

INFANT MORTALITY AND SUDDEN UNEXPECTED DEATH IN INFANCY

Introduction

Infant mortality is often used as a barometer of the social wellbeing of a country [18]. New Zealand's infant mortality rates are middling by international standards, being lower than those of the USA and some Eastern European countries, but higher than those of Central and Northern Europe [19]. New Zealand's mortality during the first year of life has remained much higher than at any other point during childhood or adolescence. During 2009, a total of 308 New Zealand infants were registered as having died prior to their first birthday [20].

Despite these relatively high numbers, New Zealand's infant mortality rates have declined during the past 40 years, with rates falling from 16.9 per 1,000 in 1969, to 4.9 per 1,000 in March 2009 [20]. While infant mortality rates are generally higher for Pacific > Māori > European/Other babies, for males, and those in the most deprived areas [21], total infant mortality rates are of limited utility in guiding population health interventions, as the causes of mortality differ markedly with the age of the infant. During the neonatal period (birth–28 days) extreme prematurity, congenital anomalies and intrauterine/birth asphyxia are the leading causes of mortality, while in the post neonatal period (29–364 days) sudden unexpected death in infancy (SUDI) and congenital anomalies make the greatest contribution [22]. Thus any interventions aimed at reducing New Zealand's infant mortality rates must, in the first instance, be based on an understanding of their component causes.

The following section uses information from the National Mortality Collection to review neonatal, post neonatal and total infant mortality, as well as SUDI rates since 1990.

Data Source and Methods

Definition

1. *Total Infant Mortality: Death of a live born infant prior to 365 days of life*
2. *Neonatal Mortality: Death of a live born infant in the first 28 days of life*
3. *Post Neonatal Mortality: Death of a live born infant after 28 days but prior to 365 days of life*
4. *Sudden Unexpected Death in Infancy (SUDI): Death of a live born infant <365 days of life, where the cause of death is SIDS, Accidental Suffocation/Strangulation in Bed or Ill-Defined/Unspecified Causes*

Data Sources

Numerator: National Mortality Collection: All deaths in the first year of life, using the definitions for total infant, neonatal and post neonatal mortality outlined above. Cause of death is derived from the ICD-10-AM main underlying cause of death as follows: Extreme Prematurity (P072), Congenital Anomalies (Q00–Q99), Perinatal Conditions (P00–P96); SIDS (R95); SUDI (R95, R96, R98, R99, W75).

Denominator: Birth Registration Dataset (Live Births Only)

Notes on Interpretation

Note 1: See **Appendix 5** for an overview of the National Mortality Collection

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).

Total Infant, Neonatal and Post Neonatal Mortality

New Zealand Distribution and Trends

New Zealand Trends

In New Zealand during 1990–2008, neonatal and post neonatal mortality both declined, with neonatal mortality exceeding post neonatal mortality from 1996 onwards (**Figure 8**).

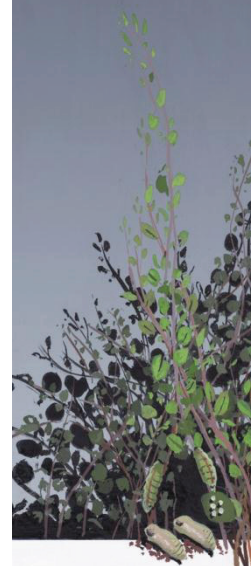
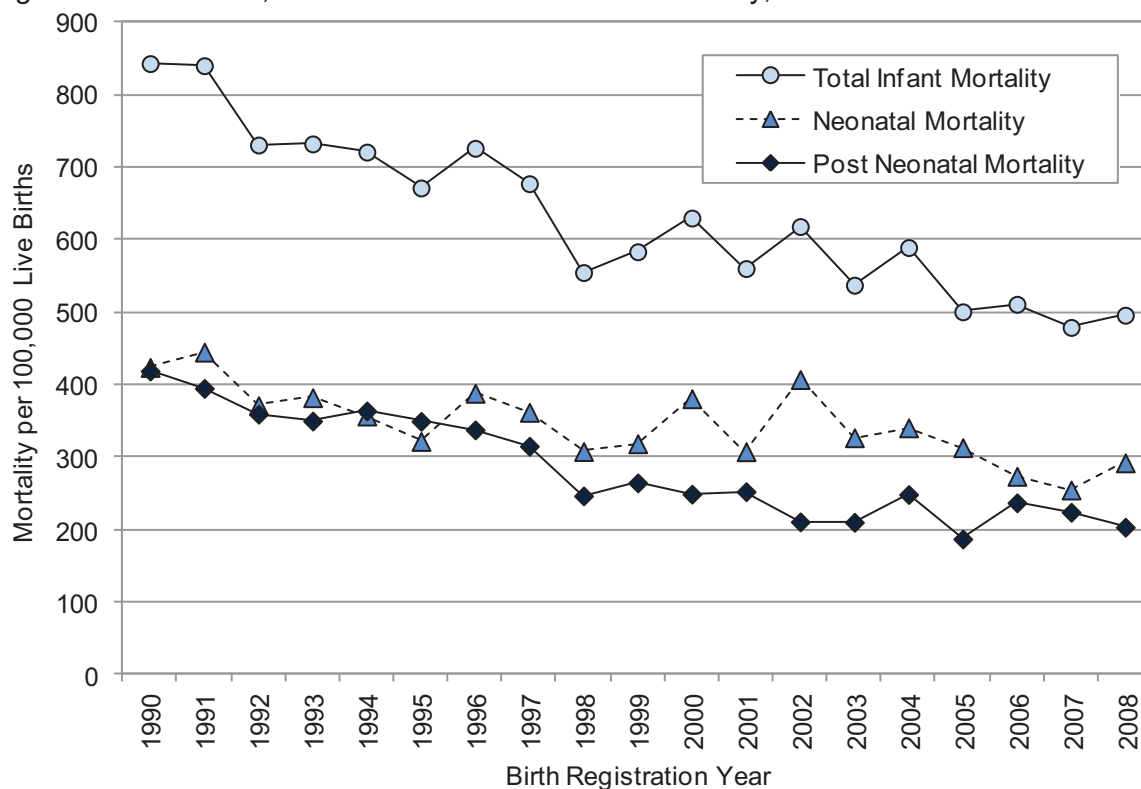
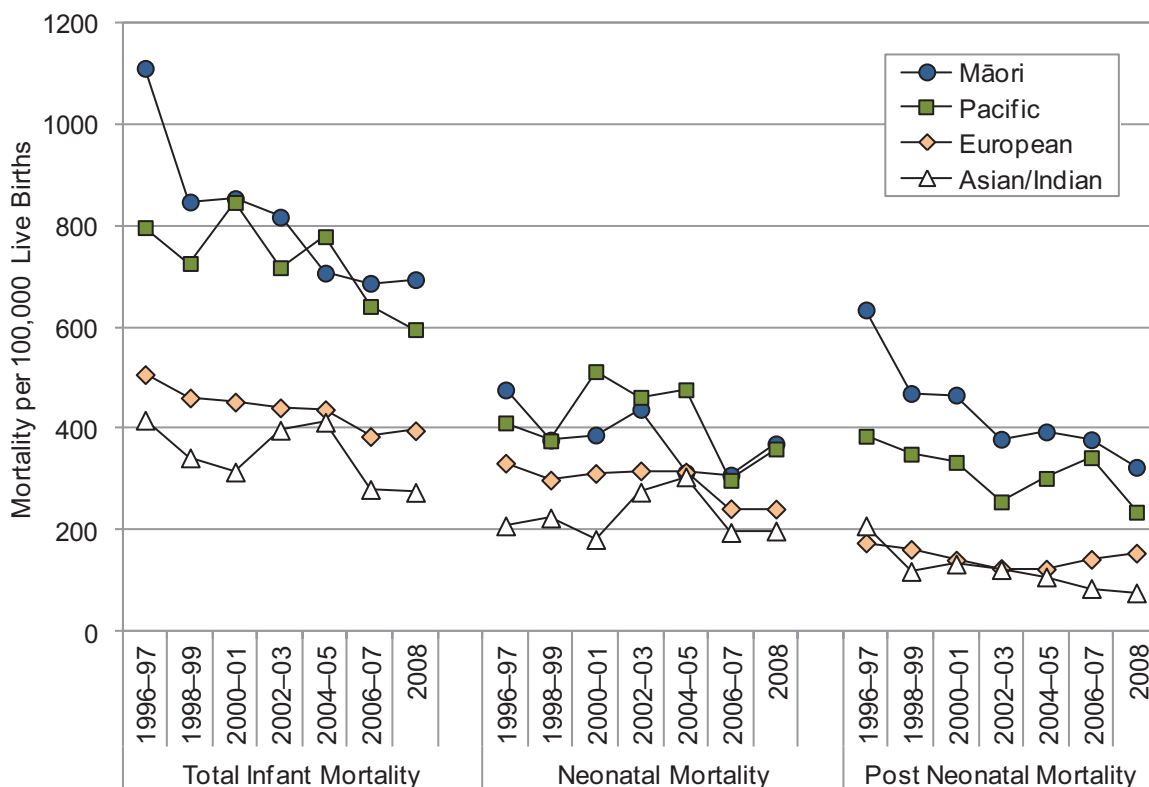


Figure 8. Total Infant, Neonatal and Post Neonatal Mortality, New Zealand 1990–2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset

Figure 9. Total Infant, Neonatal and Post Neonatal Mortality by Ethnicity, New Zealand 1996–2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset; Note: Ethnicity is Level 1 Prioritised

New Zealand Trends by Ethnicity

In New Zealand during the late 1990s, neonatal mortality was generally higher for Pacific and Māori > European > Asian/Indian infants, although ethnic differences were less consistent during the 2000s. In contrast, post neonatal mortality was higher for Māori > Pacific > European and Asian/Indian infants throughout 1996–2008 (**Figure 9**).

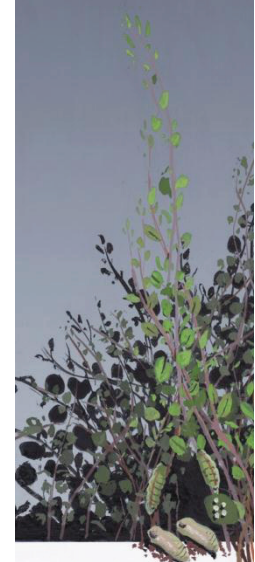
New Zealand Distribution by Cause

In New Zealand during 2004–2008, extreme prematurity and congenital anomalies were the leading causes of neonatal mortality, although intrauterine/birth asphyxia and other perinatal conditions also made a significant contribution. In contrast, SUDI was the leading cause of post neonatal mortality, followed by congenital anomalies (**Table 19**).

Table 19. Neonatal and Post Neonatal Mortality by Main Underlying Cause of Death, New Zealand 2004–2008

| Cause of Death | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent of Deaths |
|--|-------------------------------|------------------------------|---------------------|----------------------|
| New Zealand | | | | |
| Neonatal Mortality | | | | |
| Extreme Prematurity | 215 | 43.0 | 69.8 | 23.7 |
| Congenital Anomalies: CVS | 65 | 13.0 | 21.1 | 7.2 |
| Congenital Anomalies: CNS | 34 | 6.8 | 11.0 | 3.8 |
| Congenital Anomalies: Other | 130 | 26.0 | 42.2 | 14.3 |
| Intrauterine / Birth Asphyxia | 47 | 9.4 | 15.3 | 5.2 |
| Other Perinatal Conditions | 331 | 66.2 | 107.4 | 36.5 |
| SUDI: SIDS | 17 | 3.4 | 5.52 | 1.9 |
| SUDI: Suffocation / Strangulation in Bed | 25 | 5.0 | 8.11 | 2.8 |
| SUDI: Unspecified | 3 | 0.6 | 0.97 | 0.3 |
| Injury / Poisoning | 10 | 2.0 | 3.25 | 1.1 |
| Other Causes | 29 | 5.8 | 9.41 | 3.2 |
| Total Neonatal Mortality | 906 | 181.2 | 294.0 | 100.0 |
| Post Neonatal Mortality | | | | |
| SUDI: SIDS | 177 | 35.4 | 57.4 | 26.1 |
| SUDI: Suffocation / Strangulation in Bed | 79 | 15.8 | 25.6 | 11.7 |
| SUDI: Unspecified | 10 | 2.0 | 3.25 | 1.5 |
| Congenital Anomalies: CVS | 54 | 10.8 | 17.5 | 8.0 |
| Congenital Anomalies: CNS | 9 | 1.8 | 2.92 | 1.3 |
| Congenital Anomalies: Other | 63 | 12.6 | 20.4 | 9.3 |
| All Other Perinatal Conditions | 73 | 14.6 | 23.7 | 10.8 |
| Injury / Poisoning | 30 | 6.0 | 9.74 | 4.4 |
| Other Causes | 183 | 36.6 | 59.4 | 27.0 |
| Total Post Neonatal Mortality | 678 | 135.6 | 220.0 | 100.0 |
| New Zealand Total | 1,584 | 316.8 | 514.0 | 100.0 |

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



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

In New Zealand during 2004–2008, neonatal mortality was *significantly* higher for Pacific and Māori infants than for European infants, for males, for those in average-to-more deprived (NZDep decile 5–10) areas, for preterm infants, and those whose mothers were <25 years of age. During the same period, post neonatal mortality was also *significantly* higher for Māori and Pacific infants than for European and Asian/Indian infants, for males, for those in average-to-more deprived (NZDep decile 5–10) areas, preterm infants, and those whose mothers were <30 years of age (**Table 20**).

Table 20. Risk Factors for Neonatal and Post Neonatal Mortality, New Zealand 2004–2008

| New Zealand | | | | | | | |
|-----------------------------|-------|------------|-----------|--------------------|---------|------------|-----------|
| Neonatal Mortality | | | | | | | |
| Variable | Rate | Rate Ratio | 95% CI | Variable | Rate | Rate Ratio | 95% CI |
| NZ Deprivation Index Decile | | | | Ethnicity | | | |
| Decile 1–2 | 210.6 | 1.00 | | Asian/Indian | 237.5 | 0.88 | 0.68–1.13 |
| Decile 3–4 | 203.5 | 0.97 | 0.74–1.27 | European | 270.1 | 1.00 | |
| Decile 5–6 | 282.9 | 1.34 | 1.05–1.72 | Māori | 323.5 | 1.20 | 1.03–1.39 |
| Decile 7–8 | 309.3 | 1.47 | 1.16–1.86 | Pacific | 379.3 | 1.40 | 1.15–1.71 |
| Decile 9–10 | 395.2 | 1.88 | 1.50–2.35 | Gender | | | |
| Maternal Age Group | | | | Female | 263.3 | 1.00 | |
| <20 years | 504.7 | 1.96 | 1.57–2.45 | Male | 323.1 | 1.23 | 1.08–1.40 |
| 20–24 years | 328.4 | 1.28 | 1.05–1.55 | Gestation at Birth | | | |
| 25–29 years | 283.0 | 1.10 | 0.91–1.33 | 20–36 Weeks | 2,695.8 | 31.8 | 27.4–36.9 |
| 30–34 years | 257.0 | 1.00 | | 37+ Weeks | 84.7 | 1.00 | |
| 35+ years | 246.0 | 0.96 | 0.78–1.17 | | | | |
| Post Neonatal Mortality | | | | | | | |
| Variable | Rate | Rate Ratio | 95% CI | Variable | Rate | Rate Ratio | 95% CI |
| NZ Deprivation Index Decile | | | | Ethnicity | | | |
| Decile 1–2 | 107.4 | 1.00 | | Asian/Indian | 91.6 | 0.67 | 0.45–1.00 |
| Decile 3–4 | 126.7 | 1.18 | 0.82–1.70 | European | 137.4 | 1.00 | |
| Decile 5–6 | 167.0 | 1.55 | 1.11–2.18 | Māori | 372.3 | 2.71 | 2.28–3.22 |
| Decile 7–8 | 212.1 | 1.97 | 1.43–2.72 | Pacific | 304.1 | 2.21 | 1.75–2.81 |
| Decile 9–10 | 384.2 | 3.58 | 2.66–4.81 | Gender | | | |
| Maternal Age Group | | | | Female | 191.3 | 1.00 | |
| <20 years | 474.0 | 3.44 | 2.66–4.45 | Male | 247.2 | 1.29 | 1.11–1.50 |
| 20–24 years | 313.6 | 2.28 | 1.81–2.86 | Gestation at Birth | | | |
| 25–29 years | 217.0 | 1.57 | 1.25–1.99 | 20–36 Weeks | 879.2 | 5.87 | 4.96–6.94 |
| 30–34 years | 137.8 | 1.00 | | 37+ Weeks | 149.9 | 1.00 | |
| 35+ years | 144.2 | 1.05 | 0.80–1.37 | | | | |

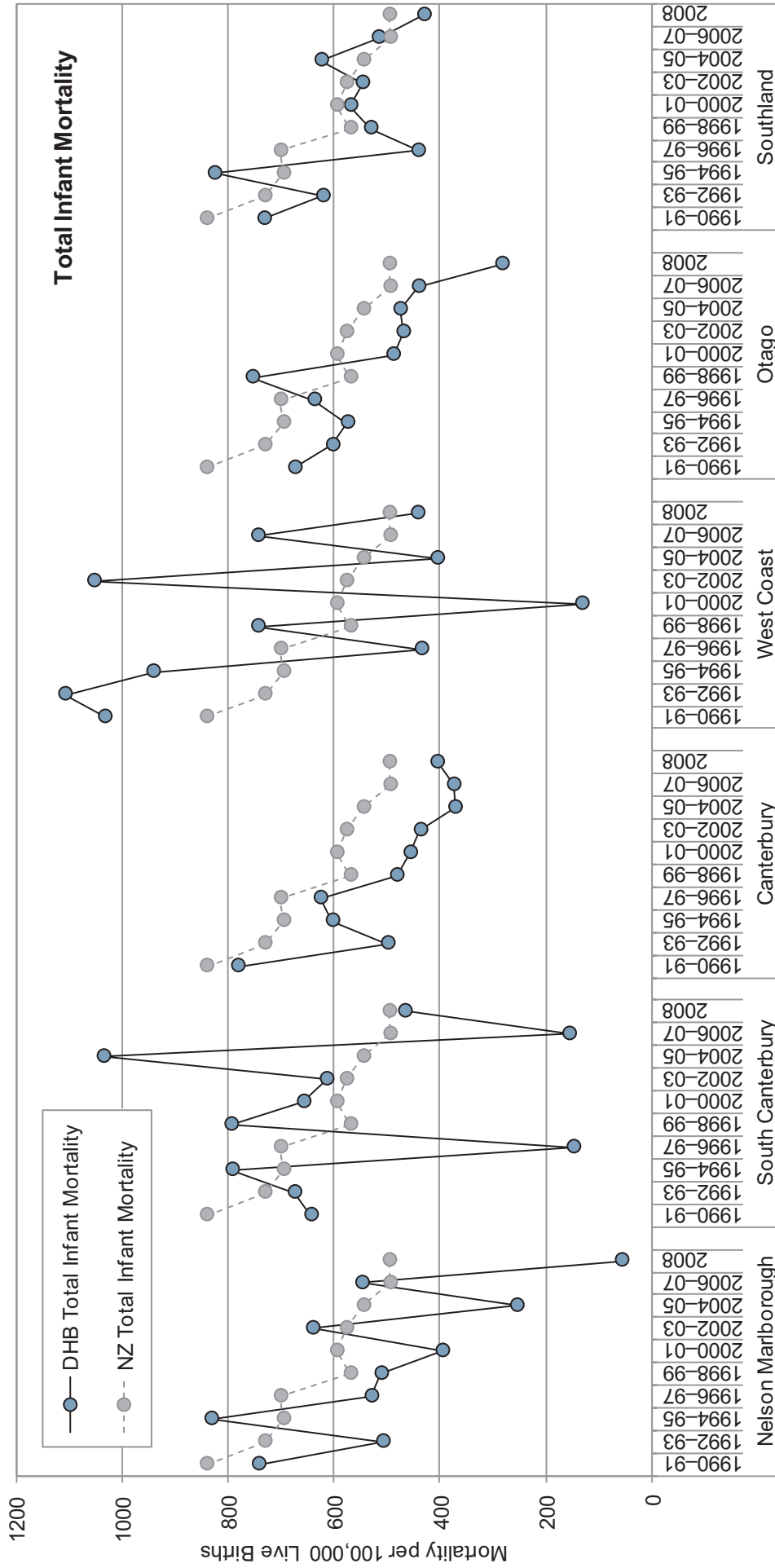
Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset; Note: Rates are per 100,000; Rate Ratios are unadjusted; Ethnicity is Level 1 Prioritised

South Island Distribution and Trends

South Island Trends

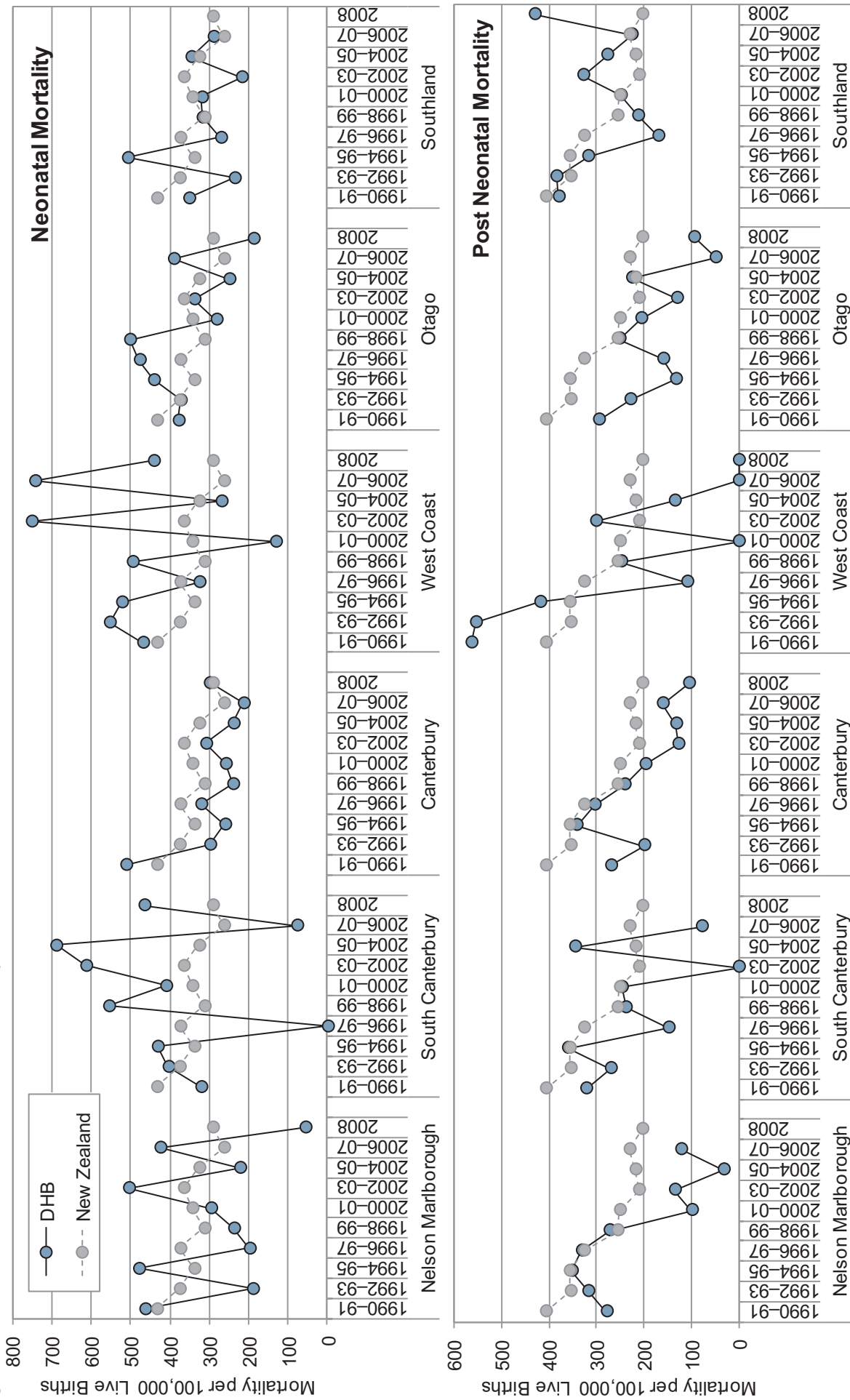
Total Infant Mortality: In Nelson Marlborough, Canterbury, Otago and Southland during 1990–2008, total infant mortality exhibited a fluctuating downward trend, although in the West Coast and South Canterbury, large year to year variations (likely as the result of small numbers) made trends more difficult to interpret (**Figure 10**).

Figure 10. Total Infant Mortality, South Island DHBs vs. New Zealand 1990–2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset

Figure 11. Neonatal and Post Neonatal Mortality, South Island DHBs vs. New Zealand 1990–2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset

Neonatal and Post Neonatal Mortality: In all of the South Island DHBs during 1990–2008, large year to year variations made trends in neonatal mortality difficult to interpret, although rates in Canterbury and Otago did exhibit a fluctuating downward trend. Post neonatal mortality in Nelson Marlborough, South Canterbury, Canterbury, the West Coast and Otago also exhibited a downward trend, while large year to year variations were evident in Southland (**Figure 11**).

South Island DHBs vs. New Zealand

During 2004–2008, while there were regional variations, neonatal mortality rates were not *significantly* different from the New Zealand rate in any of the South Island DHBs. Post neonatal mortality rates were lower than the New Zealand rate in Nelson Marlborough, Canterbury, South Canterbury and Otago, although only in the case of Nelson Marlborough and Canterbury did these differences reach statistical significance. Similarly, while higher, rates in Southland were not *significantly* different from the New Zealand rate (**Table 21**).

South Island Distribution by Cause

In the South Island DHBs during 2004–2008, congenital anomalies and extreme prematurity were frequent causes of neonatal mortality, although intrauterine/birth asphyxia also made a contribution in some DHBs. SUDI and congenital anomalies were frequent causes of post neonatal mortality (**Table 22–Table 23**).

Table 21. Neonatal and Post Neonatal Mortality, South Island DHBs vs. New Zealand 2004–2008

| DHB | Total No. Deaths 2004–2008 | No. Deaths Annual Average | Rate per 100,000 | Rate Ratio | 95% CI |
|--------------------------------|----------------------------|---------------------------|------------------|------------|-----------|
| Neonatal Mortality | | | | | |
| Nelson Marlborough | 22 | 4.4 | 268.9 | 0.91 | 0.60–1.40 |
| West Coast | 10 | 2.0 | 500.5 | 1.70 | 0.91–3.17 |
| Canterbury | 77 | 15.4 | 241.8 | 0.82 | 0.65–1.04 |
| South Canterbury | 12 | 2.4 | 389.4 | 1.32 | 0.75–2.34 |
| Otago | 30 | 6.0 | 294.1 | 1.00 | 0.70–1.44 |
| Southland | 19 | 3.8 | 249.8 | 0.85 | 0.54–1.34 |
| New Zealand | 906 | 181.2 | 294.0 | 1.00 | |
| Post Neonatal Mortality | | | | | |
| Nelson Marlborough | 5 | 1.0 | 61.1 | 0.28 | 0.12–0.67 |
| West Coast | <3 | s | s | s | s |
| Canterbury | 44 | 8.8 | 138.1 | 0.63 | 0.46–0.85 |
| South Canterbury | 5 | 1.0 | 162.2 | 0.74 | 0.31–1.78 |
| Otago | 13 | 2.6 | 127.5 | 0.58 | 0.33–1.00 |
| Southland | 22 | 4.4 | 289.2 | 1.31 | 0.86–2.01 |
| New Zealand | 678 | 135.6 | 220.0 | 1.00 | |

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset. Note: s: suppressed due to small numbers.



Table 22. Neonatal and Post Neonatal Mortality by Main Underlying Cause of Death, Nelson Marlborough, South Canterbury and Canterbury 2004–2008

| Cause of Death | Number: Total 2004– 2008 | Number: Annual Average | Rate per 100,000 | Percent of Deaths |
|--|-----------------------------------|------------------------------|------------------------|-------------------------|
| Nelson Marlborough | | | | |
| Neonatal Mortality | | | | |
| Extreme Prematurity | 4 | 0.8 | 48.9 | 18.2 |
| Congenital Anomalies: All Types | 6 | 1.2 | 73.4 | 27.3 |
| Intrauterine / Birth Asphyxia / Other Perinatal Conditions | 8 | 1.6 | 97.8 | 36.4 |
| All Other Causes | 4 | 0.8 | 48.9 | 18.2 |
| Total Neonatal Mortality | 22 | 4.4 | 269.0 | 100.0 |
| Post Neonatal Mortality | | | | |
| Total Post Neonatal Mortality | 5 | 1.0 | 61.1 | 100.0 |
| Nelson Marlborough Total | 27 | 5.4 | 330.1 | 100.0 |
| South Canterbury | | | | |
| Neonatal Mortality | | | | |
| Extreme Prematurity | 5 | 1.0 | 162.2 | 41.7 |
| Congenital Anomalies: All Types | 3 | 0.6 | 97.3 | 25.0 |
| Intrauterine / Birth Asphyxia / Other Perinatal Conditions | 3 | 0.6 | 97.3 | 25.0 |
| Other Causes | <3 | s | s | s |
| Total Neonatal Mortality | 12 | 2.4 | 389.4 | 100.0 |
| Post Neonatal Mortality | | | | |
| Total Post Neonatal Mortality | 5 | 1.0 | 162.2 | 100.0 |
| South Canterbury Total | 17 | 3.4 | 551.6 | 100.0 |
| Canterbury | | | | |
| Neonatal Mortality | | | | |
| Extreme Prematurity | 14 | 2.8 | 44.0 | 18.2 |
| Congenital Anomalies: CVS | 5 | 1.0 | 15.7 | 6.5 |
| Congenital Anomalies: CNS / Other | 12 | 2.4 | 37.7 | 15.6 |
| Intrauterine / Birth Asphyxia | 4 | 0.8 | 12.6 | 5.20 |
| Other Perinatal Conditions | 36 | 7.2 | 113.0 | 46.8 |
| All Other Causes | 6 | 1.2 | 18.8 | 7.8 |
| Total Neonatal Mortality | 77 | 15.4 | 241.8 | 100.0 |
| Post Neonatal Mortality | | | | |
| SUDI: SIDS | 10 | 2.0 | 31.4 | 22.7 |
| SUDI: Suffocation / Strangulation in Bed | 4 | 0.8 | 12.6 | 9.1 |
| Congenital Anomalies: CVS | 4 | 0.8 | 12.6 | 9.1 |
| Congenital Anomalies: Other | 4 | 0.8 | 12.6 | 9.1 |
| Other Perinatal Conditions | 6 | 1.2 | 18.8 | 13.6 |
| All Other Causes | 16 | 3.2 | 50.2 | 36.4 |
| Total Post Neonatal Mortality | 44 | 8.8 | 138.1 | 100.0 |
| Canterbury Total | 121 | 24.2 | 379.9 | 100.0 |

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset. Note: s: suppressed due to small numbers. Note: CVS = Cardiovascular System; CNS = Central Nervous System.



Table 23. Neonatal and Post Neonatal Mortality by Main Underlying Cause of Death, the West Coast, Otago and Southland 2004–2008

| Cause of Death | Number: Total 2004–2008 | Number: Annual Average | Rate per 100,000 | Percent of Deaths |
|--|-------------------------|------------------------|------------------|-------------------|
| West Coast | | | | |
| Neonatal Mortality | | | | |
| Congenital Anomalies: All Types | 3 | 0.6 | 150.2 | 30.0 |
| Other Perinatal Conditions | 6 | 1.2 | 300.3 | 60.0 |
| Other Causes | <3 | s | s | s |
| Total Neonatal Mortality | 10 | 2.0 | 500.5 | 100.0 |
| Post Neonatal Mortality | | | | |
| Total Post Neonatal Mortality | <3 | s | s | s |
| West Coast Total | 11 | 2.2 | 550.6 | 100.0 |
| Otago | | | | |
| Neonatal Mortality | | | | |
| Extreme Prematurity | 9 | 1.8 | 88.2 | 30.0 |
| Congenital Anomalies: All Types | 7 | 1.4 | 68.6 | 23.3 |
| Other Perinatal Conditions | 13 | 2.6 | 127.5 | 43.3 |
| Other Causes | <3 | s | s | s |
| Total Neonatal Mortality | 30 | 6.0 | 294.1 | 100.0 |
| Post Neonatal Mortality | | | | |
| SUDI: SIDS | 5 | 1.0 | 49.0 | 38.5 |
| Congenital Anomalies: Other Perinatal Conditions | 4 | 0.8 | 39.2 | 30.8 |
| All Other Causes | 4 | 0.8 | 39.2 | 30.8 |
| Total Post Neonatal Mortality | 13 | 2.6 | 127.5 | 100.0 |
| Otago Total | 43 | 8.6 | 421.6 | 100.0 |
| Southland | | | | |
| Neonatal Mortality | | | | |
| Congenital Anomalies: All Types | 7 | 1.4 | 92.0 | 36.8 |
| Intrauterine / Birth Asphyxia / Other Perinatal Conditions | 10 | 2.0 | 131.5 | 52.6 |
| All Other Causes | <3 | s | s | s |
| Total Neonatal Mortality | 19 | 3.8 | 249.8 | 100.0 |
| Post Neonatal Mortality | | | | |
| SUDI: SIDS | 5 | 1.0 | 65.7 | 22.7 |
| SUDI: Suffocation / Strangulation in Bed | 3 | 0.6 | 39.4 | 13.6 |
| Congenital Anomalies: Other Perinatal Conditions | 8 | 1.6 | 105.2 | 36.4 |
| All Other Causes | 6 | 1.2 | 78.9 | 27.3 |
| Total Post Neonatal Mortality | 22 | 4.4 | 289.2 | 100.0 |
| Southland Total | 41 | 8.2 | 539.1 | 100.0 |

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset. Note: s: suppressed due to small numbers.



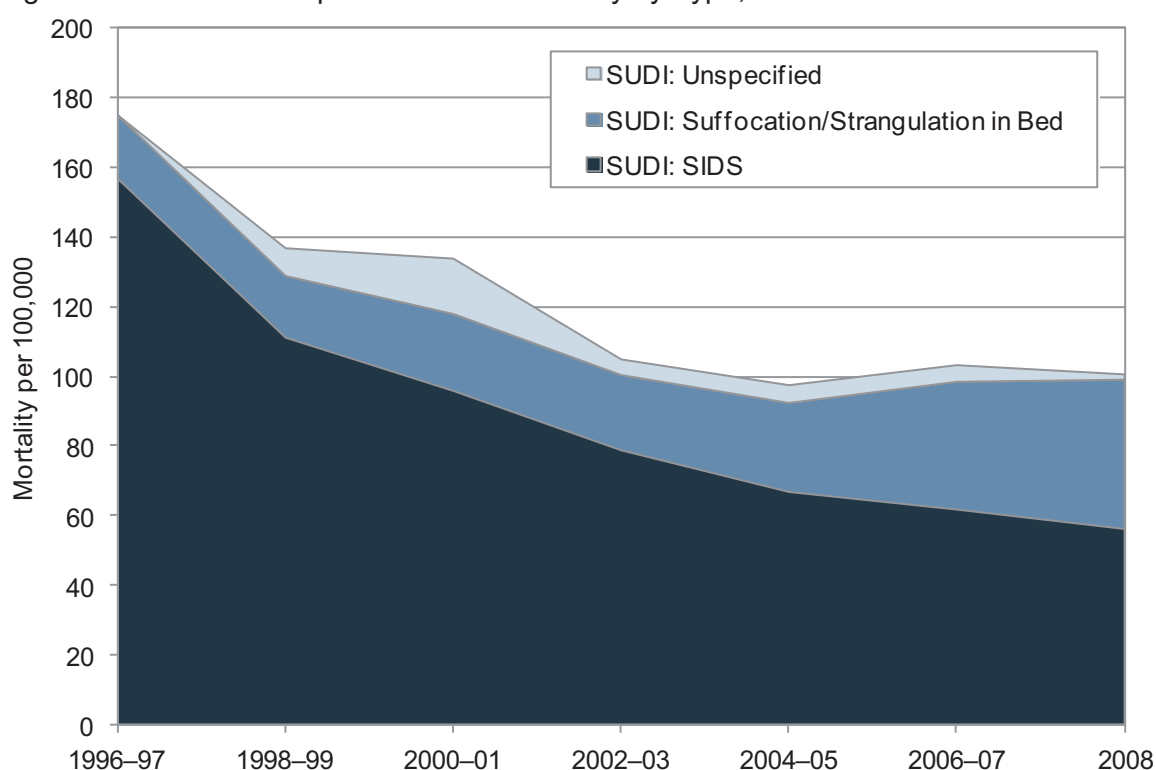
Sudden Unexpected Death in Infancy (SUDI)

New Zealand Distribution and Trends

New Zealand Trends

In New Zealand, SUDI rates declined during the late 1990s and early 2000s, but became more static after 2002–03. When broken down by SUDI sub-type, deaths attributed to SIDS continued to decline throughout 1996–2008, while deaths due to suffocation or strangulation in bed became more prominent as the period progressed. It is unclear, however, whether this represented a diagnostic shift in the coding of SUDI, or whether the sleeping environment made an increasingly greater contribution to SUDI as the period progressed (**Figure 12**).

Figure 12. Sudden Unexpected Death in Infancy by Type, New Zealand 1996–2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset

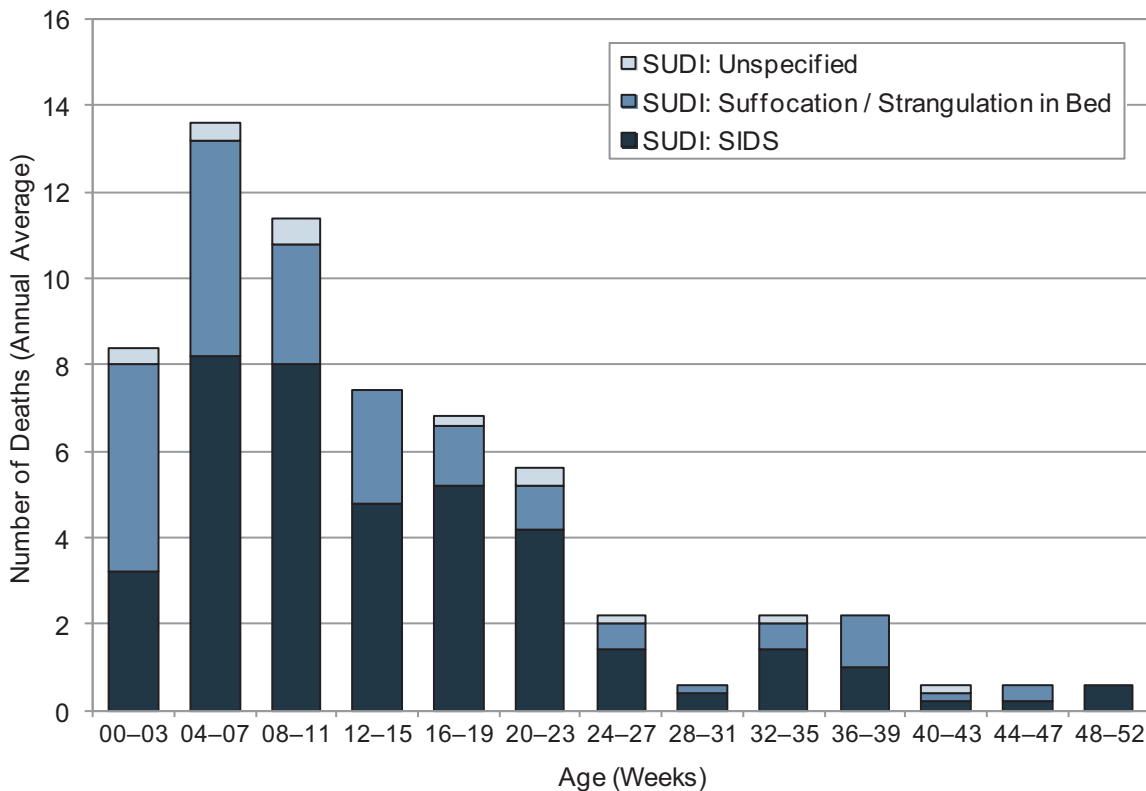
New Zealand Distribution by Age

In New Zealand during 2004–2008, SUDI mortality was highest in infants 4–7 weeks of age, followed by those aged 8–11 weeks and those 0–3 weeks. Of note, SUDI: Suffocation/Strangulation in Bed accounted for 57.1% of all SUDI deaths in those aged 0–3 weeks and 36.8% of SUDI deaths in those aged 4–7 weeks (**Figure 13**).

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

In New Zealand during 2004–2008, mortality from SUDI was *significantly* higher for Māori > Pacific > European > Asian/Indian infants, those from average-to-more deprived (NZDep decile 3–10) areas, preterm infants, and those whose mothers were <30 years of age (**Table 24**). Similar ethnic differences were seen during 1996–2008 (**Figure 14**).

Figure 13. Sudden Unexpected Death in Infancy by Type and Age in Weeks, New Zealand 2004–2008



Source: Numerator: National Mortality Collection

Table 24. Risk Factors for Sudden Unexpected Death in Infancy (SUDI), New Zealand 2004–2008

| New Zealand | | | | | | | |
|---|-------|------------|-----------|--------------------|-------|------------|-----------|
| Sudden Unexpected Death in Infancy (SUDI) | | | | | | | |
| Variable | Rate | Rate Ratio | 95% CI | Variable | Rate | Rate Ratio | 95% CI |
| NZ Deprivation Index Decile | | | | Ethnicity | | | |
| Decile 1–2 | 27.4 | 1.00 | | Asian/Indian | 13.6 | 0.30 | 0.11–0.82 |
| Decile 3–4 | 59.5 | 2.17 | 1.14–4.15 | European | 45.1 | 1.00 | |
| Decile 5–6 | 66.8 | 2.44 | 1.30–4.58 | Māori | 223.8 | 4.96 | 3.77–6.53 |
| Decile 7–8 | 92.8 | 3.39 | 1.87–6.16 | Pacific | 108.4 | 2.40 | 1.60–3.60 |
| Decile 9–10 | 202.5 | 7.40 | 4.21–13.0 | Gender | | | |
| Maternal Age Group | | | | Female | 96.0 | 1.00 | |
| <20 Years | 276.5 | 4.96 | 3.43–7.17 | Male | 105.6 | 1.10 | 0.88–1.37 |
| 20–24 Years | 183.7 | 3.29 | 2.35–4.62 | Gestation at Birth | | | |
| 25–29 Years | 84.9 | 1.52 | 1.05–2.20 | 20–36 Weeks | 255.7 | 3.23 | 2.42–4.32 |
| 30–34 Years | 55.8 | 1.00 | | 37+ Weeks | 79.1 | 1.00 | |
| 35+ Years | 47.1 | 0.84 | 0.54–1.32 | | | | |

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset. Note: Rates are per 100,000; Rate Ratios are unadjusted; Ethnicity is Level 1 Prioritised.

New Zealand Distribution by Season

In New Zealand during 2004–2008, while small numbers make precise interpretation difficult, SUDI: SIDS was generally more common in the cooler months while SUDI: Suffocation/Strangulation in Bed was more evenly distributed through the year (**Figure 15**).

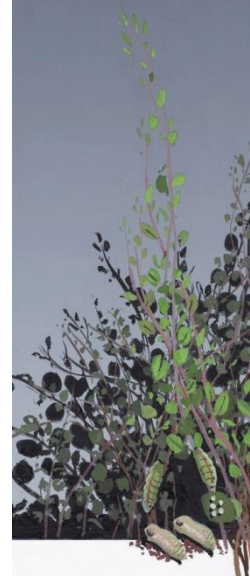
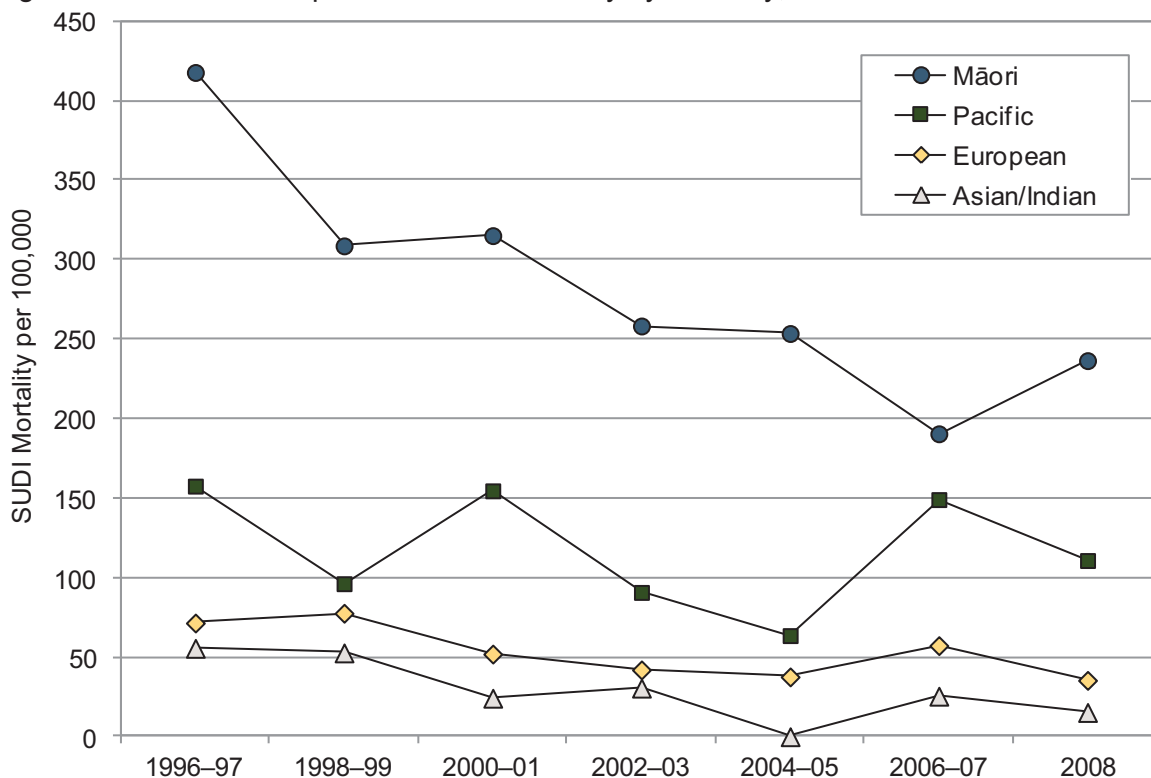
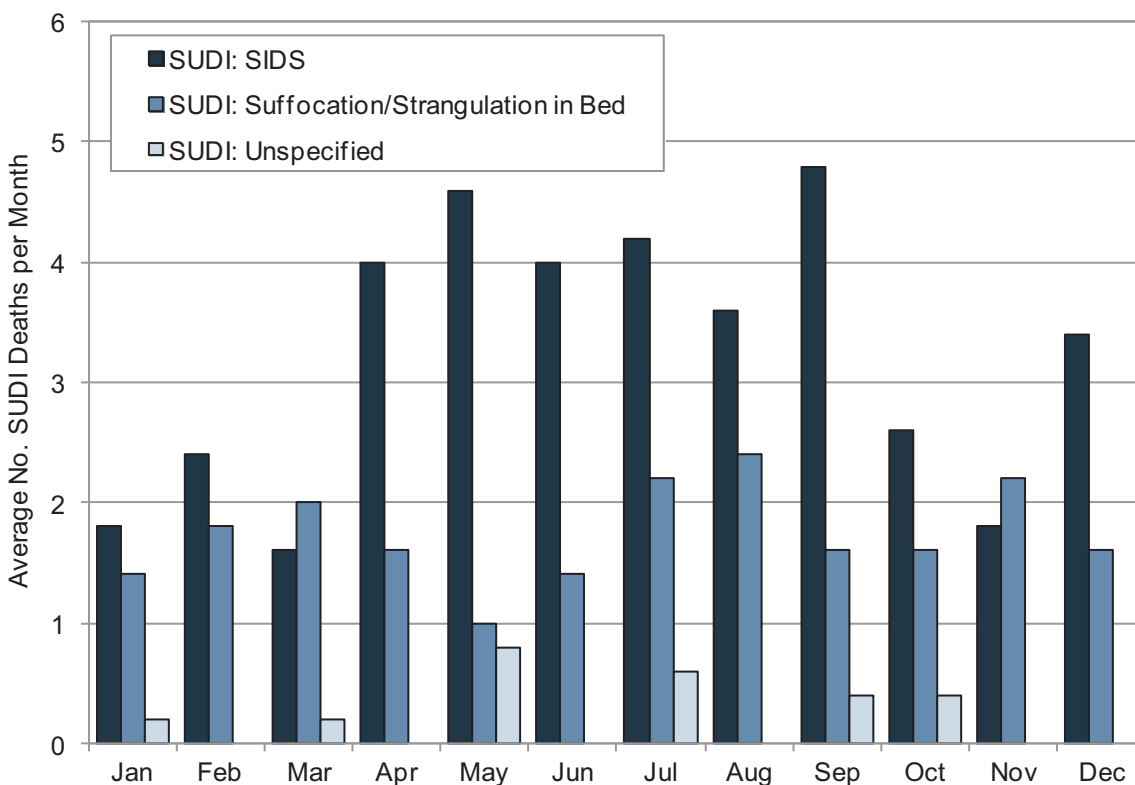


Figure 14. Sudden Unexpected Death in Infancy by Ethnicity, New Zealand 1996–2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset. Note: Ethnicity is Level 1 Prioritised.

Figure 15. Sudden Unexpected Death in Infancy by Type and Month, New Zealand 2004–2008



Source: National Mortality Collection



South Island Distribution and Trends

South Island DHBs vs. New Zealand

In Canterbury and Otago during 2004–2008, SUDI rates were lower than the New Zealand rate, although only in the case of Canterbury did these differences reach statistical significance. SUDI rates in Southland were not *significantly* different from the New Zealand rate, while in Nelson Marlborough and South Canterbury small numbers precluded a valid comparison. No SUDI deaths occurred in the West Coast during this period (**Table 25**).

Table 25. Sudden Unexpected Death in Infancy, South Island DHBs vs. New Zealand 2004–2008

| DHB | Number: Total 2004– 2008 | Number: Annual Average | Rate per 100,000 | Rate Ratio | 95% CI |
|-------------------------|--------------------------------|------------------------------|---------------------|------------|-----------|
| SUDI in Infants <1 Year | | | | | |
| Nelson Marlborough | <3 | s | s | s | s |
| West Coast | 0 | 0.0 | – | – | – |
| Canterbury | 16 | 3.2 | 50.2 | 0.50 | 0.30–0.82 |
| South Canterbury | <3 | s | s | s | s |
| Otago | 5 | 1.0 | 49.0 | 0.49 | 0.20–1.18 |
| Southland | 9 | 1.8 | 118.3 | 1.17 | 0.60–2.27 |
| New Zealand | 311 | 62.2 | 100.9 | 1.00 | |

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset. Note: s: suppressed due to small numbers.

South Island Trends

In the South Island DHBs during 1996–2008, large year to year variations (likely as the result of small numbers) made precise interpretation of SUDI trends difficult, although rates in Nelson Marlborough, Canterbury and Otago exhibited a general downward trend (**Figure 16**).

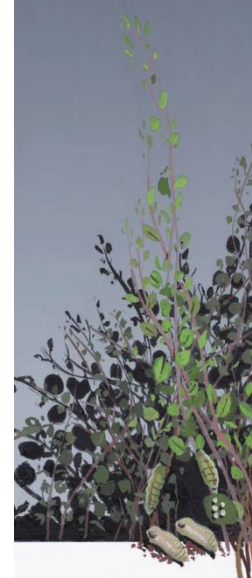
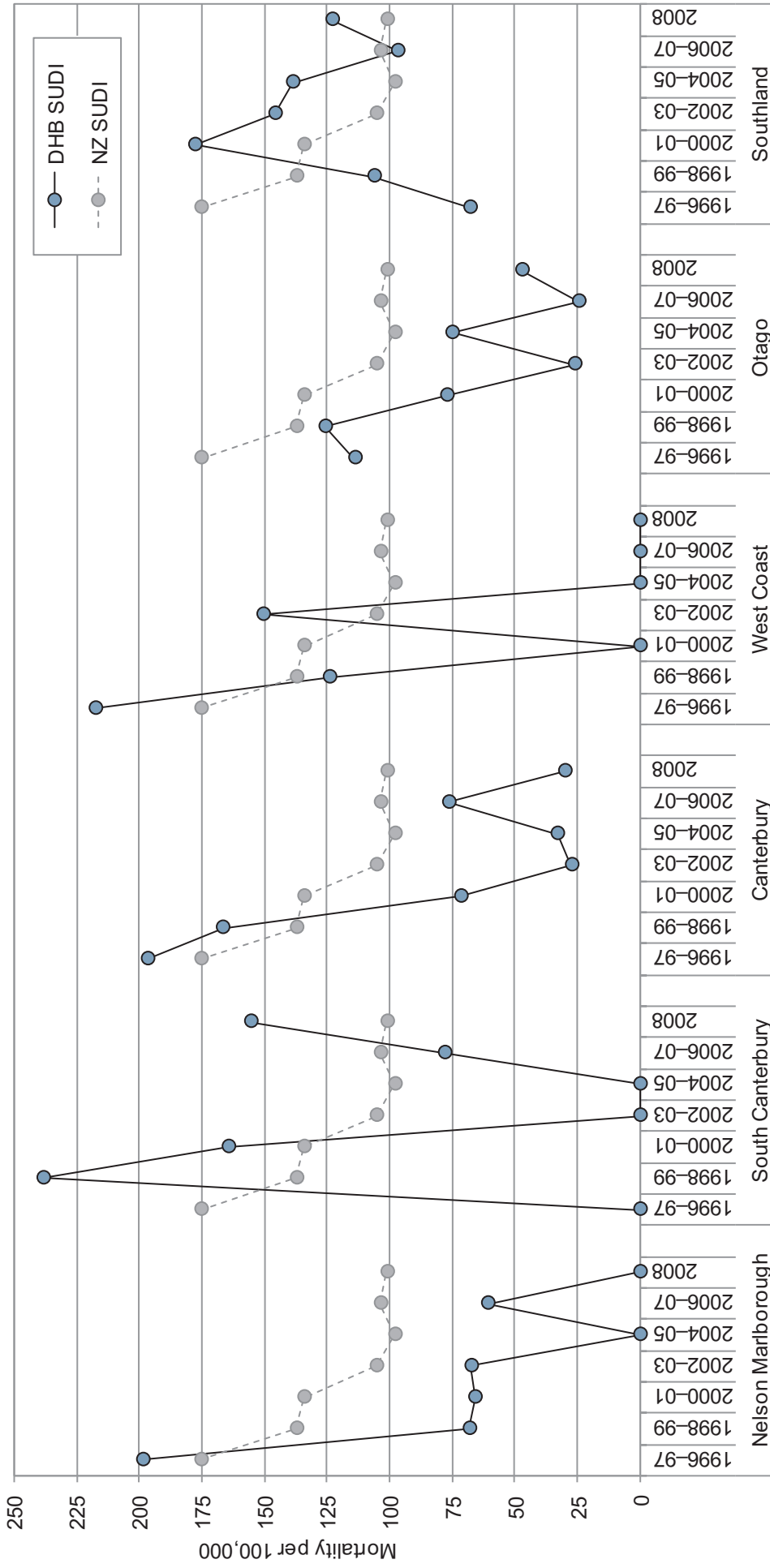


Figure 16. Sudden Unexpected Death in Infancy, South Island DHBs vs. New Zealand, 1996-2008



Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset

Summary

Neonatal and Post Neonatal Mortality

In New Zealand during 1990–2008, neonatal and post neonatal mortality both declined, with neonatal mortality exceeding post neonatal mortality from 1996 onwards. Neonatal mortality was higher for Pacific and Māori > European > Asian/Indian infants during the late 1990s, although ethnic differences were less consistent during the 2000s. In contrast, post neonatal mortality was higher for Māori > Pacific > European and Asian/Indian infants throughout 1996–2008. Neonatal and post neonatal mortality were also *significantly* higher for males, for those in average-to-more deprived areas, for preterm infants and those with younger mothers during 2004–2008.

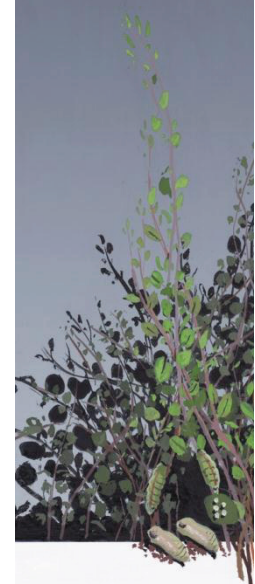
In the South Island DHBs during 2004–2008, congenital anomalies and extreme prematurity were frequent causes of neonatal mortality, although intrauterine/birth asphyxia also made a contribution in some DHBs. SUDI and congenital anomalies were frequent causes of post neonatal mortality. While there were regional variations, neonatal mortality rates were not *significantly* different from the New Zealand rate in any of the DHBs. Post neonatal mortality rates were lower than the New Zealand rate in Nelson Marlborough, Canterbury, South Canterbury and Otago, although only in the case of Nelson Marlborough and Canterbury did these differences reach statistical significance. Similarly, while higher, rates in Southland were not *significantly* different from the New Zealand rate.

SUDI

In New Zealand, SUDI rates declined during the late 1990s–early 2000s, but became more static after 2002–03. When broken down by SUDI sub-type, deaths attributed to SIDS continued to decline throughout 1996–2008, while those attributed to suffocation or strangulation in bed became more prominent as the period progressed. It is unclear whether this represented a diagnostic shift in the coding of SUDI, or whether the sleeping environment made an increasingly greater contribution as the period progressed.

During 2004–2008, SUDI mortality was highest in infants 4–7 weeks of age. Suffocation or strangulation in bed accounted for 57.1% of all SUDI deaths in those aged 0–3 weeks and 36.8% of SUDI deaths in those aged 4–7 weeks. SUDI was also *significantly* higher for Māori > Pacific > European > Asian/Indian infants, for those from average-to-more deprived (NZDep decile 3–10) areas, for preterm infants, and those with mothers <30 years of age.

In the South Island DHBs during 1996–2008, large year to year variations (likely as the result of small numbers) made precise interpretation of SUDI trends difficult, although rates in Nelson Marlborough, Canterbury and Otago exhibited a general downward trend. In Canterbury and Otago during 2004–2008, SUDI rates were lower than the New Zealand rate, although only in the case of Canterbury did these differences reach statistical significance. SUDI rates in Southland were not *significantly* different from the New Zealand rate, while in Nelson Marlborough and South Canterbury small numbers precluded a valid comparison. No SUDI deaths occurred in the West Coast during this period.



Local Policy Documents and Evidence-Based Reviews Relevant to Infant Mortality and SUDI

There are no Ministry of Health Policy documents which focus specifically on Sudden Unexpected Death in Infancy (SUDI), however the Ministry of Health and the Child and Youth Mortality Review Committee (CYMRC) have reviewed recommendations for preventing SUDI and the CYMRC has published a position paper: **Preventing Sudden Unexpected Death in Infancy** which is briefly discussed in **Table 26**, along with a range of other evidence-based reviews which may be useful for those wishing to develop local strategies for SUDI prevention

There are also a range of Government policy documents and evidence-based reviews which consider population level approaches to known SUDI risk and protective factors. Two such factors are reviewed in other sections of this report:

- Publications which relate to **Tobacco Control/Smoking** are reviewed in **Table 47** on **Page 168**
- Publications which relate to **Breastfeeding** are considered in **Table 27** on **Page 107**

Table 26. Local Policy Documents and Evidence-Based Reviews Relevant to SUDI Prevention

| Ministry of Health Policy Documents |
|--|
| <p>There are no Ministry of Health Policy documents which focus specifically on SUDI however the Ministry of Health and the Child and Youth Mortality Review Committee (CYMRC) have reviewed recommendations for preventing Sudden Unexpected Death in Infancy (SUDI) and the CYMRC has published a position paper:</p> <p>Preventing sudden unexpected death in infancy which can be viewed on the Ministry website at: http://www.moh.govt.nz/moh.nsf/indexmh/preventing-sudi-health-practitioner-info-apr08?Open</p> |
| International Guidelines |
| <p>Task Force on Sudden Infant Death Syndrome. 2011. SIDS and Other Sleep-Related Infant Deaths: Expansion of SIDS and Other Sleep-Related Infant Deaths. <i>Pediatrics</i>, 128(5), 1030-39.</p> <p>This policy statement from the American Academy of Pediatrics is an expansion of previous AAP recommendations. The new recommendations not only focus on SIDS prevention but also on safe sleep environments that can reduce the risk of all sleep-related infant deaths including suffocation, asphyxia and entrapment. The recommendations described in this publication include placing the baby in a supine position to sleep, using a firm sleeping surface, breastfeeding, sharing a room (but not a bed), routine immunisations, considering the use of a pacifier, and avoiding soft bedding, overheating and exposure to tobacco smoke, alcohol and illicit drugs.</p> <p>The evidence base for these recommendations is published as:</p> <p>Task Force on Sudden Infant Death Syndrome. 2011. Technical Report: SIDS and Other Sleep-Related Infant Deaths: Expansion of Recommendations for a Safe Infant Sleeping Environment. <i>Pediatrics</i>, 128(5), e1341-e67.</p> |
| <p>Hymel K. 2006. Distinguishing sudden infant death syndrome from child abuse fatalities. <i>Pediatrics</i> 118(1) 421-7.</p> <p>This clinical report from the American Academy of Pediatrics provides guidance for professionals regarding procedures to help avoid stigmatizing families of sudden infant death syndrome victims while allowing accumulation of appropriate evidence in potential cases of infanticide.</p> |
| Systematic and Other Reviews from the International Literature |
| <p>Mitchell EA, Blair PS, L'Hoir MP. 2006. Should pacifiers be recommended to prevent sudden infant death syndrome? <i>Pediatrics</i>, 117(5), 1755-8.</p> <p>This review reports that there is consistent evidence of a reduction in SIDS with pacifier ("dummy") use although the mechanism for the effect is unknown. Pacifier use might lead to reduced duration of breastfeeding but study results are conflicting. In New Zealand pacifier use is low overall (c. 10%) but there is wide variation within the country from c. 3% in the far south to c. 30% in the northern North Island. Pacifier use has some adverse effects: it appears to decrease the duration of breastfeeding and it is associated with higher risk of infective symptoms, particularly otitis media. The authors conclude that it is certainly appropriate to stop discouraging pacifier use but if parents wish to use a pacifier they should be advised to do so only once breastfeeding is established and only when the infant is expected to sleep..</p> |
| <p>Hauck FR, Omojokun OO, Siadaty MS. 2005. Do pacifiers reduce the risk of sudden infant death syndrome? A meta-analysis. <i>Pediatrics</i>, 116(5), e716-23.</p> <p>This paper reports on a meta-analysis of the results of seven case-control studies investigating the association between pacifier use and SIDS risk. The summary odds ratio (SOR) for usual pacifier use was calculated to be 0.90 (95% CI 0.59-0.85) using univariate odds ratios and 0.71 (95% CI 0.59-0.85) using multivariate odds ratios. For pacifier use during the last sleep the SORs using univariate and multivariate ORs were 0.47 (95% CI 0.40-0.55) and 0.39 (95% CI 0.31-0.50), respectively. Published case-control studies therefore demonstrate that pacifier use is associated with a significantly reduced risk for SIDS, particularly when an infant is placed for sleep. The authors estimate that one SIDS death would be averted for every 2733 infants who are given a pacifier when placed for sleep. They recommend that pacifiers be offered to infants to reduce the risk of SIDS but that for breastfeeding infants, pacifier use should be introduced after breastfeeding is well established.</p> |

Ponsonby A-L, Dwyer T, Cochrane J. 2002. **Population trends in sudden infant death syndrome**. *Seminars in Perinatology*, 26(4), 296-305.

This review article reports on recent trends in sudden infant death syndrome. It is based on a review of medical literature as well as national government data from various countries (including New Zealand) and internet resources. It notes that while there have been striking reductions in SIDS in many countries largely attributable to decreases in the proportion of infants sleeping prone, within countries the decline has not occurred to the same extent in different ethnic and socioeconomic groups.

Useful Websites and Other Publications

McManus V, Abel S, McCreanor T, et al. 2010. Narratives of deprivation: **Women's life stories around Māori sudden infant death syndrome**. *Social Science & Medicine*, 71(3), 643-9.

This paper reports on life story interviews conducted between 2002 and 2004 with nineteen Māori mothers whose infants died of SIDS. These mothers' stories have common themes of alienation, marginalisation and exclusion and lives lived with serious deprivation within an affluent society. It is unhelpful to view some risk factors as non-modifiable and the authors argue that new approaches that build on the WHO Social determinants of health framework are needed to stem the tide of deaths of Māori babies from SIDS.

Child and Youth Mortality Review Committee, Te Rōpū Arotake Auau Mate o te Hunga Tamariki Taiohi. 2011. **Sudden Unexpected Death in Infancy**. http://www.cymrc.health.govt.nz/moh.nsf/indexcm/cymrc-resources-sudi?Open&m_id=4.1

This webpage provides links to a number of useful resources and websites including:

Fifth Report to the Minister of Health: Reporting mortality 2002–2008

Chapter 1 of this publication deals with sudden unexpected death in infancy. It provides data from 2002-2008, qualitative data gathered from local mortality review, and recommendations from the CYMRC on how to reduce incidents of SUDI in New Zealand.

[http://www.cymrc.health.govt.nz/moh.nsf/pagescm/347/\\$File/cymrc-sudi-report-2009.pdf](http://www.cymrc.health.govt.nz/moh.nsf/pagescm/347/$File/cymrc-sudi-report-2009.pdf)

Whakawhetu: National SIDS Prevention for Māori (www.Māorisids.org.nz)

Whakawhetu was established in March 1994 to decrease SIDS mortality rates in the Māori community. Originally, the organisation was known as Māori SIDS but was rebranded as Whakawhetu in 2011. The organisation delivers national and regional services that focus on co-ordination and provision of evidence-based research with the purpose of assisting whānau, health professionals and communities to reduce the incidence of SIDS/SUDI. There is a research and information library on the website.

TAHA Well Pacific Mother and Infant Service (www.taha.co.nz)

The Pacific Health Programme, in the Department of Māori and Pacific Health at the University of Auckland, has developed a SUDI prevention programme for Pacific families in Auckland.

Change for Our Children (www.changeforourchildren.co.nz)

Change for our Children is on a mission to build a strong culture of respect for children that is visible in our country's systems and services, conversations and communities, hearts and homes. This site contains, among other useful resources, information on the pepi-pod project which provides a means of enabling babies to be close to a parent but have their own safe sleeping space (under the safe start programme tab on the website), and some useful publications both from the organisation and elsewhere.

Ministry of Health. 2010. **Fetal and Infant Deaths 2007**. Wellington: Ministry of Health.
[http://www.moh.govt.nz/moh.nsf/Files/fetalinfantdeaths/\\$file/fetal-infant-deaths07-dec10.pdf](http://www.moh.govt.nz/moh.nsf/Files/fetalinfantdeaths/$file/fetal-infant-deaths07-dec10.pdf)

This publication presents data on deaths that occurred before one completed year of life and were registered in the 2007 calendar year and information on the underlying causes of these deaths.

Schluter PJ, Paterson J, Percival T. 2007. **Infant care practices associated with sudden infant death syndrome: findings from the Pacific Islands Families study**. *Journal of Paediatrics & Child Health*, 43(5), 388-93.

The Pacific Islands Families Study followed a cohort of Pacific infants born at Middlemore Hospital between 15 March and 17 December 2000. Mothers (1376 in total) were interviewed about infant care practices at around six weeks after the birth of their infant. Bed sharing was found to be common (50% of infants) and mostly occurred in the parents' bed. Most infants (95%) wholly or partly shared a bedroom with their parents. Despite these practices, and the socio-economic disadvantage of many Pacific families the rate of SIDS among Pacific families is substantially lower than the Māori SIDS rate. The authors of this paper state "Mothers need to receive adequate information antenatally about the risks and benefits of room-sharing, bed-sharing and safe-sleeping practices and environments should they decide or have no option but to bed-share".