010.

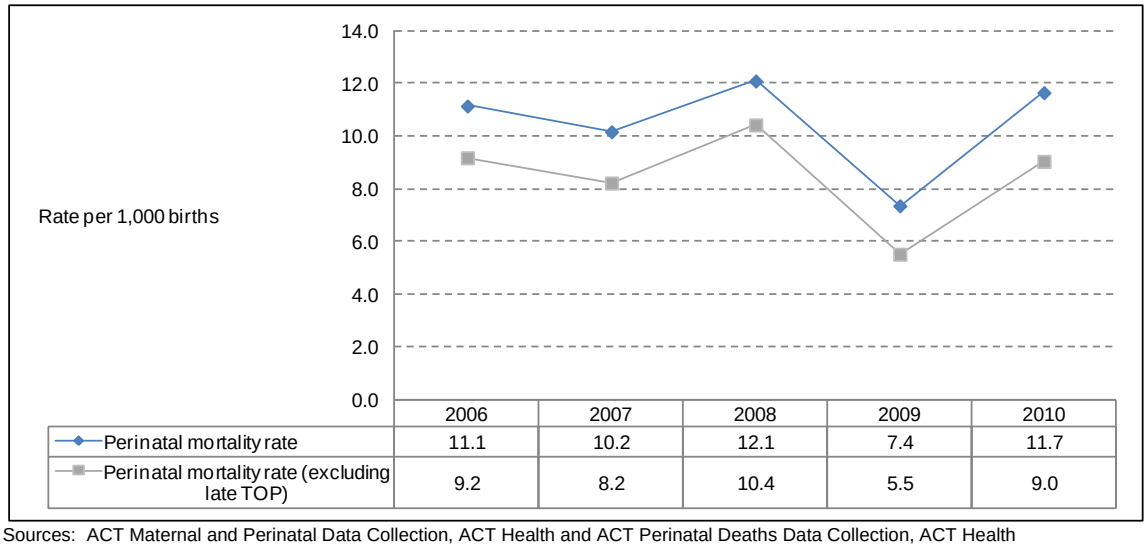
## Figure 1: Fetal, neonatal and perinatal mortality rates corrected for late terminations, ACT residents, 2006-10




| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fetal death rate | 7.4 | 7.1 | 9.0 | 6.5 | 9.2 |
| Fetal death rate (excluding late TOP) | 5.7 | 5.8 | 7.5 | 4.7 | 6.6 |




| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Neonatal mortality rate | 3.7 | 3.1 | 3.2 | 0.8 | 2.4 |
| Neonatal mortality rate (excluding late TOP) | 3.5 | 2.4 | 2.9 | 0.8 | 2.4 |




| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Perinatal mortality rate | 11.1 | 10.2 | 12.1 | 7.4 | 11.7 |
| Perinatal mortality rate (excluding late TOP) | 9.2 | 8.2 | 10.4 | 5.5 | 9.0 |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health and ACT Perinatal Deaths Data Collection, ACT Health
Note: TOP refers to Terminations of Pregnancy.

## 5.2 Antecedent cause of perinatal mortality

The main causes of perinatal mortality using the Perinatal Society of Australia and New Zealand - Perinatal Death Classification (PSANZ-PDC) system are presented in Table 3. The five leading causes of perinatal deaths were: congenital abnormality, spontaneous preterm birth, specific perinatal conditions, fetal growth restriction and unexplained antepartum death. These are discussed in more detail below. There were no significant differences in the rates of perinatal deaths by antecedent cause between 2001-05 and 2006-10.

**Table 3: Perinatal death by antecedent cause of death, ACT, 2006-10**

| | Fetal deaths | | | Neonatal deaths | | | Perinatal deaths | | |
|---|---|---|---|---|---|---|---|---|---|
| PSANZ-PDC | No. | % | Rate | No. | % | Rate | No. | % | Rate |
| Congenital abnormality | 38 | 20.2 | 1.6 | 16 | 25.8 | 0.7 | 54 | 21.6 | 2.3 |
| Perinatal infection | 5 | 2.7 | 0.2 | 0 | 0.0 | 0.0 | 5 | 2.0 | 0.2 |
| Hypertension | 4 | 2.1 | 0.2 | 2 | 3.2 | 0.1 | 6 | 2.4 | 0.3 |
| Antepartum haemorrhage | 13 | 6.9 | 0.5 | 9 | 14.5 | 0.4 | 22 | 8.8 | 0.9 |
| Maternal conditions | 3 | 1.6 | 0.1 | 1 | 1.6 | 0.0 | 4 | 1.6 | 0.2 |
| Specific perinatal conditions | 34 | 18.1 | 1.4 | 6 | 9.7 | 0.3 | 40 | 16.0 | 1.7 |
| Hypoxic peripartum deaths | 3 | 1.6 | 0.1 | 1 | 1.6 | 0.0 | 4 | 1.6 | 0.2 |
| Fetal growth restriction | 33 | 17.6 | 1.4 | 2 | 3.2 | 0.1 | 35 | 14.0 | 1.5 |
| Spontaneous preterm | 20 | 10.6 | 0.8 | 24 | 38.7 | 1.0 | 44 | 17.6 | 1.8 |
| Unexplained antepartum death | 35 | 18.6 | 1.5 | 0 | 0.0 | 0.0 | 35 | 14.0 | 1.5 |
| No obstetric antecedent | 0 | 0.0 | 0.0 | 1 | 1.6 | 0.0 | 1 | 0.4 | 0.0 |
| **Total** | **188** | **100.0** | **7.9** | **62** | **100.0** | **2.6** | **250** | **100.0** | **10.5** |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health and ACT Perinatal Deaths Data Collection, ACT Health
Notes: Fetal death rates and perinatal death rates are per 1,000 births. Neonatal death rates are per 1,000 live births.
PSANZ-PDC refers to Perinatal Society of Australia and New Zealand - Perinatal Death Classification.

Of the 54 perinatal deaths attributed to congenital abnormalities 38 were fetal deaths and 16 neonatal deaths. The most frequent congenital abnormalities were chromosomal (35.2%; 19), musculoskeletal (16.7%; 9) and central nervous system (14.8%; 8).

There were 35 unexplained antepartum deaths contributing to 14% of perinatal deaths. Fourteen (40%) of these perinatal deaths occurred at less than 28 weeks gestation, 10 (28.6%) occurred between 28 to 36 weeks gestation and 11 (31.4%) at 37 weeks or more gestation. Uteroplacental insufficiency was seen in the placental pathology of two (5.7%) of these perinatal deaths.

Spontaneous preterm birth was the third most common cause of perinatal death identified during this period, contributing to 17.6% of cases.

Of the 40 deaths attributed to specific perinatal conditions, antepartum cord complications accounted for 60% (24 deaths). Uterine abnormalities including cervical incompetence were attributed to five of the deaths. The remainder were as a consequence of feto-maternal haemorrhage, idiopathic hydrops fetalis, twin-twin transfusion syndrome and other causes.

Placental abruption and other antepartum haemorrhage were the diagnoses in the majority of antepartum haemorrhage deaths (eight and nine respectively of 22).

Perinatal infection contributed to 2.0% of perinatal deaths. Group B streptococcus and Escherischia coli accounted for the majority of infections.

## 5.3 Perinatal mortality by gestational age and birthweight

Two important factors determining a baby's health are birthweight and gestational age. Infants with extremely low birthweight and gestational age have a high risk of perinatal death.

Preterm births (those that are delivered at less than 37 weeks gestation) accounted for 7.0% of all births and 76.8% of perinatal deaths. Very preterm births (those that delivered at less than 28 weeks gestation) accounted for 0.8% of all births and 57.6% of all perinatal deaths.

The risk of perinatal death at term (deliveries at 37 weeks gestation or more) was 2.6 per 1,000 total births compared with 791.2 per 1,000 births for babies born at less than 28 weeks gestation. The four main causes of perinatal death for babies born at 37 weeks gestation or more were specific perinatal conditions, fetal growth restriction, unexplained antepartum death and antepartum haemorrhage.

**Table 4: Perinatal deaths by cause and gestational age, ACT, 2006-10**

| | Gestational age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 to 27 weeks | | 28 to 36 weeks | | 37 weeks or more | | Total | |
| PSANZ-PDC | No. | % | No. | % | No. | % | No. | % |
| Congenital abnormality | 42 | 29.2 | 9 | 18.8 | 3 | 5.2 | 54 | 21.6 |
| Perinatal infection | 1 | 0.7 | 0 | 0.0 | 4 | 6.9 | 5 | 2.0 |
| Hypertension | 1 | 0.7 | 5 | 10.4 | 0 | 0.0 | 6 | 2.4 |
| Antepartum haemorrhage | 14 | 9.7 | 3 | 6.3 | 5 | 8.6 | 22 | 8.8 |
| Maternal conditions | 2 | 1.4 | 0 | 0.0 | 2 | 3.4 | 4 | 1.6 |
| Specific perinatal conditions | 15 | 10.4 | 7 | 14.6 | 18 | 31.0 | 40 | 16.0 |
| Hypoxic peripartum deaths | 0 | 0.0 | 2 | 4.2 | 2 | 3.4 | 4 | 1.6 |
| Fetal growth restriction | 13 | 9.0 | 10 | 20.8 | 12 | 20.7 | 35 | 14.0 |
| Spontaneous preterm | 42 | 29.2 | 2 | 4.2 | 0 | 0.0 | 44 | 17.6 |
| Unexplained antepartum death | 14 | 9.7 | 10 | 20.8 | 11 | 19.0 | 35 | 14.0 |
| No obstetric antecedent | 0 | 0.0 | 0 | 0.0 | 1 | 1.7 | 1 | 0.4 |
| **Total** | **144** | **100.0** | **48** | **100.0** | **58** | **100.0** | **250** | **100.0** |
| **Rate per 1,000 births** | **791.2** | | **32.1** | | **2.6** | | **10.5** | |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health and ACT Perinatal Deaths Data Collection, ACT Health
Notes: Due to the rounding of percentages totals may not equal 100%.
PSANZ-PDC refers to Perinatal Society of Australia and New Zealand - Perinatal Death Classification

Low birthweight babies (those with a birthweight less than 2,500 grams) accounted for 5.9% of all births and 79.4% of all perinatal deaths. Infants with birthweight less than 1,000 grams (0.8% of all births) accounted for 61.2% of perinatal deaths.

The perinatal mortality rate for babies with a birthweight less than 1,000 grams was 826.1 per 1,000 births compared with 2.3 per 1,000 births for babies weighing over 2,500 grams.

A review of term perinatal deaths was performed between the two five-year reporting periods. The proportion of term deaths has remained consistent, 22.1% and 23.2% between 2001-05 and 2006-10 respectively. However, the causes of perinatal deaths have changed between these time periods. Perinatal deaths classified according to specific perinatal conditions have increased from 12.5% to 31.0% and fetal growth restriction from 14.6% to 20.7%. The number of unexplained antepartum deaths remained similar with 16.7% and 19.0% respectively for the two time periods. Many of the specific perinatal conditions resulting in perinatal death are not avoidable (e.g. feto-maternal haemorrhage, cord complications and hydrops fetalis), however unrecognised fetal growth restriction is a potentially avoidable event.

### Table 5: Perinatal deaths by cause and birthweight, ACT, 2006-10

| | Birthweight | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Less than 1,000 grams | | 1,000 to 2,499 grams | | 2,500 grams or more | | Total | |
| PSANZ-PDC | No. | % | No. | % | No. | % | No. | % |
| Congenital abnormality | 44 | 28.9 | 7 | 15.6 | 3 | 5.9 | 54 | 21.8 |
| Perinatal infection | 1 | 0.7 | 0 | 0.0 | 4 | 7.8 | 5 | 2.0 |
| Hypertension | 3 | 2.0 | 3 | 6.7 | 0 | 0.0 | 6 | 2.4 |
| Antepartum haemorrhage | 13 | 8.6 | 3 | 6.7 | 6 | 11.8 | 22 | 8.9 |
| Maternal conditions | 2 | 1.3 | 0 | 0.0 | 2 | 3.9 | 4 | 1.6 |
| Specific perinatal conditions | 17 | 11.2 | 5 | 11.1 | 18 | 35.3 | 40 | 16.1 |
| Hypoxic peripartum deaths | 0 | 0.0 | 3 | 6.7 | 1 | 2.0 | 4 | 1.6 |
| Fetal growth restriction | 19 | 12.5 | 12 | 26.7 | 4 | 7.8 | 35 | 14.1 |
| Spontaneous preterm | 40 | 26.3 | 4 | 8.9 | 0 | 0.0 | 44 | 17.7 |
| Unexplained antepartum death | 13 | 8.6 | 8 | 17.8 | 12 | 23.5 | 33 | 13.3 |
| No obstetric antecedent | 0 | 0.0 | 0 | 0.0 | 1 | 2.0 | 1 | 0.4 |
| **Total** | **152** | **100.0** | **45** | **100.0** | **51** | **100.0** | **248** | **100.0** |
| **Rate per 1,000 births** | **826.1** | | **36.6** | | **2.3** | | **10.4** | |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health and ACT Perinatal Deaths Data Collection, ACT Health
Notes: There were two perinatal deaths cases where birthweight was not recorded.
Due to the rounding of percentages totals may not equal 100%.
PSANZ-PDC refers to Perinatal Society of Australia and New Zealand - Perinatal Death Classification.

## 5.4 Fetal deaths by birthweight and gestational age

There were 188 fetal deaths (fetal death in-utero or intrapartum death) between 2006 and 2010 (Table 6). The majority of fetal deaths occurred where the fetus weighed less than 2,500 grams (78.0%) and/or was less than 37 weeks gestation (74.4%). Two fetal deaths in-utero were associated with maternal hypertension.

### Table 6: Fetal deaths by birthweight and gestational age, ACT, 2006-10

| | | No. | % |
|---|---|---|---|
| **Birthweight** | Less than 1,000 grams | 116 | 62.4 |
| | 1,000 to 2,499 grams | 29 | 15.6 |
| | 2,500 grams or more | 41 | 22.0 |
| | **Total** | **186** | **100.0** |
| **Gestational age** | Less than 28 weeks gestation | 105 | 55.9 |
| | 28 to 36 weeks gestation | 35 | 18.6 |
| | 37 weeks gestation or more | 48 | 25.5 |
| | **Total** | **188** | **100.0** |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Notes: There were two perinatal deaths cases where birthweight was not recorded. Due to the rounding of percentages totals may not equal 100%.

## 5.5 Neonatal mortality

Neonatal deaths were classified using the Perinatal Society of Australia and New Zealand - Neonatal Death Classification[1] (PSANZ-NDC) system. The most frequent cause of neonatal deaths was extreme prematurity (38.7%) followed by congenital abnormalities (24.2%) and neurological disorders (19.4%) (Table 7). These are discussed in more detail below.

There were 26.2 neonatal deaths per 10,000 ACT resident live births during 2006 to 2010. There were 10.1 neonatal deaths per 10,000 live births due to extreme prematurity, 6.3 per 10,000 live births due to congenital abnormalities, and 5.1 per 10,000 live births due to neurological conditions.

**Table 7: Neonatal deaths by cause, ACT, 2006-10**

| PSANZ-NDC | No. | % | Rate |
|---|---|---|---|
| Congenital abnormality | 15 | 24.2 | 6.3 |
| Extreme prematurity | 24 | 38.7 | 10.1 |
| Cardio-respiratory disorders | 6 | 9.7 | 2.5 |
| Infection | 4 | 6.4 | 1.7 |
| Neurological | 12 | 19.4 | 5.1 |
| Gastrointestinal | 0 | 0 | 0.0 |
| Other | 1 | 1.6 | 0.4 |
| **Total** | **62** | **100.0** | **26.2** |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Notes: Rate is per 10,000 live births.
PSANZ-NDC refers to Perinatal Society of Australia and New Zealand - Neonatal Death Classification.

Twenty four neonatal deaths were due to extreme prematurity (these are infants less than 24 weeks gestation and less than 600 grams birthweight). Of these deaths 22 were considered pre-viable and were not resuscitated. Two infants had unsuccessful resuscitation attempts.

Of the 12 neonatal deaths attributable to neurological conditions, nine were due to hypoxic ischaemic encephalopathy and three to intraventricular or intracerebral haemorrhage.

Cardio-respiratory conditions caused 6 neonatal deaths, with the main cause identified as pulmonary hypoplasia (3 deaths; 50%). Two deaths were attributed to meconium aspiration syndrome.

Of the 15 neonatal deaths attributed to congenital abnormalities, four were classified as chromosomal abnormalities, five musculoskeletal abnormalities and three were classified under other specified congenital abnormalities.

Of the four neonatal deaths attributed to infection, three were from acquired bacterial infections and one from an unspecified organism.

There were no neonatal deaths throughout the five-year period where there was an undetermined/unknown cause of death.

### Table 8: Neonatal deaths by perinatal death classification, ACT, 2006-10

| PSANZ-PDC | No. | % | Rate |
|---|---|---|---|
| Congenital abnormality | 16 | 25.8 | 6.8 |
| Hypertension | 2 | 3.2 | 0.8 |
| Antepartum haemorrhage | 9 | 14.5 | 3.8 |
| Maternal conditions | 1 | 1.6 | 0.4 |
| Specific perinatal conditions | 6 | 9.7 | 2.5 |
| Hypoxic peripartum deaths | 1 | 1.6 | 0.4 |
| Fetal growth restriction | 2 | 3.2 | 0.8 |
| Spontaneous preterm | 24 | 38.7 | 10.1 |
| No obstetric antecedent | 1 | 1.6 | 0.4 |
| **Total** | **62** | **100.0** | **26.2** |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Notes: Rate is per 10,000 live births.
PSANZ-PDC refers to Perinatal Society of Australia and New Zealand - Perinatal Death Classification.

The majority of neonatal deaths were associated with spontaneous preterm birth (38.7%), congenital anomalies (25.8%) and antepartum haemorrhage (14.5%).

## 5.6 Cause of neonatal mortality by gestational age and birthweight

Extreme prematurity (birth less than 28 weeks gestation) accounted for 62.9% of neonatal deaths (Table 9). Being born premature (less than 37 weeks gestation) contributed to 83.9% of neonatal deaths. The neonatal mortality rate for pre-term babies (less than 37 weeks gestation) was 33.8 per 1,000 live births and the overall neonatal mortality rate was 2.6 per 1,000 live births.

### Table 9: Neonatal deaths by cause and gestational age in the ACT, 2006-10

| | Gestational age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Less than 28 weeks | | 28 to 36 weeks | | 37 weeks or more | | Total | |
| PSANZ-NDC | No. | % | No. | % | No. | % | No. | % |
| Congenital abnormality | 6 | 15.4 | 7 | 53.8 | 2 | 20 | 15 | 24.2 |
| Extreme prematurity | 24 | 61.5 | 0 | 0 | 0 | 0 | 24 | 38.7 |
| Cardio-respiratory disorders | 2 | 5.1 | 2 | 15.4 | 2 | 20 | 6 | 9.7 |
| Infection | 3 | 7.7 | 1 | 7.7 | 0 | 0 | 4 | 6.4 |
| Neurological | 3 | 7.7 | 3 | 23.1 | 6 | 60 | 12 | 19.4 |
| Gastrointestinal | 0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 1 | 2.6 | 0 | 0 | 0 | 0 | 1 | 1.6 |
| **Total** | **39** | **100.0** | **13** | **100.0** | **10** | **100.0** | **62** | **100.0** |
| **Rate per 1,000 live births** | **500.0** | | **8.9** | | **0.5** | | **2.6** | |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Note: Due to the rounding of percentages totals may not equal 100%.
PSANZ-NDC refers to Perinatal Society of Australia and New Zealand - Neonatal Death Classification.

Extremely low birthweight (less than 1,000 grams) accounted for 36 (58.1%) of neonatal deaths. Fifty two neonatal deaths (83.9%) were of babies with a birthweight of less than 2,500 grams. The neonatal mortality rate for low birthweight babies (less than 2,500 grams) was 41.0 per 1,000 live births. (Table 10)

### Table 10: Neonatal deaths by cause and birthweight, ACT, 2006-10

| | Birthweight | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Less than 1,000 grams | | 1,000 to 2,499 grams | | 2,500 grams or more | | Total | |
| PSANZ-NDC | No. | % | No. | % | No. | % | No. | % |
| Congenital abnormality | 6 | 16.7 | 8 | 50.0 | 1 | 10.0 | 15 | 24.2 |
| Extreme prematurity | 24 | 66.7 | 0 | 0.0 | 0 | 0.0 | 24 | 38.7 |
| Cardio-respiratory disorders | 1 | 2.8 | 1 | 6.3 | 4 | 40.0 | 6 | 9.7 |
| Infection | 2 | 5.6 | 2 | 12.5 | 0 | 0.0 | 4 | 6.5 |
| Neurological | 2 | 5.6 | 5 | 31.3 | 5 | 50.0 | 12 | 19.4 |
| Gastrointestinal | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 0 | 0 |
| Other | 1 | 2.8 | 0 | 0.0 | 0 | 0.0 | 1 | 1.6 |
| **Total** | **36** | **100.0** | **16** | **100.0** | **10** | **100.0** | **62** | **100.0** |
| **Rate per 1,000 live births** | **521.7** | | **13.3** | | **0.4** | | **2.6** | |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Notes: Due to the rounding of percentages totals may not equal 100%.
PSANZ-NDC refers to Perinatal Society of Australia and New Zealand - Neonatal Death Classification.

## 5.7 Place and type of perinatal death

Perinatal deaths were also classified into the following categories: fetal death in-utero, intrapartum death, termination of pregnancy, labour ward death and neonatal intensive care death (Table 11).

Eighty nine per cent (88.8%) of perinatal deaths occurred prior to delivery or in the labour ward. Nineteen per cent (19.2%) were terminations of pregnancy for congenital abnormalities. Of the labour ward deaths 86.2% (25 of 29) were less than 28 weeks gestation. Four labour ward deaths were for babies 28 weeks gestation or above (two of these died from meconium aspiration syndrome).

### Table 11: Perinatal deaths by place and type, ACT, 2001-10

| | 2001 - 05 | | 2006 - 10 | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Fetal death in-utero | 98 | 45.2 | 119 | 47.6 |
| Intrapartum death | 23 | 10.6 | 26 | 10.4 |
| Termination of pregnancy | 36 | 16.6 | 48 | 19.2 |
| Labour ward death | 20 | 9.2 | 29 | 11.6 |
| Neonatal intensive care death | 40 | 18.4 | 28 | 11.2 |
| **Total** | **217** | **100.0** | **250** | **100.0** |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Note: Due to the rounding of percentages totals may not equal 100%.

Twenty eight (45.2%) neonatal deaths were for babies admitted to the Centre for Newborn Care (Table 12) with six of these deaths (21.4%) occurring within the first 24 hours of life. Nineteen (67.9%) admitted neonatal deaths occurred within the first week of life (Table 12).

**Table 12: Neonatal deaths by birthweight and time, Centre for Newborn Care, The Canberra Hospital, ACT, 2006-10**

| | 1 day or less | 2-3 days | 4-7 days | 8-14 days | 15-21 days | 22-28 days | Total |
|---|---|---|---|---|---|---|---|
| Birthweight | No. | No. | No. | No. | No. | No. | No. |
| Less than 1,500 grams | 3 | 1 | 2 | 2 | 0 | 3 | 11 |
| 1,500 to 2,499 grams | 0 | 1 | 4 | 3 | 0 | 1 | 9 |
| 2,500 grams or more | 3 | 2 | 3 | 0 | 0 | 0 | 8 |
| **Total** | **6** | **4** | **9** | **5** | **0** | **4** | **28** |

Source: ACT Perinatal Deaths Data Collection, ACT Health

## 5.8 Multiple births

During 2006-10, 3.4% of the total number of babies born in the ACT was from multiple pregnancies. There were 27 deaths involving twins and none involving triplets, contributing to 10.8% of all perinatal deaths.

The neonatal and perinatal death rates for multiple births were significantly higher than for singleton births (Table 13).

**Table 13: Perinatal deaths by plurality, ACT, 2006-10**

| | | | Fetal deaths | | | Neonatal deaths | | | Perinatal deaths | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plurality | Total births | Live births | No. | Rate | 95% CI | No. | Rate | 95% CI | No. | Rate | 95% CI |
| **Singleton** | 23,064 | 22,885 | 179 | 7.8 | 6.6 - 8.9 | 44 | 1.9 | 1.4 - 2.5 | 223 | 9.7 | 8.4 - 10.9 |
| Twins | 792 | 783 | 9 | 11.4 | 4.0 - 18.7 | 18 | 23.1 | 12.5 - 33.6 | 27 | 34.2 | 21.5 - 46.7 |
| Triplets | 12 | 12 | 0 | 0.0 | 0.0 - 0.0 | 0 | 0.0 | 0.0 - 0.0 | 0 | 0.0 | 0.0 - 0.0 |
| **Multiple births** | **804** | **795** | **9** | **11.2** | **3.9 - 18.5** | **18** | **22.7** | **12.3 - 33.1** | **27** | **33.6** | **21.1 - 46.0** |
| **Total** | **23,868** | **23,680** | **188** | **7.9** | **6.8 - 9.0** | **62** | **2.6** | **2.0 - 3.3** | **250** | **10.5** | **9.2 - 11.8** |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health and ACT Perinatal Deaths Data Collection, ACT Health
Notes: Fetal death rates and perinatal death rates are per 1,000 births. Neonatal death rates are per 1,000 live births.

The percentage of extremely low birthweight perinatal deaths (less than 1,000 grams) was similar in singleton births (60.6%) to multiple births (66.7%).

The main causes of perinatal deaths in multiple birth babies were spontaneous preterm birth (48.1%), congenital abnormalities (11.1%) and specific perinatal conditions (11.1%) (Table 14). In comparison, the main causes of perinatal death in singleton babies were congenital abnormalities (22.9%), specific perinatal conditions (16.6%), unexplained antepartum death (15.2%), fetal growth restriction (14.8%) and spontaneous preterm birth (13.9%). The number of perinatal deaths associated with twin to twin transfusion syndrome has reduced from the 2001-05 report following feedback to perinatal care providers at morbidity and mortality meetings at each of the institutions providing antenatal care and advancements in placental laser ablation treatments for this syndrome.

Multiple birth babies were significantly more likely to die from a spontaneous preterm birth than singleton babies (RR = 4.3, Table 14).

### Table 14: Perinatal deaths by cause and plurality, ACT, 2006-10

| | Singleton | | | Multiple | | | Relative | 95% CI | |
|---|---|---|---|---|---|---|---|---|---|
| PSANZ-PDC | No. | % | Rate | No. | % | Rate | Risk | Low | High |
| Congenital abnormality | 51 | 22.9 | 2.2 | 3 | 11.1 | 3.7 | 0.4 | 0.1 | - 1.4 |
| Perinatal infection | 5 | 2.2 | 0.2 | 0 | 0.0 | 0.0 | | | |
| Hypertension | 4 | 1.8 | 0.2 | 2 | 7.4 | 2.5 | 3.2 | 1.0 | - 10.4 |
| Antepartum haemorrhage | 20 | 9.0 | 0.9 | 2 | 7.4 | 2.5 | 0.8 | 0.2 | - 3.2 |
| Maternal conditions | 4 | 1.8 | 0.2 | 0 | 0.0 | 0.0 | | | |
| Specific perinatal conditions | 37 | 16.6 | 1.6 | 3 | 11.1 | 3.7 | 0.6 | 0.2 | - 2.1 |
| Hypoxic peripartum deaths | 3 | 1.3 | 0.1 | 1 | 3.7 | 1.2 | 2.3 | 0.4 | - 13.0 |
| Fetal growth restriction | 33 | 14.8 | 1.4 | 2 | 7.4 | 2.5 | 0.5 | 0.1 | - 1.9 |
| Spontaneous preterm | 31 | 13.9 | 1.3 | 13 | 48.1 | 16.2 | 4.3* | 2.2 | - 8.6 |
| Unexplained antepartum death | 34 | 15.2 | 1.5 | 1 | 3.7 | 1.2 | 0.2 | 0.0 | - 1.6 |
| No obstetric antecedent | 1 | 0.4 | 0.0 | 0 | 0.0 | 0.0 | | | |
| **Total** | **223** | **100.0** | **9.7** | **27** | **100.0** | **33.6** | | | |

Source: ACT Perinatal Deaths Data Collection, ACT Health
Note: Rates are per 1,000 births.
Due to the rounding of percentages totals may not equal 100%.
PSANZ-PDC refers to Perinatal Society of Australia and New Zealand - Perinatal Death Classification.
*Statistically significant difference at p<0.05.

## 5.9 Maternal characteristics

Maternal age is an important risk factor for adverse perinatal outcomes. Adverse outcomes were more likely to occur in older (greater than 40 years) mothers (Table 15).

The ACT perinatal mortality rate for women aged 40 years or more was significantly higher than the mortality rate for women aged 20 to 39 years (Table 15). There was no significant relationship between maternal age and neonatal death rates.

### Table 15: Perinatal deaths by maternal age, ACT, 2006-10

| | | | Fetal deaths | | | Neonatal deaths | | | Perinatal deaths | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maternal age | Total births | Live births | No. | Rate | 95% CI | No. | Rate | 95% CI | No. | Rate | 95% CI |
| Less than 20 years | 531 | 526 | 5 | 9.4 | 1.2 - 17.6 | 0 | 0.0 | 0.0 - 0.0 | 5 | 9.4 | 1.2 - 17.6 |
| 20-29 years | 8,823 | 8,757 | 67 | 7.6 | 5.8 - 9.4 | 18 | 2.1 | 1.1 - 3.0 | 85 | 9.6 | 7.6 - 11.7 |
| 30-39 years | 13,529 | 13,426 | 99 | 7.3 | 5.9 - 8.8 | 40 | 3.0 | 2.1 - 3.9 | 139 | 10.3 | 8.6 - 12.0 |
| 40 years or more | 985 | 971 | 17 | 17.3 | 9.1 - 25.4 | 4 | 4.1 | 0.1 - 8.1 | 21 | 21.3 | 12.3 - 30.3 |
| **Total** | **23,868** | **23,680** | **188** | **7.9** | **6.8 - 9.0** | **62** | **2.6** | **2.0 - 3.3** | **250** | **10.5** | **9.2 - 11.8** |

Sources: ACT Maternal and Perinatal Data Collection, and ACT Perinatal Deaths Data Collection
Notes: Fetal death rates and perinatal death rates are per 1,000 births. Neonatal death rates are per 1,000 live births.

The average age of women who experienced a perinatal death was 31.2 years. Nine per cent (8.6%) of women had conceived with assisted reproduction technology. Thirteen per cent (12.7%) of women were documented to smoke cigarettes, 0.4% use marijuana, 0.8% use methadone and 2.8% use other illicit drugs.

There were no significant differences in perinatal death rates for women who smoked during pregnancy compared with non-smokers or for primigravida women compared with multigravida women.

## 5.10 Aboriginal and Torres Strait Islander perinatal mortality

In the years 2006-10 there were eight perinatal deaths for babies born to Aboriginal and Torres Strait Islander women. There is no evidence of a higher rate of perinatal deaths for babies of Aboriginal and Torres Strait Islander women compared with other women in the ACT.

## 5.11 Perinatal autopsy

The perinatal autopsy rate for the ACT from 2006-10 for ACT and NSW resident babies born in the ACT was 53.5% (Table 16). Perinatal autopsy was declined for 40.8% of babies and an autopsy was not requested for 2.2% of babies. The reduction in the number of autopsies 'not requested' from the 2001-05 report is an important improvement; however the overall rate of perinatal autopsies is still sub-optimal with a recommended rate of 75%.

In 2005, the perinatal autopsy rate for South Australia was 51%[2]; New South Wales was 37.7%[3]; Victoria was 28.6%[4]; and Queensland was 26.3%.[5]

Perinatal autopsies were performed for 57.4% of fetal deaths and 44.7% of neonatal deaths. Perinatal autopsy was declined for almost half (49.1%) of neonatal deaths compared with 37.1% of fetal deaths (Table 16).

**Table 16: Perinatal autopsy by type of perinatal death, ACT, 2006-10**

| | Fetal death | | Neonatal death | | Total | |
|---|---|---|---|---|---|---|
| Perinatal autopsy | No | % | No | % | No | % |
| Performed | 147 | 57.4 | 51 | 44.7 | 198 | 53.5 |
| Declined | 95 | 37.1 | 56 | 49.1 | 151 | 40.8 |
| Not requested | 3 | 1.2 | 5 | 4.4 | 8 | 2.2 |
| Not stated | 11 | 4.3 | 2 | 1.8 | 13 | 3.5 |
| **Total** | **256** | **100.0** | **114** | **100.0** | **370** | **100.0** |

Source: ACT Perinatal Deaths Data Collection, ACT Health, ACT and NSW residents
Note: Due to the rounding of percentages totals may not equal 100%.
Includes babies born in the ACT to ACT and non-ACT resident women.

Perinatal autopsy was performed most frequently for perinatal infections (100%), deaths with no obstetric antecedent (100%), fetal growth restriction (72.1%) and unexplained antepartum death (65.9%).

Placental pathology was available in 99.7% of cases. Chorioamnionitis was found in 27.0% of cases, funisitis in 16.2% and villitis in 6.1%.

## Table 17: Perinatal autopsy by cause and type of death, ACT, 2006-10

| | Fetal deaths | | Neonatal deaths | | Perinatal deaths | |
|---|---|---|---|---|---|---|
| PSANZ-PDC | No. | % | No. | % | No. | % |
| Congenital abnormality | 37 | 56.1 | 18 | 66.7 | 55 | 59.1 |
| Perinatal infection | 7 | 100.0 | 0 | 0.0 | 7 | 100.0 |
| Hypertension | 2 | 40.0 | 3 | 60.0 | 5 | 50.0 |
| Antepartum haemorrhage | 7 | 36.8 | 3 | 27.3 | 10 | 33.3 |
| Maternal conditions | 3 | 60.0 | 2 | 66.7 | 5 | 62.5 |
| Specific perinatal conditions | 26 | 66.7 | 6 | 46.2 | 32 | 61.5 |
| Hypoxic peripartum deaths | 1 | 33.3 | 1 | 50.0 | 2 | 40.0 |
| Fetal growth restriction | 29 | 70.7 | 2 | 100.0 | 31 | 72.1 |
| Spontaneous preterm | 6 | 22.2 | 15 | 30.0 | 21 | 27.3 |
| Unexplained antepartum death | 29 | 65.9 | 0 | 0.0 | 29 | 65.9 |
| No obstetric antecedent | 0 | 0.0 | 1 | 100.0 | 1 | 100.0 |
| **Total** | **147** | **57.4** | **51** | **44.7** | **198** | **53.5** |

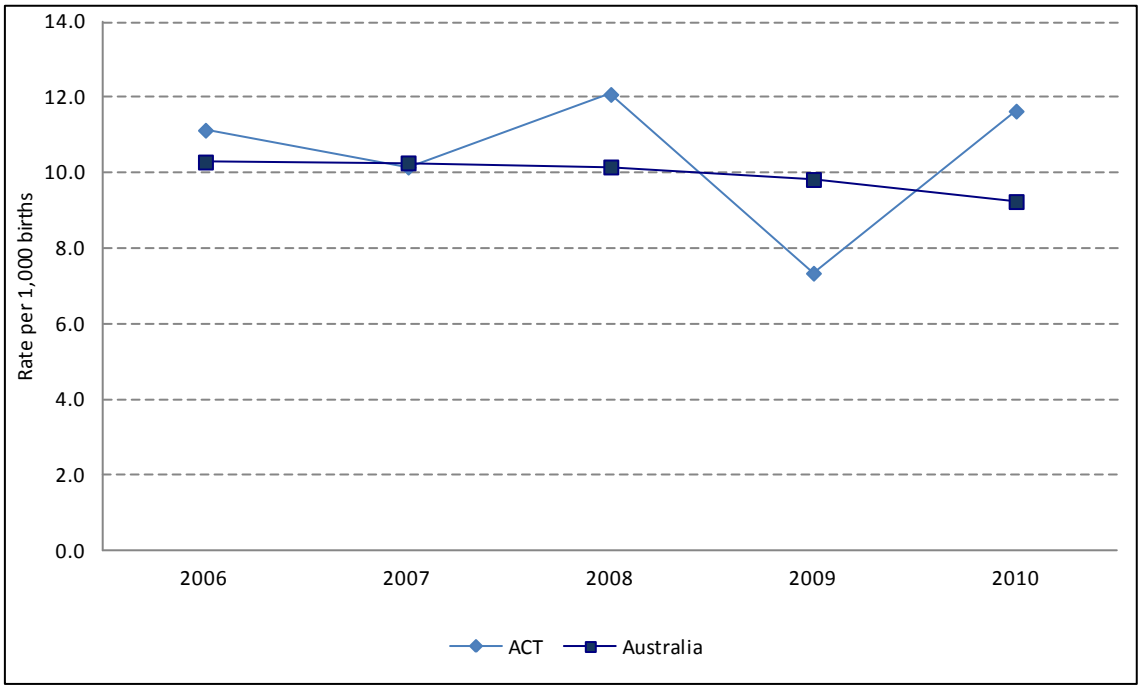
Source: ACT Perinatal Deaths Data Collection, ACT Health, ACT and NSW residents
Notes: Percentages refer to the percentage of autopsies performed in each category. For example 56.1% of fetal deaths within the congenital abnormality category had an autopsy.
PSANZ-PDC refers to Perinatal Society of Australia and New Zealand - Perinatal Death Classification.
Includes babies born in the ACT to ACT and non-ACT residents.

# 6. COMPARISON WITH NATIONAL DATA

## 6.1 Perinatal mortality rates

Perinatal mortality rates in the ACT fluctuate due to the small number of deaths each year. Between 2006-10, the ACT perinatal mortality rate ranged from 7.4 to 12.1 per 1,000 births whereas the Australian rate ranged from 9.3 to 10.3 (Figure 2).

**Figure 2: Perinatal mortality rates, ACT residents and Australia, 2006-10**




Sources: ACT Maternal and Perinatal Data Collection, ACT Health, ACT Perinatal Deaths Data Collection, ACT Health and Australia's Mothers and Babies, AIHW, 2006-10
Note: Rates are per 1,000 births.

The annual ACT mortality rates and the five-year average rates were not significantly higher than Australian rates during 2006-10 (Table 18) for fetal, neonatal and perinatal deaths. The ACT neonatal mortality rate was significantly lower than the Australian rate in 2009.

### Table 18: Fetal, neonatal and perinatal mortality rates, ACT and Australia, 2006-10

| | | ACT residents | | | Australia | | |
|---|---|---|---|---|---|---|---|
| Type of deaths | Year | Rate | 95% CI | | Rate | 95% CI | |
| **Fetal deaths** | 2006 | 7.4 | 4.9 | - 9.9 | 7.4 | 7.1 | - 7.7 |
| | 2007 | 7.1 | 4.7 | - 9.6 | 7.4 | 7.1 | - 7.7 |
| | 2008 | 9.0 | 6.3 | - 11.6 | 7.4 | 7.1 | - 7.7 |
| | 2009 | 6.5 | 4.3 | - 8.8 | 7.8 | 7.5 | - 8.1 |
| | 2010 | 9.2 | 6.6 | - 11.9 | 7.4 | 7.1 | - 7.7 |
| | **2006-10** | **7.9** | **6.8** | **- 9.0** | **7.5** | **7.3** | **- 7.6** |
| **Neonatal deaths** | 2006 | 3.7 | 2.0 | - 5.5 | 2.9 | 2.7 | - 3.1 |
| | 2007 | 3.1 | 1.5 | - 4.6 | 2.9 | 2.7 | - 3.1 |
| | 2008 | 3.2 | 1.6 | - 4.8 | 2.8 | 2.6 | - 3.0 |
| | 2009 | 0.8 | 0.0 | - 1.6 | 3.0 | 2.7 | - 3.2 |
| | 2010 | 2.4 | 1.1 | - 3.8 | 2.9 | 2.6 | - 3.1 |
| | **2006-10** | **2.6** | **2.0** | **- 3.3** | **2.9** | **2.8** | **- 3.0** |
| **Perinatal deaths** | 2006 | 11.1 | 8.1 | - 14.2 | 10.3 | 9.9 | - 10.7 |
| | 2007 | 10.2 | 7.3 | - 13.1 | 10.3 | 9.9 | - 10.6 |
| | 2008 | 12.1 | 9.0 | - 15.2 | 10.2 | 9.8 | - 10.5 |
| | 2009 | 7.4 | 5.0 | - 9.7 | 9.8 | 9.4 | - 10.2 |
| | 2010 | 11.7 | 8.7 | - 14.6 | 9.3 | 8.9 | - 9.6 |
| | **2006-10** | **10.5** | **9.2** | **- 11.8** | **10.0** | **9.8** | **- 10.2** |

Sources: ACT Maternal and Perinatal Data Collection, ACT Health, ACT Perinatal Deaths Data Collection, ACT Health and Australia's Mothers and Babies, AIHW, 2006 - 2010

Notes: Fetal death rates and perinatal death rates are per 1,000 births. Neonatal death rates are per 1,000 live births. Australian figures include: 2006 Vic, WA, SA, Tas and ACT; 2007 Vic, WA, SA and Tas; 2008 Vic, WA, SA, and Tas; 2009 WA, SA and Tas; and 2010 Qld, WA, SA, Tas, ACT and NT.

## 6.2 Antecedent causes of death

The main antecedent causes of perinatal death for both the ACT and Australia were congenital anomalies, spontaneous preterm births and unexplained antepartum deaths (Table 19).

The perinatal death rates for most antecedent causes did not differ significantly between the ACT and Australia. However, the ACT rate for maternal conditions was significantly lower than the Australian rate and the ACT rate for specific perinatal conditions and fetal growth restriction was significantly higher than the Australian rate, however, this may be a reflection of more accurate post-event reporting.

### Table 19: Perinatal deaths, by cause, ACT residents and Australia, 2006-10

| | ACT residents | | Australia | |
|---|---|---|---|---|
| PSANZ-PDC | No. | Rate | No. | Rate |
| Congenital abnormality | 54 | 2.3 | 1,621 | 2.8 |
| Perinatal infection | 5 | 0.2 | 210 | 0.4 |
| Hypertension | 6 | 0.3 | 168 | 0.3 |
| Antepartum haemorrhage | 22 | 0.9 | 398 | 0.7 |
| Maternal conditions | 4 | 0.2 | 650 | 1.1* |
| Specific perinatal conditions | 40 | 1.7 | 514 | 0.9* |
| Hypoxic peripartum deaths | 4 | 0.2 | 168 | 0.3 |
| Fetal growth restriction | 35 | 1.5 | 407 | 0.7* |
| Spontaneous preterm | 44 | 1.8 | 1,014 | 1.8 |
| Unexplained antepartum death | 35 | 1.5 | 788 | 1.4 |
| No obstetric antecedent | 1 | 0.0 | 70 | 0.1 |
| Not stated | 0 | 0 | 190 | 0.3 |

Sources: ACT Perinatal Deaths Data Collection, ACT Health, 2006 to 2010 and Australia's Mothers and Babies, 2006 to 2010

Notes: Rate is per 1,000 births. Australian figures include: 2006 Vic, WA, SA, Tas and ACT; 2007 Vic, WA, SA and Tas; 2008 Vic, WA, SA, and Tas; 2009 WA, SA and Tas; and 2010 Qld, WA, SA, Tas, ACT and NT.
*Denotes statistically significant difference at p<0.05.

# 7. APPENDIX A - SUMMARY OF PERINATAL DEATHS

## Table 20: Summary of perinatal deaths by state of residence, by year, ACT, 2001-10

| | | Fetal Death | | Neonatal death | | Perinatal death | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % |
| 2001 | ACT residents | 29 | 82.9 | 6 | 33.3 | 35 | 66.0 |
| | Non ACT residents | 6 | 17.1 | 12 | 66.7 | 18 | 34.0 |
| | **Total** | **35** | **100.0** | **18** | **100.0** | **53** | **100.0** |
| 2002 | ACT residents | 25 | 71.4 | 9 | 37.5 | 34 | 57.6 |
| | Non ACT residents | 10 | 28.6 | 15 | 62.5 | 25 | 42.4 |
| | **Total** | **35** | **100.0** | **24** | **100.0** | **59** | **100.0** |
| 2003 | ACT residents | 39 | 72.2 | 16 | 57.1 | 55 | 67.1 |
| | Non ACT residents | 15 | 27.8 | 12 | 42.9 | 27 | 32.9 |
| | **Total** | **54** | **100.0** | **28** | **100.0** | **82** | **100.0** |
| 2004 | ACT residents | 25 | 75.8 | 19 | 70.4 | 44 | 73.3 |
| | Non ACT residents | 8 | 24.2 | 8 | 29.6 | 16 | 26.7 |
| | **Total** | **33** | **100.0** | **27** | **100.0** | **60** | **100.0** |
| 2005 | ACT residents | 36 | 76.6 | 13 | 65.0 | 49 | 73.1 |
| | Non ACT residents | 11 | 23.4 | 7 | 35.0 | 18 | 26.9 |
| | **Total** | **47** | **100.0** | **20** | **100.0** | **67** | **100.0** |
| 2006 | ACT residents | 34 | 68.0 | 17 | 58.6 | 51 | 64.6 |
| | Non ACT residents | 16 | 32.0 | 12 | 41.4 | 28 | 35.4 |
| | **Total** | **50** | **100.0** | **29** | **100.0** | **79** | **100.0** |
| 2007 | ACT residents | 33 | 78.6 | 14 | 58.3 | 47 | 71.2 |
| | Non ACT residents | 9 | 21.4 | 10 | 41.7 | 19 | 28.8 |
| | **Total** | **42** | **100.0** | **24** | **100.0** | **66** | **100.0** |
| 2008 | ACT residents | 43 | 75.4 | 15 | 60.0 | 58 | 70.7 |
| | Non ACT residents | 14 | 24.6 | 10 | 40.0 | 24 | 29.3 |
| | **Total** | **57** | **100.0** | **25** | **100.0** | **82** | **100.0** |
| 2009 | ACT residents | 32 | 74.4 | 4 | 28.6 | 36 | 63.2 |
| | Non ACT residents | 11 | 25.6 | 10 | 71.4 | 21 | 36.8 |
| | **Total** | **43** | **100.0** | **14** | **100.0** | **57** | **100.0** |
| 2010 | ACT residents | 46 | 67.6 | 12 | 48.0 | 58 | 62.4 |
| | Non ACT residents | 22 | 32.4 | 13 | 52.0 | 35 | 37.6 |
| | **Total** | **68** | **100.0** | **25** | **100.0** | **93** | **100.0** |
| Total | ACT residents | 342 | 73.7 | 125 | 53.4 | 467 | 66.9 |
| | Non ACT residents | 122 | 26.3 | 109 | 46.6 | 231 | 33.1 |
| | **Total** | **464** | **100.0** | **234** | **100.0** | **698** | **100.0** |

Sources: ACT Maternal and Perinatal Data Collection, and ACT Perinatal Deaths Data Collection, ACT Health
Note: State of residence refers to maternal state of residence.

# 8. APPENDIX B - ACT PERINATAL DEATH FORM – CURRENT

35402

Mother's Sticky Label

**ACT CONFIDENTIAL REPORT ON PERINATAL DEATH**

Return completed form to:

Infant's Sticky Label

Dr Alison Kent
Centre for Newborn Care
Dept of Neonatology
The Canberra Hospital
P.O. Box 11, Woden, ACT 2606

Copy sent to Dr Alison Kent Yes / No
Copy placed in patient notes Yes / No

## ACT CONFIDENTIAL REPORT ON PERINATAL DEATH

Date information collected ……/……./…….

Information collected by ……

Father's Surname ……

Father's Suburb …… Postcode ……

**Family Status**

1 Never Married
2 Widowed
3 Separated
4 Divorced
5 Married/Defacto
6 Not Stated

**Indigenous Status**

1 Aboriginal
2 Torres Strait Islander
3 Aboriginal and Torres Strait Islander
4 Non indigenous
9 Not stated

**Accommodation**

1 Public
2 Private

**Previous Pregnancies?** 0 No 1 Yes

Number of:

_____ Live Births (survived to 28 days)
_____ Neonatal Deaths (NND)
_____ Stillbirths
_____ Spontaneous miscarriage
_____ Termination of pregnancy
_____ Ectopic pregnancies

Note: Livebirths, NND and stillbirths must be 20 weeks gestation or at least 400 grams in birth weight

**History of multiple births** 0 No 1 Yes

**This Pregnancy**

Gravidity _____ Parity _____ (exclude this pregnancy)

Date of last menstrual period ……/……/……

Clinically estimated gestation (weeks) _____

**Maternal medical conditions while pregnant**
(may circle more than one)

1 Type II Diabetes Mellitus
2 Chronic renal disease
3 Essential hypertension
4 Epilepsy
5 Cardiac disease
6 Maternal injury
7 Abdominal operation
8 Malignancy (specify) ……
9 Infection (specify) ……..
10 Maternal death (specify cause) ……..
11 BMI > 40
88 Other ……

**Obstetric Complications**
(may circle more than one)

1 APH/Placenta praevia
2 APH-other
3 Abruptio placenta
4 Pregnancy induced hypertension
5 Prelabour ruptured membranes
6 ROM < 24 hours
7 ROM > 24 hours
8 Gestational diabetes
9 Threatened abortion
10 Threatened preterm labour
11 Fetal distress
12 IUGR
13 Oligohydramnios
14 Polyhydramnios
15 Twin twin transfusion syndrome (TTTS)
16 Fetal anomaly
17 Cervical incompetence
88 Other (specify) ……

……
……

**Procedures and Operations**

Number of ultrasounds _____

0 None
1 Cardiotocography
2 Chorionic villus sampling
3 Amniocentesis < 20 weeks
4 Amniocentesis > 20 weeks
5 X-Ray/CT scan
6 MRI
7 Cervical suture

**Assisted conception** ..... No 0 ..... Yes 1

1 Hyperovulation
2 IVF/GIFT
3 Other (specify)
4 Not stated

**Responsibility for Antenatal Care**

1 Obstetrician
2 General practitioner
3 Midwife led clinic (with max 2 GP)
4 Hospital Antenatal clinic
5 Shared care
6 Independent midwife
7 Birth centre or CMP protocols
8 Aboriginal Health Service
9 Not stated

**Duration of pregnancy at first visit** ____

**No. of visits**

1 None
2 1 to 5
3 6 to 10
4 11 to 15
5 16 to 20
6 More than 20

**Baby's Place of Birth**

1 The Canberra Hospital
2 TCH Birth Centre
3 Calvary Bruce Public
4 Calvary Bruce Private
5 Calvary John James
6 National Capital Private
7 Home
8 Born before arrival
0 Interstate Hospital

**Intended Place of birth at onset of labour**

1 Hospital
2 Birth centre
4 Home

**Was mother transferred Antenatally?**

1 No
2 Prior to labour
3 During labour

**Transferred from**

1 Planned homebirth
2 Birth centre
3 Another ACT hospital
4 Interstate hospital

**Reason for transfer**

1 PTL
2 PROM
3 Fetal anomaly
4 FDIU
5 PIH
6 APH
8 Septicaemia
9 Fetal distress

**Drugs during pregnancy?**

None……..0 Alcohol …….. 7
Nicotine/Cigarettes… 1
Heroin…… ..2
Methadone……...3
Cocaine…… 4
Marijuana……...5
Other (specify)…….6

**Onset and type of labour**

1 Spontaneous
2 Induction
3 No labour

**Method of induction**

1 Oxytocin
2 Prostaglandins
3 ARM
4 Other (specify)……

**Augmented** ..... No 0 ..... Yes 1

**Method of augmentation**

1 Oxytocin
2 Prostaglandins
3 ARM
4 Other (specify)……

**Reason for augmentation or induction**

1 FDIU
2 Fetal anomaly
3 PIH
4 APH
5 Post term
6 Incoordinate contractions
7 Other

**Corticosteroids**

0 Not stated
1 None
2 Less than 24 hours prior to baby's birth
3 Complete
4 More than 7 days before baby's birth

**Analgesia**

1 None
2 Nitrous oxide
3 IMI/IV Narcotic
4 Epidural
5 Spinal
8 Other (specify) ……

**Anaesthesia**

1 None
2 Local to perineum
3 Pudendal
4 Epidural
5 Spinal
6 General
8 Other (specify) ……

**Presentation**

1 Vertex
2 Breech
3 Face
4 Brow
8 Other (compound specify)……

**Method of birth**

1 Spontaneous cephalic
2 Forceps
3 Vaginal breech
4 Caesarean Section
5 Vacuum extraction
8 Other (specify)……

**If Caesarean Section was there a medical or obstetric emergency?** ..... 0 No .....1 Yes

**Complications of labour and birth**

1 None
2 Fetal distress
3 Cord prolapse
4 Obstructed labour
5 PPH
6 Retained placenta
7 Major infection
8 Uterine rupture

**Birth Outcome**

0 Stillbirth
2 Neonatal Death

Date of birth/stillbirth ……/……/…….

Date of Neonatal Death ……/……/…….

Age at death ……..day(s) ……. hour(s)

**Sex**

1 Male 2 Female 3 Indeterminate

**Plurality**

1 Singleton 2 Twins 3 Triplets 8 Other

**Birth weight**....._____grams

**Head circumference** ....._____cm

**Length** ....._____cm

**Apgar** At 1 minute _____

At 5 minutes _____

**Resuscitation – Active measures**

1 None
2 Suction
3 Oxygen therapy
4 IPPV – bag and mask
5 IPPV – intubation
6 External cardiac massage

**Resuscitation – Drug therapy**

1 None
2 Narcotic antagonist
3 Sodium bicarbonate
4 Adrenaline
5 Other drugs (specify) ……

**Who performed resuscitation?**

0 Not done
1 Neonatologist
2 Paediatrician
3 Obstetrician
4 Neonatal Nurse
5 Neonatal Registrar
6 Paediatric Registrar
7 Obstetric Registrar
8 Midwife
9 Other (specify)……

**Admission to SCN/NICU?**

1 Yes .....Length of stay (days) _____

2 No

**PostMortem**

0 Not stated
1 Not requested
2 Declined
4 Partial
5 Full

**Histology of placenta?**

0 No
1 Yes (If histology performed include report)
2 Unknown

**Chorioamnionitis?**

0 Unknown
1 None
2 Clinically suspected
3 Pathology proven
4 Clinically & pathologically proven

**Funisitis?**

0 Unknown
1 None
2 Pathologically proven

**Lymphohistiocytic/chronic villitis?**

0 No
1 Yes

**APH?**

0 No
1 Yes

**Bleeding during pregnancy?**

0 Not stated
1 None
2 Placental abruption
3 Placenta praevia
4 Vasa praevia
5 Undetermined
6 Other ……

**Was hypertension present?**

0 Not stated
1 None
2 Chronic hypertension – essential
3 Chronic hypertension – renal disease
4 Pregnancy induced
5 Chronic superimposed PIH

**Was death an unexplained antepartum death?**

0 No
1 Yes
2 Unknown

**Was there fetal growth restriction?**

0 No
1 Yes - idiopathic
2 Yes - placental pathology
3 Yes - Other
4 Unknown

**Was there intrapartum asphyxia?**

0 No
1 Yes
2 Unknown

**Was there cord complications?**

0 No
1 Yes (Specify) ……
……..
2 Unknown

**Was haematological disease present?**

0 No
1 Yes - Resus incompatibility
2 Yes - Other feto-maternal blood group incompatibility
3 Yes – Haemoglobinopathy
4 Unknown

**Was a major fetal anomaly present?**

0 No
1 Yes (Specify) ……
……
2 Unknown

**Was there fetal/infant infection?**

0 No
1 Yes
2 Unknown

**Infection documented**

0 None
1 GBS
2 Listeria
3 CMV
4 Parvovirus
5 HSV
6 Rubella
7 Toxoplasmosis
8 Syphilis
9 E. coli
10 U histolytica
11 Other ……

**Other conditions present**

0 None
1 Twin Twin Transfusion Syndrome (TTTS)
2 Idiopathic hydrops
3 Feto-maternal haemorrhage
4 Uterine abnormality
5 Drug dependence/abuse
6 Haemolytic disease
7 Birth trauma
8 Accident, poisoning or violence
9 Cervical incompetence
10 Other ……

| Gestation | Weight (grams) 10th percentile Male | Female |
|---|---|---|
| 22 | 400 | 400 |
| 23 | 500 | 470 |
| 24 | 520 | 540 |
| 25 | 620 | 620 |
| 26 | 720 | 680 |
| 27 | 740 | 730 |
| 28 | 850 | 760 |
| 29 | 950 | 890 |
| 30 | 1080 | 1045 |
| 31 | 1310 | 1140 |
| 32 | 1400 | 1340 |
| 33 | 1640 | 1520 |
| 34 | 1840 | 1760 |
| 35 | 2110 | 2030 |
| 36 | 2320 | 2220 |
| 37 | 2550 | 2430 |
| 38 | 2780 | 2660 |
| 39 | 2940 | 2820 |
| 40 | 3070 | 2950 |
| 41 | 3180 | 3050 |
| 42 | 3210 | 3080 |
| 43 | 3080 | 2950 |
| 44 | 3050 | 2930 |

Reference: Roberts C, Lancaster P (1999) Australian national birthweight percentiles by gestational age. MJA Vol. 170: 114-118

ICD-10-AM Code _____

**Relevant factors:**

Antenatal: ……

Intrapartum: ……

Postpartum: ……

**Cause of Death Classifications**

**Australia and New Zealand Antecedent Classification of Perinatal Mortality (PSANZ-PDC)**

1 Congenital abnormality
2 Perinatal infection
3 Hypertension
4 Antepartum haemorrhage
5 Maternal conditions
6 Specific perinatal conditions
7 Hypoxic peripartum death
8 Fetal growth restriction
9 Spontaneous preterm
10 Unexplained antepartum death
11 No obstetric antecedent

**Australia and New Zealand Neonatal Death Classification (PSANZ-NDC)**

1 Congenital abnormality
2 Extreme prematurity
3 Cardio-respiratory disorders
4 Infection
5 Neurological
6 Gastrointestinal
7 Other

**PSANZ-PDC: _____PSANZ-NDC: _____**

Note: Full Classification done by obstetrician, neonatologist, perinatal pathologist and midwife/clinical coder using the PSANZ classification guideline 2007.

**Type of Death**

1. Fetal Death In-Utero
2. Intrapartum death
3. Termination of pregnancy
4. Non-admitted neonatal death
5. Admitted neonatal death

**Intrapartum Monitoring**

1. Manual Auscultation
2. Doppler
3. CTG – intermittent
4. CTG - continuous
5. CTG – scalp electrode

**Avoidability**

1. Unavoidable
2. Avoidable
3. Termination
4. Possibly avoidable – IUGR not recognised
5. Possibly avoidable – earlier delivery
6. Possibly avoidable – infection/NEC in prem neonate
7. Possibly avoidable - different cervical suture
8. Possibly avoidable – cervical surgery
9. Possibly avoidable – monitoring in labour
10. Possibly avoidable – transfer out of rural centre
11. Possibly avoidable – minimal antenatal care

# 9. APPENDIX C - PSANZ PERINATAL MORTALITY CLASSIFICATIONS

## PSANZ Perinatal Death Classification (PSANZ-PDC)

**1 Congenital abnormality (including terminations for congenital abnormalities)**
1.1 Central nervous system
1.2 Cardiovascular system
1.3 Urinary system
1.4 Gastrointestinal system
1.5 Chromosomal
1.6 Metabolic
1.7 Multiple/non chromosomal syndromes
1.8 Other congenital abnormality
- 1.81 Musculoskeletal
- 1.82 Respiratory
- 1.83 Diaphragmatic hernia
- 1.84 Haematological
- 1.85 Tumours
- 1.88 Other specified congenital abnormality

1.9 Unspecified congenital abnormality

**2 Perinatal infection**
2.1 Bacterial
- 2.11 Group B Streptococcus
- 2.12 E coli
- 2.13 Listeria monocytogenes
- 2.14 Spirochaetal e.g. Syphilis
- 2.18 Other bacterial
- 2.19 Unspecified bacterial

2.2 Viral
- 2.21 Cytomegalovirus
- 2.22 Parvovirus
- 2.23 Herpes simplex virus
- 2.24 Rubella virus
- 2.28 Other viral
- 2.29 Unspecified viral

2.3 Protozoal e.g. Toxoplasma
2.5 Fungal
2.8 Other specified organism
2.9 Other unspecified organism

**3 Hypertension**
3.1 Chronic hypertension: essential
3.2 Chronic hypertension: secondary, e.g. renal disease
3.3 Chronic hypertension: unspecified
3.4 Gestational hypertension
3.5 Pre-eclampsia
- 3.51 With laboratory evidence of thrombophilia

3.6 Pre-eclampsia superimposed on chronic hypertension
- 3.61 With laboratory evidence of thrombophilia

3.9 Unspecified hypertension

**4 Antepartum haemorrhage (APH)**

4.1 Placental abruption
- 4.11 With laboratory evidence of thrombophilia

4.2 Placenta praevia
4.3 Vasa praevia
4.8 Other APH
4.9 APH of undetermined origin

**5 Maternal conditions**

5.1 Termination of pregnancy for maternal psychosocial indications
5.2 Diabetes / Gestational diabetes
5.3 Maternal injury
- 5.31 Accidental
- 5.32 Non-accidental

5.4 Maternal sepsis
5.5 Lupus obstetric syndrome
5.6 Obstetric cholestasis
5.8 Other specified maternal conditions

**6 Specific perinatal conditions**

6.1 Twin-twin transfusion
6.2 Fetomaternal haemorrhage
6.3 Antepartum cord complications (e.g. cord haemorrhage; true knot with evidence of occlusion)
6.4 Uterine abnormalities, e.g. bicornuate uterus, cervical incompetence
6.5 Birth trauma (typically infants of >24 weeks gestation or >600g birthweight)
6.6 Alloimmune disease
- 6.61 Rhesus
- 6.62 ABO
- 6.63 Kell
- 6.64 Alloimmune thrombocytopenia
- 6.68 Other
- 6.69 Unspecified

6.7 Idiopathic hydrops
6.8 Other specific perinatal conditions (includes iatrogenic conditions such as rupture of membranes after amniocentesis, termination of pregnancy for suspected but unconfirmed congenital abnormality).

**7 Hypoxic peripartum death (typically infants of >24 weeks gestation or >600g birthweight)**

7.1 With intrapartum complications
- 7.11 Uterine rupture
- 7.12 Cord prolapse
- 7.13 Shoulder dystocia
- 7.18 Other

7.2 Evidence of non-reassuring fetal status in a normally grown infant (e.g. abnormal fetal heart rate, fetal scalp pH/lactate, fetal pulse oximetry without intrapartum complications)
7.3 No intrapartum complications and no evidence of non-reassuring fetal status.
7.9 Unspecified hypoxic peripartum death

**8 Fetal Growth Restriction (FGR)**

8.1 With evidence of reduced vascular perfusion on Doppler studies and /or placental histopathology (e.g. significant infarction, acute atherosis, maternal and/or fetal vascular thrombosis or maternal floor infarction)
8.2 With chronic villitis
8.3 No placental pathology
8.4 No examination of placenta

8.8 Other specified placental pathology
8.9 Unspecified or not known whether placenta examined

**9 Spontaneous preterm (<37 weeks gestation)**

9.1 Spontaneous preterm with intact membranes, or membrane rupture <24 hours before delivery
- 9.11 With chorioamnionitis on placental histopathology
- 9.12 Without chorioamnionitis on placental histopathology
- 9.13 With clinical evidence of chorioamnionitis, no examination of placenta
- 9.17 No clinical signs of chorioamnionitis, no examination of placenta
- 9.19 Unspecified or not known whether placenta examined

9.2 Spontaneous preterm with membrane rupture ≥24 hours before delivery
- 9.21 With chorioamnionitis on placental histopathology
- 9.22 Without chorioamnionitis on placental histopathology
- 9.23 With clinical evidence of chorioamnionitis, no examination of placenta
- 9.27 No clinical signs of chorioamnionitis, no examination of placenta
- 9.29 Unspecified or not known whether placenta examined

9.3 Spontaneous preterm with membrane rupture of unknown duration before delivery
- 9.31 With chorioamnionitis on placental histopathology
- 9.32 Without chorioamnionitis on placental histopathology
- 9.33 With clinical evidence of chorioamnionitis, no examination of placenta
- 9.37 No clinical signs of chorioamnionitis, no examination of placenta
- 9.39 Unspecified or not known whether placenta examined

**10 Unexplained antepartum death**

10.1 With evidence of reduced vascular perfusion on Doppler studies and /or placental histopathology (e.g. significant infarction, acute atherosis, maternal and/or fetal vascular thrombosis or maternal floor infarction)
10.2 With chronic villitis
10.3 No placental pathology
10.4 No examination of placenta
10.8 Other specified placental pathology
10.9 Unspecified or not known whether placenta examined

**11 No obstetric antecedent**

11.1 Sudden Infant Death Syndrome (SIDS)
- 11.11 SIDS Category IA: Classic features of SIDS present and completely documented.
- 11.12 SIDS Category IB: Classic features of SIDS present but incompletely documented.
- 11.13 SIDS Category II : Infant deaths that meet Category I except for one or more features.

11.2 Postnatally acquired infection
11.3 Accidental asphyxiation
11.4 Other accident, poisoning or violence (postnatal)
11.8 Other specified
11.9 Unknown/Undetermined
- 11.91 Unclassified Sudden Infant Death
- 11.92 Other Unknown/Undetermined

## PSANZ Neonatal Death Classification (PSANZ-NDC)

**1 Congenital abnormality (including terminations for congenital abnormalities)**
1.1 Central nervous system
1.2 Cardiovascular system
1.3 Urinary system
1.4 Gastrointestinal system
1.5 Chromosomal
1.6 Metabolic
1.7 Multiple/non chromosomal syndromes
1.8 Other congenital abnormality
- 1.81 Musculoskeletal
- 1.82 Respiratory
- 1.83 Diaphragmatic hernia
- 1.84 Haematological
- 1.85 Tumours
- 1.88 Other specified congenital abnormality

1.9 Unspecified congenital abnormality

**2 Extreme prematurity (typically infants of ≤24 weeks gestation or ≤600g birthweight)**
2.1 Not resuscitated
2.2 Unsuccessful resuscitation
2.9 Unspecified or not known whether resuscitation attempted

**3 Cardio-respiratory disorders**
3.1 Hyaline membrane disease / Respiratory distress syndrome (RDS)
3.2 Meconium aspiration syndrome
3.3 Primary persistent pulmonary hypertension
3.4 Pulmonary hypoplasia
3.5 Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)
3.8 Other

**4 Infection**
4.1 Bacterial
- 4.11 Congenital bacterial
- 4.12 Acquired bacterial

4.2 Viral
- 4.21 Congenital viral
- 4.22 Acquired viral

4.3 Protozoal, e.g. Toxoplasma
4.4 Spirochaetal, e.g. Syphilis
4.5 Fungal
4.8 Other
4.9 Unspecified organism

**5 Neurological**
5.1 Hypoxic ischaemic encephalopathy / Perinatal asphyxia (typically infants of >24 weeks gestation or >600g birthweight)
5.2 Intracranial haemorrhage
5.8 Other

**6 Gastrointestinal**
6.1 Necrotising enterocolitis
6.8 Other

**7 Other**

7.1 Sudden Infant Death Syndrome (SIDS)
- 7.11 SIDS Category 1A: Classic features of SIDS present and completely documented.
- 7.12 SIDS Category 1B: Classic features of SIDS present but incompletely documented.
- 7.13 SIDS Category II : Infant deaths that meet category 1 except for one or more features.

7.2 Multisystem failure-only if unknown primary cause or trigger event

7.3 Trauma

7.8 Other specified

7.9 Unknown/Undetermined
- 7.91 Unclassified Sudden Infant Death
- 7.92 Other Unknown/Undetermined

# 10. GLOSSARY

**ABORIGINAL AND TORRES STRAIT ISLANDER IDENTIFICATION (STATUS)** refers to whether or not a person is of Aboriginal and/or Torres Strait Islander descent who self identifies as an Aboriginal and/or Torres Strait Islander and is accepted as such by the community in which he or she lives.

**ABORTION** is a common term often used to mean termination of pregnancy or induced abortion.

**ANOMALY** is a deviation from what is regarded as normal. An example would be a congenital malformation or congenital anomaly.

**ANTENATAL** refers to the time period of pregnancy before birth.

**ANTEPARTUM FETAL DEATH** refers to a fetal death occurring before the onset of labour.[6]

**BIRTH** refers to the birth or delivery of a child.

**BIRTH STATUS** is the condition of the baby immediately after birth. The status may be a live birth or stillbirth (fetal death).

**BIRTHWEIGHT** is the first weight of the baby (stillborn or live born) obtained after birth. It is usually measured to the nearest five grams.

**CONFIDENCE INTERVAL** (95% CI) is a computed interval with a given probability (for example, 95%) that a true value of a variable such as a rate, mean or proportion, is contained between the low and high values. When the confidence intervals of two estimated values do not overlap, the values are statistically significantly different.

**CONGENITAL ANOMALIES** are the structural or anatomical abnormalities that are present at or existing from the time of birth, usually resulting from abnormal development in the first trimester of pregnancy. These were previously reported as birth defects, congenital anomalies or malformations.

**CRUDE DEATH RATE** is the number of deaths per 1,000 population (unless otherwise stipulated) in a given year (ABS definition).

**FETAL DEATH** refers to death prior to the complete expulsion or extraction from its mother of a product of conception of 20 or more completed weeks of gestation or of 400g or more of birthweight; the death is indicated by the fact that after separation the fetus does not breathe or show any other evidence of life, such as the beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles (WHO definition).

**GESTATION** is the period of development of a baby from the time of conception (fertilisation of the ovum) to birth.

**GESTATIONAL AGE** is the duration of the pregnancy in completed weeks from the first day of the last normal menstrual period. This is estimated from clinical assessment (including estimates from ultrasound examinations) when accurate information on the last menstrual period is not available or not consistent with the clinical assessment of gestational age.

**GRAVIDITY** refers to a pregnancy; the state of being pregnant, and is unrelated to the outcome.

**ICD-9 (or ICD-9-CM)** refers to the International Classification of Diseases Ninth Revision as developed by the World Health Organisation. The CM stands for Country Modification.

**ICD-10 (or ICD-10-AM)** refers to the International Classification of Diseases Tenth Revision as developed by the World Health Organisation. The AM stands for Australian Modification. In the ACT and most other states in Australia, ICD-10-AM codes were introduced in July 1998 to code hospital (morbidity) inpatient data.

**INTRAPARTUM FETAL DEATH** refers to a fetal death occurring during labour.[6]

**LIVE BIRTH** refers, in this publication, to the complete expulsion or extraction from its mother of a baby of 20 completed weeks gestation or more or at least 400 grams in birthweight or who after being born breathes or shows any other evidence of life, such as a heartbeat. The WHO defines live birth differently, as the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta attached, each product of such a birth is considered live born.

**MISCARRIAGE** is a common term used to mean spontaneous abortion. See the definition for 'Spontaneous abortion'.

**MORBIDITY** is a diseased state or the ratio of sick to well in the community.[7]

**MORTALITY** is a fatal outcome or the relative number of deaths (death rate) in a given population at a given time.

**MULTIGRAVIDA** refers to a woman who has been pregnant more than once.

**MULTIPARA** refers to pregnant women who have had at least one previous pregnancy resulting in a live birth or stillbirth.

**MULTIPLE BIRTH** refers to a pregnancy resulting in more than one birth. For example twins, triplets etc.

**NEONATAL DEATH** is the death of a live born baby within 28 days of birth.

**NEONATAL MORBIDITY** refers to any condition or disease of the baby diagnosed within 28 days of birth.

**PARITY** refers to the total number of previous pregnancies experienced by the woman that have resulted in a live birth or a stillbirth. The definition of parity has been changed since the last publication to align with the revised National Perinatal Data Development Committee's accepted definition.

**PERINATAL** refers to the period from 20 weeks gestation to within 28 days after birth.

**PERINATAL DEATH** refers to a stillbirth or a neonatal death.

**PLURALITY** refers to the number of fetuses or babies from a pregnancy. On this basis a pregnancy may be classified as single or multiple.[8]

**POST NEONATAL DEATH** refers to the death of a baby after 28 completed days and before 365 completed days.

**PRETERM BIRTH** refers to a birth before 36 completed weeks of gestation. Extremely preterm refers to births between 20 and 27 weeks gestation; moderately preterm refers to births between 28 and 31 weeks gestation; and mildly preterm refers to births between 32 and 36 weeks gestation.

**PRIMIGRAVIDA** refers to a woman pregnant for the first time.

**PRIMIPARA** refers to a pregnant woman who has had no previous pregnancy resulting in a live birth or stillbirth.

**PROLONGED RUPTURE OF MEMBRANES** refers to the spontaneous rupture of membranes for at least 18 hours prior to the onset of regular contractions with cervical dilation.

**RESUSCITATION OF A BABY** refers to active measures taken shortly after birth to assist the baby's ventilation and heartbeat, or to treat depressed respiratory effort and to correct metabolic disturbances.

**SEPARATION** (from hospital) refers to when a patient is discharged from hospital, transferred to another hospital or other health care accommodation, or dies in hospital following formal admission (ABS definition).

**SINGLETON BIRTH** refers to a pregnancy resulting in one birth.

**SPONTANEOUS ABORTION** refers to the premature expulsion from the uterus of the products of conception, of the embryo, or of a nonviable fetus (a fetus of less than 400 grams birthweight or less than 20 weeks gestation). These may be classified as complete or incomplete.

**STATISTICALLY SIGNIFICANT** infers that it can be concluded on the basis of statistical analysis that it is highly probable.

**STILLBIRTH** see ‘Fetal death’.

# 11. LIST OF PUBLICATIONS

The Epidemiology Section of ACT Health maintains and adds to an ongoing health series of publications to inform health professionals, policy developers and the community on health status in the Territory. Information contained therein will assist in the development of appropriate policy and service delivery models, the evaluation of programs, and an understanding of how the ACT compares with Australia as a whole with regard to health status.

Number 1: ACT's Health: A report on the health status of ACT residents, Carol Gilbert, Ursula White, October 1995

Number 2: The Epidemiology of Injury in the ACT, Carol Gilbert, Chris Gordon, February 1996

Number 3: Cancer in the Australian Capital Territory 1983 - 1992, Norma Briscoe, April 1996

Number 4: The Epidemiology of Asthma in the ACT, Carol Gilbert, April 1996

Number 5: The Epidemiology of Diabetes Mellitus in the ACT, Carol Gilbert, Chris Gordon, July 1996

Number 6: Developing a Strategic Plan for Cancer Services in the ACT, Kate Burns, June 1996

Number 7: The First Year of The Care Continuum and Health Outcomes Project, Bruce Shadbolt, June 1996

Number 8: The Epidemiology of Cardiovascular Disease in the ACT, C Gilbert, U White, January 1997

Number 9: Health Related Quality of Life in the ACT: 1994 - 95, D Gannon, C Gordon, B Egloff, B Shadbolt, February 1997

Number 10: Disability and Ageing in the ACT: An Epidemiological Review, C Gilbert, April 1997

Number 11: Mental Health in the ACT, Ursula White, C Gilbert, May 1997

Number 12: Aboriginal and Torres Strait Islander Health in the ACT, N Briscoe, J McConnell, M Petersen, July 1997

Number 13: Health Indicators in the ACT: Measures of health status and health services in the ACT, C Kee (Gilbert), G Johansen, U White, J McConnell, January 1998

Number 14: Health status of the ACT by statistical sub divisions, C Kee, G Bodilson (Johansen), April 1998

Number 15: Results from the 1996 ACT Secondary School Students' Survey, H Phung, A Webb, N Briscoe, June 1998

Number 16: Childhood immunisation & preventable diseases in the ACT 1993 - 1997, H Phung, M Petersen, June 1998

Number 17: Health Related Quality of Life in the ACT 1994 - 97, H Phung, U White, B Egloff, June 1998

Number 18: Maternal and Perinatal Status, ACT, 1994 - 96, M Bourne, C Kee, September 1998

Number 19: Health risk factors in the ACT, C Kee, M Petersen, K Rockpool, October 1998

Number 20: Communicable diseases in the ACT, L Halliday, M Petersen, November 1998

Number 21: Illicit drug samples seized in the ACT, 1980 - 97, D Pianca, November 1998

Number 22: Health Status of Young People in the A.C.T, L Halliday, J McConnell, October 1998

Number 23: Health Status of Older People in the A.C.T, C Kee, G Bodilsen, October 1999

Number 24: Drug related health in the ACT, J Barac (McConnell), P Luke, O Phongkham, December 1999

Number 25: ACT Maternal and Perinatal 1997 Tables, M Bourne, March 2000

Number 26: ACT Maternal and Perinatal 1998 Tables, M Bourne, March 2001

Number 27: Cancer in the Australian Capital Territory 1994 – 1999, PHRC, February 2002

Number 28: Health of older people in the ACT, 1999, PHRC, May 2002

Number 29: Physical activity patterns of adults in the ACT, 2000, PHRC, November 2003

Number 30: Perinatal Deaths in the ACT 1991 – 2000, PHRC, June 2003

Number 31: Breast Cancer in the ACT, PHRC, June 2003

Number 32: Maternal and Perinatal Health in the ACT, 1999, PHRC, June 2003

Number 33: Alcohol and Tobacco Use by ACT Secondary School Students 1996-2002, PHRC, Sep 2003

Number 34: Cancer in the ACT 1996-2000, PHRC, November 2003

Number 35: Preventing injury in older people: fear of falling and physical activity ACT 2003, PHRC, November 2003

Number 36: Maternal and Perinatal Health in the ACT, 1997 - 2001, PHRC, September 2004

Number 37: Substance use & other health related behaviours among ACT Secondary Students, PHRC, December 2004

Number 38: Review of ACT child deaths, PHRC, June 2006

Number 39: The results of the 2005 ACT secondary student drug and health risk survey, PHRC, February 2007

Number 40: The Health of Aboriginal and Torres Strait Islander People in the ACT, 2000 – 2004, May 2007

Number 41: Sustainable Healthy Development – the ACT way, June 2007

Number 42: Cancer in the ACT 1998-2004, August 2007

Number 43: Report on the 2006 ACT Year 6 Physical Activity and Nutrition Survey, August 2007

Number 44: Maternal and Perinatal Health in the ACT 200-2004, December 2007

Number 45: Perinatal Mortality in the ACT 2001 – 2005, August 2008

Number 46: Health Status of Women in the ACT, November 2008

Number 47: Cancer in the ACT Survival estimates 1995 – 2004, August 2009

Number 48: Cancer in the ACT Incidence and Mortality 2009, August 2009

Number 49: Review of breast cancer in ACT women, October 2010

Number 50: ACT Secondary Student Drug and Health Risk Behaviours, February 2011

Number 51: Maternal and Perinatal Health in the ACT 1999 – 2008, January 2011

Number 52: Report on the 2009 Year 6 Physical Activity and Nutrition Survey (ACTPANS), January 2012

Number 53: Health Status of young people in the ACT, April 2011

Number 54: Mental Health & Wellbeing in the ACT, 2011

Number 55: 2010 ACT Inmate Health Survey: Summary results, July 2011

Number 56: Cancer in the ACT Incidence and Mortality 2011, November 2011

Number 57: Review of Colorectal Cancer, January 2012

Number 58: The Health of Aboriginal and Torres Strait Islander People in the ACT, 2006 – 2011, February 2013

Number 59: Health Status of Children in the ACT: Results from the 2007-10 ACT General Health Survey, November 2013

Number 60: Substance Use and Other Health-Related Behaviours among ACT Secondary Students: Results of the 2011 ACT Secondary Students' Alcohol and Drug Survey, November 2013

Publications are available here: http://health.act.gov.au/healthinfo

# 12. REFERENCES


[1] Perinatal Society of Australia and New Zealand (2004). *Clinical Practice Guideline for Perinatal Mortality Audit, Section 7*. PSANZ.

[2] Government of South Australia, Department of Health (2006). *Maternal, Perinatal and Infant Mortality in South Australia.* Available at: http://www.dh.sa.gov.au/pehs/PDF-files/2005-mortality-report-dec06.pdf.

[3] Centre for Epidemiology and Research, NSW Department of Health (2007). New South Wales Mothers and Babies, 2005. *NSW Public Health Bulletin, 2005, 16 (S-4).*

[4] The Consultative Council on Obstetric and Paediatric Mortality and Morbidity (2006). *Annual Report for the Year 2005, incorporating the 44th Survey of Perinatal Deaths in Victoria.* CCOPMM; Melbourne.

[5] Queensland Health. *Health Information Centre, Perinatal Statistics (2005).* Available at: http://www.health.qld.gov.au/hic/peri2005/Deaths.pdf.

[6] Li Z, Zeki R, Hilder L and Sullivan EA (2012). *Australia's mothers and babies, 2010.*, in *Perinatal statistics series no. 27. Cat. no. PER 57.* AIHW: Canberra.

[7] Stedmans Medical Dictionary 26th Edition, (1995). Williams and Wilkins, Hagerstown, US.

[8] Taylor L and Pym M (1995). *New South Wales Data Collection,* Vol 7/No. S-1.