



New Zealand Child and Youth
Epidemiology Service

Health and wellbeing of under-five year olds in the South Island 2017

Under-five mortality

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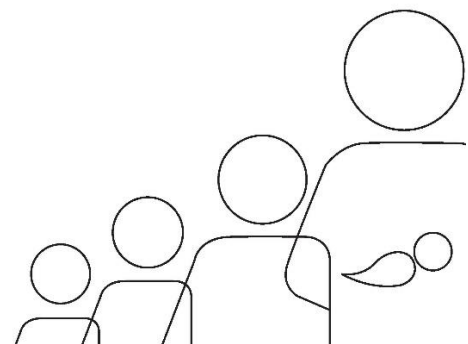
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This report has been prepared for the South Island Alliance: Nelson Marlborough, Canterbury, South Canterbury, West Coast and Southern District Health Boards.

While every endeavour has been made to use accurate data in this report, there are currently variations in the way data are collected from DHB and other agencies that may result in errors, omissions or inaccuracies in the information in this report. The NZCYES does not accept liability for any inaccuracies arising from the use of these data in the production of these reports, or for any losses arising as a consequence thereof.

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IV. UNDER-FIVE MORTALITY

The mortality rate for children aged under five years is an indicator of both the level of child health, and the development and well-being of a population.¹ Relative poverty is the most important social determinant for child deaths in high-income countries, with a persistent inverse association between socioeconomic status and child mortality.² Continuing disparities in child mortality between and within countries emphasise the importance of engaging with the deep social inequalities inherent in society, and to seek to understand the complex pathways that ultimately lead to poor outcomes for children.³ Effective interventions to reduce infant and child deaths need to be solution-focused and to tackle underlying causes.³

Infant mortality, the rate at which babies and children of less than one year of age die, reflects the effect of economic and social conditions on the health of mothers and newborns, including the social environment, individual lifestyles as well as the characteristics and effectiveness of health systems.⁴ It serves as an indicator of national commitment to universal maternal and child health, particularly for poor and marginalised families.⁵ In all high-income countries, infant mortality rates have reduced to fewer than 10 infant deaths per 1,000 live births. Infant mortality in New Zealand is higher than the OECD average; in 2013 New Zealand ranked sixth highest among the 35 OECD countries with data available.⁶

This section reviews all under-five mortality, infant mortality including sudden unexpected death in infancy (SUDI), and deaths of 1–4 year olds using information from the National Mortality Collection and the Birth Registration Dataset.

Data sources and methods

Indicator

1. Under-five mortality rate
2. Infant mortality
3. Child mortality (1–4 years)

Definition and data sources

Under-five mortality rate

Numerator: Number of deaths of children aged under five years

Source: National Mortality Collection (MORT)

Denominator: Total number of children aged under five years

Source: StatsNZ estimated resident population (ERP; with linear extrapolation between Census years)

Infant mortality

Numerator: Number of deaths of a live born infant before the first year of life is completed (prior to 365 days of life)

Source: National Mortality Collection (MORT)

Denominator: Total number of live born babies

Source: Birth Registration Dataset (BDM; live births only)

Infant mortality are further defined into

Neonatal mortality: Death of a live-born infant before 28 completed days after birth

Post neonatal mortality: Death of a live-born infant between 28 completed days and before the first year of life is completed

Sudden Unexpected Death in Infancy (SUDI)

Death of an infant where the cause of death is Sudden Infant Death Syndrome (SIDS), accidental suffocation or strangulation in bed, inhalation of gastric contents or food, or ill-defined or unspecified causes

Child mortality (1–4 years)

Numerator: Number of deaths of children aged between one and four years

Source: National Mortality Collection (MORT)

Denominator: Total number of children aged between one and four years

Source: StatsNZ estimated resident population (ERP; with linear extrapolation between Census years)

Additional information

An overview of the National Mortality Collection (MORT) is provided in the appendices.

Cause of death was the main underlying cause of death. Refer to Appendix 5 for the corresponding codes.

Two additional codes were added to the SUDI indicator in 2013 (Inhalation of gastric contents; and Inhalation and ingestion of food causing obstruction of the respiratory tract) to ensure consistency with the NZ Child and Youth Mortality Review Committee's SUDI reporting. As a result, the rates in this section are not directly comparable with those presented in NZCYES reports prior to 2013.

Figure IV–1 and Table IV–1 present the mortality rate for children aged under five years during 2010–2014. The under-five mortality rate was slightly lower than the national rate for Canterbury, and not significantly different for the other South Island DHBs.

Figure IV–1 Under five mortality, by district health board, 2010–2014

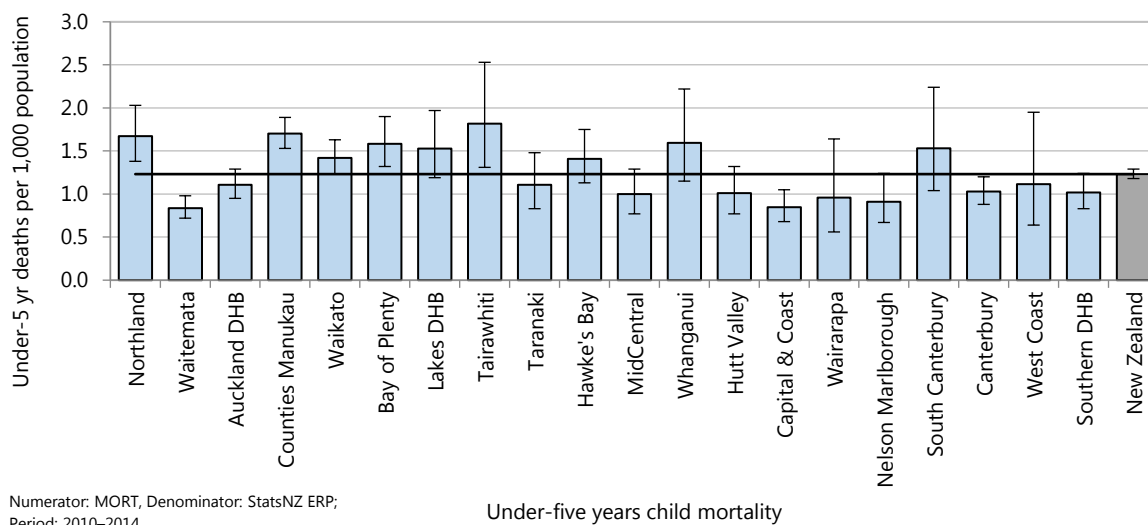


Table IV–1 Under five mortality, South Island DHBs 2010–2014

DHB	2010–2014 (n)	Annual average	Rate per 1,000 population	Rate ratio	95% CI
Under-five mortality					
Nelson Marlborough	39	8	0.91	0.74	0.54–1.01
South Canterbury	26	5	1.53	1.24	0.84–1.83
Canterbury	164	33	1.03	0.83	0.71–0.98
West Coast	12	2	1.11	0.90	0.51–1.60
Southern	96	19	1.02	0.83	0.67–1.01
New Zealand	1,898	380	1.23	1.00	

Numerator: MORT, Denominator: StatsNZ ERP; Rate ratios are unadjusted

Infant mortality

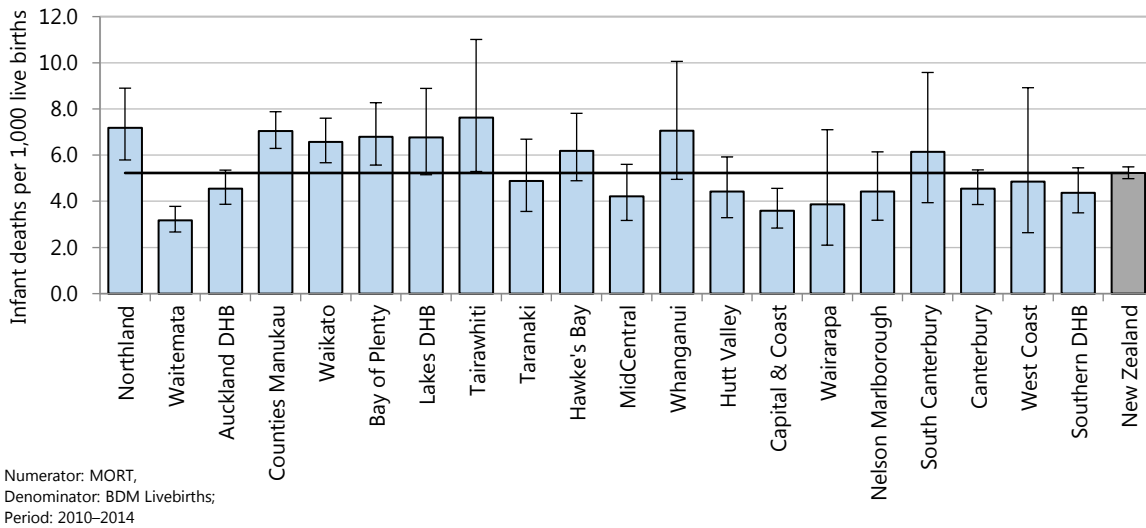
Table IV–2 presents the registered live births and infant mortality rate for each district health board in the South Island during 2010–2014. The proportion of babies that died in the first year of life varied but was not significantly different from the national rate in any of the South Island DHBs, as shown in Figure IV–2.

Table IV–2 Live births and infant mortality, South Island DHBs 2010–2014

DHB	Live births (n) 2010–2014	Infant mortality				
		2010–2014 (n)	Annual average	Rate per 1,000 live births	Rate ratio	95% CI
Nelson Marlborough	7,918	35	7	4.42	0.85	0.61–1.18
South Canterbury	3,092	19	4	6.14	1.18	0.75–1.85
Canterbury	30,788	140	28	4.55	0.87	0.73–1.03
West Coast	2,059	10	2	4.86	0.93	0.50–1.73
Southern	17,849	78	16	4.37	0.84	0.67–1.05
New Zealand	306,894	1,604	321	5.23	1.00	

Numerator: MORT, Denominator: BDM Live births; Rate ratios are unadjusted

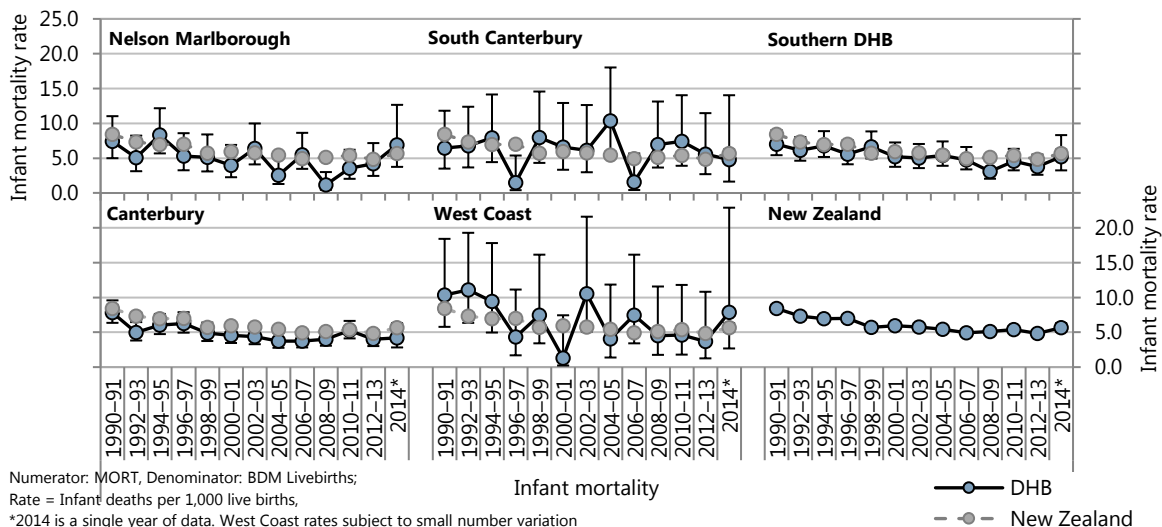
Figure IV–2 Infant mortality, by district health board, 2010–2014



Numerator: MORT, Denominator: BDM Livebirths; Period: 2010–2014

Nationally infant mortality rates have declined since 1990. The most pronounced fall occurred pre-2000 after which the decline has been more gradual. Similar declines were observed within the South Island DHBs (Figure IV–3).

Figure IV–3 Trends in infant mortality, South Island DHBs vs New Zealand, 1990–2014



Numerator: MORT, Denominator: BDM Livebirths; Rate = Infant deaths per 1,000 live births;

*2014 is a single year of data. West Coast rates subject to small number variation

—●— DHB
- - ● - - New Zealand

Death rates for infants in New Zealand are higher during the first 27 days of life (neonatal period) than in the post-neonatal period. In all South Island DHBs, the more than half of the infant deaths occurred during the neonatal period (Table IV–3, Figure IV–4).

Figure IV–4 Infant mortality, by type and district health board, 2010–2014

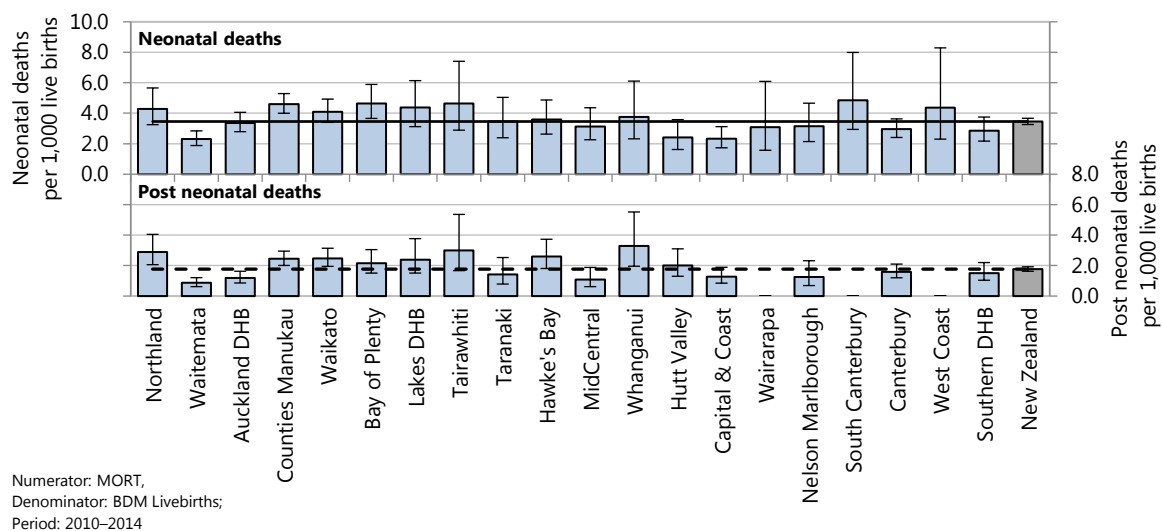


Table IV–3 Infant mortality, by type, South Island DHBs 2010–2014

DHB	2010–2014 (n)	Annual average	Rate per 1,000 live births	Rate ratio	95% CI
Neonatal mortality					
Nelson Marlborough	25	5	3.16	0.91	0.61–1.36
South Canterbury	15	3	4.85	1.40	0.84–2.33
Canterbury	91	18	2.96	0.85	0.69–1.06
West Coast	9	2	4.37	1.26	0.66–2.43
Southern	51	10	2.86	0.83	0.62–1.09
New Zealand	1,061	212	3.46	1.00	
Post neonatal mortality					
Nelson Marlborough	10	2	1.26	0.71	0.38–1.33
South Canterbury	<5	s	s	s	s
Canterbury	49	10	1.59	0.90	0.67–1.20
West Coast	<5	s	s	s	s
Southern	27	5	1.51	0.85	0.58–1.26
New Zealand	543	109	1.77	1.00	

Numerator: MORT, Denominator: BDM Live births; Rate ratios are unadjusted

Figure IV–5 presents the infant mortality rates for differing demographic groups in New Zealand, specifically the residential deprivation score (NZDep2013 index), maternal age, ethnicity, and gender. The unadjusted rate ratio presents the gap, if any, between the groups and the reference group.

- The mortality rate for infants residing in areas with the highest scores on the NZDep2013 index of deprivation (quintile 5; deciles 9-10) was almost 3 times higher than the mortality rate for infants born in areas with the lowest NZDep2013 scores (quintile 1; deciles 1-2)
- The mortality rates for Māori and Pacific infants were more than 1.5 times higher than mortality rates of European/Other infants
- The mortality rates were 2-3 times higher for infants born to mothers aged less than 20 years and aged 20-24 years compared with infants born to mothers aged 30-34 years.

A similar pattern of high infant mortality rates for those residing in quintile 5 areas or for infants born to mothers aged under 20 years were seen within the South Island DHBs. The infant mortality demographic profile is presented in Figure IV–6 for Canterbury DHB and Figure IV–7 for Southern DHB.

The small number of infant deaths within Nelson Marlborough, South Canterbury and West Coast DHBs do not allow for meaningful comparisons by demographic factor and are therefore not presented.

Figure IV-5 Infant mortality, comparison by demographic factors, New Zealand 2010-2014

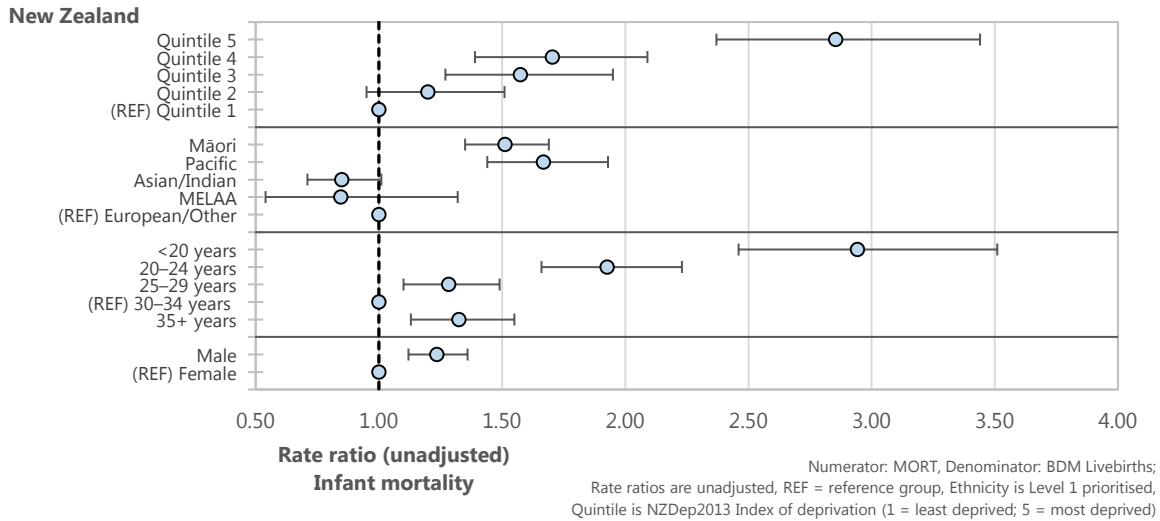


Figure IV-6 Infant mortality, comparison by demographic factors, Canterbury DHB 2010-2014

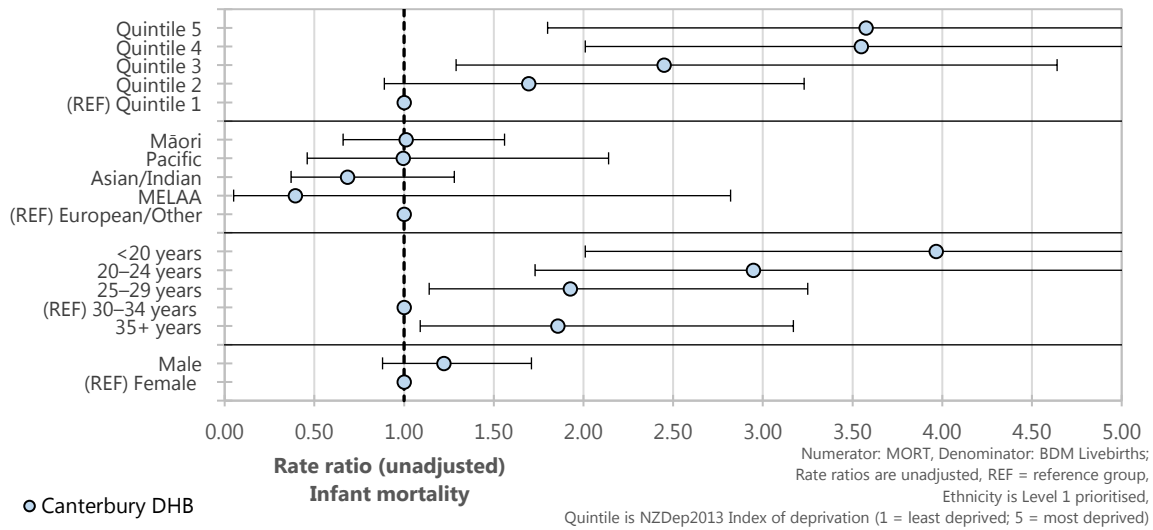
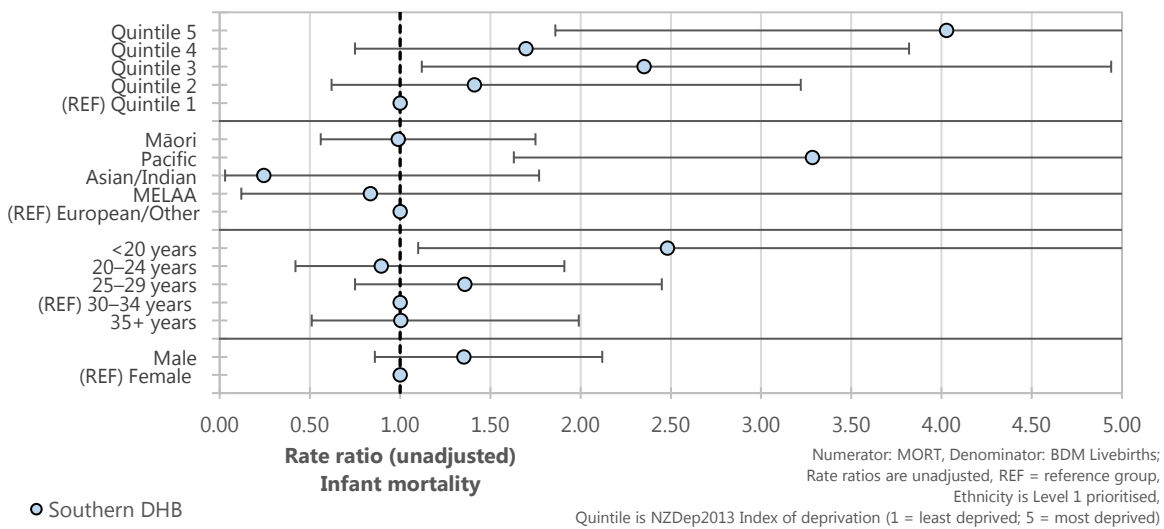


Figure IV-7 Infant mortality, comparison by demographic factors, Southern DHB 2010-2014



In all five South Island DHBs, the main conditions contributing to infant deaths were congenital anomalies, extreme prematurity and other perinatal conditions (Table IV–4). Sudden unexpected death in infancy (SUDI) is presented in more detail in the subsequent section.

Table IV–4 Infant mortality, by cause of death, South Island DHBs 2010–2014

Cause of death	2010–2014 (n)	Annual average	Rate per 1,000 live births	%
Infant mortality				
Nelson Marlborough				
Congenital anomalies	7	1	0.88	20.0
Extreme prematurity	<5	s	s	s
Other perinatal conditions	14	3	1.77	40.0
SUDI: SIDS	<5	s	s	s
SUDI: suffocation or strangulation in bed	<5	s	s	s
Other causes	7	1	0.88	20.0
Total	35	7	4.42	100.0
South Canterbury				
Extreme prematurity	6	1	1.94	31.6
Congenital anomalies	7	1	2.26	36.8
Other causes	6	1	1.94	31.6
Total	19	4	6.14	100.0
Canterbury				
Extreme prematurity	29	6	0.94	20.7
Congenital anomalies	23	5	0.75	16.4
Other perinatal conditions	45	9	1.46	32.1
SUDI: SIDS	12	2	0.39	8.6
SUDI: suffocation or strangulation in bed	10	2	0.32	7.1
Injury or poisoning	7	1	0.23	5.0
Other causes	14	3	0.45	10.0
Total	140	28	4.55	100.0
West Coast				
Perinatal conditions	7	1	3.40	70.0
Other causes	<5	s	s	s
Total	10	2	4.86	100.0
Southern DHB				
Congenital anomalies	18	4	1.01	23.1
Extreme prematurity	11	2	0.62	14.1
All other perinatal conditions	25	5	1.40	32.1
SUDI: SIDS	10	2	0.56	12.8
Other causes	14	3	0.78	17.9
Total	78	16	4.37	100.0

Numerator: MORT, Denominator: BDM Live births; SUDI = Sudden Unexpected Death in Infancy; SIDS = Sudden Infant Death Syndrome

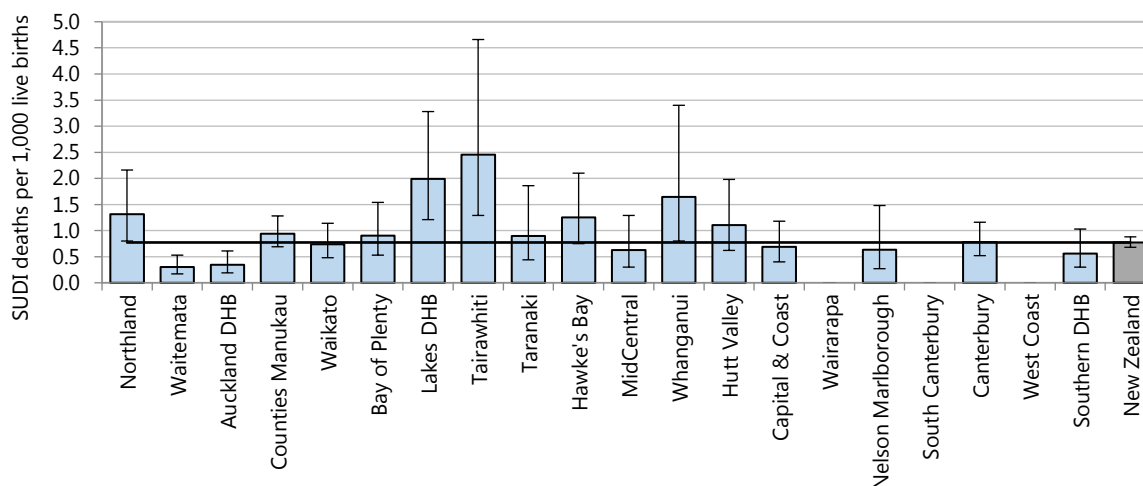
Sudden unexpected death in infancy

Sudden unexpected death in infancy (SUDI) is the leading cause of death for New Zealand infants aged 28–364 days. Such deaths occur suddenly and unexpectedly in the first year of life, usually in otherwise healthy infants, and often during sleep.^{7,8}

Rates of SUDI were not significantly different from the national SUDI rate in Nelson Marlborough, Canterbury and Southern DHBs during 2010–2014 (Figure IV–8, Table IV–5). There were fewer than five SUDI deaths in South Canterbury and on the West Coast in this time period.

Since 1996, the SUDI rate has declined in Canterbury and Southern DHBs as well as nationally (Figure IV–9). For the same period, there were 19 SUDI deaths in Nelson Marlborough, nine in South Canterbury and five on the West Coast.

Figure IV-8 Sudden unexpected death in infancy (SUDI), by district health board 2010–2014



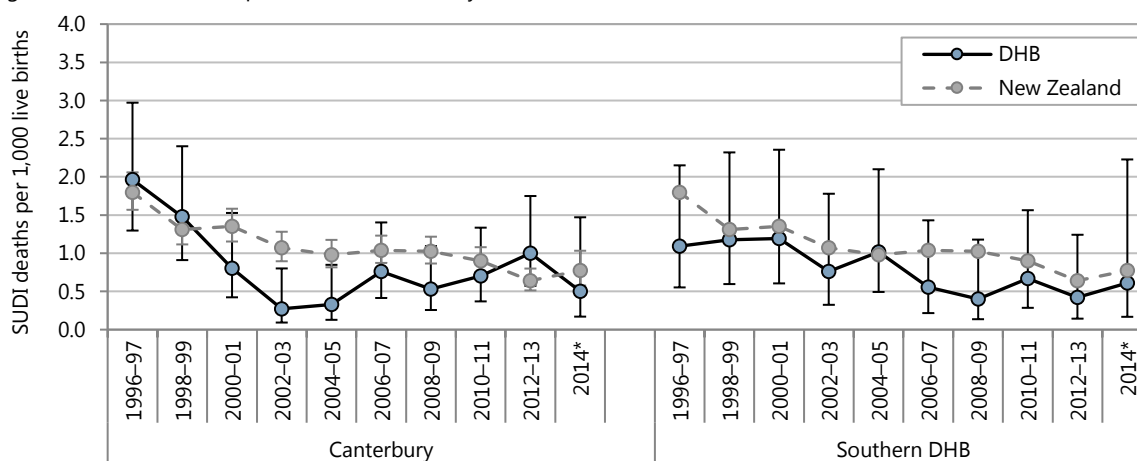
Numerator: MORT, Denominator: BDM Livebirths;
 Period: 2010–2014. Rates suppressed due to small numbers for Wairarapa, South Canterbury, and West Coast DHBs

Table IV-5 Sudden unexpected death in infancy (SUDI), South Island DHBs 2010–2014

DHB	2010–2014 (n)	Annual average	Rate per 1,000 live births	Rate ratio	95% CI
Sudden unexpected death in infancy (SUDI)					
Nelson Marlborough	5	1	0.63	0.82	0.34–1.98
South Canterbury	<5	s	s	s	s
Canterbury	24	5	0.78	1.01	0.66–1.54
West Coast	<5	s	s	s	s
Southern	10	2	0.56	0.73	0.39–1.37
New Zealand	237	47	0.77	1.00	

Numerator: MORT, Denominator: BDM Live births; Rate ratios are unadjusted

Figure IV-9 Sudden unexpected death in infancy (SUDI) trend, South Island DHBs vs New Zealand 1996–2014



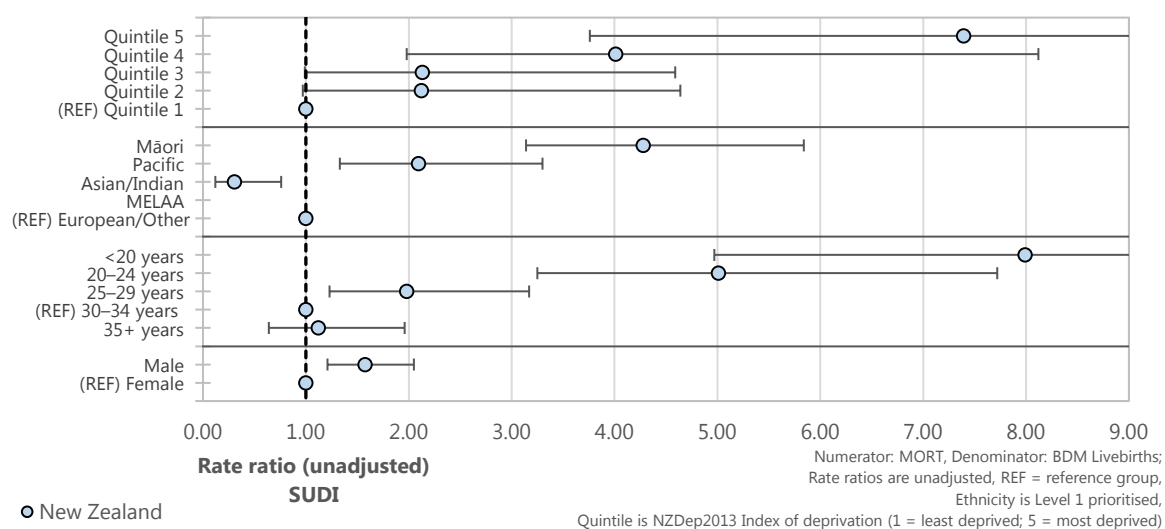
Numerator: MORT, Denominator: BDM Livebirths;
 Rate = SUDI deaths per 1,000 live births, *2014 is a single year of data.
 Caution: DHB rates based on small numbers, and suppressed for Nelson Marlborough, South Canterbury and West Coast

There were disparities in SUDI rates by score of infant domicile on the NZDep2013 index of deprivation, maternal age, (prioritised) ethnicity, and gender (Figure IV–10). The following associations were observed, bearing in mind that this univariate analysis does not quantify the independent effect of each factor:

- Infants living in areas of high deprivation (quintile 5; deciles 9–10) had a SUDI rate over 7 times higher compared with those residing in areas of low deprivation (quintile 1; deciles 1–2)
- The SUDI rate for infants born to mothers aged under 20 years was almost 8 times the rate for infants born to mothers aged 30 years or older, and the SUDI rate was more than 5 times for infants born to mothers aged 20–24 years
- The SUDI rate for Māori infants was 4 times higher than the SUDI rate for European/Other infants. The SUDI rate for Pacific infants was twice that of European/Other infants
- The SUDI rate for male infants was slightly but significantly higher than the SUDI rate for female infants.

Small SUDI numbers within the district health boards do not allow for meaningful comparisons by demographic factor and are therefore not presented.

Figure IV–10 Sudden unexpected death in infancy (SUDI), comparison by demographic factors, New Zealand 2010–2014



Child mortality

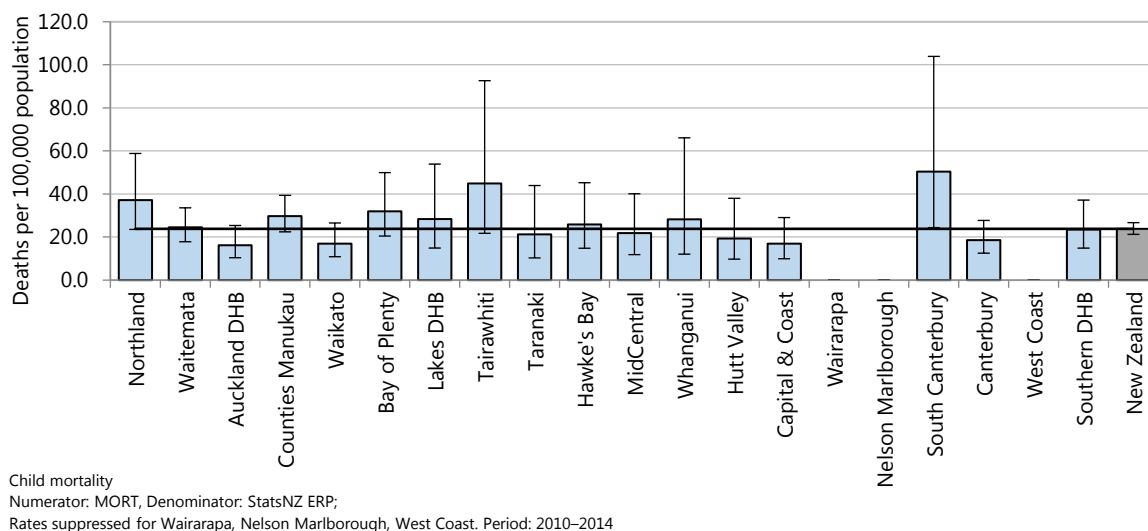
Table IV–6 and Figure IV–11 present the mortality rate for children aged 1–4 years during 2010–2014. The child mortality rates for South Canterbury DHB were marginally higher than the national rate and rates were not significantly different for Canterbury and Southern DHBs. There were fewer than five deaths of 1–4 year olds in the Nelson Marlborough and West Coast DHBs during this period.

Table IV–6 Child mortality, South Island DHBs 2010–2014

DHB	2010–2014 (n)	Annual average	Rate per 100,000 population	Rate ratio	95% CI
Child mortality					
Nelson Marlborough	<5	s	s	s	s
South Canterbury	7	1	50.36	2.11	1.00–4.47
Canterbury	24	5	18.64	0.78	0.52–1.19
West Coast	<5	s	s	s	s
Southern	18	4	23.52	0.99	0.61–1.59
New Zealand	294	59	23.82	1.00	

Numerator: MORT, Denominator: StatsNZ ERP; Rate ratios are unadjusted

Figure IV–11 Child mortality, by district health board, 2010–2014



Nationally child mortality rates have gradually declined since the early 1990s. Similar declines, with year-on-year variability, were observed for Nelson Marlborough, Canterbury and Southern DHBs (Figure IV–12). In the same period there were a total of 19 deaths of 1–4 year olds in South Canterbury and 14 on the West Coast.

Figure IV–12 Trends in child mortality, South Island DHBs vs New Zealand, 1992–2014

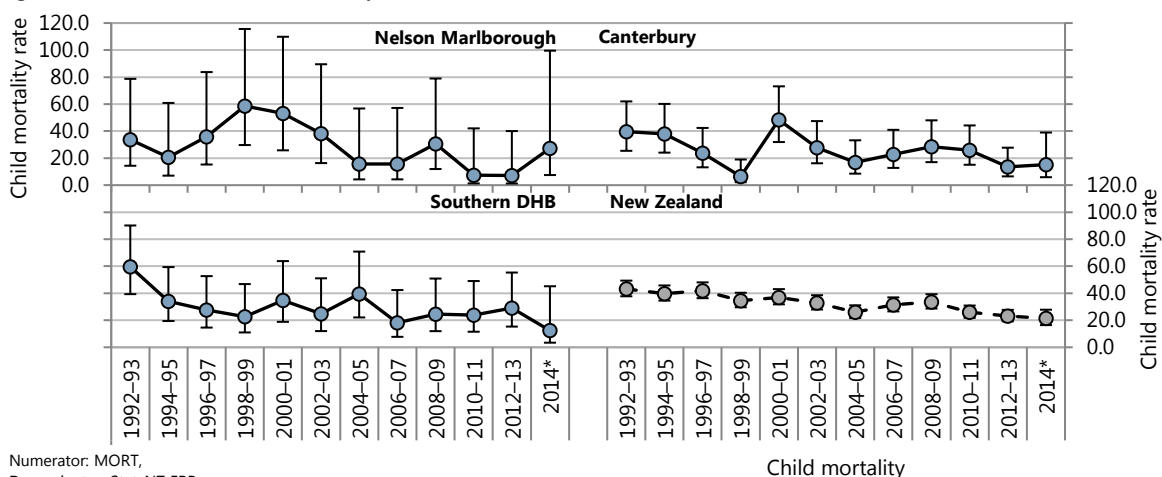
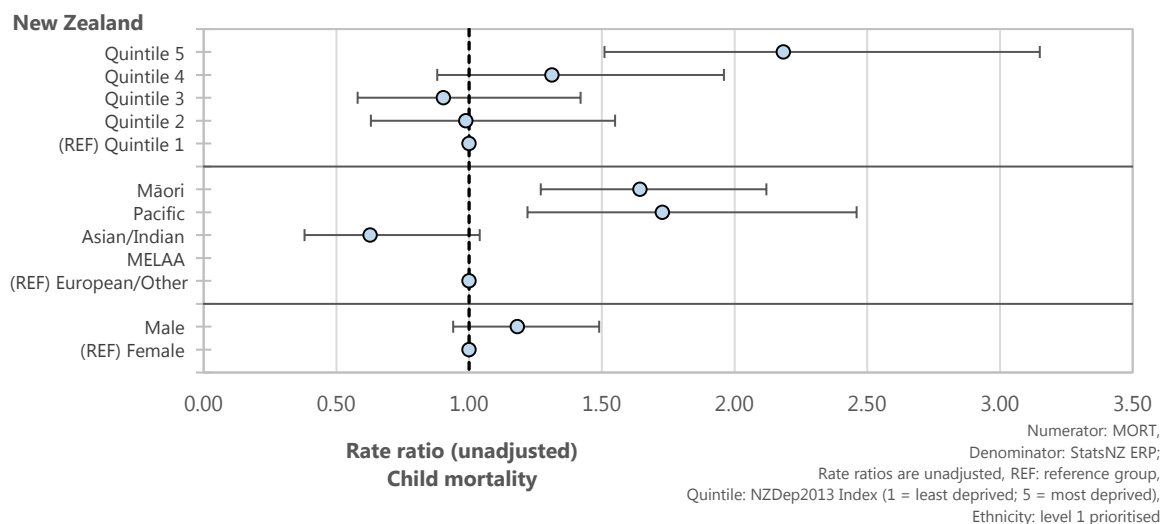


Figure IV–13 presents the child mortality rates for differing demographic groups by the residential deprivation score (NZDep2013 index of deprivation score), maternal age, ethnicity, and gender. The unadjusted rate ratio presents the gap, if any, between the groups and the reference group. The following associations were observed, bearing in mind that this univariate analysis does not quantify the independent effect of each factor:

- The mortality rate of 1–4 year olds residing in areas with the highest scores on the NZDep2013 index of deprivation (quintile 5; deciles 9-10) was more than 2 times higher than the mortality rate for 1–4 year olds residing in areas with the lowest NZDep2013 scores (quintile 1; deciles 1–2)
- The mortality rates for Māori and Pacific 1–4 year olds were more than 1.5 times higher than mortality rates of European/Other infants

The small number of child deaths within the district health boards do not allow for meaningful comparisons by demographic factor and are therefore not presented.

Figure IV-13 Child mortality, comparison by demographic factors, New Zealand 2010-2014



Nationally injury and poisoning was the leading cause of death of children aged 1–4 years, followed by cancer and congenital anomalies. These three causes accounted for half of all child deaths in 2010–2014. The leading causes of child deaths for Canterbury were cancer and congenital anomalies, and injury and poisoning for Southern DHB (Table IV-7).

While causes of child deaths in Nelson Marlborough, South Canterbury and West Coast DHBs included injury and poisoning, cancer and other diseases, data are not presented due to small numbers.

Table IV-7 Child mortality, by cause of death, South Island DHBs 2010–2014

Cause of death	2010–2014 (n)	Annual average	Rate	%
Child mortality				
Nelson Marlborough				
All causes	<5	s	s	s
Total	<5	s	s	s
South Canterbury				
All causes	7	1	50.36	100.0
Total	7	1	50.36	100.0
Canterbury				
Cancer	5	1	3.88	20.8
Congenital anomalies	5	1	3.88	20.8
All other causes	14	3	10.87	58.3
Total	24	5	18.64	100.0
West Coast				
All causes	<5	s	s	s
Total	<5	s	s	s
Southern DHB				
Injury and poisoning	6	1	7.84	33.3
All other causes	12	2	15.68	66.7
Total	18	4	23.52	100.0

Numerator: MORT, Denominator: StatsNZ ERP. Rate per 100,000 population

Evidence for good practice

The evidence already provided for good antenatal care will contribute to a reduction in infant mortality, particularly in the neonatal period. The information below relates to sudden unexpected death in infancy (SUDI) and childhood injury, which are the main causes of death for 0–4 year olds

Equity

The fall in sudden unexpected death in infancy (SUDI) rates in New Zealand since the 1980s has not occurred equitably across ethnic groups, with rates for Māori and Pacific infants consistently higher than non-Māori non-Pacific rates.⁹ The population groups that experience the highest risk of SUDI frequently do not receive

information to help keep infants safe, or they do not receive it in a form that leads to understanding and adoption of safe practice.¹⁰ Review of well child contacts has shown that Māori parents are less likely to receive SUDI prevention information than parents in other ethnic groups.¹¹ Māori health providers have taken the lead in developing a culturally appropriate programme aimed to promote 'safe sleep for every baby, every sleep'. This action has arguably contributed to fewer deaths and improving equity for high-risk infants.¹⁰

Around the world, indigenous children experience higher risk of injury compared with their non-indigenous peers.¹² There have been very few evaluated interventions to specifically address injury rates among indigenous populations. Findings that are available suggest that culturally appropriate interventions and involvement of Indigenous communities in the design and delivery of interventions are common themes in effective interventions. Inclusion of Indigenous communities in shaping interventions and policy is important in terms of intervention effectiveness, and also underpins the key human rights principles of Indigenous rights to self-determination and cultural preservation.¹²

Prevention

The Child and Youth Mortality Review Committee has articulated the need for health services to better serve Māori whānau and communities, as well those living in areas with high NZDep2013 scores.⁹ The wahakura has developed as a strong aid to communication with whānau about safe sleeping spaces for infants.^{10,13} This can be described as an example of a health intervention where health researchers and practitioners worked in partnership to develop evidenced-based interventions that address Māori health inequities.¹⁴

The prevention of child injury is complex, with many local contextual factors affecting the occurrence of injury. However strategies that offer proven or promising strategies to reduce unintentional child injuries include environmental modification (e.g. reducing the height of playground equipment, or introducing traffic calming measures), product modification such child resistant caps for medication or poisonous substances, legislation, regulation and enforcement, use of safety devices such as child passenger restraints, home visits to families of young children to provide age-appropriate information and to provide free or low-cost safety equipment, community based interventions to change community values and behaviours.¹⁵ Parenting interventions, most commonly provided on a one-to-one basis in the home as part of multi-faceted interventions to improve a range of child outcomes during the first two years of a child's life, are effective in reducing self-reported or medically attended injury amongst young children.¹⁶

New Zealand guidelines

- Observation of mother and baby in the immediate postnatal period: consensus statements guiding practice <http://www.health.govt.nz/system/files/documents/publications/observation-mother-baby-immediate-postnatal-period-consensus-statements.pdf>
- Safekids Aotearoa. 2015. **Child unintentional deaths and injuries in New Zealand, and prevention strategies.** Auckland: Safekids Aotearoa. <http://www.safekids.nz/Resources/ProdID/134/CatID/5>

International guidelines

- Mackay M & Vincenten J. 2014. **Action planning for child safety: 2014 update on the strategic and coordinated approach to reducing the number one cause of death for children in Europe - injury.** Birmingham: European Child Safety Alliance. <http://www.childsafetyeurope.org/tactics/info/final-report-csap.pdf>
- Peden M, et al. 2008. **World report on child injury prevention.** Geneva: World Health Organization.

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- Mitchell EA, et al. 2017. **The combination of bed sharing and maternal smoking leads to a greatly increased risk of sudden unexpected death in infancy: The New Zealand SUDI nationwide case control study.** N Z Med J, 130(1456), 52-64.
- Abel S, et al. 2015. **The wahakura: A qualitative study of the flax bassinet as a sleep location for New Zealand Māori infants.** N Z Med J, 128(1413), 12-9
- Shepherd M, et al. 2013. **Preventing child unintentional injury deaths: Prioritising the response to the New Zealand child and adolescent injury report card.** Australian & New Zealand Journal of Public Health, 37(5), 470-4.

Websites

- Ministry of Health: Safe sleep <http://www.health.govt.nz/your-health/pregnancy-and-kids/first-year/helpful-advice-during-first-year/safe-sleep>
- Safekids Aotearoa <http://www.safekids.nz/> includes child injury profiles for each DHB
<http://www.safekids.nz/Resources/ProdID/121/CatID/20>

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