

# FETAL DEATHS

## Introduction

Stillbirths are often defined as the “*Death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the foetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles*” (WHO 1977).

While internationally, controversy still exists regarding the exact gestation at which a death becomes a fetal death rather than a spontaneous abortion (some countries use 22 weeks [1] and others 24 weeks [2]), in New Zealand the Perinatal and Maternal Mortality Review Committee defines a fetal death as “*the death of a fetus born at 20 weeks gestation or beyond, or weighing at least 400g if gestation is unknown. Fetal death includes stillbirth and termination of pregnancy*” [3].

In addition to varying gestational age criteria, there are also a number of classification systems used internationally to assign a single underlying cause to deaths occurring in utero [1]. While a comprehensive review is beyond the scope of this section, in essence each takes into consideration a variety of maternal, placental, cord and fetal factors when trying to determine the precise cause of a fetal death. Using one such system (the ONS Classification System), a New Zealand study noted that during 1995–99, 43.9% of late fetal deaths were attributed to antepartum asphyxia, 14.8% to congenital anomalies, and 22.8% to unspecified causes (although only 24.2% of unspecified deaths underwent a post-mortem, making it difficult to determine whether these deaths were unexplained or merely uninvestigated [4]). In another New Zealand study, which used the Perinatal Society of Australia and New Zealand Perinatal Death Classification System, only 14.1% of stillbirths in an Auckland cohort (20+ weeks gestation n=306) were deemed to be unexplained, with the authors concluding that the proportion of unexplained fetal deaths was likely to vary with the classification system used [5].

In terms of risk factors, in New Zealand fetal deaths have been shown to be higher for Indian and Pacific women, older women (35+ years), smokers, those from more deprived areas (NZDep decile 9-10), and for growth restricted babies [6] [7]. In one recent local case control study (155 late fetal deaths vs. 310 controls), risk of late fetal death was also significantly associated with maternal overweight and obesity, nulliparity, grandmultiparity, not being married, and not being in paid work. The excess risk for Pacific women disappeared once these other risk factors were taken into account [8]. Additional risk factors from the international literature include intrauterine infections, gestational diabetes, pregnancy induced hypertension, antepartum haemorrhage, and low maternal education [1] [2] [9,10] [11].

The following section reviews intermediate and late fetal deaths using information from the National Mortality Collection. The section concludes with a brief review of policy documents and evidence-based reviews which consider how fetal deaths might be prevented at the population level.

### Data Sources and Methods

#### Indicator

##### 1. Intermediate Fetal Deaths

Numerator: National Mortality Collection: Fetal deaths occurring between 20 and 27 weeks gestation.

Denominator: Birth Registration Dataset and National Mortality Collection: All births 20+ weeks gestation.

##### 2. Late Fetal Deaths

Numerator: National Mortality Collection: Fetal deaths occurring 28+ weeks gestation.

Denominator: Birth Registration Dataset and National Mortality Collection: All births 28+ weeks gestation.

### 3. Unspecified Fetal Deaths

**Numerator:** National Mortality Collection: Fetal deaths occurring 20+ weeks gestation where the main fetal cause of death was unspecified (ICD-10-AM P95 or R99) and there were no additional fetal or maternal causes of death listed.

**Denominator:** Birth Registration Dataset and National Mortality Collection: All births 20+ weeks gestation.

In the National Mortality Collection, all fetal deaths are assigned a main underlying (fetal) cause of death. In addition other fetal and maternal causes contributing to the death are also listed. In this section, the main (fetal) underlying cause of death was assigned using the following ICD-10-AM codes: Malnutrition/Slow Fetal Growth (P05), Extreme Immaturity/Low Birth Weight (P070, P072), Intrauterine Hypoxia: Pre Labour Onset (P200), Intrauterine Hypoxia: In Labour/Unspecified (P201, P209), Congenital Pneumonia (P23), Infections Specific to Perinatal Period (P35–P39), Fetal Blood Loss (P50), Unspecified Cause (P95), Congenital Anomalies: CNS (Q00–Q07), Congenital Anomalies: CVS (Q20–Q28), Chromosomal Anomalies (Q90–Q99), Congenital Anomalies: Other (remainder Q08–Q89), Other Causes (remainder ICD-10-AM).

In addition, the first maternal cause of death (if present) was assigned using the following ICD-10-AM codes: Incompetent Cervix/Premature Rupture Membranes (P010, P011), Oligohydramnios (P012), Multiple Pregnancy (P015), Placenta Praevia/Other Placental Separation/Haemorrhage (P020, P021), Other/Unspecified Placental Anomalies (P022), Compression of Umbilical Cord (P025), Chorioamnionitis (P027), Maternal Hypertensive Disorders (P000), Placental Transfusion Syndrome (P023), Other Causes (remainder ICD-10-AM).

For gestational age specific rates, the denominator was those remaining in utero at the specified gestational age (e.g. the 22 week denominator excludes all births occurring at 20 and 21 weeks)

#### Notes on Interpretation

Note 1: Death Registration data do not differentiate between spontaneous fetal deaths and late terminations of pregnancy (all fetal deaths 20+ weeks gestation require death registration). The admixture of spontaneous and induced fetal deaths is likely to be most prominent at earlier gestations (e.g. the high number of deaths attributed to congenital anomalies prior to 25 weeks gestation) and this must be taken into account when interpreting the data in this section.

Note 2: 95% confidence intervals have been provided for the rate ratios in this section and where appropriate, the terms *significant* or not *significant* have been used to communicate the significance of the observed associations. Tests of statistical significance have not been applied to other data in this section, and thus (unless the terms *significant* or non-*significant* are specifically used) the associations described do not imply statistical significance or non-significance (see **Appendix 2** for further discussion of this issue).

## New Zealand Distribution and Trends

### New Zealand Distribution by Cause

**Intermediate Fetal Deaths:** In New Zealand during 2004–2008, unspecified cause was the most frequently listed fetal cause of death for babies dying in utero between 20 and 27 weeks of gestation, followed by extreme immaturity/low birth weight and chromosomal anomalies. Congenital anomalies as a group, however, also made a significant contribution. Of those intermediate fetal deaths with a maternal cause listed, the most frequent causes were placenta praevia/placental separation/haemorrhage and chorioamnionitis (**Table 5**).

**Late Fetal Deaths:** In New Zealand during 2004–2008, unspecified cause was also the most frequently listed fetal cause of death for babies dying in utero at 28+ weeks gestation, followed by malnutrition/slow fetal growth and intrauterine hypoxia. Congenital anomalies as a group, however, still made a significant contribution. Of those late fetal deaths with a maternal cause listed, the most frequent causes were placenta praevia/placental separation/haemorrhage/other placental anomalies, and compression of the umbilical cord (**Table 6**).

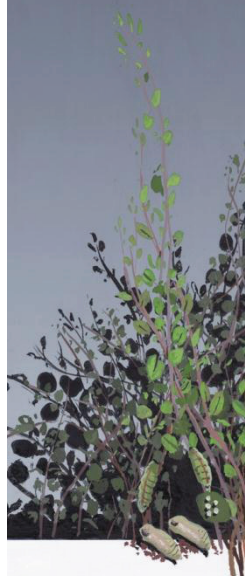


Table 5. Intermediate Fetal Deaths by Cause of Death, New Zealand 2004–2008

| Cause of Death                                      | New Zealand             |                        |                  |             |
|---|-------------------------|------------------------|------------------|-------------|
|   | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent (%) |
| Intermediate Fetal Deaths                           |                         |                        |                  |             |
| Main Fetal Cause of Death                           |                         |                        |                  |             |
| Unspecified Cause                                   | 310                     | 62.0                   | 99.9             | 24.1        |
| Extreme Immaturity / Low Birth Weight               | 198                     | 39.6                   | 63.8             | 15.4        |
| Chromosomal Anomalies                               | 161                     | 32.2                   | 51.9             | 12.5        |
| Congenital Anomalies: CNS                           | 139                     | 27.8                   | 44.8             | 10.8        |
| Congenital Anomalies: CVS                           | 86                      | 17.2                   | 27.7             | 6.70        |
| Congenital Anomalies: Other                         | 133                     | 26.6                   | 42.9             | 10.4        |
| Malnutrition / Slow Fetal Growth                    | 79                      | 15.8                   | 25.5             | 6.15        |
| Congenital Pneumonia                                | 30                      | 6.0                    | 9.67             | 2.34        |
| Infections Specific to Perinatal Period             | 29                      | 5.8                    | 9.35             | 2.26        |
| Fetal Blood Loss                                    | 21                      | 4.2                    | 6.77             | 1.64        |
| Intrauterine Hypoxia: In Labour/Unspecified         | 9                       | 1.8                    | 2.90             | 0.70        |
| Intrauterine Hypoxia: Pre Labour Onset              | 8                       | 1.6                    | 2.58             | 0.62        |
| Other Causes  | 81                      | 16.2                   | 26.1             | 6.31        |
| Total   | 1,284                   | 256.8                  | 413.9            | 100.0       |
| First Listed Maternal Cause                         |                         |                        |                  |             |
| No Listed Maternal Cause                            | 649                     | 129.8                  | 209.2            | 50.5        |
| Placenta Praevia / Placental Separation/Haemorrhage | 117                     | 23.4                   | 37.7             | 9.11        |
| Other / Unspecified Placental Anomalies             | 76                      | 15.2                   | 24.5             | 5.92        |
| Chorioamnionitis                                    | 78                      | 15.6                   | 25.1             | 6.07        |
| Incompetent Cervix / Premature Rupture Membranes    | 76                      | 15.2                   | 24.5             | 5.92        |
| Multiple Pregnancy                                  | 46                      | 9.2                    | 14.8             | 3.58        |
| Oligohydramnios                                     | 45                      | 9.0                    | 14.5             | 3.50        |
| Placental Transfusion Syndrome                      | 27                      | 5.4                    | 8.70             | 2.10        |
| Maternal Hypertensive Disorders                     | 21                      | 4.2                    | 6.77             | 1.64        |
| Compression of Umbilical Cord                       | 17                      | 3.4                    | 5.48             | 1.32        |
| Other Causes  | 132                     | 26.4                   | 42.5             | 10.3        |
| Total   | 1,284                   | 256.8                  | 413.9            | 100.0       |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: CNS = Central Nervous System, CVS = Cardiovascular System



Table 6. Late Fetal Deaths by Cause of Death, New Zealand 2004–2008

| Cause of Death                                      | New Zealand                       |                              |                     |                |
|---|-----------------------------------|------------------------------|---------------------|----------------|
|   | Number:<br>Total<br>2004–<br>2008 | Number:<br>Annual<br>Average | Rate per<br>100,000 | Percent<br>(%) |
| <b>Late Fetal Deaths</b>                            |                                   |                              |                     |                |
| <b>Main Fetal Cause of Death</b>                    |                                   |                              |                     |                |
| Unspecified Cause                                   | 526                               | 105.2                        | 171.0               | 50.2           |
| Malnutrition / Slow Fetal Growth                    | 92                                | 18.4                         | 29.9                | 8.78           |
| Intrauterine Hypoxia: Pre Labour Onset              | 55                                | 11.0                         | 17.9                | 5.25           |
| Intrauterine Hypoxia: In Labour/Unspecified         | 44                                | 8.8                          | 14.3                | 4.20           |
| Congenital Anomalies: CNS                           | 30                                | 6.0                          | 9.76                | 2.86           |
| Congenital Anomalies: CVS                           | 29                                | 5.8                          | 9.43                | 2.77           |
| Congenital Anomalies: Other                         | 53                                | 10.6                         | 17.2                | 5.06           |
| Chromosomal Anomalies                               | 42                                | 8.4                          | 13.7                | 4.01           |
| Fetal Blood Loss                                    | 38                                | 7.6                          | 12.4                | 3.63           |
| Infections Specific to Perinatal Period             | 18                                | 3.6                          | 5.85                | 1.72           |
| Congenital Pneumonia                                | 6                                 | 1.2                          | 1.95                | 0.57           |
| Extreme Immaturity / Low Birth Weight               | 4                                 | 0.8                          | 1.30                | 0.38           |
| Other Causes  | 111                               | 22.2                         | 36.1                | 10.6           |
| <b>Total</b>  | <b>1,048</b>                      | <b>209.6</b>                 | <b>340.8</b>        | <b>100.0</b>   |
| <b>First Listed Maternal Cause</b>                  |                                   |                              |                     |                |
| No Listed Maternal Cause                            | 359                               | 71.8                         | 116.7               | 34.3           |
| Placenta Praevia / Placental Separation/Haemorrhage | 108                               | 21.6                         | 35.1                | 10.3           |
| Other / Unspecified Placental Anomalies             | 119                               | 23.8                         | 38.7                | 11.4           |
| Compression of Umbilical Cord                       | 113                               | 22.6                         | 36.7                | 10.8           |
| Chorioamnionitis                                    | 59                                | 11.8                         | 19.2                | 5.63           |
| Multiple Pregnancy                                  | 39                                | 7.8                          | 12.7                | 3.72           |
| Maternal Hypertensive Disorders                     | 30                                | 6.0                          | 9.76                | 2.86           |
| Placental Transfusion Syndrome                      | 19                                | 3.8                          | 6.18                | 1.81           |
| Oligohydramnios                                     | 19                                | 3.8                          | 6.18                | 1.81           |
| Incompetent Cervix / Premature Rupture Membranes    | 17                                | 3.4                          | 5.53                | 1.62           |
| Other Causes  | 166                               | 33.2                         | 54.0                | 15.8           |
| <b>Total</b>  | <b>1,048</b>                      | <b>209.6</b>                 | <b>340.8</b>        | <b>100.0</b>   |

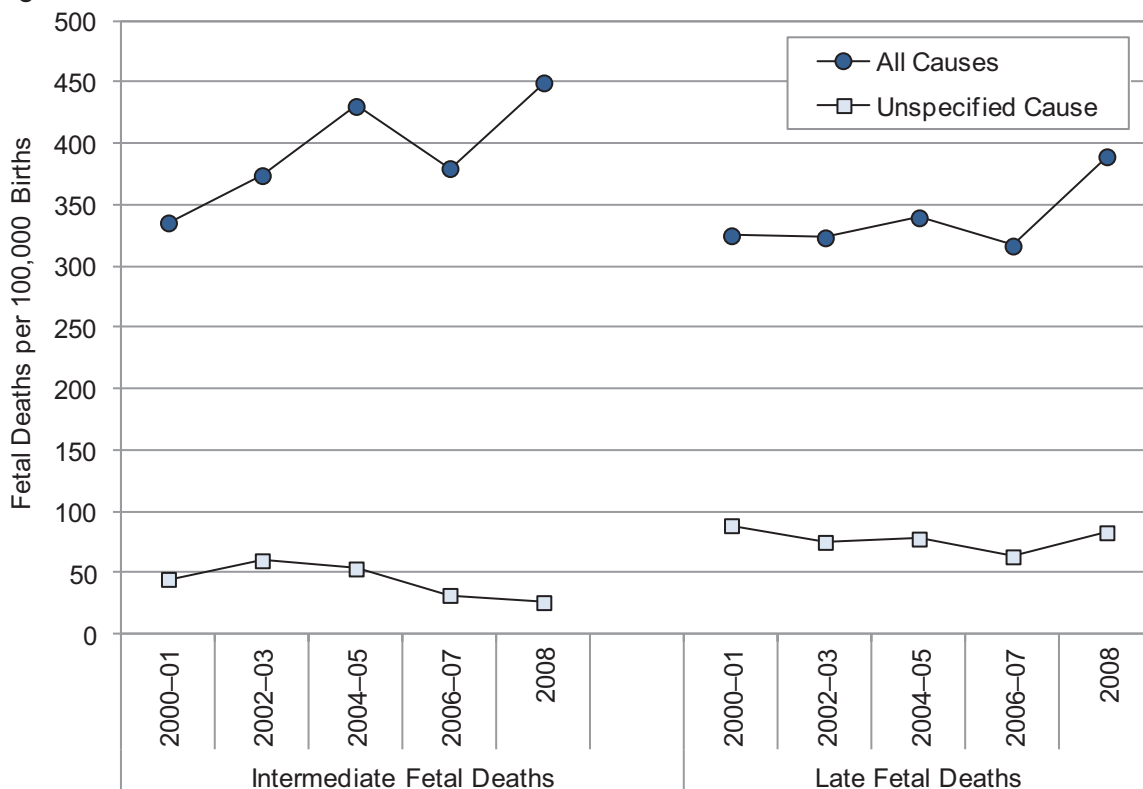
Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: CNS = Central Nervous System, CVS = Cardiovascular System.

### New Zealand Trends

In New Zealand, late fetal deaths were relatively static during the early-to-mid 2000s. While an upswing in rates was evident during 2008, it is too early to tell if this was a one off fluctuation, or the beginning of a longer term trend. Intermediate fetal deaths increased during the early 2000s, but were more variable after 2004–05, with the contribution unspecified deaths made to each category remaining relatively constant throughout this period (**Figure 1**).

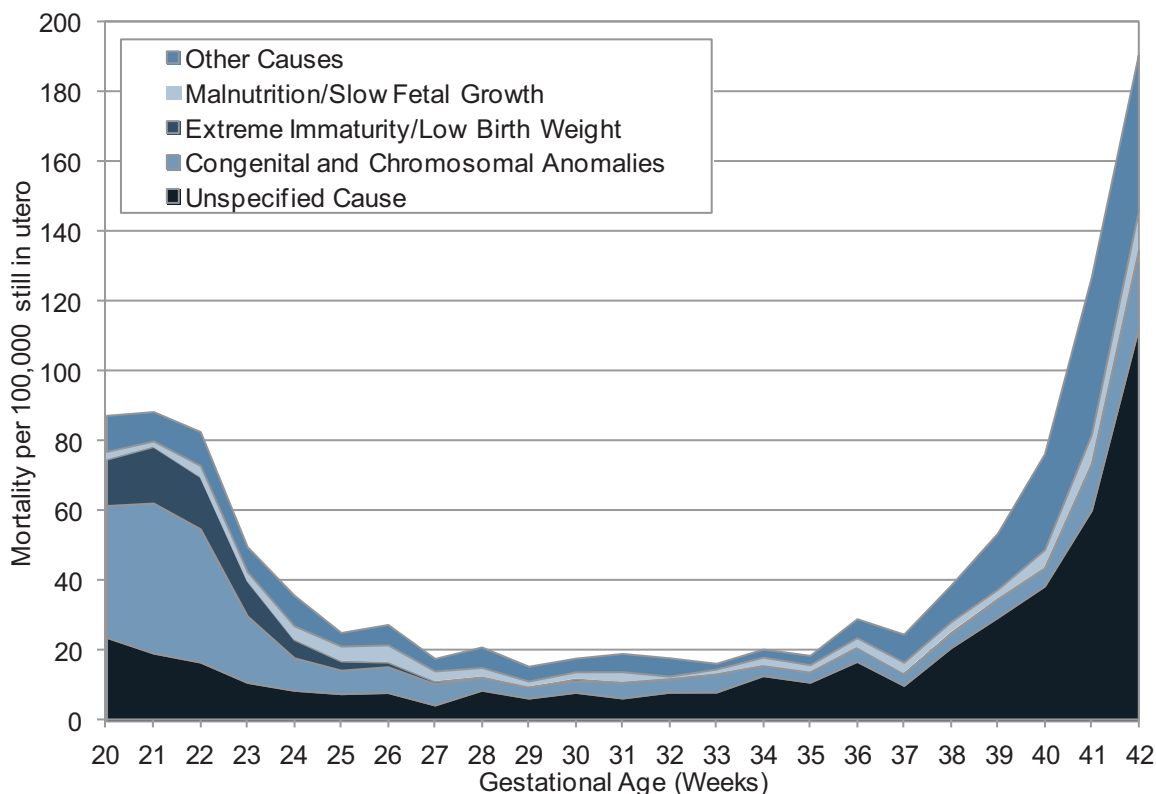


Figure 1. Intermediate and Late Fetal Deaths, New Zealand 2000–2008



Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection

Figure 2. Fetal Deaths by Gestational Age and Main Fetal Cause of Death, New Zealand 2004–2008

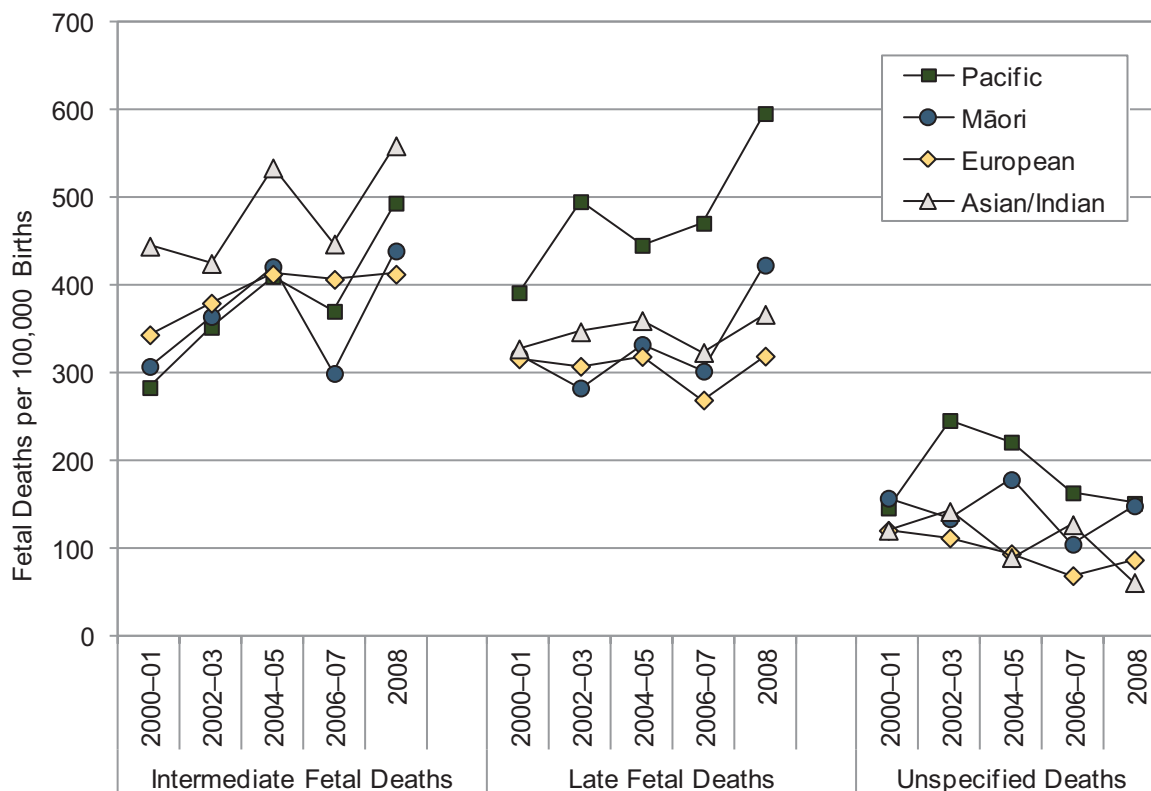


Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection

## New Zealand Distribution by Gestational Age and Cause

In New Zealand during 2004–2008, fetal deaths exhibited a J-shaped distribution with gestational age. A peak was evident at <25 weeks, and rates increased rapidly again after 37 weeks. In interpreting these figures, it must be remembered that rates were calculated by dividing the number of fetal deaths at each gestational age by the number of babies remaining in utero. Thus, while the absolute number of babies dying in utero did not rise exponentially towards term, the risk for those remaining in utero increased markedly with increasing age. Further, it was not always possible to distinguish between spontaneous fetal deaths and late terminations of pregnancy and thus the high mortality rates (e.g. from congenital anomalies) in those <25 weeks must be interpreted with this in mind. When broken down by cause, fetal deaths arising from congenital anomalies and extreme immaturity/low birth weight were highest in babies 20–22 weeks gestation, while unspecified fetal deaths increased rapidly after 37 weeks (**Figure 2**).

Figure 3. Intermediate and Late Fetal Deaths and Unspecified Deaths by Ethnicity, New Zealand 2000–2008



Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: Unspecified deaths include all those 20+ weeks; Ethnicity is Level 1 Prioritised.

## New Zealand Distribution by Ethnicity, NZDep Index Decile, Maternal Age and Gender

**Intermediate Fetal Deaths:** In New Zealand during 2004–2008, intermediate fetal deaths were *significantly* higher for Asian/Indian babies than for European babies, and for babies born to women aged 35+ years (vs. women 30–34 years) (**Table 7**). Similar ethnic differences were seen during 2000–2008 (**Figure 3**).

**Late Fetal Deaths:** In New Zealand during 2004–2008, late fetal deaths were *significantly* higher for Pacific babies than for European babies, for those from average-to-more deprived (NZDep decile 5–10) areas and for babies born to teenage women (vs. women aged 30–34 years) (**Table 7**). Similar ethnic differences were seen during 2000–2008 (**Figure 3**).

**Unspecified Fetal Deaths:** In New Zealand during 2004–2008, unspecified fetal deaths were *significantly* higher for Pacific and Māori babies than for European babies, and for



babies from more deprived (NZDep 7–10) areas (**Table 7**). Similar ethnic differences were seen during 2000–2008 (**Figure 3**).

Table 7. Intermediate and Late Fetal Deaths and Unspecified Deaths by Ethnicity, NZ Deprivation Index Decile, Maternal Age and Gender, New Zealand 2004–2008

| Variable                                  | Rate  | Rate Ratio | 95% CI    | Variable     | Rate  | Rate Ratio | 95% CI    |
|---|-------|------------|-----------|--------------|-------|------------|-----------|
| <b>Intermediate Fetal Deaths</b>          |       |            |           |              |       |            |           |
| NZ Deprivation Index Quintile             |       |            |           | Maternal Age |       |            |           |
| Decile 1–2                                | 422.7 | 1.00       |           | < 20 Years   | 457.1 | 1.24       | 1.00–1.54 |
| Decile 3–4                                | 406.2 | 0.96       | 0.79–1.16 | 20–24 Years  | 418.4 | 1.14       | 0.96–1.34 |
| Decile 5–6                                | 445.0 | 1.05       | 0.88–1.27 | 25–29 Years  | 387.2 | 1.05       | 0.90–1.23 |
| Decile 7–8                                | 396.5 | 0.94       | 0.78–1.13 | 30–34 Years  | 368.5 | 1.00       |           |
| Decile 9–10                               | 414.2 | 0.98       | 0.82–1.17 | 35+ Years    | 485.2 | 1.32       | 1.13–1.53 |
| Prioritised Ethnicity                     |       |            |           | Gender       |       |            |           |
| European                                  | 410.1 | 1.00       |           | Female       | 394.7 | 1.00       |           |
| Māori                                     | 374.7 | 0.91       | 0.80–1.04 | Male         | 427.0 | 1.08       | 0.97–1.21 |
| Pacific                                   | 412.1 | 1.00       | 0.84–1.21 |              |       |            |           |
| Asian/Indian                              | 504.8 | 1.23       | 1.03–1.47 |              |       |            |           |
| <b>Late Fetal Deaths</b>                  |       |            |           |              |       |            |           |
| NZ Deprivation Index Quintile             |       |            |           | Maternal Age |       |            |           |
| Decile 1–2                                | 251.0 | 1.00       |           | < 20 Years   | 462.8 | 1.43       | 1.14–1.78 |
| Decile 3–4                                | 292.1 | 1.16       | 0.92–1.48 | 20–24 Years  | 351.8 | 1.09       | 0.90–1.30 |
| Decile 5–6                                | 324.0 | 1.29       | 1.03–1.62 | 25–29 Years  | 295.9 | 0.91       | 0.77–1.09 |
| Decile 7–8                                | 336.6 | 1.34       | 1.07–1.67 | 30–34 Years  | 324.1 | 1.00       |           |
| Decile 9–10                               | 442.6 | 1.76       | 1.43–2.17 | 35+ Years    | 361.9 | 1.12       | 0.94–1.32 |
| Prioritised Ethnicity                     |       |            |           | Gender       |       |            |           |
| European                                  | 298.4 | 1.00       |           | Female       | 340.0 | 1.00       |           |
| Māori                                     | 339.2 | 1.14       | 0.98–1.31 | Male         | 341.6 | 1.00       | 0.89–1.13 |
| Pacific                                   | 488.3 | 1.64       | 1.37–1.96 |              |       |            |           |
| Asian/Indian                              | 346.6 | 1.16       | 0.94–1.44 |              |       |            |           |
| <b>Unspecified Cause (All Gestations)</b> |       |            |           |              |       |            |           |
| NZ Deprivation Index Quintile             |       |            |           | Maternal Age |       |            |           |
| Decile 1–2                                | 81.6  | 1.00       |           | < 20 Years   | 143.6 | 1.45       | 0.98–2.16 |
| Decile 3–4                                | 68.6  | 0.84       | 0.53–1.32 | 20–24 Years  | 127.2 | 1.29       | 0.94–1.76 |
| Decile 5–6                                | 85.5  | 1.05       | 0.69–1.60 | 25–29 Years  | 101.8 | 1.03       | 0.76–1.40 |
| Decile 7–8                                | 137.5 | 1.69       | 1.16–2.45 | 30–34 Years  | 98.9  | 1.00       |           |
| Decile 9–10                               | 152.6 | 1.87       | 1.31–2.68 | 35+ Years    | 111.5 | 1.13       | 0.83–1.53 |
| Prioritised Ethnicity                     |       |            |           | Gender       |       |            |           |
| European                                  | 81.8  | 1.00       |           | Female       | 109.9 | 1.00       |           |
| Māori                                     | 141.1 | 1.73       | 1.35–2.21 | Male         | 110.5 | 1.01       | 0.81–1.24 |
| Pacific                                   | 182.2 | 2.23       | 1.64–3.03 |              |       |            |           |
| Asian/Indian                              | 97.6  | 1.19       | 0.80–1.79 |              |       |            |           |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: Rate is per 100,000 births; Ethnicity is Level 1 Prioritised; Decile is NZDep2001.



## South Island Distribution and Trends

### South Island DHBs vs. New Zealand

During 2004–2008, while there was some regional variability, intermediate and late fetal death rates were not *significantly* different from the New Zealand rate in any of the South Island DHBs (Table 8).

Table 8. Intermediate and Late Fetal Deaths, South Island DHBs vs. New Zealand 2004–2008

| DHB                              | Number:<br>Total 2004–<br>2008 | Number:<br>Annual<br>Average | Rate per<br>100,000 | Rate Ratio | 95% CI    |
|----------------------------------|--------------------------------|------------------------------|---------------------|------------|-----------|
| <b>Intermediate Fetal Deaths</b> |                                |                              |                     |            |           |
| Nelson Marlborough               | 34                             | 6.8                          | 412.6               | 1.00       | 0.71–1.40 |
| West Coast                       | 6                              | 1.2                          | 298.7               | 0.72       | 0.32–1.61 |
| Canterbury                       | 134                            | 26.8                         | 417.9               | 1.01       | 0.85–1.21 |
| South Canterbury                 | 7                              | 1.4                          | 225.8               | 0.55       | 0.26–1.15 |
| Otago                            | 44                             | 8.8                          | 428.4               | 1.04       | 0.77–1.40 |
| Southland                        | 33                             | 6.6                          | 430.8               | 1.04       | 0.74–1.47 |
| New Zealand                      | 1,284                          | 256.8                        | 413.9               | 1.00       |           |
| <b>Late Fetal Deaths</b>         |                                |                              |                     |            |           |
| Nelson Marlborough               | 28                             | 5.6                          | 342.6               | 1.01       | 0.69–1.46 |
| West Coast                       | 8                              | 1.6                          | 401.2               | 1.18       | 0.59–2.36 |
| Canterbury                       | 91                             | 18.2                         | 286.2               | 0.84       | 0.68–1.04 |
| South Canterbury                 | 11                             | 2.2                          | 357.0               | 1.05       | 0.58–1.90 |
| Otago                            | 31                             | 6.2                          | 304.5               | 0.89       | 0.63–1.28 |
| Southland                        | 25                             | 5.0                          | 329.3               | 0.97       | 0.65–1.44 |
| New Zealand                      | 1,048                          | 209.6                        | 340.8               | 1.00       |           |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection

### South Island Trends

In the South Island during 2000–2008, large year to year variations (likely as the result of small numbers) made trends in intermediate and late fetal deaths difficult to interpret, although intermediate fetal deaths in Nelson Marlborough increased consistently during this period (Figure 4).

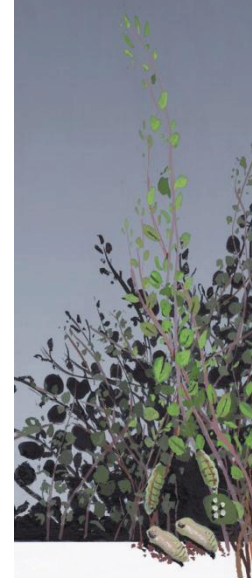
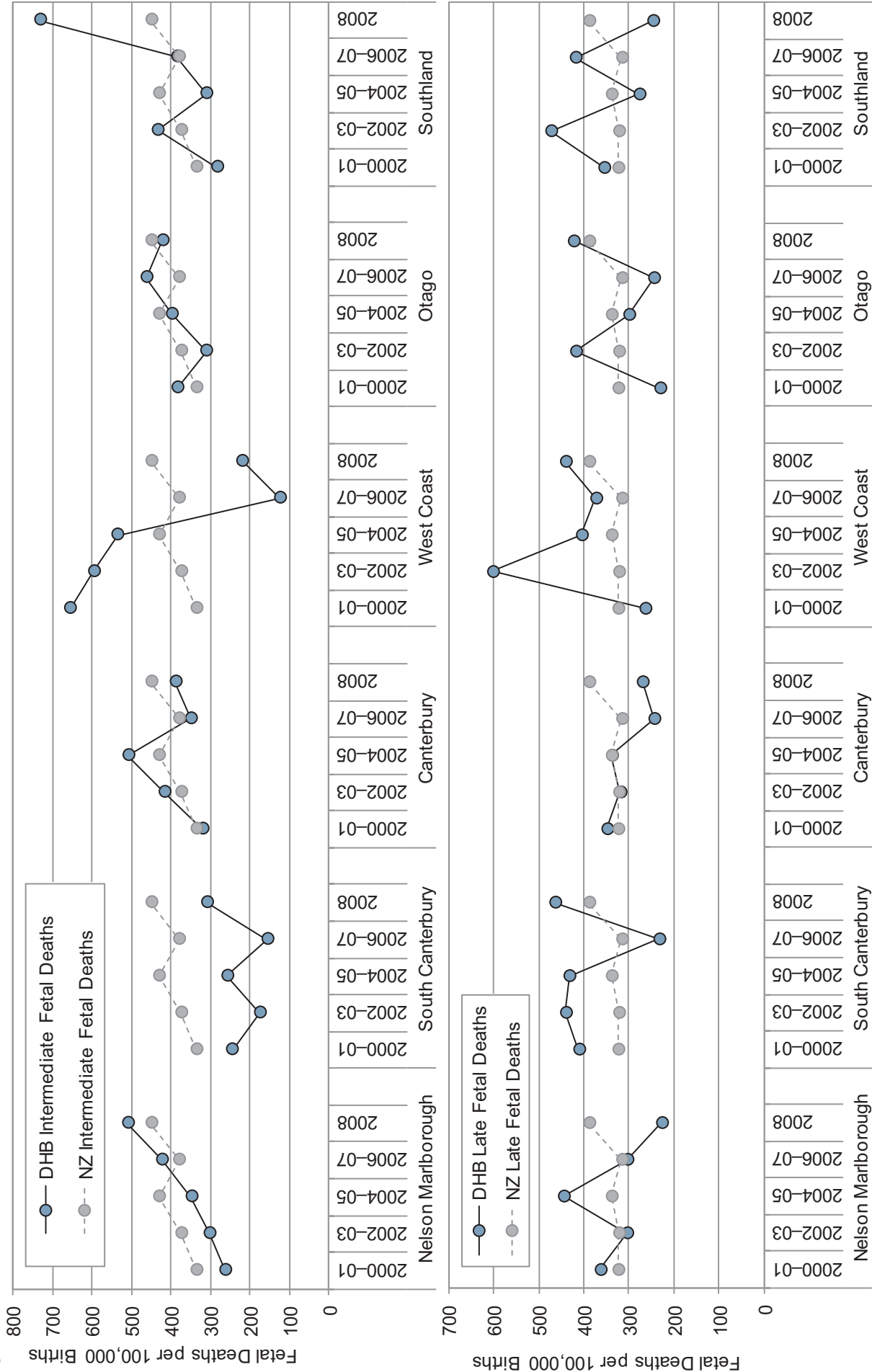




Figure 4. Intermediate and Late Fetal Deaths, South Island DHBs vs. New Zealand 2000-2008



Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection

## South Island Distribution by Cause

In the South Island DHBs during 2004–2008, extreme immaturity/low birth weight, congenital and chromosomal anomalies and unspecified causes were frequently listed fetal causes of intermediate fetal deaths. Of those intermediate fetal deaths which had a maternal cause listed, frequent causes were placenta praevia/other placental anomalies, incompetent cervix/premature rupture of the membranes and chorioamnionitis. Unspecified causes, intrauterine hypoxia and congenital and chromosomal anomalies were also common fetal causes of late fetal deaths. Of those late fetal deaths which had a maternal cause listed, frequent causes were placenta praevia/other placental anomalies and compression of the umbilical cord (**Table 9–Table 14**).

Table 9. Intermediate and Late Fetal Deaths by Cause, Nelson Marlborough 2004–2008

| Cause of Death                                      | Nelson Marlborough      |                        |                  |              |
|---|-------------------------|------------------------|------------------|--------------|
|   | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent (%)  |
| <b>Intermediate Fetal Deaths</b>                    |                         |                        |                  |              |
| <b>Main Fetal Cause of Death</b>                    |                         |                        |                  |              |
| Unspecified Cause                                   | 11                      | 2.2                    | 133.5            | 32.4         |
| Extreme Immaturity / Low Birth Weight               | 6                       | 1.2                    | 72.8             | 17.6         |
| Chromosomal Anomalies                               | 4                       | 0.8                    | 48.5             | 11.8         |
| Congenital Anomalies: CVS                           | 3                       | 0.6                    | 36.4             | 8.8          |
| Congenital Anomalies: All Other                     | 5                       | 1.0                    | 60.7             | 14.7         |
| Other Causes  | 5                       | 1.0                    | 60.7             | 14.7         |
| <b>Total</b>  | <b>34</b>               | <b>6.8</b>             | <b>412.6</b>     | <b>100.0</b> |
| <b>First Listed Maternal Cause</b>                  |                         |                        |                  |              |
| No Listed Maternal Cause                            | 14                      | 2.8                    | 169.9            | 41.2         |
| Placenta Praevia / Placental Separation/Haemorrhage | 7                       | 1.4                    | 85.0             | 20.6         |
| Other/Unspecified Placental Anomalies               | 3                       | 0.6                    | 36.4             | 8.8          |
| Incompetent Cervix / Premature Rupture Membranes    | 4                       | 0.8                    | 48.5             | 11.8         |
| Other Causes  | 6                       | 1.2                    | 72.8             | 17.6         |
| <b>Total</b>  | <b>34</b>               | <b>6.8</b>             | <b>412.6</b>     | <b>100.0</b> |
| <b>Late Fetal Deaths</b>                            |                         |                        |                  |              |
| <b>Main Fetal Cause of Death</b>                    |                         |                        |                  |              |
| Unspecified Cause                                   | 10                      | 2.0                    | 122.3            | 35.7         |
| Congenital and Chromosomal Anomalies                | 6                       | 1.2                    | 73.4             | 21.4         |
| Intrauterine Hypoxia                                | 6                       | 1.2                    | 73.4             | 21.4         |
| Fetal Blood Loss                                    | 3                       | 0.6                    | 36.7             | 10.7         |
| Other Causes  | 3                       | 0.6                    | 36.7             | 10.7         |
| <b>Total</b>  | <b>28</b>               | <b>5.6</b>             | <b>342.6</b>     | <b>100.0</b> |
| <b>First Listed Maternal Cause</b>                  |                         |                        |                  |              |
| No Listed Maternal Cause                            | 7                       | 1.4                    | 85.6             | 25.0         |
| Compression of Umbilical Cord                       | 6                       | 1.2                    | 73.4             | 21.4         |
| Placenta Praevia / Other Placental Causes           | 4                       | 0.8                    | 48.9             | 14.3         |
| Other Causes  | 11                      | 2.2                    | 134.6            | 39.3         |
| <b>Total</b>  | <b>28</b>               | <b>5.6</b>             | <b>342.5</b>     | <b>100.0</b> |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: CVS = Cardiovascular System.

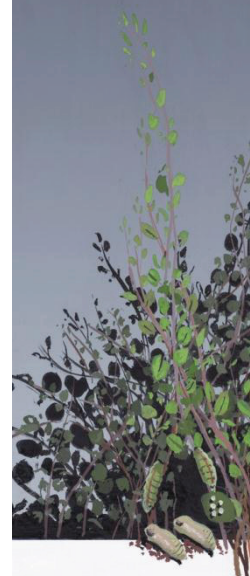


Table 10. Intermediate and Late Fetal Deaths by Cause, South Canterbury 2004–2008

| Cause of Death                | South Canterbury        |                        |                  |             |
|-------------------------------|-------------------------|------------------------|------------------|-------------|
|                               | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent (%) |
| Intermediate Fetal Deaths     |                         |                        |                  |             |
| Main Fetal Cause of Death     |                         |                        |                  |             |
| Unspecified Cause             | 5                       | 1.0                    | 161.3            | 71.4        |
| Other Causes                  | 2                       | 0.4                    | 64.5             | 28.6        |
| Total                         | 7                       | 1.4                    | 225.8            | 100.0       |
| First Listed Maternal Cause   |                         |                        |                  |             |
| No Listed Maternal Cause      | 3                       | 0.6                    | 96.8             | 42.9        |
| Other Causes                  | 4                       | 0.8                    | 129.0            | 57.1        |
| Total                         | 7                       | 1.4                    | 225.8            | 100.0       |
| Late Fetal Deaths             |                         |                        |                  |             |
| Main Fetal Cause of Death     |                         |                        |                  |             |
| Unspecified Cause             | 7                       | 1.4                    | 227.2            | 63.6        |
| Other Causes                  | 4                       | 0.8                    | 129.8            | 36.4        |
| Total                         | 11                      | 2.2                    | 357.0            | 100.0       |
| First Listed Maternal Cause   |                         |                        |                  |             |
| Compression of Umbilical Cord | 3                       | 0.6                    | 97.4             | 27.3        |
| No Listed Maternal Cause      | 2                       | 0.4                    | 64.9             | 18.2        |
| Other Causes                  | 6                       | 1.2                    | 194.7            | 54.5        |
| Total                         | 11                      | 2.2                    | 357.0            | 100.0       |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection

Table 11. Intermediate and Late Fetal Deaths by Cause, the West Coast 2004–2008

| Cause of Death              | West Coast              |                        |                  |             |
|-----------------------------|-------------------------|------------------------|------------------|-------------|
|                             | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent (%) |
| Intermediate Fetal Deaths   |                         |                        |                  |             |
| Main Fetal Cause of Death   |                         |                        |                  |             |
| All Causes                  | 6                       | 1.2                    | 298.7            | 100.0       |
| Total                       | 6                       | 1.2                    | 298.7            | 100.0       |
| First Listed Maternal Cause |                         |                        |                  |             |
| No Listed Maternal Cause    | 2                       | 0.4                    | 99.6             | 33.3        |
| Other Causes                | 4                       | 0.8                    | 199.1            | 66.7        |
| Total                       | 6                       | 1.2                    | 298.7            | 100.0       |
| Late Fetal Deaths           |                         |                        |                  |             |
| Main Fetal Cause of Death   |                         |                        |                  |             |
| Unspecified Cause           | 4                       | 0.8                    | 200.6            | 50.0        |
| Other Causes                | 4                       | 0.8                    | 200.6            | 50.0        |
| Total                       | 8                       | 1.6                    | 401.2            | 100.0       |
| First Listed Maternal Cause |                         |                        |                  |             |
| No Listed Maternal Cause    | 3                       | 0.6                    | 150.5            | 37.5        |
| Other Causes                | 5                       | 1.0                    | 250.8            | 62.5        |
| Total                       | 8                       | 1.6                    | 401.2            | 100.0       |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection

Table 12. Intermediate and Late Fetal Deaths by Cause, Canterbury 2004–2008

| Cause of Death                                      | Canterbury              |                        |                  |              |
|---|-------------------------|------------------------|------------------|--------------|
|   | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent (%)  |
| <b>Intermediate Fetal Deaths</b>                    |                         |                        |                  |              |
| <b>Main Fetal Cause of Death</b>                    |                         |                        |                  |              |
| Unspecified Cause                                   | 24                      | 4.8                    | 74.9             | 17.9         |
| Chromosomal Anomalies                               | 24                      | 4.8                    | 74.9             | 17.9         |
| Congenital Anomalies: CNS                           | 16                      | 3.2                    | 49.9             | 11.9         |
| Congenital Anomalies: CVS                           | 15                      | 3.0                    | 46.8             | 11.2         |
| Congenital Anomalies: Other                         | 16                      | 3.2                    | 49.9             | 11.9         |
| Extreme Immaturity / Low Birth Weight               | 14                      | 2.8                    | 43.7             | 10.4         |
| Malnutrition / Slow Fetal Growth                    | 5                       | 1.0                    | 15.6             | 3.7          |
| Infections Specific to Perinatal Period             | 4                       | 0.8                    | 12.5             | 3.0          |
| Other Causes  | 16                      | 3.2                    | 49.9             | 11.9         |
| <b>Total</b>  | <b>134</b>              | <b>26.8</b>            | <b>417.9</b>     | <b>100.0</b> |
| <b>First Listed Maternal Cause</b>                  |                         |                        |                  |              |
| No Listed Maternal Cause                            | 68                      | 13.6                   | 212.1            | 50.7         |
| Placenta Praevia / Placental Separation/Haemorrhage | 17                      | 3.4                    | 53.0             | 12.7         |
| Other / Unspecified Placental Anomalies             | 7                       | 1.4                    | 21.8             | 5.2          |
| Chorioamnionitis                                    | 9                       | 1.8                    | 28.1             | 6.7          |
| Oligohydramnios                                     | 7                       | 1.4                    | 21.8             | 5.2          |
| Incompetent Cervix / Premature Rupture Membranes    | 6                       | 1.2                    | 18.7             | 4.5          |
| Multiple Pregnancy                                  | 4                       | 0.8                    | 12.5             | 3.0          |
| Placental Transfusion Syndrome                      | 3                       | 0.6                    | 9.36             | 2.2          |
| Compression of Umbilical Cord                       | 3                       | 0.6                    | 9.36             | 2.2          |
| Other Causes  | 10                      | 2.0                    | 31.2             | 7.5          |
| <b>Total</b>  | <b>134</b>              | <b>26.8</b>            | <b>417.9</b>     | <b>100.0</b> |
| <b>Late Fetal Deaths</b>                            |                         |                        |                  |              |
| <b>Main Fetal Cause of Death</b>                    |                         |                        |                  |              |
| Unspecified Cause                                   | 35                      | 7.0                    | 110.1            | 38.5         |
| Intrauterine Hypoxia: Pre Labour Onset              | 9                       | 1.8                    | 28.3             | 9.9          |
| Intrauterine Hypoxia: In Labour/Unspecified         | 3                       | 0.6                    | 9.44             | 3.3          |
| Chromosomal Anomalies                               | 4                       | 0.8                    | 12.6             | 4.4          |
| Congenital Anomalies: CNS                           | 3                       | 0.6                    | 9.44             | 3.3          |
| Congenital Anomalies: All Other                     | 7                       | 1.4                    | 22.0             | 7.7          |
| Fetal Blood Loss                                    | 3                       | 0.6                    | 9.44             | 3.3          |
| Other Causes  | 27                      | 5.4                    | 84.9             | 29.7         |
| <b>Total</b>  | <b>91</b>               | <b>18.2</b>            | <b>286.2</b>     | <b>100.0</b> |
| <b>First Listed Maternal Cause</b>                  |                         |                        |                  |              |
| No Listed Maternal Cause                            | 25                      | 5.0                    | 78.6             | 27.5         |
| Placenta Praevia / Placental Separation/Haemorrhage | 10                      | 2.0                    | 31.4             | 11.0         |
| Other/Unspecified Placental Anomalies               | 14                      | 2.8                    | 44.0             | 15.4         |
| Compression of Umbilical Cord                       | 12                      | 2.4                    | 37.7             | 13.2         |
| Multiple Pregnancy                                  | 3                       | 0.6                    | 9.44             | 3.3          |
| Other Causes  | 27                      | 5.4                    | 84.9             | 29.7         |
| <b>Total</b>  | <b>91</b>               | <b>18.2</b>            | <b>286.2</b>     | <b>100.0</b> |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: CNS = Central Nervous System, CVS = Cardiovascular System.



Table 13. Intermediate and Late Fetal Deaths by Cause, Otago 2004–2008

| Cause of Death                                   | Otago                             |                              |                     |                |
|--|-----------------------------------|------------------------------|---------------------|----------------|
|  | Number:<br>Total<br>2004–<br>2008 | Number:<br>Annual<br>Average | Rate per<br>100,000 | Percent<br>(%) |
| <b>Intermediate Fetal Deaths</b>                 |                                   |                              |                     |                |
| <b>Main Fetal Cause of Death</b>                 |                                   |                              |                     |                |
| Unspecified Cause                                | 11                                | 2.2                          | 107.1               | 25.0           |
| Congenital Anomalies                             | 12                                | 2.4                          | 116.8               | 27.3           |
| Extreme Immaturity / Low Birth Weight            | 6                                 | 1.2                          | 58.4                | 13.6           |
| Chromosomal Anomalies                            | 5                                 | 1.0                          | 48.7                | 11.4           |
| Malnutrition / Slow Fetal Growth                 | 3                                 | 0.6                          | 29.2                | 6.8            |
| Infections Specific to Perinatal Period          | 3                                 | 0.6                          | 29.2                | 6.8            |
| Fetal Blood Loss                                 | 3                                 | 0.6                          | 29.2                | 6.8            |
| Other Causes                                     | 1                                 | 0.2                          | 9.74                | 2.3            |
| <b>Total</b>                                     | <b>44</b>                         | <b>8.8</b>                   | <b>428.4</b>        | <b>100.0</b>   |
| <b>First Listed Maternal Cause</b>               |                                   |                              |                     |                |
| No Listed Maternal Cause                         | 15                                | 3.0                          | 146.0               | 34.1           |
| Multiple Pregnancy                               | 4                                 | 0.8                          | 38.9                | 9.1            |
| Incompetent Cervix / Premature Rupture Membranes | 3                                 | 0.6                          | 29.2                | 6.8            |
| Oligohydramnios                                  | 3                                 | 0.6                          | 29.2                | 6.8            |
| Chorioamnionitis                                 | 3                                 | 0.6                          | 29.2                | 6.8            |
| Placenta Praevia / Other Placental Causes        | 6                                 | 1.2                          | 58.4                | 13.6           |
| Other Causes                                     | 10                                | 2.0                          | 97.4                | 22.7           |
| <b>Total</b>                                     | <b>44</b>                         | <b>8.8</b>                   | <b>428.4</b>        | <b>100.0</b>   |
| <b>Late Fetal Deaths</b>                         |                                   |                              |                     |                |
| <b>Main Fetal Cause of Death</b>                 |                                   |                              |                     |                |
| Unspecified Cause                                | 11                                | 2.2                          | 108.0               | 35.5           |
| Congenital Anomalies: CVS                        | 4                                 | 0.8                          | 39.3                | 12.9           |
| Other Congenital and Chromosomal Anomalies       | 4                                 | 0.8                          | 39.3                | 12.9           |
| Intrauterine Hypoxia                             | 4                                 | 0.8                          | 39.3                | 12.9           |
| Other Causes                                     | 8                                 | 1.6                          | 78.6                | 25.8           |
| <b>Total</b>                                     | <b>31</b>                         | <b>6.2</b>                   | <b>304.5</b>        | <b>100.0</b>   |
| <b>First Listed Maternal Cause</b>               |                                   |                              |                     |                |
| No Listed Maternal Cause                         | 7                                 | 1.4                          | 68.7                | 22.6           |
| Placenta Praevia / Other Placental Causes        | 6                                 | 1.2                          | 58.9                | 19.4           |
| Chorioamnionitis                                 | 5                                 | 1.0                          | 49.1                | 16.1           |
| Other Causes                                     | 13                                | 2.6                          | 127.7               | 41.9           |
| <b>Total</b>                                     | <b>31</b>                         | <b>6.2</b>                   | <b>304.5</b>        | <b>100.0</b>   |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: CVS = Cardiovascular System.

Table 14. Intermediate and Late Fetal Deaths by Cause, Southland 2004–2008

| Cause of Death                            | Southland               |                        |                  |             |
|---|-------------------------|------------------------|------------------|-------------|
|   | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent (%) |
| Intermediate Fetal Deaths                 |                         |                        |                  |             |
| Main Fetal Cause of Death                 |                         |                        |                  |             |
| Congenital Anomalies: CNS                 | 8                       | 1.6                    | 104.4            | 24.2        |
| Congenital Anomalies: All Other           | 4                       | 0.8                    | 52.2             | 12.1        |
| Extreme Immaturity / Low Birth Weight     | 7                       | 1.4                    | 91.4             | 21.2        |
| Unspecified Cause                         | 6                       | 1.2                    | 78.3             | 18.2        |
| Chromosomal Anomalies                     | 4                       | 0.8                    | 52.2             | 12.1        |
| Other Causes                              | 4                       | 0.8                    | 52.2             | 12.1        |
| Total                                     | 33                      | 6.6                    | 430.8            | 100.0       |
| First Listed Maternal Cause               |                         |                        |                  |             |
| No Listed Maternal Cause                  | 24                      | 4.8                    | 313.3            | 72.7        |
| Placenta Praevia / Other Placental Causes | 3                       | 0.6                    | 39.2             | 9.1         |
| Other Causes                              | 6                       | 1.2                    | 78.3             | 18.2        |
| Total                                     | 33                      | 6.6                    | 430.8            | 100.0       |
| Late Fetal Deaths                         |                         |                        |                  |             |
| Main Fetal Cause of Death                 |                         |                        |                  |             |
| Unspecified Cause                         | 14                      | 2.8                    | 184.4            | 56.0        |
| Intrauterine Hypoxia                      | 6                       | 1.2                    | 79.0             | 24.0        |
| Other Causes                              | 5                       | 1.0                    | 65.9             | 20.0        |
| Total                                     | 25                      | 5.0                    | 329.3            | 100.0       |
| First Listed Maternal Cause               |                         |                        |                  |             |
| No Listed Maternal Cause                  | 8                       | 1.6                    | 105.4            | 32.0        |
| Placenta Praevia / Other Placental Causes | 5                       | 1.0                    | 65.9             | 20.0        |
| Compression of Umbilical Cord             | 3                       | 0.6                    | 39.5             | 12.0        |
| Other Causes                              | 9                       | 1.8                    | 118.5            | 36.0        |
| Total                                     | 25                      | 5.0                    | 329.3            | 100.0       |

Source: Numerator: National Mortality Collection; Denominators: Birth Registration Dataset and National Mortality Collection. Note: CNS = Central Nervous System.

## Summary

In New Zealand during 2004–2008, unspecified cause was the most frequently listed fetal cause of intermediate fetal deaths, followed by extreme immaturity/low birth weight. Congenital and chromosomal anomalies as a group however, also made a significant contribution. Of intermediate fetal deaths with a maternal cause listed, the most frequent causes were placenta praevia/separation/haemorrhage and chorioamnionitis. Unspecified cause was also the most frequently listed fetal cause of late fetal deaths, followed by malnutrition/slow fetal growth. Congenital and chromosomal anomalies as a group however, also made a significant contribution. Of late fetal deaths with a maternal cause listed, the most frequent causes were placenta praevia/separation/ haemorrhage/other anomaly, and compression of the umbilical cord.

In the South Island during 2000–2008, large year to year variations (likely as the result of small numbers) made trends in intermediate and late fetal deaths difficult to interpret. During 2004–2008, while there was some regional variability, intermediate and late fetal death rates were not *significantly* different from the New Zealand rate in any of the South Island DHBs.



In the South Island DHBs during 2004–2008, extreme immaturity/low birth weight, congenital and chromosomal anomalies and unspecified causes were frequently listed fetal causes of intermediate fetal deaths. Of those intermediate fetal deaths which had a maternal cause listed, frequent causes were placenta praevia/other placental anomalies, incompetent cervix/premature rupture of the membranes and chorioamnionitis. Unspecified causes, intrauterine hypoxia and congenital and chromosomal anomalies were also common fetal causes of late fetal deaths. Of those late fetal deaths which had a maternal cause listed, frequent causes were placenta praevia/other placental anomalies and compression of the umbilical cord.

## Local Policy Documents and Evidence-Based Reviews Relevant to the Prevention of Fetal Deaths

In New Zealand at present, there is no single strategy which focuses on the prevention of fetal deaths, and thus any local strategies developed will need to incorporate evidence from a variety of sources. **Table 15** provides an overview of a range of New Zealand policy documents and evidence-based reviews which may be useful in this context. In addition, **Table 18** reviews similar publications of relevance to Preterm Births.

Table 15. Local Policy Documents and Evidence-Based Reviews Relevant to the Prevention of Fetal Deaths

| Ministry of Health Policy Documents   |
|---|
| <p>Ministry of Health. 2011. <b>New Zealand Maternity Standards: A set of standards to guide the planning, funding and monitoring of maternity services by the Ministry of Health and District Health Boards</b>. Wellington: Ministry of Health. <a href="http://www.moh.govt.nz/moh.nsf/pagesmh/10767/\$File/nz-maternity-stds-Sept2011.pdf">http://www.moh.govt.nz/moh.nsf/pagesmh/10767/\$File/nz-maternity-stds-Sept2011.pdf</a></p> <p>These standards provide guidance for the provision of safe, equitable and high quality maternity services throughout New Zealand. They consist of three high level strategic statements to guide the funding, planning, provision and monitoring of maternity services by the Ministry of Health, DHBs, service providers and health practitioners. The standards underpin the DHB maternity service specifications, the Primary Maternity Services Notice 2007, the Maternal Referral Guidelines, and other high-level guidelines and requirements.</p> |
| <p>Ministry of Health. 2011. <b>Guidelines for consultation with obstetric and related medical services (Referral Guidelines)</b>. Wellington: Ministry of Health. <a href="http://www.moh.govt.nz/moh.nsf/Files/maternity/\$file/lmc-referral-guidelines-jul2011.pdf">http://www.moh.govt.nz/moh.nsf/Files/maternity/\$file/lmc-referral-guidelines-jul2011.pdf</a></p> <p>These guidelines are intended for lead maternity carers and outline criteria and processes for referral to primary care, referral for specialist consultation, and referral for the transfer of clinical responsibility for care, transfer of clinical responsibility for care in an emergency and emergency transport.</p>   |
| <p>Ministry of Health. 2008. <b>Maternity Action Plan 2008–2012 - Draft for Consultation</b>. Wellington: Ministry of Health. <a href="http://www.moh.govt.nz/moh.nsf/pagesmh/8445/\$File/maternity-action-plan-draft08-12.pdf">http://www.moh.govt.nz/moh.nsf/pagesmh/8445/\$File/maternity-action-plan-draft08-12.pdf</a></p> <p>This Plan was developed by the Ministry of Health with assistance from the Maternity Services Strategy Advisory Group (which provides expert advice to the Ministry). It discusses current service provision, the vision for maternity services, and current issues in maternity services, and it sets out priorities, actions and goals under the headings of leadership, quality and safety, maternity information systems and data collection, inequalities, maternity workforce and relationships and multidisciplinary co-operation.</p>  |
| <p>Health Funding Authority. 2000. <b>Maternity Services: A Reference Document</b>. Hamilton: Health Funding Authority. <a href="http://www.moh.govt.nz/moh.nsf/ea6005dc347e7bd44c2566a40079ae6f/64f4a80cd43629704c2569d9001a01c9/\$FILE/Maternity%20Services%20November%202000%20-%20final%20version.pdf">http://www.moh.govt.nz/moh.nsf/ea6005dc347e7bd44c2566a40079ae6f/64f4a80cd43629704c2569d9001a01c9/\$FILE/Maternity%20Services%20November%202000%20-%20final%20version.pdf</a></p> <p>This document provides a history of maternity services in New Zealand, and description of New Zealand's maternity services as they were in 2000 before the Health Funding Authority was dis-established and its functions were taken over by the Ministry of Health and the DHBs and it sets out a plan for the future direction of the services.</p>  |
| International and Australasian Guidelines   |
| <p>Royal College of Obstetricians and Gynaecologists (RCOG). 2011. <b>Reduced fetal movements (Green-top guideline; no. 57)</b>. London (U.K.): Royal College of Obstetricians and Gynaecologists (RCOG). <a href="http://www.rcog.org.uk/files/rcog-corp/GTG57RFM25022011.pdf">http://www.rcog.org.uk/files/rcog-corp/GTG57RFM25022011.pdf</a></p> <p>The purpose of this guideline is to provide advice to clinicians, based on the best available evidence, on the management of women presenting with reduced fetal movements in pregnancy (excluding those with multiple pregnancy). The guidelines are structured as a series of clinical questions. The authors note that the available evidence is limited and that this is reflected in the low grading of some of the recommendations. Appendix 1 provides a care algorithm (flowchart) and Appendix 2 explains the grading scheme used for the evidence and recommendations. There is a comprehensive list of references.</p>              |

Queensland Maternity and Neonatal Clinical Guidelines Program. 2010. **Stillbirth Care**. Brisbane: Queensland Government. [http://www.health.qld.gov.au/qcg/documents/g\\_still5-0.pdf](http://www.health.qld.gov.au/qcg/documents/g_still5-0.pdf)

These guidelines are intended for health professionals in Queensland maternity services and they are consistent with the Perinatal Society of Australia and New Zealand (PSANZ) Clinical Practice Guideline for Perinatal Mortality. They cover clinical standards, diagnosis and birth, investigations, autopsy and subsequent pregnancy care. They are concise and well referenced but do not discuss the research evidence.

Preston S, Mahomed K, Chadha Y, et al. 2010. **Clinical Practice Guideline for the Management of Women who report Decreased Fetal Movements**. Brisbane: Australian and New Zealand Stillbirth Alliance (ANZSA). [http://www.stillbirthalliance.org.au/doc/FINAL%20DFM%20guideline%20Ed1V1%201\\_16Sept2010.pdf](http://www.stillbirthalliance.org.au/doc/FINAL%20DFM%20guideline%20Ed1V1%201_16Sept2010.pdf)

The purpose of this guideline is to assist clinicians provide evidence-based best-practice management for women with singleton pregnancies who report, or are concerned about, decreased fetal movements (DFM) in the third trimester of pregnancy. It does not deal with the management of specific pregnancy conditions such as fetal growth restriction, hypertension or diabetes which may be identified in the course of care. Mothers are often concerned about DFM and there is good evidence that maternal perception of DFM is associated with many adverse outcomes. Fetal growth restriction appears to be a major contributor to these. While women should be made aware of the importance of fetal movement and provided with information, routine fetal movement counting is not recommended. The guidelines discuss the evidence and recommendations are each accompanied by an indication of the evidence level and the strength of the recommendation although the authors note that there is an absence of robust research in this area and more high quality research is needed on both screening tools and management.

Royal College of Obstetricians and Gynaecologists (RCOG). 2010. **Late intrauterine fetal death and stillbirth**. London, U.K.: Royal College of Obstetricians and Gynaecologists (RCOG). <http://www.rcog.org.uk/files/rcog-corp/GTG%2055%20Late%20Intrauterine%20fetal%20death%20and%20stillbirth%2010%2011%2010.pdf>

The purpose of this guideline, which is primarily for obstetricians and midwives, is to identify evidence-based options for women (and their families) who have a late intra-uterine death (after 24 weeks) and to provide guidance on general care before, during and after birth, and care in subsequent pregnancies. The levels of evidence and the grades of recommendations in this guideline follow the system used by the Scottish Intercollegiate Guidelines Network (SIGN). They cover diagnosis, investigations, labour and birth, the puerperium, psychological and social aspects of care, follow-up, pregnancy following unexplained stillbirth, clinical governance and recommendations for further research.

Flenady V, King J, Charles A, et al. 2009. **PSANZ Clinical Practice Guideline for Perinatal Mortality. Version 2.2**. Perinatal Society of Australia and New Zealand (PSANZ). [http://www.stillbirthalliance.org.au/doc/Section\\_1\\_Version\\_2.2\\_April\\_2009.pdf](http://www.stillbirthalliance.org.au/doc/Section_1_Version_2.2_April_2009.pdf)

The purpose of this guideline is to assist clinicians in the audit of perinatal deaths, to enable a systematic approach to perinatal audit in Australia and New Zealand, and also to provide guidance on dealing with the psychological and social aspects of perinatal bereavement, peri-natal post-mortem examination, investigation of stillbirths and neonatal deaths and the use of perinatal mortality classifications.

National Collaborating Centre for Women's and Children's Health. 2010. **Pregnancy and complex social factors. A model for service provision for pregnant women with complex social factors**. London (UK): National Institute for Health and Clinical Excellence (NICE). <http://www.nice.org.uk/nicemedia/live/13167/50861/50861.pdf>

This very comprehensive 300+ page guideline, which is complementary to the NICE guideline 'Antenatal care: routine care for the healthy pregnant woman' (NICE clinical guideline 62), applies to pregnant women with complex social factors, in particular:

- women who misuse substances (alcohol and/or drugs)
- women who are recent migrants, asylum seekers or refugees, or who have difficulty speaking English,
- young women aged under 20
- women who experience domestic abuse

It is intended for health professionals caring for pregnant women, those responsible for commissioning and planning health services and it may be of relevance to those working in social services and education. It is based on, and reports on, systematic reviews of the literature aiming to determine which interventions lead to improved pregnancy outcomes.

National Institute for Health and Clinical Excellence. 2010. **Dietary interventions and physical activity interventions for weight management before, during and after pregnancy**. London: National Institute for Health and Clinical Excellence. <http://www.nice.org.uk/nicemedia/live/13056/49926/49926.pdf>

Obese women who become pregnant are at increased risk of complications during pregnancy and childbirth and babies born to obese women face higher risks of a number of adverse outcomes: fetal death, stillbirth, congenital abnormality, shoulder dystocia, macrosomia (large body size) and subsequent obesity. Pregnant women are not encouraged to diet but they can be encouraged to take regular exercise and not to "eat for two". This guideline on dietary and physical activity interventions for weight management before, during and after pregnancy are intended for NHS and other commissioners, health service managers and health professionals. The evidence reviews on which the guideline was based, and some other relevant background publications can be found at: <http://guidance.nice.org.uk/PH27> .



Flenady V, New K, MacPhail J, et al. 2005. **Clinical Practice Guideline for Smoking Cessation in Pregnancy**. Brisbane: Centre for Clinical Studies, Mater Health Services.  
[http://www.stillbirthalliance.org.au/doc/Guideline\\_for\\_Smoking\\_Cessation\\_in\\_Pregnancy.pdf](http://www.stillbirthalliance.org.au/doc/Guideline_for_Smoking_Cessation_in_Pregnancy.pdf)

The purpose of this guideline is to assist clinicians in identifying pregnant women who smoke and assisting them to quit. Smoking cessation interventions for pregnant women can reduce smoking rates and reduce pre term births and low birth weights. Smoking rates are particularly high among teenage and indigenous Australians. The guideline is based on the "5As" approach to smoking cessation (Ask, Advise, Assess, Assist, Arrange Support). For women not ready to quit, motivation interventions using the 5R's framework (relevance, risk, rewards, roadblocks and repetition) may be used to improve motivation to quit. Recommendations in the guidelines are accompanied by a grade indicating the level of evidence and by references.

#### Systematic and Other Reviews from the International Literature

Flenady V, Middleton P, Smith GC, et al. **Stillbirths: the way forward in high-income countries**. The Lancet, 377(9778), 1703-17.

This paper, which is one of six in the Lancet's 2011 Stillbirth Series, notes that in developed countries, disparities in stillbirth rates between different population groups indicate that there is scope for further reductions in stillbirth rates. Overweight, obesity and smoking are important modifiable risk factors. Advanced maternal age is also a risk factor. A substantial proportion of stillbirths are linked to placental pathologies and infection associated with preterm birth. National perinatal mortality audit programmes aimed at improving the quality of care could reduce stillbirth rates and an international consensus on definitions and classifications related to stillbirth is necessary. All parents should be offered a thorough investigation including a high-quality autopsy and placental histopathology. Future research should focus on screening and interventions to reduce antepartum stillbirth as a result of placental dysfunction

The other papers in the Lancet stillbirth series, which provide a global perspective on the issue of stillbirth, are:

Frøen JF, Cacciatori J, McClure EM, et al. 2011. **Stillbirths: why they matter**. The Lancet, 377(9774), 1353-66.

Lawn JE, Blencowe H, Pattinson R, et al. 2011. **Stillbirths: Where? When? Why? How to make the data count?** The Lancet, 377(9775), 1448-63.

Bhutta ZA, Yakoob MY, Lawn JE, et al. 2011. **Stillbirths: what difference can we make and at what cost?** The Lancet, 377(9776), 1523-38.

Pattinson R, Kerber K, Buchmann E, et al. **Stillbirths: how can health systems deliver for mothers and babies?** The Lancet, 377(9777), 1610-23.

Goldenberg RL, McClure EM, Bhutta ZA, et al. 2011. **Stillbirths: the vision for 2020**. Lancet, 377(9779), 1798-805.

Flenady V, Koopmans L, Middleton P, et al. 2011. **Major risk factors for stillbirth in high-income countries: a systematic review and meta-analysis**. Lancet, 377(9774), 1331-40.

This systematic review included 96 population-based studies. The highest ranking modifiable risk factor for stillbirth was found to be maternal obesity with a population attributable risk (PAR) calculated to be 8 -18% across five countries (Australia, Canada, Netherlands, UK, and USA). Advanced maternal age (> 35 years) had a PAR of 7-11% and maternal smoking had a PAR of 4-7%. In disadvantaged populations the PAR for smoking could be as high as 20%. Primiparity contributes to about 15% of stillbirths. Placental pathology has an important role in stillbirth, as indicated by the PARs for small-for-gestational-age (23%) and placental abruption (15%). Pre-existing maternal diabetes and hypertension still contribute to stillbirth in high income countries. Priority areas for stillbirth prevention are raising awareness and implementing interventions to address obesity, maternal age and smoking.

Lumley J, Chamberlain C, Dowswell T, et al. 2009. **Interventions for promoting smoking cessation during pregnancy**. Cochrane Database of Systematic Reviews(3), Art. No.: CD001055. DOI: 10.1002/14651858.CD001055.pub3

This review included fifty-six RCTs (20,000+ women) and nine cluster-randomised trials (5000+ women) of a variety of smoking cessation interventions in pregnancy. The interventions were, overall, associated with a small but statistically significant reduction in smoking in late pregnancy (risk ratio 0.94, 95% CI 0.93 to 0.96) i.e. 6% of pregnant women stopped smoking. The interventions reduced low birth weight (RR 0.83, 95% CI 0.73 to 0.95) and preterm birth (RR 0.86, 95% CI 0.74 to 0.98), and there was a 53.91g (95% CI 10.44 g to 95.38 g) increase in mean birth weight. There were no statistically significant differences in stillbirths, neonatal intensive care unit admissions, very low birth weight, perinatal or neonatal mortality but these analyses were underpowered since only a few trials reported these outcomes.

Grivell RM, Wong L, Bhatia V. 2009. **Regimens of fetal surveillance for impaired fetal growth**. Cochrane Database of Systematic Reviews, 2009(1), Art. No.: CD007113. DOI: 10.1002/14651858.CD007113.pub2.

There are wide variations in the policies and protocols for fetal surveillance in pregnancies where fetal growth impairment is suspected and there are many different techniques used for assessment of fetal growth and wellbeing. This review reports on one RCT done in New Zealand (167 women and babies) which compared a twice-weekly surveillance regimen (biophysical profile, non-stress tests, umbilical artery and middle cerebral artery Doppler and uterine artery Doppler) with the same regimen applied fortnightly (both groups had fetal growth assessed fortnightly). There was no difference between the groups in the primary maternal outcome (emergency caesarean for fetal distress) but women in the twice-weekly surveillance group were more likely to have induction of labour than those in the fortnightly surveillance group (Risk ratio 1.25, 95% CI 1.04-1.50) and overall their babies were born four day earlier. There was insufficient data to assess perinatal mortality or serious morbidity. No fetal deaths occurred in either group.

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| <p>The <b>Cochrane Collection</b> contains a large number of other reviews relating to tests which may be used to assess fetal wellbeing. Some of the interventions which have been the subject of Cochrane reviews are: fetal movement counting, fetal and umbilical Doppler ultrasound, amniotic fluid index vs. single deepest vertical pocket as a screening test, biochemical tests of placental function, biophysical profiles, routine ultrasound at 24 weeks, symphysis-fundal height measurement, fetal fibronectin testing, and near infrared spectroscopy.</p>  |
| <p>Flenady V, Wilson T. 2008. <b>Support for mothers, fathers and families after perinatal death.</b> Cochrane Database of Systematic Reviews, 2008(1), Art. No.: CD000452. DOI: 10.1002/14651858.CD000452.pub2.</p> <p>In the developed world it is widely accepted that a perinatal death is devastating for the parents and family. This review assessed the effects of the provision of counselling or any form of medical, nursing, social or psychological support, or both, for mothers, fathers and families after perinatal death. There were no RCTs identified and the review authors state that more research is needed to determine what kinds of support and counselling are most helpful.</p>   |
| <p>Rawlinson WD, Hall B, Jones CA, et al. 2008. <b>Viruses and other infections in stillbirth: what is the evidence and what should we be doing?</b> Pathology, 40(2), 149-60.</p> <p>In Australia, as in other developed countries, many stillbirths are of unknown aetiology and occur in pregnancies with no known risk factors. It has been postulated that viruses and other hard-to-culture organisms may be responsible for some of these. It is known that certain viruses including rubella, human cytomegalovirus (CMV), parvovirus B19, herpes simplex virus (HSV) and varicella zoster virus (VSV) may cause intrauterine deaths but more research is needed to determine the role of other viruses and hard-to-culture organisms in stillbirths. There are now modern molecular techniques such as multiplex PCR which allow searches for multiple agents and the clinical usefulness of such testing needs to be assessed.</p>   |
| <p>Dodd JM, Crowther CA. 2007. <b>Specialised antenatal clinics for women with a multiple pregnancy to improve maternal and infant outcomes.</b> Cochrane Database of Systematic Reviews, 2007(2), Art. No.: CD005300. DOI: 10.1002/14651858.CD005300.pub2.</p> <p>Women who have a multiple pregnancy are at greater risk of a number of adverse outcomes, including prematurity (the greatest risk), hypertension, gestational diabetes, and stillbirth. This review assessed the benefits and harms of "specialised" antenatal clinics compared to standard antenatal care, for women with multiple pregnancy. The review authors did not identify any RCTs on this issue and they concluded that there is no evidence to support the provision of "specialised" antenatal clinics for women with multiple pregnancy.</p>   |
| <p>Alfirevic Z, Devane D, Gyte Gillian ML. 2006. <b>Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour.</b> Cochrane Database of Systematic Reviews, 2006(3), Art. No.: CD006066. DOI:10.1002/14651858.CD006066.</p> <p>Cardiotocography (CTG, electronic fetal monitoring) records changes in the fetal heart rate in relation to uterine contractions. It is used to identify babies who may be hypoxic so that additional methods of assessment of fetal wellbeing (e.g. blood sampling) can be used or delivery expedited by instrumental methods (with vacuum extraction or forceps) or caesarean section. This review included 12 RCTs or quasi-RCTs (37,000+ women in total), only two of which were of high quality. The authors concluded that continuous CTG during labour is associated with a reduction in neonatal seizures but no significant differences in cerebral palsy, infant mortality, or other standard measures of infant wellbeing. Continuous CTG monitoring was, however, associated with increases in caesarean section (RR 1.66, 95% CI 1.30 to 2.13, 10 trials, n=18,761) and instrumental vaginal births (RR 1.66, 95% CI 1.30 to 2.13, 10 trials n=18,761).</p> |
| <p><b>Other Relevant Publications</b></p>  |
| <p>Stacey T, Thompson JMD, Mitchell EA, et al. 2011. <b>The Auckland Stillbirth study, a case-control study exploring modifiable risk factors for third trimester stillbirth: methods and rationale.</b> Australian and New Zealand Journal of Obstetrics and Gynaecology, 51(1), 3-8.</p> <p>This paper reports on the Auckland Stillbirth study, a case-control study conducted from July 2006 to June 2009. Women who had a late stillbirth (<math>\geq 28</math> weeks) were matched with two controls of the same gestation. Almost 60% of stillbirths were either "unexplained" (39.4%) or due to "fetal growth restriction" (18.7%). Women who had a late stillbirth were more likely to be of Pacific ethnicity (OR 1.7, 95% CI 1.2 - 2.6) and/or of parity <math>\geq 4</math> (OR 2.7, 95% CI 1.4 - 5.3).</p>  |
| <p>Stacey T, Thompson JMD, Mitchell EA, et al. 2011. <b>Relationship between obesity, ethnicity and risk of late stillbirth: a case control study.</b> BMC Pregnancy &amp; Childbirth, 11, 3.</p> <p>This paper reports on the Auckland Stillbirth study, a case-control study conducted from July 2006 to June 2009. Women who had a late stillbirth (<math>\geq 28</math> weeks) were matched with two controls of the same gestation as each case. In the univariate analysis of results, Pacific ethnicity, overweight and obesity, grand multiparity, not being married, not being in paid work, social deprivation, exposure to tobacco smoke and use of recreational drugs were associated with an increased risk of late stillbirth. In the multivariate analysis Maternal overweight and obesity, nulliparity, grand multiparity, not being married and not being in paid work were independently associated with late stillbirth but Pacific ethnicity was no longer significant (adjusted Odds Ratio 0.99; 0.51-1.91). The disparity in stillbirth rates between Pacific and European women can be explained by confounding factors such as high parity and maternal obesity.</p>   |

PMMRC. 2011. **Fifth Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2009**. Wellington: Health Quality & Safety Commission.

[http://www.pmmrc.health.govt.nz/moh.nsf/Files/pmmrcfiles2011/\\$file/pmmrc-5th-report-2009.pdf](http://www.pmmrc.health.govt.nz/moh.nsf/Files/pmmrcfiles2011/$file/pmmrc-5th-report-2009.pdf)

The Perinatal and Maternal Mortality Review Committee (PMMRC) reviews all perinatal and maternal deaths in New Zealand with the aim of identifying areas for improvement in maternal and newborn care. This report is based on the data collected by the Mortality Review Data Group. A perinatal death is defined as one occurring after 20 weeks gestation (or of a baby weighing at least 400g if gestation is unknown) and up to and including the 28<sup>th</sup> day of life. Besides reporting statistics, the report also makes recommendations for future work by the PMMRC, the Ministry of Health, lead maternity cares, DHBs and others. The most commonly reported classification of fetal deaths was unexplained (25% of all stillbirths) and other classifications which each accounted for > 10% of stillbirths were antepartum haemorrhage, specific perinatal conditions, fetal growth restriction and spontaneous preterm. Fifteen per cent of stillbirths were thought to be potentially avoidable and the most common contributing factors were barriers to accessing or engaging with maternity and health services.

Crawford B, Lilo S, Stone S, et al. 2008. **Review of the Quality, Safety and Management of Maternity Services in the Wellington Area**. Wellington: Ministry of Health. [http://www.moh.govt.nz/moh.nsf/pagesmh/8444/\\$File/maternity-services-review-oct08-v2.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/8444/$File/maternity-services-review-oct08-v2.pdf)

This review followed the death of a baby at CCDHB's Kenepuru maternity facility and its objectives were to:

- Understand, based on evidence, the quality, safety and management of maternity services in the Wellington region
- Maintain public confidence in the maternity services provided to the region
- Identify opportunities for improvement