Perinatal and Maternal Mortality Review Committee

He matenga ohorere, he wairua uiui, wairua mutunga-kore

Neonatal Encephalopathy

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Presentation

- **PMMRC background**
- NEWG and data collection
- 11th PMMRC report – NE
- What has NEWG achieved?
- Current work

PMMRC

- The Perinatal and Maternal Mortality Review Committee (PMMRC) was established under the New Zealand Public Health and Disability Act 2000
- The PMMRC's primary function is to review and report to the Health Quality & Safety Commission (HQSC) on maternal and perinatal mortality and morbidity
- The PMMRC role includes developing strategic plans and methodologies to reduce mortality and morbidity

PMMRC definitions

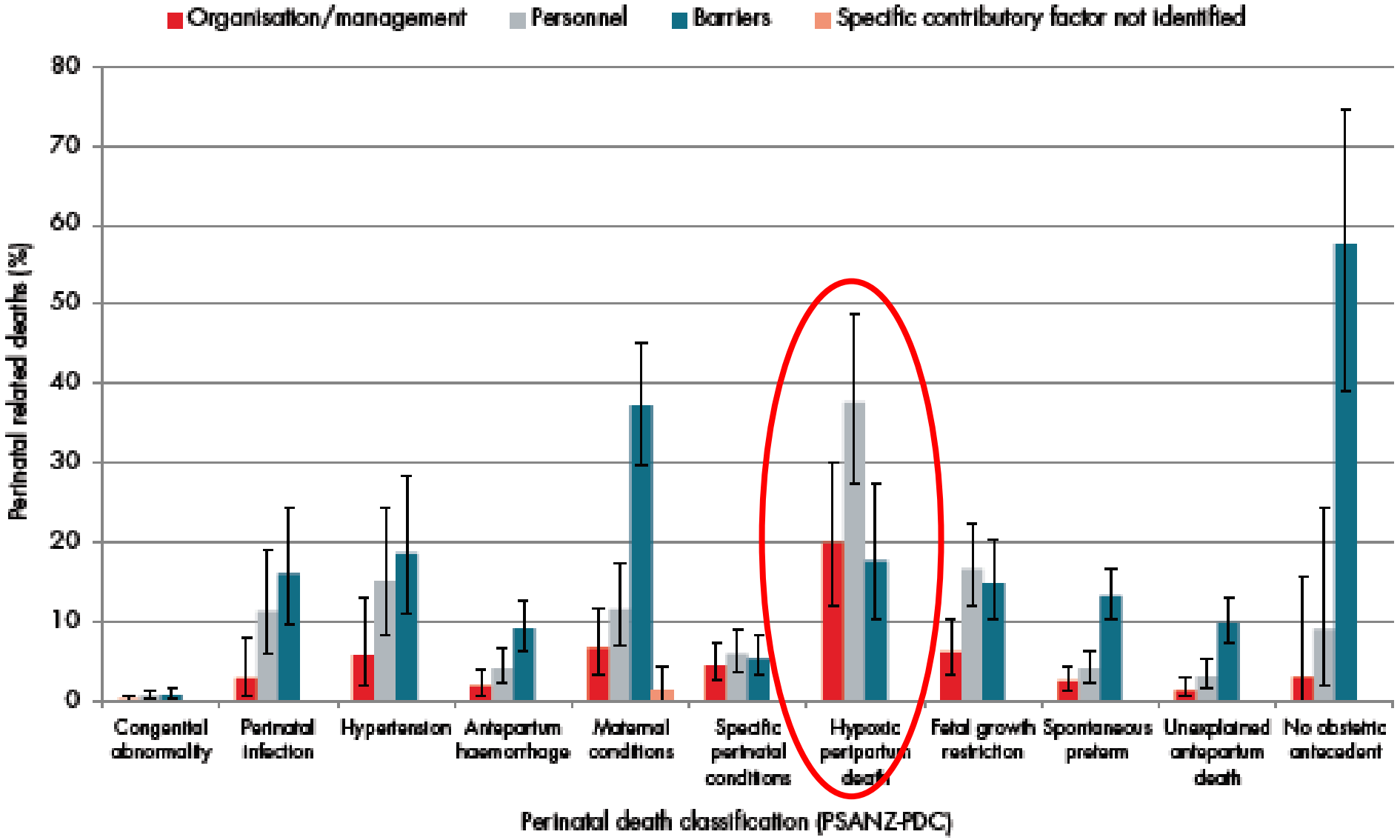
Neonatal Encephalopathy Working Group (NEWG)

- The NEWG was established in 2007
- Multidisciplinary working group
- The purpose of the NEWG is to review New Zealand data on NE
  - To establish the true size of the problem
  - Assess predictors of NE
  - Identify areas where there may be the potential for improvement of services.

Why NE?

- NE is major cause of brain injury in the term infant
- 25% of those surviving will have long term neurological complications
- 50% of deaths potentially avoidable (PMMRC 6th and 11th Reports)
  - 2010 – 50% potentially avoidable
  - 2015 – 48% potentially avoidable

Main contributory factor(s) in potentially avoidable perinatal related deaths by perinatal death classification (PSANZ-PDC) 2011–2015 (Figure 3.23)



NE Definition

- **Neonatal encephalopathy (NE):** a clinically defined syndrome of disturbed neurological function within the first week of life in the term (≥37 weeks) infant, manifested by difficulty in initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness and often seizures.
- Includes moderate and severe NE only (Sarnat stage 2 and 3).
- 2016 – from 35 weeks gestation

Sarnat Staging

NE Staging	Stage 2 / Moderate	Stage 3 / Severe
Level of consciousness	lethargic or obtunded	stuporous
Muscle Tone	mild / moderate hypotonia	flaccid
Posture	strong distal flexion	intermittent decerebration
Stretch reflexes	overactive	decrease or absent
Suck	weak or absent	absent
Moro	weak / incomplete high threshold	absent
Autonomic Function	generalized parasympathetic overactivity	both systems depressed
Seizures	common	uncommon

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NE data collection

Baby identified with Sarnat Stage 2 or 3

- Initially notification was via PSU (2010-2012)
- **Current** – NE baby data collection form completed online by NNP, Paediatrician, Neonatologist, identifies LMC
- NE mother data collection form completed by LMC
- The information provided is strictly confidential
- Information published by the PMMRC is grouped and individuals are not identifiable

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11th PMMRC Report - released in June 2017

Perinatal mortality 2007-2015 (9 years)

Maternal mortality 2006-2015 (10 years)

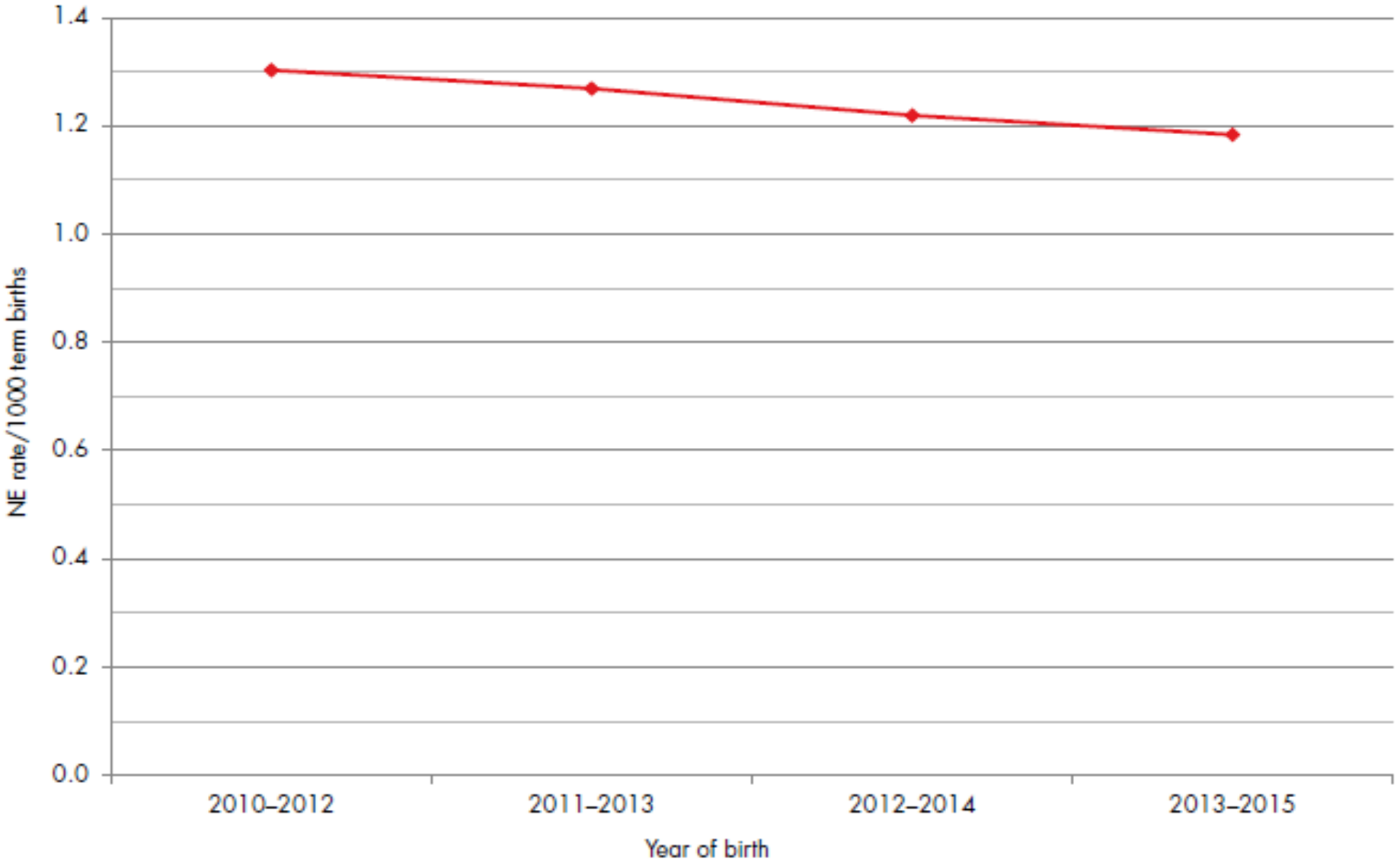
Neonatal encephalopathy 2010-2015 (6 years)

NE reporting

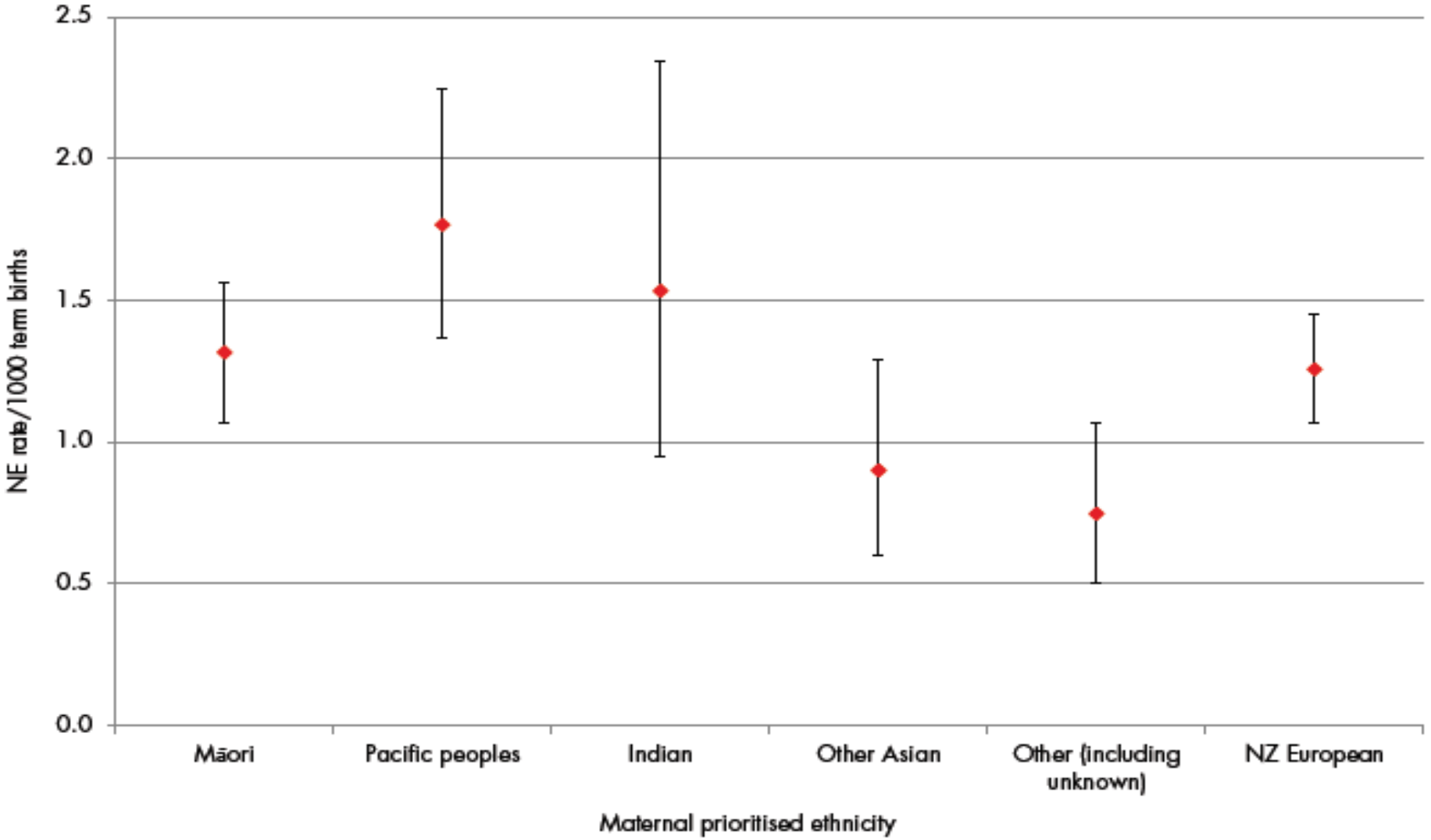
- 2015 = 70 babies with NE
- 2010 – 2015 = 423 babies with NE

  (1.24 per 1000 term births)
- Mortality - 19%
- Morbidity - 81%
- Moderate – 69%
- Severe – 31%

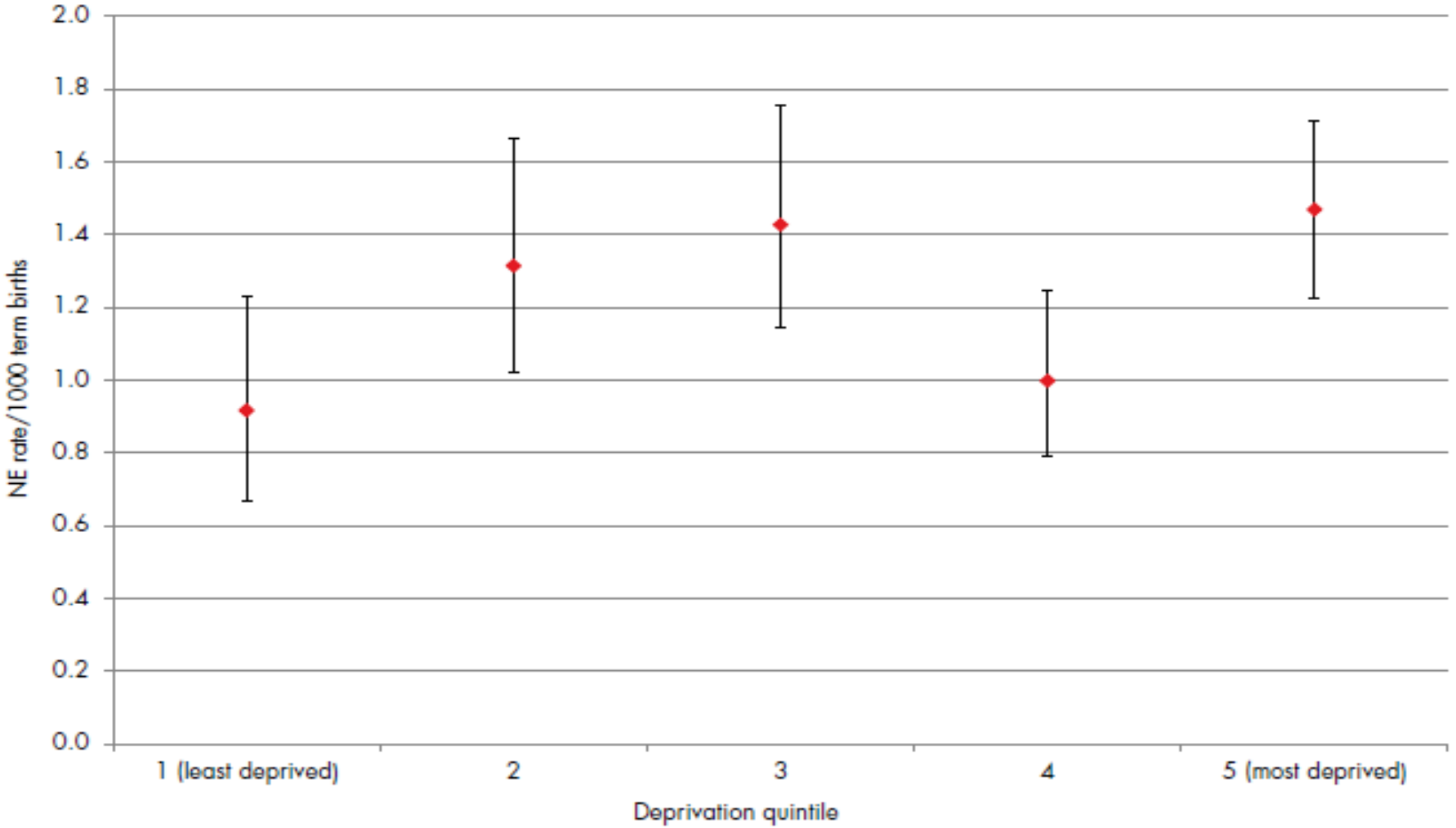
NE rates 2010–2015 (Figure 6.1)



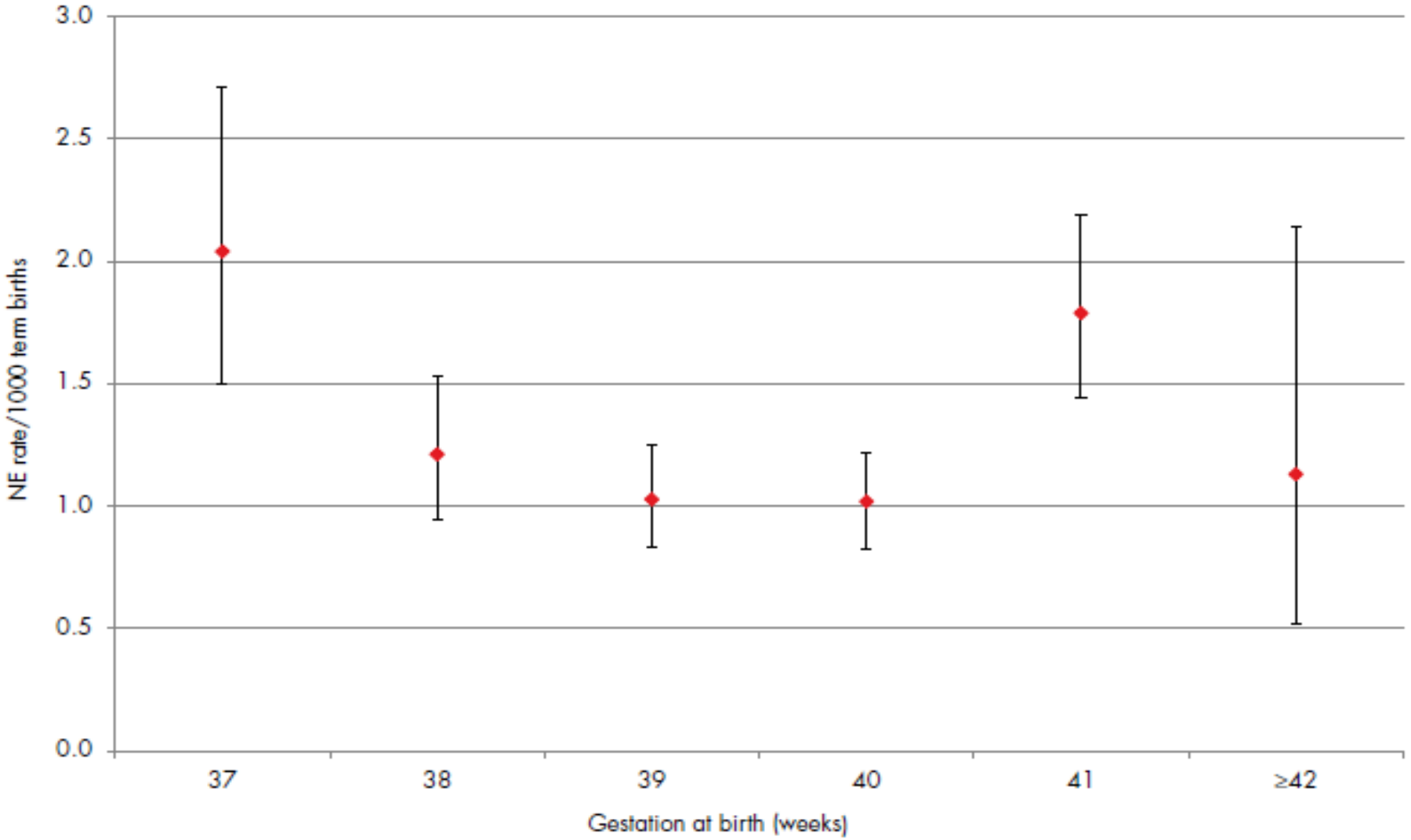
NE rates by ethnicity 2010-2015 (Figure 6.2)



NE rates by deprivation 2010-2015 (Figure 6.3)

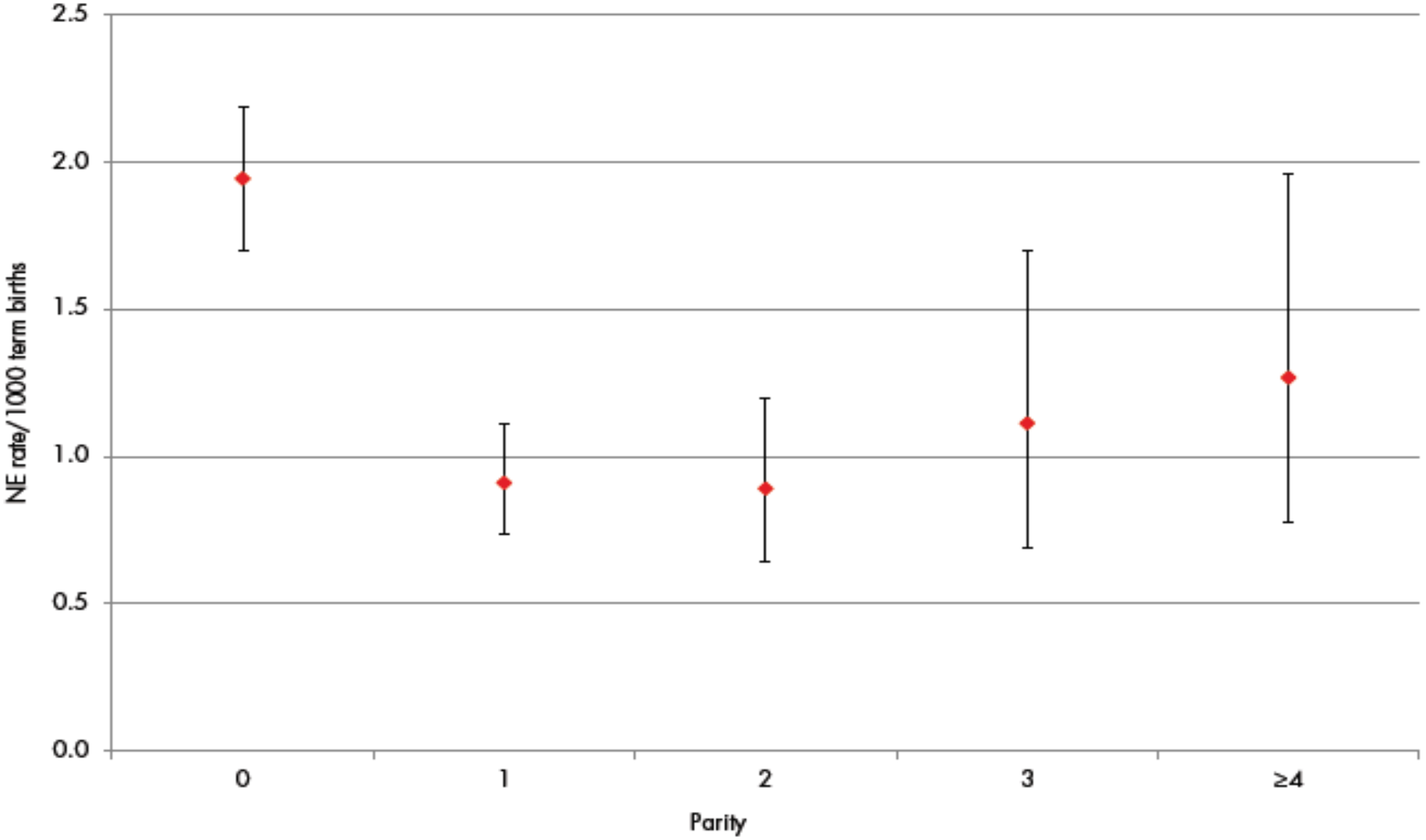


NE rates by gestation (2010-2015) (Figure 6.5)



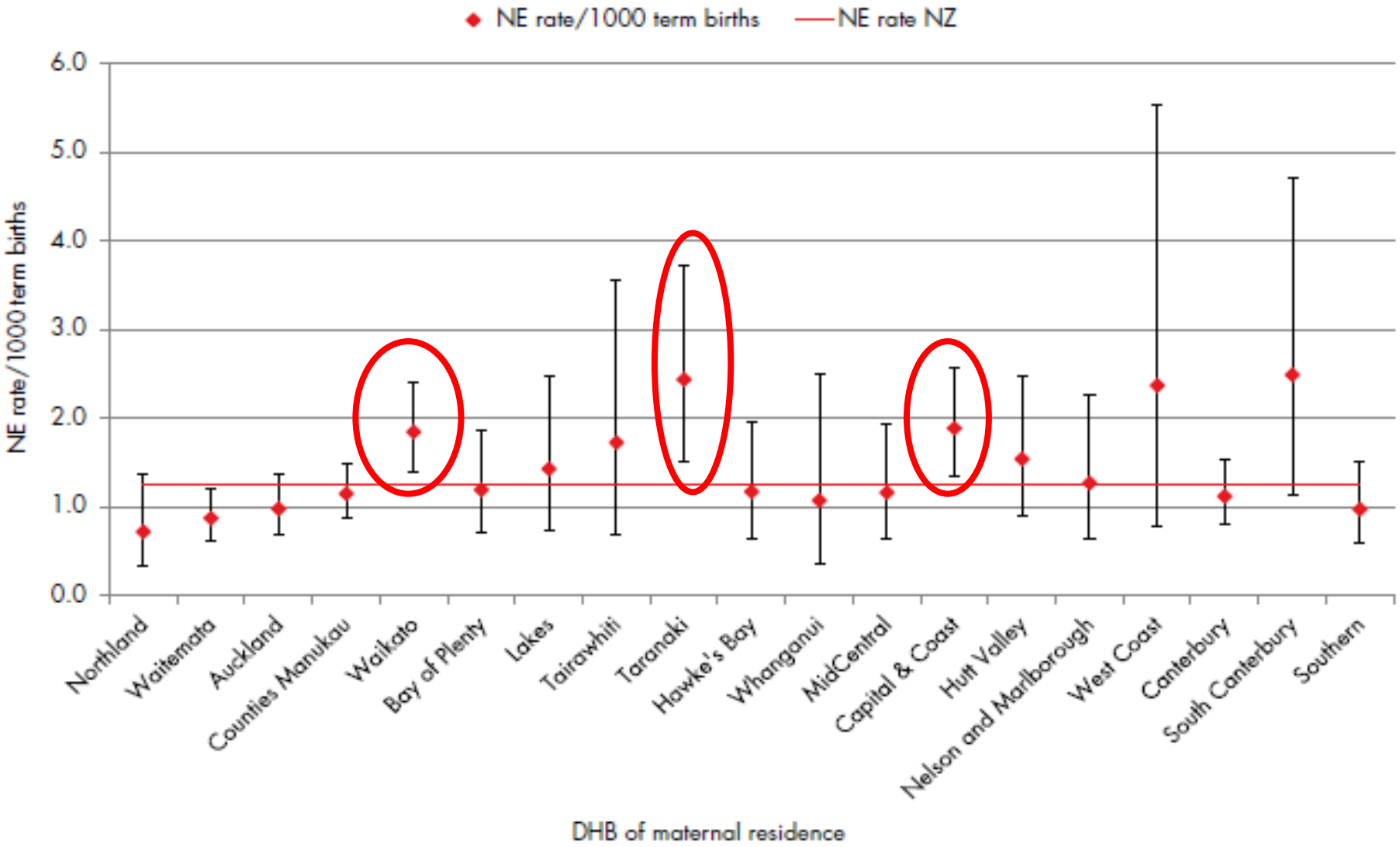
NE rates by parity 2010-2015

(Figure 6.6)



NE rates by DHB 2010-2015

(Figure 6.4)



Supporting best practice

Management of Umbilical Cord Blood Results

Management of umbilical cord lactate results

Cord lactates should be taken and processed within 10 minutes of cord clamping.

Umbilical cord lactate result	Action
Less than 6.0	Document results
6.0 or above	Send paired umbilical cord gases

Management of umbilical cord gas results

Umbilical cord gases can be analysed within one hour of birth if clamped immediately after delivery. Both umbilical cord arterial and venous gases should be analysed.

Umbilical cord gas result	Action
pH less than 7.0 or base excess less than or equal to –12 mmol/L	Call paediatrician for review.
pH 7.0–7.15 or base excess –11 to –7 mmol/L Or umbilical cord gas result not available and cord lactate greater than or equal to 6.0 mmol/L	Monitor baby for signs of neonatal encephalopathy (hypotonia, poor feeding, lethargy, weak or absent suck/gag or Moro reflex, seizures). Call paediatrician if any concerns.
pH above 7.15 and base excess above –7	

PMMRC Recommendations (11th Report)

- **The PMMRC investigate why there has been no reduction in neonatal mortality in New Zealand.**
  - Neonatal mortality has remained static in New Zealand since 2007
  - Reductions have been reported in the UK, Australia and Scandinavia

PMMRC Recommendations (11th Report)

That district health boards with rates of perinatal related mortality and neonatal encephalopathy significantly higher than the national rate review, or continue to review, the higher rate of mortality or morbidity in their area and identify areas for improvement.

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Previous PMMRC NE Recommendation

Widespread multidisciplinary education is required on the recognition of neonatal encephalopathy

This should include:

- recognition of babies at increased risk by their history
- signs suggestive of encephalopathy
- knowledge of clinical pathways to induced cooling if required

Update - recommendation on recognition of NE

- ACC has facilitated a cross-Ministry initiative to look at reducing the incidence of treatment injury by developing strategies to address the issues raised by the NEWG
- Lead to establishment of the ACC NE Taskforce Working on:
  - Newborn Observation Chart
  - Lactate Testing Evaluation
  - Improved Maternal and Fetal Monitoring

Update - ACC NE Taskforce

$7.35 million

Funding for work to < NE

PMMRC NE Practice Point - on recognition of NE

PRACTICE POINT: RECOGNISING THE BABY AT RISK OF NEONATAL ENCEPHALOPATHY

All practitioners working across primary, secondary and tertiary maternity settings need to be mindful of the potential for neonatal encephalopathy and skilled at identifying which babies may go on to develop neonatal encephalopathy. The early initiation of advanced care (including cooling where appropriate) is an important contributor to the baby's outcome.

Practitioners who are supporting women to give birth in primary settings (and who may therefore have delayed access to secondary or tertiary level care) should liaise early with the local paediatric service when they identify a neonate who may be compromised, to discuss the baby's care prior to and during transfer and to ensure timeliness of transfer. Good lines of communication for contacting the local DHB paediatrician for advice are essential to the provision of optimal care.

Recognising the neonate who may go on to develop neonatal encephalopathy

A number of factors have been associated with the potential for a newborn to develop neonatal encephalopathy, and the presence of these factors should prompt consideration of paediatric consultation. These include:

- an abnormal cardiotocograph in labour
- an Apgar score ≤7 at five minutes of age
- decreased tone, or absent primitive reflexes
- difficulty establishing or maintaining respirations
- requiring resuscitation at birth (especially if this has included assisted ventilation or use of drugs)
- being slower than usual to initiate feeding
- abnormal level of consciousness (eg, hyper alert, irritable or lethargic)
- a weak or absent cry
- seizure activity.

Consensus statements – re recognition of NE

- **Observation of mother and baby in the immediate postnatal period:**
  Consensus statements guiding practice (MOH 2012)
- **Newborn Clinical Network**

  Consensus Statement for Treatment of Neonatal Encephalopathy (2015)

Previous PMMRC Recommendation

That multi-disciplinary fetal surveillance training be mandatory for all clinicians involved in intrapartum care.

a. This training includes risk assessment for mothers and babies throughout pregnancy as well as intrapartum observations.

b. The aims include strengthening of supervision and support to promote professional judgement, interdisciplinary conversations and reflective practice.

Update – recommendation on fetal surveillance training

- Some DHBs reported that mandatory attendance at multi-disciplinary was required for all core staff. Other DHBs have responded that multi-disciplinary fetal surveillance training is occurring but is not compulsory.
- The ACC NE Taskforce working on
  - Newborn Observation Chart
  - Lactate Testing Evaluation
  - Improved Maternal and Fetal Monitoring

Previous PMMRC NE Recommendation

That all DHBs review local incident cases of neonatal encephalopathy (Sarnat stages 2 and 3).

The findings of these reviews should be shared at multidisciplinary local forum and form the basis of quality improvements as appropriate.

Update – recommendation on local review of NE

- In 2016 72% of NE cases underwent a review at their DHB of birth.
- Multidisciplinary review at place of birth occurred in 62% of cases.

Previous Recommendation

- **In cases of neonatal encephalopathy (Sarnat stages 2 and 3):**
  - **All babies with encephalopathy should undergo investigation to predict prognosis**, including formal neurological examination, cerebral magnetic resonance imaging (MRI) and, if available, formal electroencephalography (EEG)
  - **All parents of an affected child should have a formal discussion with the neonatologist/paediatrician** providing care in order to review the prognosis and ongoing care of their child.

Update – recommendation on investigations (MRI)(Table 6.9)

Table 6.9: Investigations and neonatal outcome by Sarnat stage of neonatal encephalopathy survivors 2010–2015

Investigations	2010		2011		2012		2013		2014		2015		Total NE survivors	
	n=59		n=54		n=67		n=59		n=44		n=58		n=341	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MRI (investigation done)	41	69.5	35	64.8	43	64.2	50	84.7	38	86.4	48.0	82.8	255	74.8
No MRI or Unknown	18	30.5	19	35.2	24	35.8	9	15.3	6	13.6	10.0	17.2	86	25.2

2016 Survey of DHBs and Discharge Examination for Babies Diagnosed with Neonatal Encephalopathy

In 2016 Clinical Directors of Neonatal Intensive Care and Special Care Baby Units were asked to provide details of discharge examination for babies diagnosed with NE.

This included:

- which tool, if any, was used for the discharge examination for babies diagnosed with NE
- if a formal tool was not used for the discharge examination for babies diagnosed with NE, whether they had considered using a formal tool (such as the Dubowitz examination)
- what they thought were the barriers to using a formal tool for the discharge examination
- details of where the result of examination was documented.

All six Level 3 Units advised that they use a formal tool to assist with the discharge examination for babies diagnosed with NE, either the Dubowitz examination or a modification of this. The practice was less consistent in the Level 2 Units. The barriers identified to the use of a formal tool included training in the use of the tool and interpretation of the findings given small numbers of babies diagnosed with NE in their DHBs.

Previous PMMRC NE Recommendation

Arterial and venous cord gases should be performed on all babies born with an Apgar score <7 at one minute, and if neonatal encephalopathy is clinically suspected in the immediate hours after birth, early consultation with a neonatal paediatrician is recommended in order to avoid a delay in commencing cooling.

Immediate newborn wellbeing

(Table 6.5)

Table 6.5: Immediate newborn wellbeing among neonatal encephalopathy babies 2010–2015

	2010		2011		2012		2013		2014		2015		Total	
	n=82		n=67		n=79		n=70		n=55		n=70		n=423	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Cord blood gases: summary data														
Normal (none of pH ≤7, BE ≤–12, lactate ≥6)	12	14.6	14	20.9	11	13.9	13	18.6	7	12.7	8	11.4	65	15.4
Abnormal (any of pH ≤7, BE ≤–12, lactate ≥6)	47	57.3	41	61.2	55	69.6	48	68.6	40	72.7	47	67.1	278	65.7
No gases reported	23	28.0	12	17.9	13	16.5	9	12.9	8	14.5	15	21.4	80	18.9
No gases and Apgar score <7 at 1 minute	14	17.1	8	11.9	8	10.1	6	8.6	8	14.5	6	8.6	50	11.8
No gases and Apgar score ≥7 at 1 minute	8	9.8	4	6.0	5	6.3	3	4.3	-	-	9	12.9	29	6.9

Cooling (Table 6.6)

Table 6.6: Induced cooling therapy among neonatal encephalopathy babies 2010–2015

Cooling	2010		2011		2012		2013		2014		2015		Total	
	n=82		n=67		n=79		n=70		n=55		n=70		n=423	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Yes	56	68.3	51	76.1	62	78.5	58	82.9	45	81.8	56	80.0	328	77.5
No	26	31.7	16	23.9	17	21.5	12	17.1	10	18.2	14	20.0	95	22.5
Age at cooling	n=56		n=51		n=62		n=58		n=45		n=56		n=328	
≤6 hours	46	82.1	39	76.5	53	85.5	47	81.0	39	86.7	44	78.6	268	81.7
>6 hours	10	17.9	8	15.7	9	14.5	11	19.0	6	13.3	11	19.6	55	16.8
Unknown time	-	-	4	7.8	-	-	-	-	-	-	1	1.8	5	1.5

NE audits (11th report)

- Babies not cooled 2011-14
  - 54 babies (22 severe; 32 moderate)
  - 2 severe and 9 moderate babies may have benefited from cooling
    - Late recognition, late consultation, late transfer

NE Journal Publications

- Contributory factors and potentially avoidable neonatal encephalopathy associated with perinatal asphyxia.
  Am J Obstet Gynecol 2016
  - National multidisciplinary case review

- Demographics and clinical outcome.
  Journal of Paediatrics and Child Health (2016)

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Current work

NE following an acute intrapartum event

- 47 babies 2013-2015
- Review of LMC and DHB mother and baby clinical notes
- National interdisciplinary review 2016-2017
- Funded by ACC
- Reporting this year

Current NEWG membership

- Dr Kitty Bach — Neonatologist
- Dr David Bailey — Obstetrician
- Dr Malcolm Battin — Neonatologist
- Karen Bennington — Neonatal Nurse Practitioner
- Dr Jutta van den Boom (Chair) — Neonatologist
- Anne Jackson — Neonatal Nurse Practitioner
- Suzanne Miller — Midwife
- Dr. Kristy Wolff — Obstetrician
- ? — Midwife

(Previous **Neonatal Nursing** Members - Anja Hale, Deborah Harris)

ACKNOWLEDGEMENTS

- Babies, families and whānau
- LMCs
- Neonatal Nurses, Neonatal Nurse Practitioners
- Paediatricians, Neonatologists
- DHB local coordinators
- Otago Mortality Data Group
- PMMRC and the NE working group – past and present
- National coordination service
- HQSC