New Zealand Child and Youth Epidemiology Service

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

Birth outcomes

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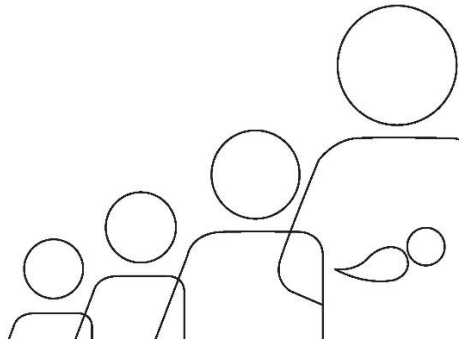

This report has been prepared for the South Island Alliance: Nelson Marlborough, Canterbury, South Canterbury, West Coast and Southern District Health Boards.

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III. BIRTH OUTCOMES

Gestation

The length of a normal pregnancy is between 37–42 completed weeks gestation. Preterm birth is defined as being born alive before 37 completed weeks of pregnancy.[1] It is a leading cause of fetal and infant deaths. Around 82% of the fetal deaths and 60% of the infant deaths registered in 2014 in New Zealand were preterm (< 37 weeks' gestation), and most of these were very preterm (< 28 weeks' gestation).[2] Preterm birth, especially very preterm birth, is associated with an increased risk of developmental problems including cognitive and learning disorders, motor problems, such as cerebral palsy, and emotional and behavioural problems, and physical and sensory disorders, such as chronic lung disease and visual and hearing impairments.[3] For the majority of cases of preterm birth, around two-thirds, are spontaneous preterm births following spontaneous onset of labour, preterm rupture of membranes, or premature dilation of the cervix (cervical insufficiency).[4] The remaining third are medically induced (iatrogenic) due to maternal or fetal complications.[4]

This section reviews gestational ages of live born babies, and numbers of preterm births, using information from the National Maternity Collection.

Data sources and methods

Indicators

1. *Gestational age of live born babies*
2. *Preterm births*

Data source and definitions

National Maternity Collection (MAT)

Gestational age of live born babies

Numerator:	Number of live born babies born with a documented gestational age
Denominator:	Total number of live born babies

Gestational age groups were defined in accordance with WHO criteria [5]

Preterm:	less than 37 completed weeks (less than 259 days) of gestation
Term:	from 37 completed weeks to less than 42 completed weeks (259 to 293 days) of gestation
Post-term:	42 completed weeks or more (294 days or more) of gestation

Preterm births

Numerator:	Number of live born babies born under 37 weeks gestation
Denominator:	Total number of live born babies

Preterm births were classified into:[5,6]

Extremely preterm:	less than 28 completed weeks
Very preterm:	28 completed weeks to less than 32 completed weeks
Moderate to late preterm:	32 completed weeks to less than 37 completed weeks

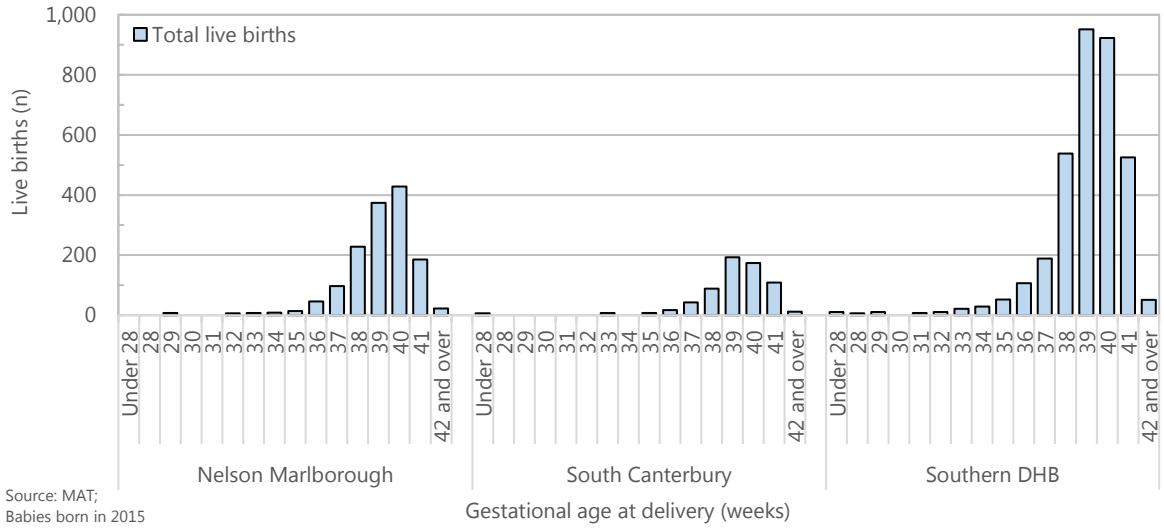
Additional information

An overview of the National Maternity Collection (MAT) is provided in the appendices.

Gestational age is the duration of pregnancy in completed weeks. Duration is measured from the first day of the last normal menstrual period and the date of delivery.[5]

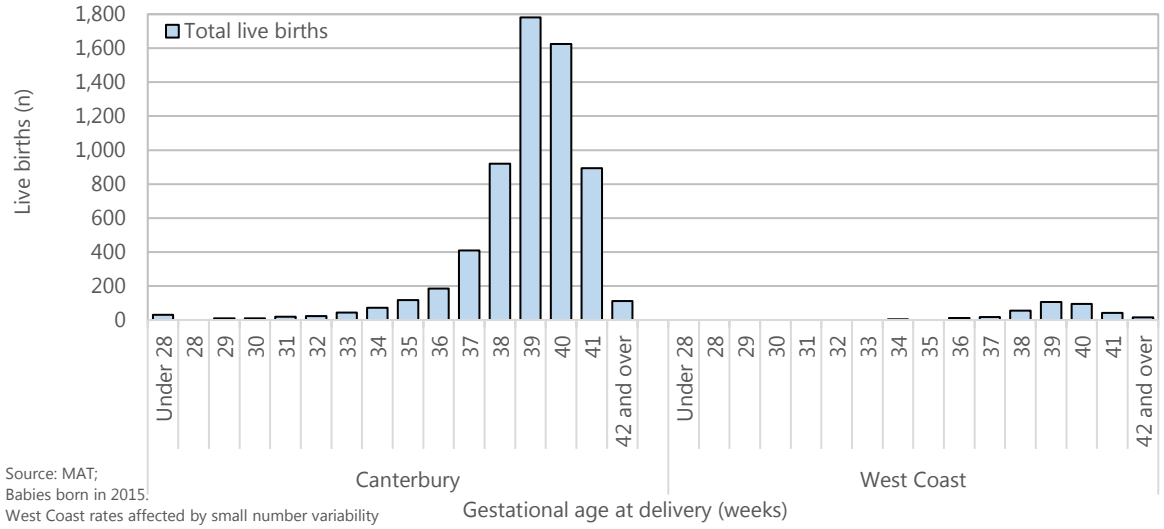
The majority of babies with a known gestation in the South Island DHBs in 2015 were born between 37 and 41 completed weeks gestation (Figure III–1, Figure III–2).

Figure III–1 Distribution of live births, by gestational age, Nelson Marlborough, South Canterbury and Southern DHBs 2015



Source: MAT;
Babies born in 2015

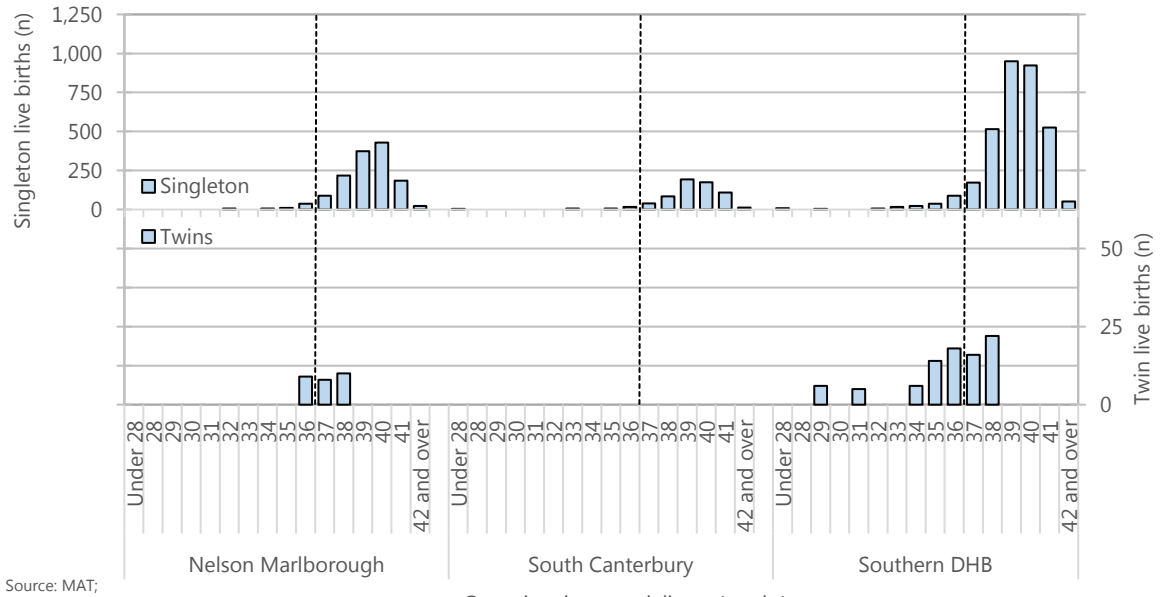
Figure III–2 Distribution of live births, by gestational age, Canterbury and West Coast DHBs 2015



Source: MAT;
Babies born in 2015.
West Coast rates affected by small number variability

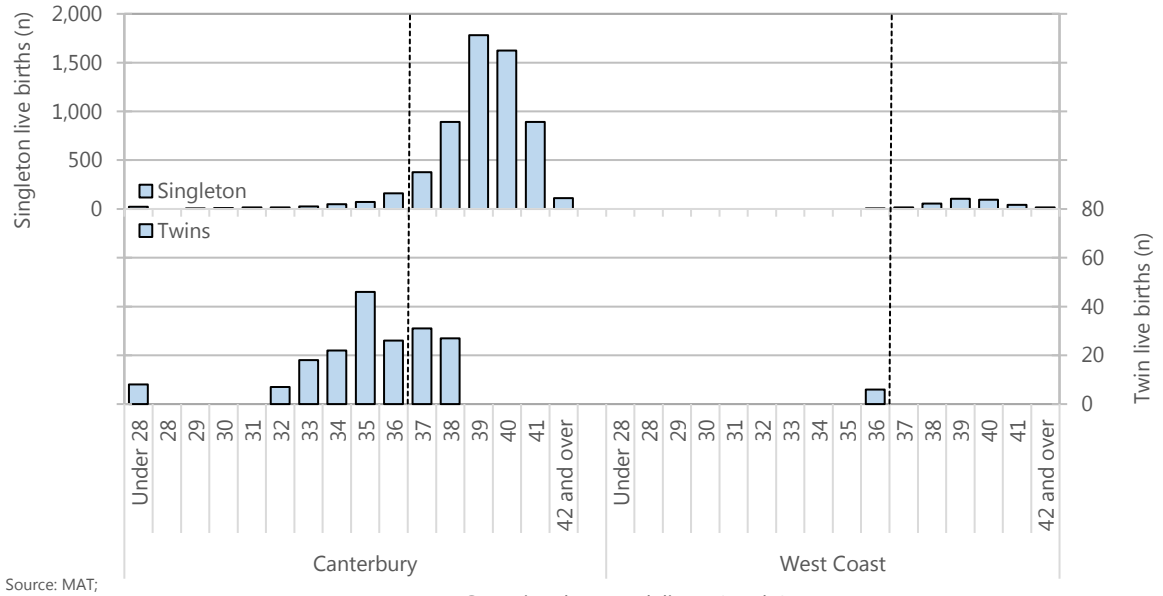
The gestational age of live born babies by plurality is presented in Figure III–3 and Figure III–4. These figures show that multiple babies born from a single pregnancy are more likely to be born preterm.

Figure III–3 Distribution of live births, by gestational age and plurality, Nelson Marlborough, South Canterbury and Southern DHBs 2015



Source: MAT;
Babies born in 2015.
Rates for multiple births suppressed due to small numbers

Figure III–4 Distribution of live births, by gestational age and plurality, Canterbury and West Coast DHBs 2015



Source: MAT;
Babies born in 2015.
Multiple births suppressed due to small numbers

Preterm births

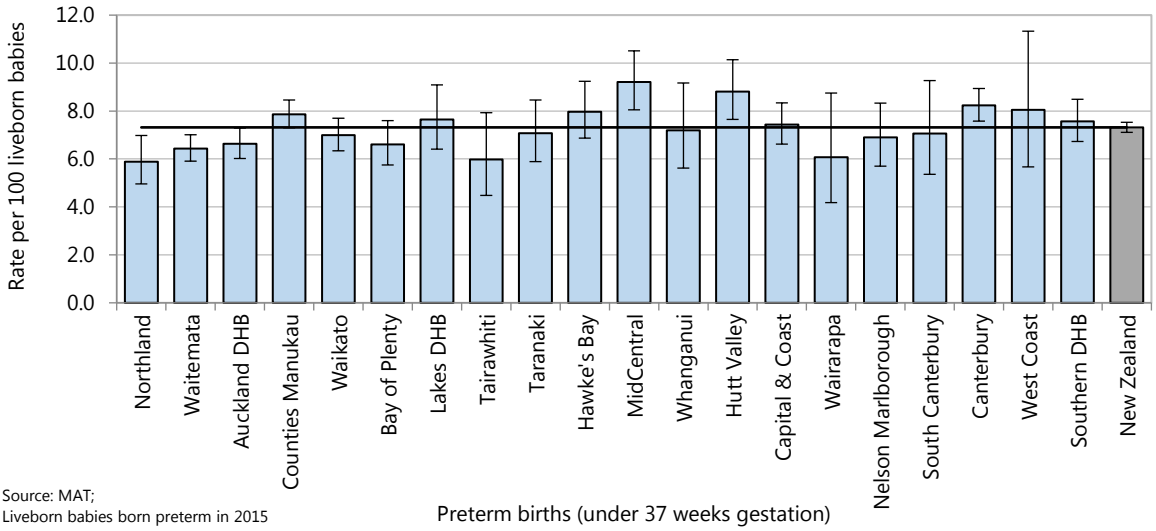
Table III–1 presents the proportion of live born babies born preterm (before 37 weeks gestation) for each district health board in the South Island during 2015. The preterm birth rate was significantly higher than the national rate in Canterbury, and rates were not significantly different in the other South Island DHBs, as shown in Figure III–5.

Table III–1 Preterm births, South Island DHBs 2015

DHB	2015 (n)	Rate per 100 live born babies*	Rate ratio	95% CI
Babies born in 2015				
Preterm births (under 37 weeks gestation)				
Nelson Marlborough	99	6.9	0.94	0.78–1.14
South Canterbury	47	7.1	0.96	0.73–1.27
Canterbury	515	8.2	1.13	1.03–1.23
West Coast	29	8.1	1.10	0.78–1.56
Southern	260	7.6	1.03	0.92–1.17
New Zealand	4,322	7.3	1.00	

Source: MAT; Rate per 100 live born babies who delivered in 2015. Rate ratios are unadjusted

Figure III–5 Preterm births (under 37 weeks gestation), by district health board 2015



Source: MAT;
Liveborn babies born preterm in 2015

The preterm birth rate ranged from 6.9 per 100 live born babies in Nelson Marlborough to 8.2 per 100 live births in Canterbury (Table III–2, Table III–3). Of the preterm babies, more than 80% were born between 32 and 36 completed weeks gestation. Of the preterm babies, around one-fifth were twins in Nelson Marlborough, South Canterbury and Southern DHBs, one-quarter in Canterbury and on the West Coast DHB one-third were twins.

Table III–2 Preterm births, by maturity and plurality, Nelson Marlborough, South Canterbury and Southern DHBs 2015

	n	Rate*	Rate†	*n*	Rate*	Rate†	*n*	Rate*	Rate†
Registered mothers who gave birth in 2015									
	Nelson Marlborough			South Canterbury			Southern DHB		
Gestational age of live born babies									
Under 20 weeks	0	..		0	..		0	..	
20–36 weeks	99	6.91		47	7.06		260	7.56	
37 weeks and over	1,334	93.09		619	92.94		3,177	92.44	
Total live births	1,433	100.00		666	100.00		3,437	100.00	
Prematurity of preterm babies									
Extremely preterm (<28 weeks)	<5	s	4.04	6	0.90	12.77	11	0.32	4.23
Very preterm (28 to <32 weeks)	12	0.84	12.12	<5	s	4.26	29	0.84	11.15
Moderate to late preterm (32 to <37 weeks)	83	5.79	83.84	39	5.86	82.98	220	6.40	84.62
Total preterm babies	99	6.91	100.00	47	7.06	100.00	260	7.56	100.00
Plurality of preterm babies									
Singleton	73	5.09	73.74	38	5.71	80.85	198	5.76	76.15
Twin	20	1.40	20.20	9	1.35	19.15	59	1.72	22.69
Multiple birth	6	0.42	6.06	0	..	0.00	<5	s	1.15

Source: MAT; *Rate per 100 live born babies. †Rate per 100 preterm babies

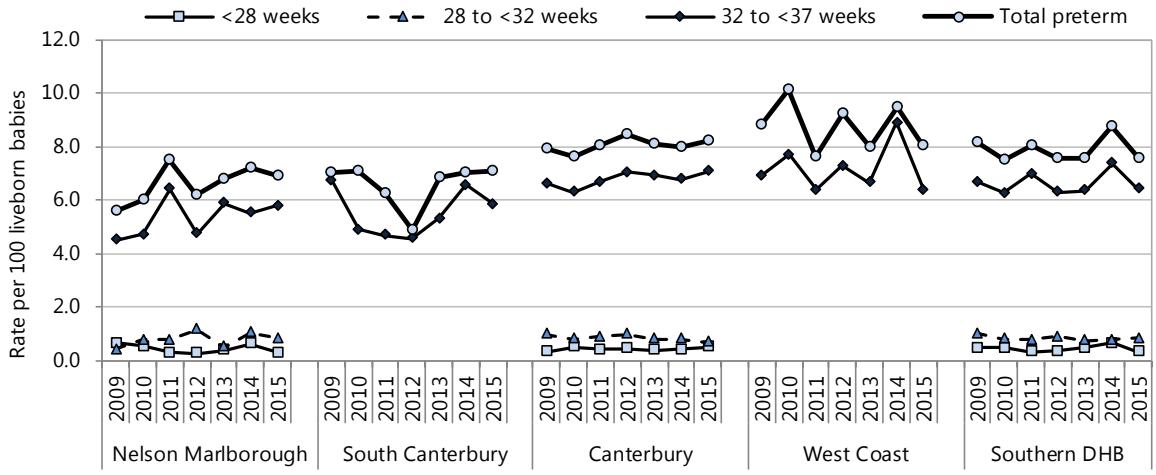
Table III–3 Preterm births, by maturity and plurality, Canterbury and West Coast DHBs 2015

	n	Rate*	Rate†	n	Rate*	Rate†
Registered mothers who gave birth in 2015						
	Canterbury			West Coast		
Gestational age of live born babies						
Under 20 weeks	0	..		0	..	
20–36 weeks	515	8.23		29	8.1	
37 weeks and over	5,739	91.77		331	91.9	
Total live births	6,254	100.00		360	100.0	
Prematurity of preterm babies						
Extremely preterm (<28 weeks)	31	0.50	6.02	<5	s	13.79
Very preterm (28 to <32 weeks)	42	0.67	8.16	<5	s	6.90
Moderate to late preterm (32 to <37 weeks)	442	7.07	85.83	23	6.4	79.31
Total preterm babies	515	8.23	100.00	29	8.1	100.00
Plurality of preterm babies						
Singleton	381	6.09	73.98	19	5.3	65.52
Twin	134	2.14	26.02	10	2.8	34.48
Multiple birth	0	..	0.00	0	..	0.00

Source: MAT; *Rate per 100 live born babies. †Rate per 100 preterm babies

Figure III–6 presents the preterm birth rate for the South Island DHBs. The rates of preterm births been fairly stable in South Canterbury, West Coast and Southern DHBs, and increased slightly for Nelson Marlborough and Canterbury from 2009 to 2015.

Figure III–6 Trends in premature births, by prematurity, South Island DHBs 2009–2015



Source: MAT;
South Canterbury and West Coast rates for under 32 weeks suppressed due to small numbers

The small number of preterm births on the West Coast do not allow for meaningful comparisons by demographic factor and are therefore not presented.

Table III–4, Table III–5, Figure III–7 and Figure III–8 present the preterm birth rate within each district health board by the residential deprivation score (NZDep2013 index of deprivation score), maternal age, ethnicity, sex, and maternal smoking at first registration with a LMC or at delivery). Tables are used for district health boards with lower overall numbers. 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 demographic factor, nor account for completeness of reporting:

- There were no significant differences in preterm birth rate by NZDep2013 score in the South Island DHBs
- There was no consistent pattern to preterm birth rates by ethnicity in the South Island DHBs. Compared with the rates for European/Other babies, preterm birth rates were significantly lower for Pacific babies in Canterbury
- Compared with babies born to mothers aged 30–34 years, preterm birth rates were significantly higher among babies born to mothers aged under 20 years in South Canterbury, and for babies born to mothers aged over 34 years in Canterbury and Southern DHBs
- The preterm birth rate was significantly higher for babies born to mothers who smoked compared with non-smoking mothers (based on reporting at first registration with a LMC and/or at delivery) although this difference was not statistically significant for Nelson Marlborough DHB.

Table III–4 Preterm births, by demographic factor, Nelson Marlborough 2015

Factor	2015 (n)	Rate per 100 live born babies	Rate ratio	95% CI
Preterm births				
Nelson Marlborough				
NZ Deprivation Index decile				
Quintile 1 (least deprived)	9	7.09	1.00	
Quintile 2	36	8.49	1.20	0.59–2.42
Quintile 3	14	5.22	0.74	0.33–1.66
Quintile 4	36	7.02	0.99	0.49–2.00
Quintile 5 (most deprived)	<5	s	s	s
Maternal age				
<20 years	<5	s	s	s
20–24 years	16	6.61	0.81	0.46–1.44
25–29 years	28	7.04	0.86	0.53–1.40
30–34 years	34	8.13	1.00	
35+ years	19	5.94	0.73	0.42–1.26
Prioritised ethnicity				
Māori	31	8.86	1.44	0.94–2.19
Pacific	<5	s	s	s
Asian/Indian	9	7.32	1.19	0.60–2.34
MELAA	0	..	..	..
European/Other	56	6.15	1.00	
Sex				
Male	56	7.32	1.14	0.77–1.67
Female	43	6.45	1.00	
Maternal smoking				
Non-smoker	65	6.19	1.00	
Smoker	15	8.38	1.35	0.79–2.32

Source: MAT; Rate per 100 live born babies. Rate ratios are unadjusted. Maternal smoking based on reporting at registration with a Lead Maternity Carer or at delivery

Table III–5 Preterm births, by demographic factor, South Canterbury 2015

Factor	2015 (n)	Rate per 100 live born babies	Rate ratio	95% CI
Preterm births				
South Canterbury				
NZ Deprivation Index decile				
Quintile 1 (least deprived)	<5	s	s	
Quintile 2	16	8.79	1.63	0.56–4.70
Quintile 3	9	4.89	0.90	0.29–2.85
Quintile 4	17	9.24	1.71	0.59–4.91
Quintile 5 (most deprived)	<5	s	s	s
Maternal age				
<20 years	6	21.43	3.82	1.56–9.37
20–24 years	9	6.47	1.15	0.50–2.67
25–29 years	15	8.93	1.59	0.77–3.31
30–34 years	12	5.61	1.00	
35+ years	5	4.27	0.76	0.28–2.11
Prioritised ethnicity				
Māori	5	4.31	0.54	0.22–1.35
Pacific	0	..	..	..
Asian/Indian	<5	s	s	s
MELAA	0	..	..	..
European/Other	39	7.91	1.00	
Sex				
Male	28	8.54	1.52	0.87–2.67
Female	19	5.62	1.00	
Maternal smoking				
Non-smoker	21	4.95	1.00	
Smoker	19	15.57	3.14	1.75–5.66

Source: MAT; Rate per 100 live born babies. Rate ratios are unadjusted. Maternal smoking based on reporting at registration with a Lead Maternity Carer or at delivery

Figure III–7 Preterm births, by demographic factor, Canterbury DHB 2015

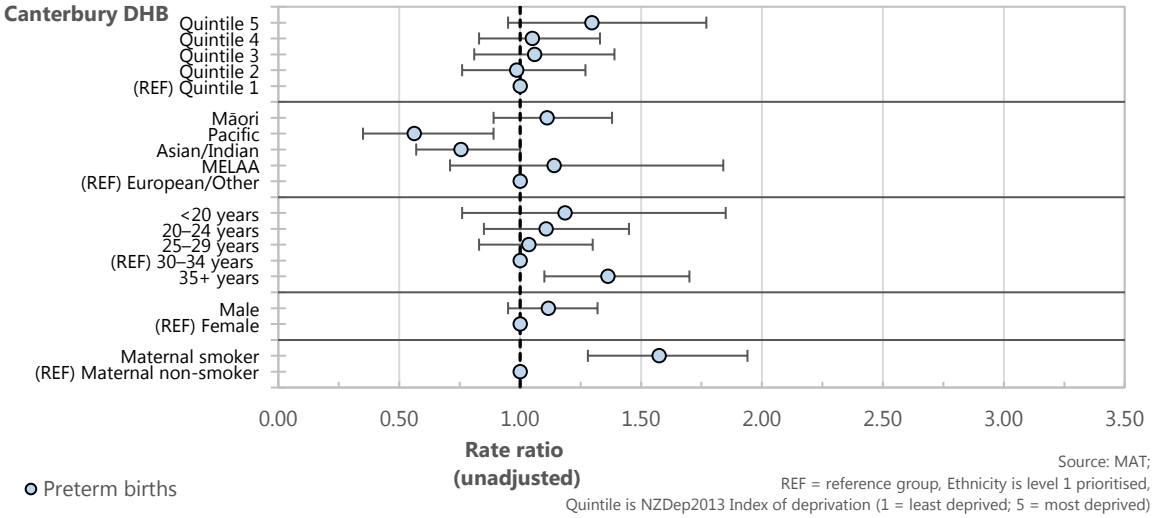
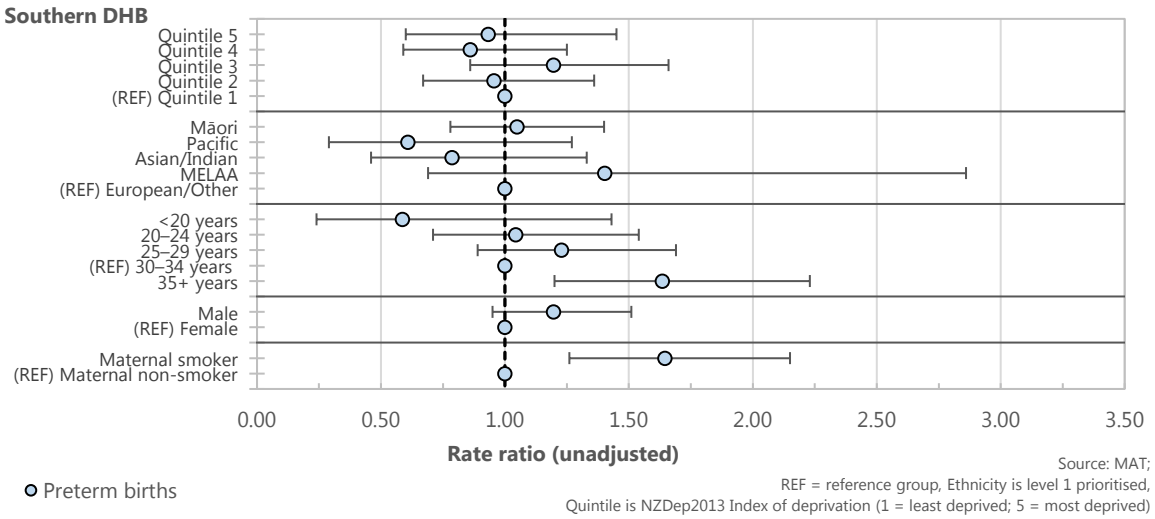


Figure III–8 Preterm births, by demographic factor, Southern DHB 2015



Birthweight

Low birthweight is defined by the World Health Organization (WHO) as weight at birth less than 2,500 g. Low birthweight continues to be a significant public health problem globally and is associated with a range of both short- and long-term consequences.[7] Low birthweight is complex and includes both preterm neonates (born before 37 weeks of gestation) and small for gestational age neonates at term. It is difficult to separate effects on infant outcomes of birthweight and effects of gestational age, and adjusting for gestational age in analyses can introduce bias.[8,9] There are multiple causes of low birthweight, including early induction of labour or caesarean birth (for medical or non-medical reasons), multiple pregnancies, infections and chronic conditions such as diabetes and high blood pressure.[7]

Data sources and methods

Indicator

Numerator:	Number of live born babies (at any gestation) with a documented birthweight
Denominator:	Total number of live born babies

Birthweight groups were classified in accordance with WHO criteria[5]

High birthweight:	4,500 grams and over
'Normal' birthweight:	2,500 to 4,499 grams
Low birthweight:	Less than 2,500g (up to, and including, 2,499g)
Very low birthweight:	Less than 1,500g (up to, and including, 1,499g)
Extremely low birthweight:	Less than 1,000g (up to, and including, 999g)

Data source and definition(s)

National Maternity Collection (MAT)

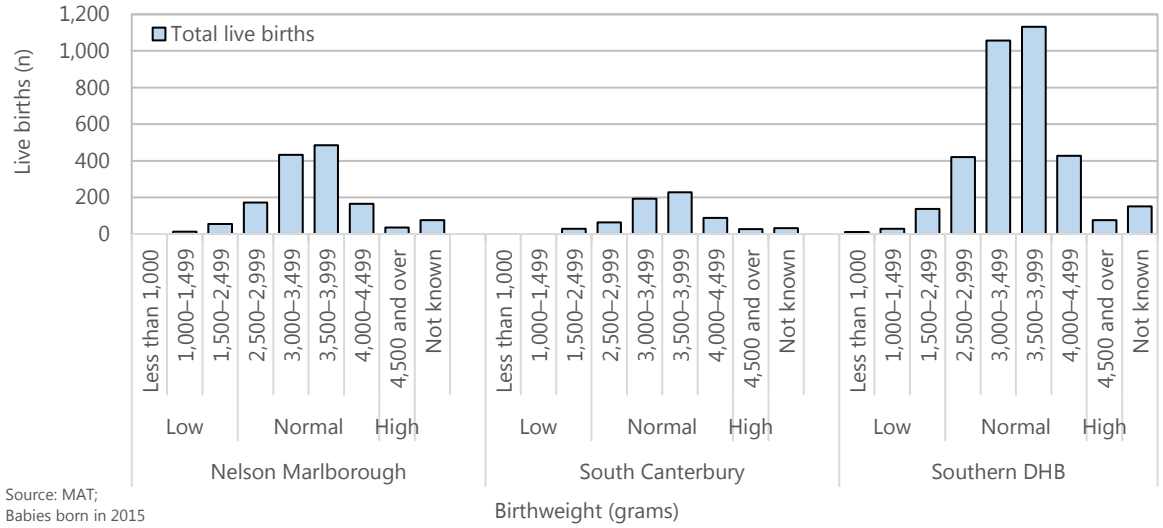
Additional information

Birthweight is the first weight of the fetus or baby obtained after birth.

An overview of the National Maternity Collection is provided in the appendices.

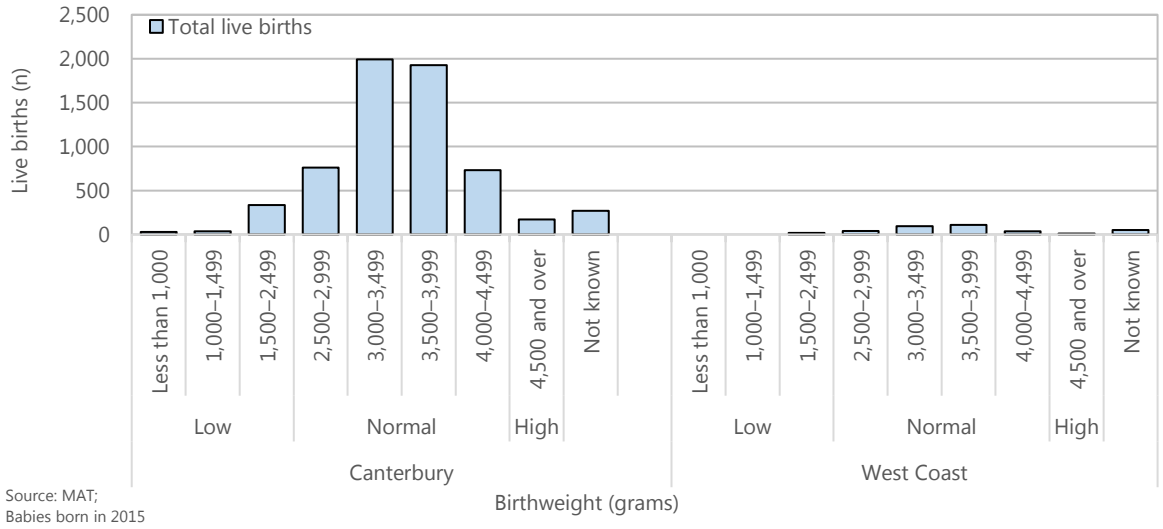
Figure III–9 to Figure III–10 present the birthweight of live babies born in 2015. The majority of live born babies in the South Island DHBs were born with healthy/normal birthweights (2.5–<4.5kg), with most of these weighing between 3–4kg.

Figure III–9 Distribution of live births, by birthweight, Nelson Marlborough, South Canterbury and Southern DHBs 2015



Source: MAT;
Babies born in 2015

Figure III–10 Distribution of live births, by birthweight, Canterbury and West Coast DHBs 2015



Source: MAT;
Babies born in 2015

The majority of babies in the South Island DHBs were born within the normal/healthy weight range (Table III–6). The proportion of babies with a low birthweight ranged from 4.9% to 6.4% in the five South Island DHBs, and the proportion of high birthweight babies was between 2% and 4% (Table III–6).

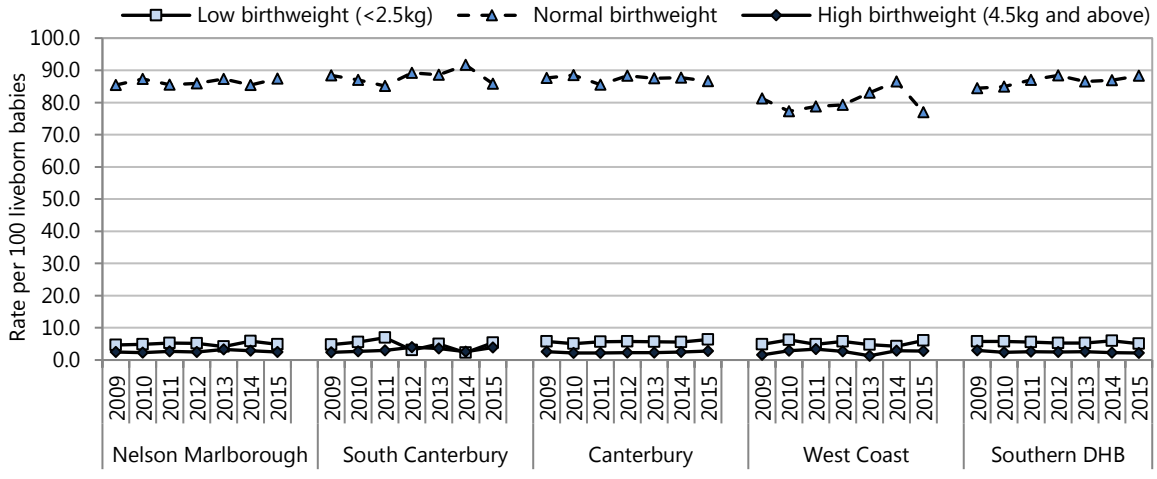
Table III–6 Birthweight of live born babies, South Island DHBs 2015

Birthweight	2015 (n)	Rate per 100 live born babies
Live born babies born in 2015		
Nelson Marlborough		
Low birthweight (under 2.5kg)	70	4.88
Normal birthweight (2.5–<4.5kg)	1,254	87.39
High birthweight (4.5kg and over)	35	2.44
Not known	76	5.30
Total live born babies	1,435	
South Canterbury		
Low birthweight (under 2.5kg)	36	5.41
Normal birthweight (2.5–<4.5kg)	571	85.86
High birthweight (4.5kg and over)	26	3.91
Not known	32	4.81
Total live born babies	665	
Canterbury		
Low birthweight (under 2.5kg)	397	6.35
Normal birthweight (2.5–<4.5kg)	5,417	86.60
High birthweight (4.5kg and over)	172	2.75
Not known	269	4.30
Total live born babies	6,255	
West Coast		
Low birthweight (under 2.5kg)	22	6.11
Normal birthweight (2.5–<4.5kg)	277	76.94
High birthweight (4.5kg and over)	10	2.78
Not known	51	14.17
Total live born babies	360	
Southern DHB		
Low birthweight (under 2.5kg)	175	5.09
Normal birthweight (2.5–<4.5kg)	3,037	88.34
High birthweight (4.5kg and over)	76	2.21
Not known	150	4.36
Total live born babies	3,438	

Source: MAT; Live born babies born in 2015. Rate ratios are unadjusted

Figure III–11 presents the trends in birthweight categories for babies within the South Island DHBs. For Nelson Marlborough, South Canterbury, and Canterbury DHBs all categories have been relatively stable since 2009 and been variable on the West Coast; the normal birthweight rate gradually increased in Southern DHB.

Figure III–11 Trends in live births, by birthweight, South Island DHBs 2009–2015

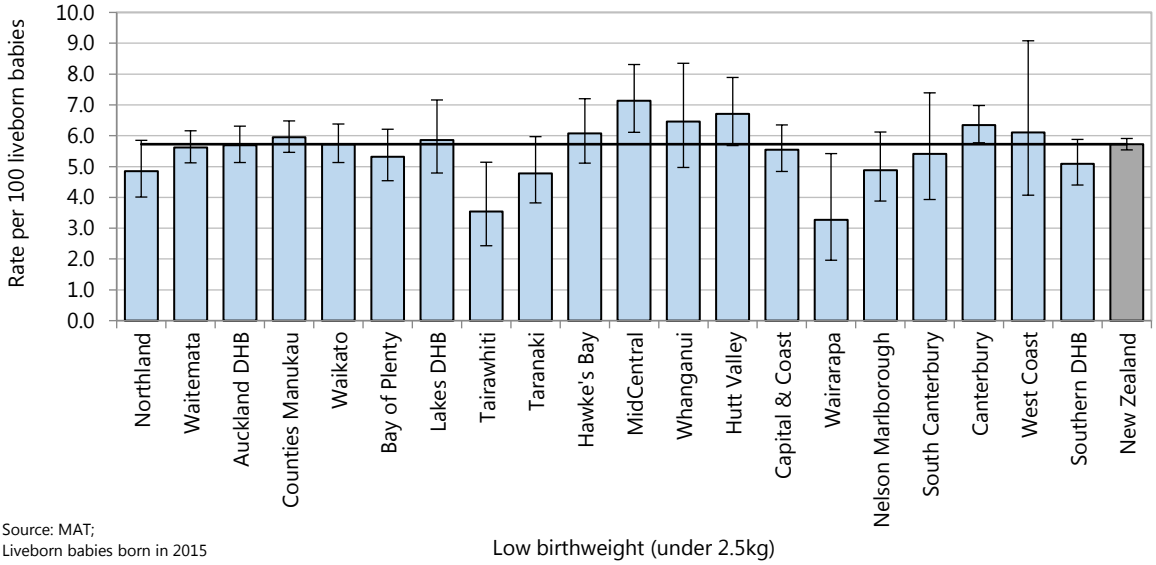


Source: MAT

Low birthweight babies

Figure III–12 and Table III–7 presents the proportion of babies born in South Island babies with birthweight below 2.5kg in 2015. The rates of low birthweight babies in the South Island DHBs were not significantly different from the national rate (Figure III–12, Table III–7).

Figure III–12 Rates of low birthweight babies, district health board compared to New Zealand, 2015



Source: MAT;
Liveborn babies born in 2015

Table III–7 Low birthweight babies, by district health board, South Island DHBs 2015

DHB	2015 (n)	Rate per 100 live born babies	Rate ratio	95% CI
Babies born in 2015				
Low birthweight (under 2.5kg)				
Nelson Marlborough	70	4.88	0.85	0.68–1.07
South Canterbury	36	5.41	0.94	0.69–1.30
Canterbury	397	6.35	1.11	1.00–1.23
West Coast	22	6.11	1.07	0.71–1.60
Southern	175	5.09	0.89	0.77–1.03
New Zealand	3,382	5.72	1.00	

Source: MAT; Rate ratios are unadjusted

Table III–8 and Table III–9 present the proportion of low birthweight babies in Canterbury and Southern DHBs by the residential deprivation score (NZDep2013 index of deprivation score), ethnicity, sex, plurality, gestational age group, maternal smoking status and maternal weight. In Nelson Marlborough, South Canterbury and West Coast DHBs the numbers of low birthweight babies were too small for meaningful analysis by demographic factors and are therefore not presented. 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 demographic factor:

- There was no statistically significant difference in low birthweight rates by NZDep2013 scores nor by ethnicity in these South Island DHBs
- Singletons were much less likely to be of low birthweight than babies born as a result of twin or other multiple birth pregnancies
- Low birthweight rates were over 30 times higher for babies born preterm than the rates for babies born at term.
- Babies born to mothers who reported smoking (at registration with a Lead Maternity Carer or at delivery) had significantly higher rates of low birthweight, compared to non-smoking mothers, in these two South Island DHBs

Table III–8 Low birthweight babies, by demographic factor, Canterbury DHB 2015

Factor	2015 (n)	Rate	Rate ratio	95% CI
Low birthweight (under 2.5kg) live born babies				
Canterbury				
NZDep2013 Index of deprivation quintile				
Quintile 1 (least deprived)	90	6.38	1.00	
Quintile 2	72	5.31	0.83	0.62–1.12
Quintile 3	76	7.20	1.13	0.84–1.52
Quintile 4	124	6.45	1.01	0.78–1.31
Quintile 5 (most deprived)	35	6.85	1.07	0.74–1.56
Prioritised ethnicity				
Māori	60	6.07	0.97	0.74–1.27
Pacific	14	3.74	0.60	0.35–1.01
Asian/Indian	64	7.80	1.24	0.95–1.62
MELAA	14	8.54	1.36	0.81–2.28
European/Other	245	6.27	1.00	
Sex				
Male	201	6.27	0.98	0.81–1.18
Female	196	6.42	1.00	
Plurality				
Singleton	276	4.55	1.00	
Twin	121	63.02	13.84	11.82–16.22
Multiple	0	..	..	..
Gestational age				
<37 weeks	299	58.06	34.00	27.57–41.93
37+ weeks	98	1.71	1.00	
Maternal smoking status				
Non-smoker	317	5.87	1.00	
Smoker	74	9.56	1.63	1.28–2.07
Maternal weight (Body Mass Index)				
Underweight (BMI:<18.5)	17	8.99	1.35	0.84–2.16
Healthy weight (BMI: 18.5–<25.0)	193	6.68	1.00	
Overweight (BMI: 25.0–<30.0)	112	6.22	0.93	0.74–1.17
Obese (BMI: ≥30.0)	72	5.33	0.80	0.61–1.04

Source: MAT; Rate per 100 low birthweight babies Rate ratios are unadjusted. Weight is maternal BMI; Maternal smoking is self-reported at registration/delivery

Table III–9 Low birthweight babies, by demographic factor, Southern DHB 2015

Factor	2015 (n)	Rate	Rate ratio	95% CI
Low birthweight (under 2.5kg) live born babies				
Southern DHB				
NZDep2013 Index of deprivation quintile				
Quintile 1 (least deprived)	39	4.99	1.00	
Quintile 2	38	5.07	1.02	0.66–1.57
Quintile 3	57	6.95	1.39	0.94–2.07
Quintile 4	29	4.07	0.82	0.51–1.31
Quintile 5 (most deprived)	12	3.23	0.65	0.34–1.22
Prioritised ethnicity				
Māori	30	4.48	0.88	0.60–1.30
Pacific	8	5.33	1.05	0.52–2.11
Asian/Indian	14	6.01	1.18	0.69–2.02
MELAA	5	7.69	1.51	0.64–3.58
European/Other	118	5.08	1.00	
Sex				
Male	93	5.24	1.06	0.79–1.42
Female	82	4.93	1.00	
Plurality				
Singleton	121	3.63	1.00	
Twin	51	51.52	14.20	10.96–18.40
Multiple	<5	s	s	s
Gestational age				
<37 weeks	134	51.54	39.94	28.82–55.34
37+ weeks	41	1.29	1.00	
Maternal smoking status				
Non-smoker	121	4.37	1.00	
Smoker	50	8.47	1.94	1.41–2.66
Maternal weight (Body Mass Index)				
Underweight (BMI:<18.5)	7	7.95	1.55	0.74–3.25
Healthy weight (BMI: 18.5–<25.0)	78	5.14	1.00	
Overweight (BMI: 25.0–<30.0)	45	4.55	0.89	0.62–1.27
Obese (BMI: ≥30.0)	43	5.20	1.01	0.70–1.45

Source: MAT; Rate per 100 low birthweight babies Rate ratios are unadjusted. Weight is maternal BMI; Maternal smoking is self-reported at registration/delivery

Fetal deaths

A fetal death is defined by the World Health Organization as "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 fetus 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".[10] The Perinatal and Maternal Mortality Review Committee uses this definition to define a fetal death.[11] Fetal deaths include both spontaneous deaths (often referred to as stillbirths) and deaths due to termination of pregnancy (for example because of severe congenital malformations). Most countries require registration of fetal deaths but the gestation beyond which a fetal death must be registered varies between countries.[10] In New Zealand, the Births, Deaths, Marriages, and Relationships Registration Act 1995 requires that all stillbirths are registered; a still-born child is a dead fetus that weighed at least 400 g when it issued from its mother or issued from its mother after the 20th week of pregnancy.[12]

In high income countries around one in two hundred babies who reaches 22 weeks gestation or more is stillborn.[13] In high income countries major contributors to stillbirth are factors related to placental dysfunction and very pre-term birth.[13] In a significant minority of cases (27 percent in New Zealand in 2012)[11] no cause is identified. The most significant potentially modifiable risk factors for stillbirth are maternal obesity and smoking.[11,13]

This section reviews fetal deaths using information from the National Mortality Collection and the Birth Registration Dataset.

Data sources and methods

Indicator

Fetal deaths

Data sources

Numerator:	Number of fetal deaths (or stillbirths)
Source:	National Mortality Collection (MORT)
Denominator:	Total births—the number of fetal deaths plus the number of live births
Source:	Birth Registration Dataset (BDM; live births only) and National Mortality Collection (MORT)

Definition

Fetal death is when the baby is born deceased, weighing 400 grams or more, or is issued from its mother after the 20th week of pregnancy.[14]

Fetal deaths are further defined into:

Intermediate:	Fetal deaths occurring between 20 and 27 weeks gestation
Late:	Fetal deaths occurring 28+ weeks gestation
Unspecified:	Fetal deaths occurring from 20 weeks or more gestation where the main fetal cause of death was unspecified and no additional fetal or maternal causes of death were listed.

Additional information

An overview of the Birth Registration and National Mortality Collections are provided in the appendices.

Cause of death was the main underlying cause of death. Maternal cause of death was the first maternal cause of death. Refer to Appendix5 for the corresponding codes.

Death registration data does not differentiate between spontaneous fetal deaths and late terminations of pregnancy. 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.

Table III–10 presents the total births and fetal deaths (or stillbirths) registered for each district health board in the South Island during 2010–2014. The fetal death rates were not significantly different from the national rate in the South Island DHBs, as shown in Figure III–13.

Just over half of the fetal deaths occurred between 20 and 27 weeks gestation (intermediate fetal deaths) and the remainder occurred from 28 weeks gestation (late fetal deaths). Table III–11 and Figure III–14 present the rates of fetal deaths for the different gestational groups.

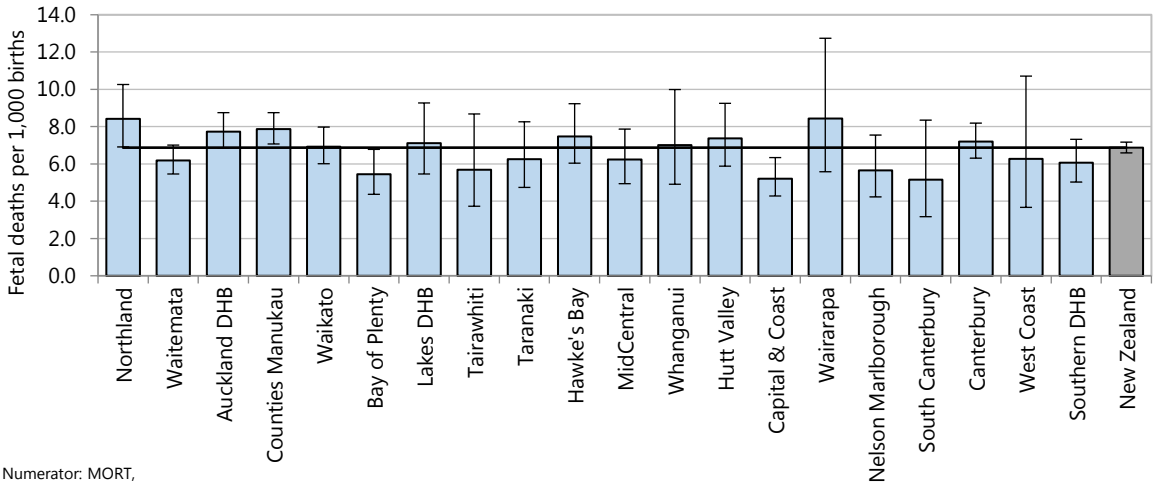
Nelson Marlborough, South Canterbury and Southern DHBs had intermediate fetal death rates that were lower than the national rate, while rates were higher in Canterbury DHB. Late fetal death rates were higher than the national rate for West Coast, while similar for the remaining South Island DHBs. None of the South Island DHBs had intermediate or late fetal death rates that differed significantly.

Table III–10 Total births and fetal deaths, South Island DHBs 2010–2014

DHB	Births (n) 2010–2014	2010–2014 (n)	Annual average	Rate per 1,000 births	Rate ratio	95% CI
		Fetal deaths				
Nelson Marlborough	7,963	45	9	5.65	0.82	0.61–1.10
South Canterbury	3,108	16	3	5.15	0.75	0.46–1.22
Canterbury	31,011	223	45	7.19	1.05	0.91–1.20
West Coast	2,072	13	3	6.27	0.91	0.53–1.57
Southern	17,958	109	22	6.07	0.88	0.73–1.07
New Zealand	309,018	2,124	425	6.87	1.00	

Numerator: MORT, Denominator: BDM LB & MORT; Rate ratios are unadjusted

Figure III–13 Fetal deaths, by district health board, 2010–2014



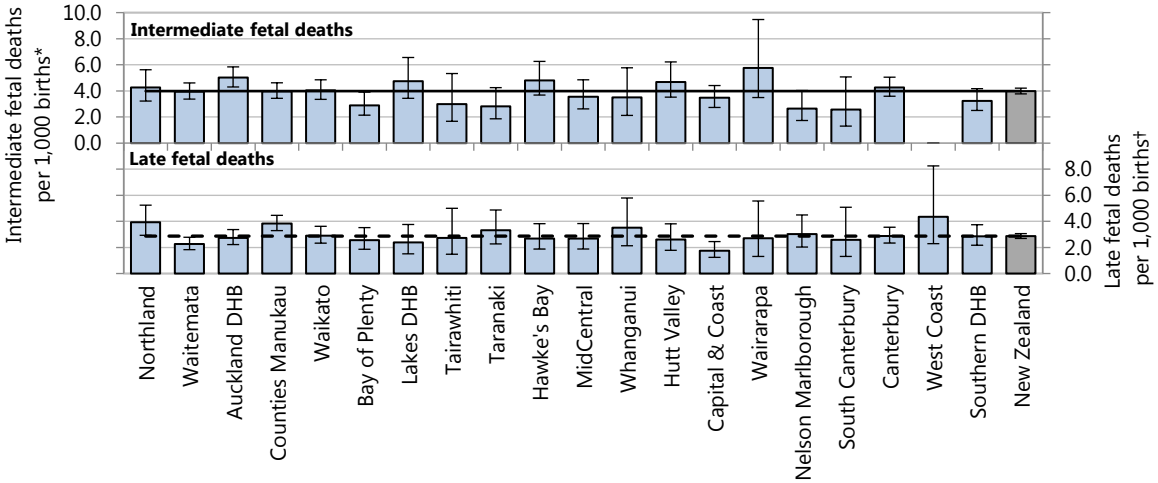
Numerator: MORT,
Denominator: BDM LB & MORT;
Period: 2010–2014

Table III–11 Fetal deaths, by type, South Island DHBs 2010–2014

DHB	2010–2014 (n)	Annual average	Rate per 1,000 births	Rate ratio	95% CI
Intermediate fetal deaths					
Nelson Marlborough	21	4	2.64	0.66	0.43–1.02
South Canterbury	8	2	2.57	0.65	0.32–1.29
Canterbury	132	26	4.26	1.07	0.89–1.28
West Coast	<5	s	s	s	s
Southern	58	12	3.23	0.81	0.62–1.05
New Zealand	1,231	246	3.98	1.00	
Late fetal deaths					
Nelson Marlborough	24	5	3.02	1.05	0.70–1.58
South Canterbury	8	2	2.58	0.90	0.45–1.80
Canterbury	89	18	2.88	1.00	0.81–1.25
West Coast	9	2	4.35	1.52	0.79–2.92
Southern	51	10	2.85	0.99	0.75–1.32
New Zealand	883	177	2.87	1.00	

Numerator: MORT, Denominator: BDM LB & MORT; Rate ratios are unadjusted

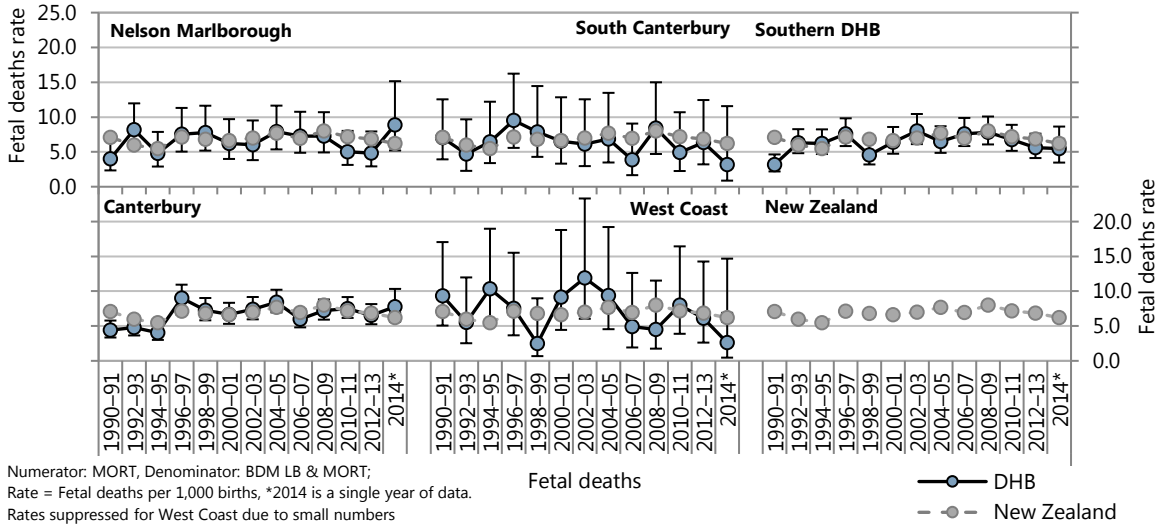
Figure III–14 Fetal deaths, by type, New Zealand 2010–2014



Numerator: MORT, Denominator: BDM LB & MORT;
*Births = live births & fetal deaths 20+weeks gestation, †Births = live births & fetal deaths 28+weeks gestation

Nationally the fetal death rate has remained relatively constant since 1990 with the year-to-year fluctuations around an average of 6.84 deaths per 1,000 births. Rates of fetal death have tended to increase for Nelson Marlborough and Southern DHBs, however, rates in South Canterbury and West Coast DHBs have decreased in recent years and rates in Canterbury have been relatively stable (Figure III–15).

Figure III–15 Trends in fetal deaths, South Island DHBs 1990–2014



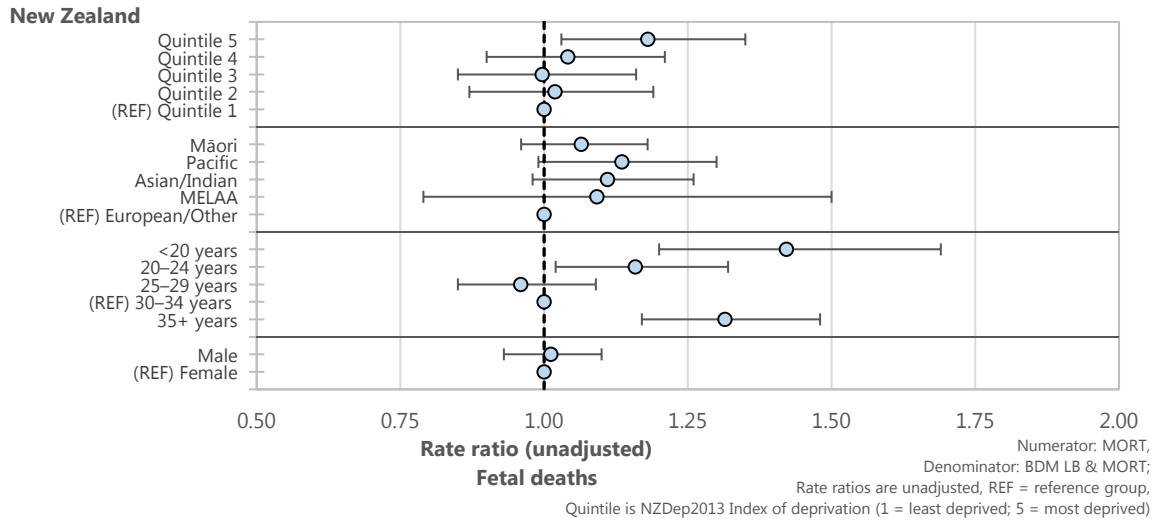
Numerator: MORT, Denominator: BDM LB & MORT;
Rate = Fetal deaths per 1,000 births, *2014 is a single year of data.
Rates suppressed for West Coast due to small numbers

Figure III–16 presents the fetal death rate for differing demographic groups in New Zealand by the residential deprivation score (NZDep2013 index of deprivation score), maternal age, ethnicity, and sex. 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 fetal death rate was higher for those residing in areas with the highest scores on the NZDep2013 index of deprivation (quintile 5; deciles 9-10) than for residing in areas with lower NZDep2013 scores (quintiles 1-4; deciles 1-2)
- The fetal death rates were higher among mothers aged under 25 and over 34 years compared with mothers aged 30–34 years.

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

Figure III–16 Fetal deaths, comparison by demographic factors, New Zealand 2010-2014



Numerator: MORT,
Denominator: BDM LB & MORT;
Rate ratios are unadjusted, REF = reference group,
Quintile is NZDep2013 Index of deprivation (1 = least deprived; 5 = most deprived)

Table III–12 presents the main causes of fetal deaths during 2010–2014. There was no specified cause for between 20% and 60% of fetal deaths in South Island DHBs. Where a cause of fetal death was specified, the frequent causes were congenital anomalies, malnutrition or slow fetal growth, and prematurity or low birthweight.

Table III–12 Fetal deaths, by main underlying cause of death and district health board, South Island DHBs 2010–2014

Main cause of fetal death	2010–2014 (n)	Annual average	Rate per 1,000 births	%
Fetal deaths				
Nelson Marlborough				
Congenital anomalies	14	2.80	1.76	31.1
Malnutrition or slow fetal growth	7	1.4	0.88	15.6
Other causes	<5	s	s	s
Unspecified cause of fetal death	20	4.0	2.51	44.4
Total	45	9.0	5.65	100.0
South Canterbury				
All documented causes*	12	2.4	3.86	75.0
Unspecified cause of fetal death	<5	s	s	s
Total	16	3.2	5.15	100.0
Canterbury				
Congenital anomalies	61	12.2	1.97	27.4
Prematurity or low birthweight	27	5.4	0.87	12.1
Malnutrition or slow fetal growth	27	5.4	0.87	12.1
Intrauterine hypoxia	16	3.2	0.52	7.2
Fetal blood loss	12	2.4	0.39	5.4
Congenital pneumonia	7	1.4	0.23	3.1
Infections specific to perinatal period	5	1.0	0.16	2.2
Other causes	22	4.4	0.71	9.9
Unspecified cause of fetal death	46	9.2	1.48	20.6
Total	223	44.6	7.19	100.0
West Coast				
All documented causes*	5	1.0	2.41	38.5
Unspecified cause of fetal death	8	1.6	3.86	61.5
Total	13	2.6	6.27	100.0
Southern DHB				
Congenital anomalies	25	5.0	1.39	22.9
Malnutrition or slow fetal growth	9	1.8	0.50	8.3
Intrauterine hypoxia	9	1.8	0.50	8.3
Infections specific to perinatal period	5	1.0	0.28	4.6
Other causes	9	1.8	0.50	8.3
Unspecified cause of fetal death	52	10.4	2.90	47.7
Total	109	21.8	6.07	100.0

Numerator: MORT, Denominator: BDM LB & MORT; *All causes include congenital anomalies, prematurity or low birthweight, infections specific to perinatal period

No maternal cause was listed for around 30–40% of fetal deaths in South Island DHBs during 2010–2014. Where listed, the predominant maternal causes of fetal deaths were placenta praevia or placental separation and haemorrhage, or other abnormalities of the placenta (Table III–13).

Table III–13 Fetal deaths, by main maternal cause of fetal death and district health board, Nelson Marlborough and South Canterbury DHBs 2010–2014

Main maternal cause of fetal death	2010–2014 (n)	Annual average	Rate per 1,000 births	%
Fetal deaths				
Nelson Marlborough				
Placenta praevia/placental separation and haemorrhage	5	1.00	0.63	11.1
Other abnormalities of placenta	6	1.2	0.75	13.3
Other causes	15	3.0	1.88	33.3
No listed maternal cause	19	3.8	2.39	42.2
Total	45	9.0	5.65	100.0
South Canterbury				
All documented maternal causes*	10	2.0	3.22	62.5
No listed maternal cause	6	1.2	1.93	37.5
Total	16	3.2	5.15	100.0
Canterbury				
Placenta praevia/placental separation and haemorrhage	27	5.4	0.87	12.1
Other abnormalities of placenta	22	4.4	0.71	9.9
Chorioamnionitis	19	3.8	0.61	8.5
Compression of umbilical cord	14	2.8	0.45	6.3
Multiple pregnancy	13	2.6	0.42	5.8
Incompetent cervix/premature rupture of membranes	12	2.4	0.39	5.4
Maternal hypertensive disorders	8	1.6	0.26	3.6
Placental transfusion syndromes	7	1.4	0.23	3.1
Other causes	36	7.2	1.16	16.1
No listed maternal cause	65	13.0	2.10	29.1
Total	223	44.6	7.19	100.0
West Coast				
All documented maternal causes†	10	2.0	4.83	76.9
No listed maternal cause	<5	s	s	s
Total	13	2.6	6.27	100.0
Southern DHB				
Chorioamnionitis	12	2.4	0.67	11.0
Placenta praevia/placental separation and haemorrhage	10	2.0	0.56	9.2
Other abnormalities of placenta	8	1.6	0.45	7.3
Compression of umbilical cord	7	1.4	0.39	6.4
Multiple pregnancy	5	1.0	0.28	4.6
Other causes	33	6.6	1.84	30.3
No listed maternal cause	34	6.8	1.89	31.2
Total	109	21.8	6.07	100.0

Numerator: MORT, Denominator: BDM LB & MORT; *All causes include compression of umbilical cord, placenta praevia/placental separation and haemorrhage, chorioamnionitis, incompetent cervix/premature rupture of membranes, placental transfusion syndromes, †All causes include maternal hypertensive disorders, placenta praevia/placental separation and haemorrhage, compression of umbilical cord, multiple pregnancy

Evidence for good practice

Good antenatal care can help prevent common causes of low birthweight, including fetal growth restriction and preterm birth, and also help to identify and address potentially modifiable risk factors for stillbirth. Evidence for good practice in antenatal care is discussed in the previous section. This evidence for good practice section focuses on preterm births.

Equity

In New Zealand, there is little variation in preterm birth rates by either ethnicity or deprivation.[15] Internationally, socioeconomic status has been found to be associated with preterm birth in some studies but not others.[16] It has been suggested that the increase in iatrogenic preterm births over recent decades is responsible for this inconsistency.[16,17] A Canadian study examined spontaneous and iatrogenic preterm singleton births separately to address this issue.[17] It found that spontaneous, but not iatrogenic, preterm births were somewhat higher in women in the lowest family income group versus the highest (rate ratio 1.14, 95% confidence interval 1.03 to 1.25). Adjustment for maternal characteristics, including maternal age, parity, marital status, pre-pregnancy weight, and smoking status, abolished this relationship. This suggests that modifiable factors are major contributors to socioeconomic inequalities in spontaneous preterm births rates.

Possibilities for prevention

Prevention of preterm birth is challenging because the causes are multiple and not well understood and the risk factors may not be avoidable.[4] The most significant risk factor for spontaneous preterm birth is having had a previous preterm birth.[4] Other maternal risk factors include (in roughly decreasing order of relative risk): low socioeconomic status, carrying a male fetus, an inter-pregnancy interval of less than six months, an underweight pre-pregnancy BMI, a family history of preterm birth, and smoking.[4]

Common reasons why a preterm birth may be medically indicated (because the risk to the baby of remaining in utero is greater than that of being born early) are pregnancy complications such as preeclampsia, intrauterine growth retardation (IUGR) and placental abruption.[18] Collectively these three conditions have been termed ischaemic placental disease. Their causes are unknown but suspected to be related to poor development of the placenta in early pregnancy and subsequent placental insufficiency.[19] There are currently no ways to prevent or treat ischaemic placental disease.[19] Risk factors for all three conditions include maternal age of < 20 years or ≥35 years, multiple pregnancy, chronic hypertension, diabetes, cocaine use, and a previous history of any of the three conditions.[20] Obesity increases the risk of preeclampsia, while underweight increases the risk of IUGR.[20] Cigarette smoking increases the risk of placental abruption and IUGR (but decreases the risk of preeclampsia).[20]

Risk scoring systems have been developed to estimate a woman's risk of preterm birth based on factors such as age, height and weight, marital and socioeconomic status, smoking, threatened miscarriage, previous low birthweight baby, and previous stillbirth. Such risk scoring systems have not been subjected to randomised controlled trials, so a 2015 Cochrane review concluded that the value of such systems is unknown.[21]

Cervical insufficiency (when the cervix starts to shorten and dilate too early in pregnancy) is a cause of late miscarriage and preterm birth.[22] Cervical cerclage is a surgical technique which involves putting a stitch around the neck of the womb (the cervix) to provide mechanical support to the cervix and keep it closed. In women with a singleton pregnancy who are at high risk of pregnancy loss because of a previous history of late miscarriage or preterm birth, and/or a clinical examination or ultrasound finding of a short cervix, cerclage reduces the risk of preterm birth and probably reduces the risk of perinatal deaths.[22] For women with multiple pregnancy, limited data provides no evidence that cervical cerclage is effective for preventing preterm births and reducing perinatal deaths or neonatal morbidity.[23]

Although in high-income countries it is common for women with a previous history of giving birth preterm to attend specialised antenatal clinics, a 2011 Cochrane review found no evidence that this reduces the numbers of preterm births. The trials included in the review were all conducted in the 1980s and the review authors noted that this was before many of the tests currently used in specialised clinics had been developed. They stated that, since specialised clinics are now an established part of antenatal care, it is unlikely that further randomised trials will be possible.[24]

Bed rest at home or in hospital has been recommended for the prevention of preterm births, but a 2015 Cochrane review found no evidence either supporting or refuting this practice.[25] The authors noted that bed rest may be disruptive to a woman's home and work life. Another 2015 review found evidence from one trial that infection screening and treatment programs for pregnant women before 20 weeks' gestation reduce rates of preterm birth and preterm low birthweight.[26]

Preterm birth is usual in multiple pregnancies. Around 60% of twin pregnancies result in spontaneous birth before 37 weeks and around 75% of triplet pregnancies result in spontaneous birth before 35 weeks (Triplets are often delivered by Caesarean section.[27,28]).[29] A 2017 Cochrane review found that, in women with a multiple pregnancy, the administration of prenatal progestogens did not appear to reduce the risk of preterm birth or improve neonatal outcomes.[30] Older women are more likely to become pregnant with twins (in the US from 2007 to 2013, the probability of twin pregnancy increased from 1.3% in women 15–17 years old to 5.0% in women 35–39 years old and 6.9% in women >40 years old).[31]Assisted reproductive technology (ART) was a major contributor to multiple births in the past but in Australia and New Zealand single embryo transfer is now usual (85.7% in 2015) and multiple delivery rates following ART have fallen from 6.9% in 2011 to 4.4% in 2015.[32]

Best practice in the care of women about to give birth preterm

The World Health Organization has made the following recommendations, largely based on Cochrane reviews:

- Antenatal corticosteroids (to increase the maturity of the baby's lungs) should be given to women at risk of preterm birth from 24 to 34 weeks' gestation, provided: gestational age has been accurately assessed; preterm birth is considered to be imminent; there is no evidence of maternal infection; there are facilities to provide adequate childbirth care and care for the premature newborn (including resuscitation, thermal care, feeding support, safe oxygen use, and infection treatment)
- Magnesium sulfate should be given to women at risk of imminent preterm birth before 32 weeks, to reduce the risk of the child having cerebral palsy
- Antibiotics should be given to women with preterm rupture of membranes but not routinely to women in preterm labour with intact membranes and no clinical signs of infection
- Tocolytic agents (which inhibit uterine contractions) should not be routinely given to women at imminent risk of preterm birth for the purpose of improving newborn outcomes, but their use can be considered in women at risk of imminent preterm birth whose pregnancy is otherwise uncomplicated, to provide time for the administration of antenatal corticosteroids and/or transfer to a hospital with appropriate neonatal care capabilities, although there is no direct evidence that this improves neonatal outcomes
- Routine caesarean section should not be performed to improve newborn outcomes regardless of whether presentation is cephalic (head first) or breech.

Best practice in the care of premature newborns

The World Health Organization recommends:

- Kangaroo mother care (where the baby is carried in skin-to-skin contact with its mother's chest) should be part of routine care for newborns weighing < 2000g at birth as soon as newborns are clinically stable
- If the baby is too unwell for Kangaroo care it should be kept in a thermoneutral environment under either radiant warmers or in an incubator
- Continuous positive airway pressure therapy for infants with respiratory distress syndrome
- Surfactant replacement therapy for infants with respiratory distress syndrome
- When ventilating preterm babies born at or before 32 weeks, therapy should begin with 30% oxygen rather than 100% oxygen, and the use of progressively higher oxygen concentrations should be considered only if the baby's heart rate is < 60 beats per minute after 30 seconds of adequate ventilation with 30% oxygen.

Ministry of Health publications and websites

- Ministry of Health. 2016. New Zealand Maternity Clinical Indicators 2015. Wellington: Ministry of Health. https://www.health.govt.nz/publication/new-zealand-maternity-clinical-indicators-2015

Other New Zealand publications and websites

- Newborn Clinical Network. https://www.starship.org.nz/for-health-professionals/new-zealand-child-and-youth-clinical-networks/newborn-clinical-network/ (this site has a number of guidelines, practice recommendations and consensus statements.)

New Zealand Guidelines

- Women's Health Service, Christchurch Women's Hospital. **Preterm Labour/Birth**. Maternity guideline. 2017. Canterbury District Health Board. https://www.cdhb.health.nz/Hospitals-Services/Health-Professionals/maternity-care-guidelines/Documents/GLM0027-Preterm-Labour-Birth.pdf

International guidelines

- National Institute for Health and Care Excellence. 2017. **Developmental follow-up of children and young people born preterm**. https://www.nice.org.uk/guidance/ng72
- Davidson JE, Aslakson RA, Long AC, et al. 2017. **Guidelines for Family-Centered Care in the Neonatal, Pediatric, and Adult ICU**. Critical care medicine, 45(1), 103-28. http://dx.doi.org/10.1097/ccm.0000000000002169
- National Institute for Health and Care Excellence. 2015. **Preterm labour and birth**. https://www.nice.org.uk/guidance/ng25
- World Health Organization. 2015. **WHO recommendations on interventions to improve preterm birth outcomes**. Geneva: World Health Organization. http://apps.who.int/iris/bitstream/10665/183037/1/9789241508988_eng.pdf?ua=1
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- 2014. **ACOG Practice Bulletin No.142: Cerclage for the management of cervical insufficiency**. Obstetrics and gynecology, 123(2 Pt 1), 372-9. http://dx.doi.org/10.1097/01.AOG.0000443276.68274.cc
- Brown R, Gagnon R, Delisle MF. 2013. **Cervical insufficiency and cervical cerclage**. Journal of obstetrics and gynaecology Canada, 35(12), 1115-27. http://dx.doi.org/10.1016/s1701-2163(15)30764-7

The National Guideline Clearinghouse website has a summary of the above two guidelines, highlighting areas of agreement and difference, at https://www.guideline.gov/syntheses/synthesis/50662/cervical-cerclage?q=preterm See also the review below comparing these two guidelines with the those of the RCOG.

- Sperling JD, Dahlke JD, Gonzalez JM. 2017. **Cerclage Use: A Review of 3 National Guidelines**. Obstetrical & gynecological survey, 72(4), 235-41. http://dx.doi.org/10.1097/ogx.0000000000000422
- 2014. **ACOG Practice Bulletin No. 144: Multifetal gestations: twin, triplet, and higher-order multifetal pregnancies**. Obstetrics and gynecology, 123(5), 1118-32. http://dx.doi.org/10.1097/01.AOG.0000446856.51061.3e
- Guillén Ú, Weiss EM, Munson D, et al. 2015. **Guidelines for the Management of Extremely Premature Deliveries: A Systematic Review**. Pediatrics, 136(2), 343. http://pediatrics.aappublications.org/content/136/2/343.abstract
- The Royal Children's Hospital Melbourne. **Preterm infant management guideline package.** https://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/Preterm_Infant_Management_Guideline_Package/

Evidence-Based Medicine reviews

- Glover AV, Manuck TA. 2017. **Screening for spontaneous preterm birth and resultant therapies to reduce neonatal morbidity and mortality: A review**. Seminars in fetal & neonatal medicine. http://dx.doi.org/10.1016/j.siny.2017.11.007
- Dodd JM, Grivell RM, Obrien CM, et al. 2017. **Prenatal administration of progestogens for preventing spontaneous preterm birth in women with a multiple pregnancy**. The Cochrane Database of Systematic Reviews, (10). http://dx.doi.org/10.1002/14651858.CD012024.pub2
- Roberts D, Brown J, Medley N, et al. 2017. **Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth**. The Cochrane Database of Systematic Reviews, (3). http://dx.doi.org/10.1002/14651858.CD004454.pub3
- Alfirevic Z, Stampalija T, Medley N. 2017. **Cervical stitch (cerclage) for preventing preterm birth in singleton pregnancy**. The Cochrane database of systematic reviews, (6). http://dx.doi.org/10.1002/14651858.CD008991.pub3
- Crowther CA, McKinlay CJD, Middleton P, et al. 2015. **Repeat doses of prenatal corticosteroids for women at risk of preterm birth for improving neonatal health outcomes**. The Cochrane Database of Systematic Reviews, (7). http://dx.doi.org/10.1002/14651858.CD003935.pub4

Other relevant publications

- March of Dimes, The Partnership for Maternal, Newborn & Child Health, Save the Children, World Health Organization 2012. **Born too soon: The global action report on preterm birth**. Geneva: World Health Organization. http://www.who.int/maternal_child_adolescent/documents/born_too_soon/en/

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2. Ministry of Health. 2017. Fetal and Infant Deaths 2014. https://www.health.govt.nz/publication/fetal-and-infant-deaths-2014 accessed January 2018.
3. National Institute for Health and Care Excellence. 2017. Developmental follow-up of children and young people born preterm. https://www.nice.org.uk/guidance/ng72 accessed January 2018.
4. Glover AV, Manuck TA. 2017. Screening for spontaneous preterm birth and resultant therapies to reduce neonatal morbidity and mortality: A review. *Seminars in fetal & neonatal medicine*. http://dx.doi.org/10.1016/j.siny.2017.11.007
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