Perinatal and Maternal Mortality Review Committee

He matenga ohorere, he wairua uiui, wairua mutungakore

Health Quality & Safety Commission New Zealand
Kupu Taurangi Hauora o Aotearoa

Fifteenth Annual Report of the Perinatal and Maternal Mortality Review Committee | Te Pūrongo ā-Tau Tekau mā Rima o te Komiti Arotake Mate Pēpi, Mate Whaea Hoki

Reporting Mortality and Morbidity 2020 | Te Tuku Pūrongo mō te Mate me te Whakamate 2020

December 2022 | Hakihea 2022

He mate nga ohorere, he wairua uiui, wairua *mutunga-kore*. The grief of a sudden, untimely death will never be forgotten.

Perinatal and Maternal Mortality Review Committee. 2022. *Fifteenth Annual Report of the Perinatal and Maternal Mortality Review Committee | Te Pūrongo ā-Tau Tekau mā Rima o te Komiti Arotake Mate Pēpi, Mate Whaea Hoki: Reporting Mortality and Morbidity 2020 | Te Tuku Pūrongo mō te Mate me te Whakamate 2020*. Wellington: Health Quality & Safety Commission.

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Acknowledgements | He Mihi

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- The lead maternity carers (LMCs) and district health board (DHB) clinicians throughout Aotearoa New Zealand and local coordinators within each DHB who helped collect data for this report
- The University of Otago's New Zealand Mortality Review Data Group (NZMRDG) – the epidemiology team of Dr Pauline Dawson, Dr Wendy Burgess (Ngāti Kahungunu, Ngāti Hāwea), Dr Melyssa Roy, and Dr Helen Paterson and previously Professor Sue Crengle (Kāi Tahu, Kāti Māmoe, Waitaha) and Dr Gabrielle McDonald, who designed the analysis and prepared this report, and Joseph Hii, Kasia Szymanska, Nick Wolfe, Dr Rachael Lawrence Lodge, Craig Rayner and Stephen Chalmers, who established and maintain the perinatal and maternal mortality and morbidity websites, collated the data and produced the tables and figures in this report
- The PMMRC secretariat of the Health Quality & Safety Commission, which includes Debbie Davies and previously Sarah McQuillan Smith and Kirsty Mitchell (the national coordinators of the PMMRC during this time, who ensured the dataset was as complete and accurate as possible and helped prepare this report) and Jo Sorasio who contributed to many aspects of report production
- The members of the PMMRC, who provided advice and guidance for the analysis and determined the recommendations for this report
- The Maternal Mortality Review Working Group, which worked on the maternal mortality chapter
- The Neonatal Encephalopathy Working Group, which worked on the neonatal encephalopathy chapter
- Associate Professor Jason Gurney (Ngāpuhi), Ms Melanie Tarrant, Ms Tania Cornwall, Dr Owen Sinclair (Te Rarawa) and Ms Beatrice Leatham (Ngāti Porou), who provided peer review on an earlier version of the report (Note: This final report does not necessarily reflect their views.)
- The staff at Analytical Services, Ministry of Health, who provided the denominator data.

Perinatal and Maternal Mortality Review Committee

The PMMRC members in 2022 are:

- Mr John Tait (Chair), obstetrician and gynaecologist, Chief Medical Officer, Te Whatu Ora – Health New Zealand Interim District Director Capital, Coast and Hutt Valley
- Dr Rose Elder (Deputy Chair), obstetrician and gynaecologist, Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley district
- Ms Pania Paraku (Ngāti Tamaterā, Ngāti Porou), Ngā Pou Arawhenua member, Friends of Sands member, Wellington Hutt Valley; Programme lead, Digital Strategy; involved in Sleep on Side and Death of a Child projects and the Whetūrangitia website development
- Ms Yvonne Daymond, IT delivery consultant, hapori (community) lived-experience member
- Dr Robin Cronin, midwife and researcher, Te Whatu Ora – Health New Zealand Counties Manukau
- Claire MacDonald, midwifery advisor and midwife, New Zealand College of Midwives | Te Kāreti o ngā Kaiwhakawhānau ki Aotearoa
- Dr Kasey Tawhara (Ngāti Raukawa ki te Tonga, Ngāti Porou, Taranaki, Te Arawa), Ngā Pou Arawhenua member, obstetrician gynaecologist, Te Whatu Ora – Health New Zealand Lakes district; committee member of He Hono Wāhine, Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) and Te Rōpū Whakakaupapa Urutā
- Dr Liza Edmonds (Ngāpuhi, Ngāti Whātua), Ngā Pou Arawhenua member, neonatal paediatrician, Te Whatu Ora – Health New Zealand Southern district, Senior Lecturer Kohatu Centre for Hauora Māori, Division of Health Sciences and Senior Lecturer Dunedin School of Medicine, University of Otago.

A special thanks also to PMMRC Pou Tikanga Mr Denis Grennell (Ngāti Maniopoto), Ngā Pou Arawhenua kaumatua, cultural facilitation, development, coaching and training consultant.

Maternal Mortality Review Working Group

The Maternal Mortality Review Working Group (MMRWG) members in 2022 are:

- Dr Rose Elder (Chair), obstetrician and gynaecologist, Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley district
- Jo McMullan, midwife, Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley district
- Dr Amy Spark, forensic pathologist, Te Whatu Ora – Health New Zealand Te Pae Hauora o Ruahine o Tararua
- Mr John Tait (Chair, PMMRC), obstetrician and gynaecologist, Chief Medical Officer, Te Whatu Ora – Health New Zealand Interim District Director Capital, Coast and Hutt Valley
- Dr Susan Tutty, general practitioner and GP liaison women's health, Te Whatu Ora – Health New Zealand Counties Manukau district
- Dr Lindsay Twiss, perinatal psychiatrist, Te Whatu Ora – Health New Zealand Te Toka Tumai
- Ms Karen Whiterod, specialty clinical nurse, Perinatal Mental Health, Te Uru Pā Harakeke | Healthy Women, Children and Youth, Te Pae Hauora o Ruahine o Tararua | MidCentral
- Brigid Beehan, midwifery advisor, New Zealand College of Midwives | Te Kāreti o ngā Kaiwhakawhānau ki Aotearoa.

Expert advisors who contributed to the work of the Maternal Mortality Review Working Group

- Dr Sue Belgrave, obstetrician and gynaecologist, Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland
- Dr Eileen Bass, obstetric physician, Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley district.

Neonatal Encephalopathy Working Group

The Neonatal Encephalopathy Working Group members in 2022 are:

- Dr Jutta van den Boom (Chair), neonatal paediatrician, Te Whatu Ora – Health New Zealand Waitematā district
- Dr Malcolm Battin (expert advisor), neonatal paediatrician, Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland district
- Dr Kitty Bach, neonatal paediatrician, Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland district
- Dr David Bailey, obstetrician and gynaecologist, Te Whatu Ora – Health New Zealand Te Tai Tokerau district
- Ms Karen Bennington, neonatal nurse practitioner, Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley district
- Dr Robin Cronin, midwife and researcher, Te Whatu Ora – Health New Zealand Counties Manukau
- Julie Richards, midwife, Ara Institute of Canterbury, Te Whatu Ora – Health New Zealand Nelson Marlborough district
- Mr John Tait (Chair), obstetrician and gynaecologist, Chief Medical Officer, Te Whatu Ora – Health New Zealand Interim District Director Capital, Coast and Hutt Valley.

Past Neonatal Encephalopathy Working Group member

- Dr Kristy Wolff, obstetrician and gynaecologist, Te Whatu Ora – Health New Zealand Te Tai Tokerau district.

The PMMRC would also like to acknowledge the following individuals who were committee or working group members during the production of this report.

Past Perinatal and Maternal Mortality Review Committee Members

- Dr Max Berry, neonatologist, University of Otago, Wellington
- Dr Donna Cormack (Kāti Māmoe, Kāi Tahu), senior researcher and lecturer with joint positions at Te Kupenga Hauora Māori, Faculty of Medical and Health Sciences, University of Auckland and Te Rōpū Rangahau Hauora a Eru Pōmare, Department of Public Health, University of Otago, Wellington
- Ms Louise Kuraia (Ngāpuhi, Ngāti Manu, Kōhatu Taka me Ngāi Tai ki Tainui), chief advisor (Māori Crown Relations), Ministry of Health
- Dr Sarah Tout, obstetrician and gynaecologist, Clinical Director Women's Health, Counties Manukau Health.

Past Maternal Mortality Review Working Group Members

- Dr Sarah Wadsworth (previous MMRWG Chair), obstetrician, Te Whatu Ora – Health New Zealand Counties Manukau district
- Dr Anne Hart, anaesthetist, Te Whatu Ora – Health New Zealand Counties Manukau district
- Beatrice Leatham (Ngāti Porou), midwife at Hauora Tairāwhiti; and lecturer at Auckland University of Technology (AUT)
- Dr Rexson Tse, forensic pathologist, previously Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland district.

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Foreword – Dr Dale Bramley | Kupu Takamua – nā Tākuta Dale Bramley

The Health Quality & Safety Commission (the Commission) is pleased to present the fifteenth report of the Perinatal and Maternal Mortality Review Committee (the PMMRC).

As with previous reports from the PMMRC, the content has been difficult to read, and we appreciate how much harder it is, and has been, for families and whānau who personally endure the loss of a loved one. We owe it to them to listen and learn – and to improve.

The whole Commission Board wishes to emphasise the clear lack of improvement over the years highlighted within this report and the ongoing serious systemic issues demonstrated. Many of these deaths are preventable.

On behalf of the Commission Board, I fully support and endorse the recommendations within this report. These recommendations must be prioritised immediately to achieve equity for whānau Māori and groups where inequities persist in both prevention and bereavement care pathways and services.

We are committed to working with Te Whatu Ora – Health New Zealand and Te Aka Whai Ora | Māori Health Authority to drive and enact progress and continued prioritisation of maternity. This requires increased understanding of how we can support the people and organisations working within the system as well as being accountable for implementing and embedding recommendations to eliminate preventable harm.

Investment in women's health, and particularly the health of wāhine Māori, in Aotearoa New Zealand needs fast-tracked prioritisation to enhance the wellbeing of our communities and of society as a whole. The death of a mother or a baby is a devastating loss, and this work to inform efforts to minimise the number of these tragic events needs serious attention.

We know there are clinicians going 'above and beyond' within the work they do. The system, including the Commission, needs to support them to provide the care that would bring better outcomes for our mothers and babies.

I would like to thank the Chair, Mr John Tait, and the PMMRC members for their dedication and determination to improve the quality and safety of maternal and perinatal care.

Also, I wish to acknowledge the dedicated team of people who assisted with the significant amount of work required to prepare this report: the local coordinators across Aotearoa New Zealand who care for our mothers and babies and provide the data; the New Zealand Mortality Review Data Group and the epidemiology team; and the mortality review committees' secretariat staff at the Commission.

My sincere thanks go to you all as you influence system change and improvement across our perinatal and maternity services.

Dr Dale Bramley

Chair, Health Quality & Safety Commission

Chair's Introduction | Te Kupu Whakataki a te Manukura – Mr John Tait

Every year in Aotearoa New Zealand, approximately 650 babies and 10 mothers[1] die in pregnancy or shortly afterwards. I want to say that these deaths have reduced over time, but I am saddened and frustrated to say this is not so.

Since the first Perinatal and Maternal Mortality Review Committee (PMMRC) report was released in 2007, it has been the purpose of the PMMRC to collect information on perinatal deaths to improve knowledge and understanding, with the aim of reducing the number of families who experience the death of a baby.

However, the rates of death have not significantly changed since 2007.The unacceptable disparities and differential access to care and resources continue for the groups that bear the collective name of 'priority populations'. These are the people who the system continues to fail, including Māori, Pacific peoples and Indian families and whānau, mothers under 20 years old and those living in high areas of deprivation. Yet again, it is these families and whānau who experience the worst outcomes in perinatal and maternal mortality compared with New Zealand European.

It is important to also note that, while in 2020 there were no statistically significant differences detected in perinatal and maternal mortality outcomes in the context of the COVID-19 pandemic, infection became much more widespread in the community from 2021. Continued monitoring is imperative.

As health care professionals, government officials and regulatory bodies, we all play a part in this lack of equitable, or even improved, outcomes. Aotearoa New Zealand continues to tolerate a health and welfare system that serves Pākehā better than anyone else, having been built around western values and bio-medical ideals. This report, and the previous 14 PMMRC reports, are evidence of this.

> *The report details a legacy of neglect and indifference to Māori (and Pasifika) in the perinatal system. The system is ignoring the opportunity to prevent large amounts of preventable morbidity and mortality as opposed to just recording it.*
>
> Dr Owen Sinclair, paediatrician

In this, the fifteenth report, we aim to:

- provide epidemiological analysis of perinatal mortality from 2007 to 2020, maternal mortality from 2010 to 2020 and neonatal encephalopathy from 2010 to 2020
- monitor and track trends and disparities to identify areas for improvement
- stimulate discussion around appropriate areas for further research
- provide information on outcomes by year and the appendix containing 2019 tables and figures can be used as a marker in time for future reference
- focus on previous, critical recommendations that must be embedded into policies, protocols, consensus statements, guidelines and practices to reduce these deaths.

The PMMRC recommendations support the reformed health system's aim to create a more equitable, accessible, cohesive and people-centred system. It is imperative that our focus in achieving this is to prioritise our responsibility to Te Tiriti o Waitangi and ensure an overarching emphasis on achieving equity. We believe urgent prioritisation is required to implement the following previous four recommendations to accelerate high-quality, appropriate and equitable care.

Recommendation 1: Regulatory bodies to mandate cultural safety education for all individuals working across all areas of the maternity and neonatal workforce. Culturally safe care is an expectation.

Recommendation 2: Government agencies to address the impact of structural racism and recognise and address the impact of socioeconomic deprivation on perinatal death, specifically on preterm birth, which after congenital abnormality is the leading cause of perinatal death.

[1] While this report uses the terms women, mothers, and maternities, the PMMRC acknowledges the gender diversity of birthing people in Aotearoa New Zealand. We look forward to adopting inclusive language in future reports.

Recommendation 3: Te Whatu Ora – Health New Zealand districts to prioritise the development of evidence-based solutions in consultation with young mothers; maternity services that meet the needs of, and are acceptable to, mothers under 20 years old; and adequate resources for these services.

Recommendation 4: Health practitioners to identify women with risk factors for perinatal related death and work individually and collectively to ensure that care is accessible and appropriate to the needs of these women. Equitable health care is a fundamental right. Risk factors that require particular focus include:

- pre-pregnancy care for known medical diseases, such as diabetes
- access to appropriate antenatal care
- antenatal recognition and management of threatened preterm labour
- following evidence-based recommendations for indications for induction of labour
- advice to women and appropriate management of decreased fetal movements.

I am encouraged to report that since the release of the fourteenth PMMRC annual report in 2021, work on the following recommendations has commenced.

- The introduction of mandatory folate in bread is coming into effect from mid-2023. We expect to see a reduction in perinatal deaths related to congenital anomalies as a direct result of this.
- In November 2021, the Associate Minister of Health Hon Dr Ayesha Verrall announced that work had commenced on a bereavement pathway.[2] Further work is needed to expedite and embed a national bereavement pathway/service to improve access and reduce local inconsistencies in care and services received by parents, particularly for Māori, Pacific peoples and Indian families and whānau and mothers under 20 years old.
- Also, in November the *Maternal Mental Health Service Provision in New Zealand: Stocktake of district health board services* report was released in response to a recommendation made by the PMMRC.[3] The stocktake found that current service delivery is inequitable, with unmet need and gaps in the continuum of care. The next step is to take action on the key findings of the report, including expanding the maternal mental health workforce and strengthening cultural models of care.

On behalf of the PMMRC, I acknowledge those whose lives and deaths are represented in this report and the families and whānau who bear the grief of a death. We will continue to work to prevent others from experiencing the loss that you have experienced.

And finally, to those who provide safe care and support for families and whānau, my biggest and most heartfelt thank you goes to you all. Thanks also to those who enact the principles of Te Tiriti o Waitangi, those who privilege priority groups, those who remain accountable to and advocate for these babies, mothers and families and whānau, those who provide information and knowledge to prevent and support bereavement, those who embrace bicultural and multicultural practices and those who embrace change and work to implement recommendations by the PMMRC. Your continued dedication to this work is essential and invaluable.

Ngā mihi nui ki a koutou katoa.

John Tait

Chair, Perinatal and Maternal Mortality Review Committee

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[2] Verrall A. 26 November 2021. Investment to support maternal mental health. Releases, Beehive.govt.nz. URL: beehive.govt.nz/release/investment-support-maternal-mental-health (accessed 18 October 2022).

[3] Ministry of Health. 2021. *Maternal Mental Health Service Provision in New Zealand: Stocktake of district health board services*. Wellington: Ministry of Health. URL: health.govt.nz/system/files/documents/publications/maternal_mental_health_service_provision_in_new_zealand-19_nov.pdf (accessed 18 October 2022).

Parents, Families, Communities | Ngā Mātua, ngā Whānau me ngā Hapori

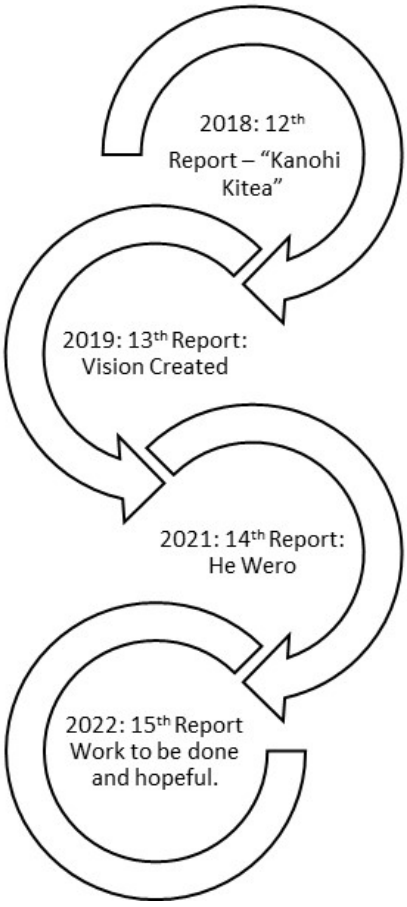
Tuia i runga, tuia i raro, tuia i roto, tuia i waho, tuia te here tangata e pae nei, tēnā koutou, tēnā koutou, tēnā koutou katoa. – *I thread together the forces from above, from below, from within and from what surrounds us, to bind us together and I pay special greetings to you all.*

Ka rere ngā mihi matakuikui ki a koutou katoa kua eke ki tēnei waka e pā ana ki te pūrongorongo o te PMMRC. Nau mai, haere mai. – *Special greetings once again and welcome to our PMMRC report.*

Ko wai au? Ko Pania Paraku ahau, he uri au nō Hauraki, nō Aerana hoki. – *My name is Pania (Lisa) Paraku and I hail from the beautiful Coromandel with ancestry and connection to Northern Ireland.*

It is my pleasure once again, to greet you on behalf of our kaimanaaki/lived experience advocates. This will be my last greeting to you, as my time on this important committee comes to an end. Our advocacy continues with our remaining kaimanaaki and all of our members at the PMMRC.

It is my pleasure to summarise the mahi that has been done during our time together:



Joining the committee in 2017 to serve our pēpi, māmā, whānau and on behalf of our Jasmine Lee, I was grateful to continue the fine work completed by my predecessors Dr Vicki Culling and Linda Penlington in our kaimanaaki roles and my fellow kaimahi Māori Dr Sue Crengle, Dr Donna Cormack and Louise Kuraia.

- In 2018, I trust I represented you when I said that our hope following the loss of our precious pēpi or māmā is 'to be seen, kanohi kitea' – to be listened to, understood and cared for in the way that we need, so that our grief journey can be a little more gentle.
- In 2019, we as the PMMRC created our vision to serve – working together across the system towards zero preventable deaths or harm to all mothers and babies, families and whānau.
- In 2021, in the thick of the COVID pandemic we issued a wero or a challenge to the system and on behalf, I asked – Why? Is this kaupapa not important enough, the health and wellbeing of our precious babies, their mothers? Why are our babies and mothers dying, when in some cases this is preventable?

Why are my people the ones most affected, when we hold the right to equitable outcomes under Te Tiriti? Why are our cousins in the Pacific, our young mothers and our friends from India also those most affected? I then asked – How? How can we engender a collective response that recognises shared space and shared value in order to implement the recommendations of the PMMRC? How do we dismantle and decolonise our system, standing strong in anti-racism and begin to heal the mamae of historical trauma? The answers have been gifted to us, within the Hauora Report, within the Health and Disability System Review, in particular the alternative view, and within our humble recommendations from the PMMRC.

I tēnei wā, in this time of 2022, with the changes to the health system and forming of Te Aka Whai Ora standing together with Te Whatu Ora, along with the changes to our own Health Quality & Safety Commission mortality review committees, we continue the wero that equity must prevail, that anti-racism remains at the heart of all we do, and that decolonisation is realised. The system has heard our collective call and is changing.

And we are hopeful.

The system has taken up our three priority recommendations:

1. Folic acid in breads to be released in 2023 for our hapū māmā.
2. Our plea for a focus on maternal mental health and wellbeing of our hapū māmā, especially our hapū māmā of non-European ethnicities, with Māori, Pacific and Asian women more likely to experience antenatal depression. The system has responded with the approval of a maternal mental health 'stocktake'.
3. Our hope for equitable bereavement care for those of us who must walk the path that no one ever wishes for, bereavement care that is not reliant on where we live, what level of knowledge we hold about the health system in order to gain entry, or our alignment to the care models that are predominantly western. Care that is available when we need it, where we need it and tailored to who we are and how we need it. This is the focus of the National Bereavement Care Pathway/Service project led by Whakarongorau Aotearoa.

And we are grateful.

E hoa mā, he kaupapa nui tēnei. My friends, this is such an important kaupapa for us all. To my fellow PMMRC whānau, e mihi maioha ki a koutou, many thanks for what you do. This is heavy mahi that must be done to achieve equitable outcomes, prevent our babies and mothers dying where we can, and create a gentle path when our loved ones do die. You do this mahi with grace – I acknowledge you and on behalf, I thank you. To my fellow bereaved parents, whānau and families, we stand with you. I thank you for having me and hope I have managed to give voice to the hopes of our bereaved whānau.

Let me close with a whakataukī or proverb from my home and people of Pare Hauraki – 'Ngātini ki te rangi, hōrapa rapa ki te whenua' – 'Let the myriad of stars of the heavens glow over the land'. Jasmine Lee, I know you are one of those stars that glows over us, I do this mahi for you.

E ngā pēpē, moe mai rā. Ki ngā huia kaimanawa kua ngaro ki te pō, moe mai koutou. To our precious ones who have disappeared into the night, rest in peace. I acknowledge our precious babies, our grief and our journey.

Pania Paraku

Neonatal Encephalopathy Infographic Poster Developed by the PMMRC for Health Professionals

English version

Te Reo Māori version

Me pēhea e mōhio rawa ai me te whakamaimoa tonu i te mate roro o ngā pēpi hou

Kia mōhio

Kia kōrero

Kia whakamātao

Ia tau, i ia tau i Aotearoa nei e āhua 67 ngā pēpi hou ka whakatauria ki te mate roro.
Ina kore e whakamaimoatia i muri tata tonu mai ka huri hei mate roro pēpi hou me te aha ka pērā tonutia mō ake tonu atu.

Ko te rongoa pai rawa atu ko te whakamātao i muri tata tonu mai.

1 Kia mōhio

Te mate roro pēpi hou:

- kia whakaora i te pēpi i tōna whānautanga mai
- he iti te kaute Apgar i te whānautanga mai
- he tino kamakama, tino ngoikore rānei, tē ngote

NEWS (newborn early warning score):

- hau pūkoro tinana/waikawa waiū.

2 Kia kōrero

He mea tino nui te whakamōhio atu.
Kōrerotia tō āwangawanga ki tētahi hoa.
whakakaha ake mā te kōrero ki te rōpū pēpi hou.
Whakaritea he whakawhitinga mō te taurima tonu.
Hoatu ki te whānau he whiringa kia aromatawai i te whenua.

3 Whakamātao

KAUA E TAKAROA

Me tīmata te mahi whakamātao roro nō roto mai i te ono haora whai muri i te whānautanga mai.

KIA WAWE TE WHAKAMĀTAO.

WITHIN 6 HOURS

0422-0.2

Perinatal and Maternal Mortality Review Committee

Health Quality & Safety Commission New Zealand

Te Kāwanatanga o Aotearoa
New Zealand Government

Key Findings from the PMMRC's Fifteenth Annual Report | Ngā Kitenga Matua Mai i te Pūrongo ā-tau Tekau mā Rima o te PMMRC

Ethnic, deprivation and age inequities persist in all findings.

The health system continues to fail:

- Māori
- Pacific peoples
- Indian populations
- those aged under 20 years
- those living in areas of high deprivation,

all of whom experience worse perinatal outcomes than those of New Zealand European ethnicity.

Neonatal encephalopathy rates remain static with no significant improvement. While it is recommended that all babies with moderate neonatal encephalopathy receive magnetic resonance imaging (MRI), this is not being achieved.

Wāhine Māori, Pacific women and women in higher deprivation areas suffer a disproportionate burden of maternal mortality.

Increased risk of maternal mortality is correlated with women aged 40 years and over.

Wāhine Māori were 2.91 times more likely to die by suicide as a direct result of maternal mortality than women of New Zealand European ethnicity in the 2006–2022 period.

Executive Summary | Whakarāpopototanga Matua

The vision of the Perinatal and Maternal Mortality Review Committee (PMMRC) is to work with mothers, families, whānau, hapū and iwi providers, health professionals, policymakers and researchers to ensure that all women in Aotearoa New Zealand have equitable access to high-quality health care that meets their needs.

This fifteenth annual report outlines some of the trends in mortality in babies and mothers and serious morbidity from neonatal encephalopathy (NE). Deaths are usually multifactorial in nature, with more than one thing usually causing a death.

The Family Violence Death Review Committee speaks in its seventh report about the legacy of colonisation and how this is a significant factor in the context of which these deaths occur in Aotearoa New Zealand, stating, '… the Committee has drawn attention to the legacy of colonisation, trauma and inadequate service responses that has resulted in layers of social entrapment, erroneously placing the responsibility on women for finding safety for themselves and their children'.[4] The PMMRC also acknowledges this legacy impact on whānau whose data are contained within this report.

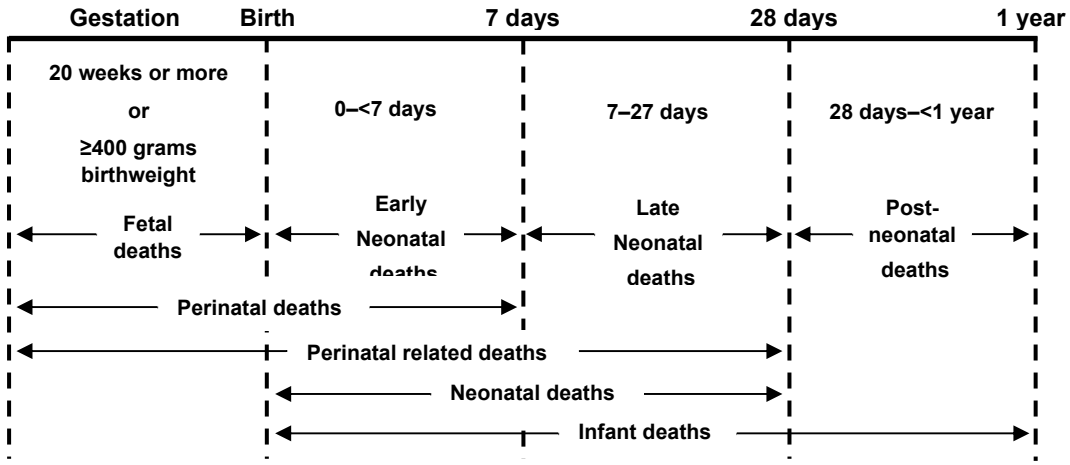
The aim of our work is to monitor trends and look at systems issues that could be modified to prevent future deaths.

This fifteenth report contains data up to and including 2020, with commentary, and an appendix (A) of data analysis up to and including 2019, without commentary.

The report takes a 'Year A' format. In 2020, the PMMRC approved the adoption of Year A and Year B report formats for use in future PMMRC annual reporting. Both Year A and B formats report key summary data on perinatal and neonatal mortality year to year, but each format has a different focus. The overall format was streamlined to improve flow and ease of reading but maintains content by appending some tables and figures.

Recurring themes in perinatal and maternal mortality show the disproportionate impact on Māori, Pacific and Indian women, those under 20 years old and the effects of increasingly severe socioeconomic deprivation on these outcomes.

Definitions Used by the PMMRC – Perinatal Related and Infant Deaths



(Adapted from *Fetal and Infant Deaths 2003 & 2004*[5] and *Fetal and Infant Deaths 2006*[6].)

[4] Family Violence and Death Review Committee. 2013. *Seventh Report: A duty to care – Me manaaki te tangata*. Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/FVDRC/Publications-resources/Seventh-report-transcripts/FVDRC-seventh-report-web.pdf (accessed 4 November 2022).

[5] New Zealand Health Information Service. 2007. *Fetal and Infant Deaths 2003 & 2004*. Wellington: Ministry of Health. URL: health.govt.nz/system/files/documents/publications/fetal200304.pdf (accessed 18 October 2022).

[6] Ministry of Health. 2010. *Fetal and Infant Deaths 2006*. Wellington: Ministry of Health. URL: health.govt.nz/system/files/documents/publications/fetal-and-infant-deaths-2006.pdf (accessed 18 October 2022).

Perinatal Mortality

The PMMRC has collected data since 2007. Over this time, the overall perinatal related mortality rate (which includes both fetal and neonatal mortalities) has not significantly decreased. There has been a reduction in the fetal death rate,[7] which is due to a significant decrease in the rate of stillbirths.[8] Overall rates of termination of pregnancy and neonatal deaths have not changed significantly over this period.

Whilst perinatal related mortality rates have reduced for babies with mothers of Indian ethnicity over the period 2011–2020, no other perinatal related mortality ethnicity indices have improved, and there are worse outcomes for babies of Māori and Pacific mothers compared with those of New Zealand European mothers, indicating these inequities are yet to be addressed.

It is also evident that socioeconomic deprivation is associated with worse perinatal outcomes. Mothers from New Zealand Index of Deprivation (NZDep) quintile 5 (most deprived) areas have higher perinatal mortality rates for almost all causes compared with babies born to mothers living in quintile 1 (least deprived) areas. Over the period 2016–2020, the association of deprivation with perinatal mortality rates has become even more marked.

Women aged under 20 years of age experienced the highest rate of neonatal death, at a rate of 5.46 deaths per 1000 live births, compared with an average rate of 2.72 deaths per 1000 live births for all maternal age groups.

Neonatal Encephalopathy

Neonatal encephalopathy (NE) is a clinically defined syndrome of disturbed neurological function within the first week after birth in an infant born after 35 weeks gestation.

The PMMRC collects data on babies who present with moderate or severe NE in the first seven days after birth. Data have been collected on babies with NE from 37 weeks gestation onwards since 2010 and have included 35- and 36-weeks gestations from 2016.[9]

Over the period 2016–2020, including gestations from 35 weeks, the rate of NE cases per 1000 births varied from year to year. However, there has been no statistically significant trend in either direction, for either 2010–2018 for ≥37 weeks gestation or 2016–2020 for ≥35 weeks gestation.[10] Therefore, while rates have not significantly worsened, they have not improved either.

No ethnicity group reached a statistically significant difference, but again Other European mothers continue to have the lowest rates. NE rates varied by NZDep quintile. Rates of NE were higher at 41 weeks gestation. However, included for the first time, rates of NE were highest in babies born at 35–36 weeks gestation. Although the PMMRC has previously recommended that all babies with moderate and severe NE receive an MRI scan,[11] about 12 percent of babies with moderate NE did not receive an MRI scan in 2016–2020.

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[7] Regression for trend (95% confidence intervals) -0.062 (-0.118, -0.006), p<0.05

[8] Regression for trend (95% confidence intervals) -0.090 (-0.129, -0.031), p<0.01.

[9] American College of Obstetricians and Gynecologists' Task Force on Neonatal Encephalopathy. 2014. Executive summary: Neonatal encephalopathy and neurologic outcome, second edition. Report of the American College of Obstetricians and Gynecologists' Task Force on Neonatal Encephalopathy. *Obstetrics & Gynecology* 123(4): 896–901. DOI: 10.1097/01.AOG.0000445580.65983.d2 (accessed 7 November 2022).

[10] Regression for trend 2016–2020=0.089 (95% CI -0.007, 0.185); 2010–2020=-0.11 (95%CI -0.42-0.020)

[11] PMMRC. 2013. *Seventh Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2011*. Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/PMMRC/Publications-resources/Seventh-PMMRC-Report-FINAL-June-2013.pdf (accessed 8 November 2022).

Maternal Mortality

Maternal death is the death of a woman while pregnant or within 42 days of the end of pregnancy (miscarriage, termination[12] or birth), irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Over the period 2006–2020, there were 76 direct maternal deaths and 57 indirect maternal deaths recorded. Suicide was the largest single cause of maternal death in Aotearoa New Zealand. Cardiac and neurological complications resulting in indirect maternal deaths were the second most common causes of mortality.

A maternal age of 40 years or over was associated with the highest risk of maternal death of all age groups. Wāhine Māori and Pacific women had significantly higher rates of deaths per 100,000 maternities than New Zealand European women. There was a general pattern of increasing mortality with increasing deprivation.

Death by suicide continues to disproportionately affect wāhine Māori. Over the period 2006–2020, wāhine Māori were 2.91 times more likely to die by suicide than women of New Zealand European ethnicity; with wāhine Māori having both the highest number of deaths and highest rate of death due to suicide over this period. Prevention of maternal suicide requires not only individual interventions but also a systems-level response; addressing the wider political and social systems that create the structural determinants of health – these include poverty, housing, employment and institutional racism.[13,14]

COVID-19

The continuing COVID-19 outbreak has impacted on maternity care in a number of ways. There have been, and continue to be, difficulties in health care access across the health and disability sector. Whānau have not always been able to attend hospital for their births and the maternity sector has been challenged with caring for women with recommendations of staying out of hospital as much as possible.

While in 2020 there were no statistically significant differences detected in perinatal and maternal mortality outcomes, monitoring will continue as COVID-19 infection became much more widespread in the community from 2021.

[12] Termination of pregnancy is the interruption of an ongoing pregnancy (whether the baby was stillborn or live born). This report only includes termination of pregnancy from 20 weeks gestation.

[13] Ngā Pou Arawhenua, Child and Youth Mortality Review Committee, Suicide Mortality Review Committee. 2020. *The Mauri – the Life Force*. Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/SuMRC/Publications-resources/TeMauriTheLifeForce_final.pdf (accessed 29 April 2022).

[14] Dawson P, Jaye C, Gauld R, et al. 2019. Barriers to equitable maternal health in Aotearoa New Zealand: an integrative review. *International Journal for Equity in Health* 18: 168.

Methods | Te Tikanga

See also the Methods and Definitions for Perinatal and Maternal Mortality Review Committee Reporting document at www.hqsc.govt.nz/resources/resource-library/fifteenth-annual-report-of-the-perinatal-and-maternal-mortality-review-committee-reporting-mortality-and-morbidity-2020.

Definitions Used by the PMMRC

Fetal death is the death of a fetus at 20 weeks gestation or beyond (≥20 weeks) or weighing at least 400g if gestation is unknown. Fetal death includes stillbirth and termination of pregnancy.

Maternal death is the death of a woman while pregnant or within 42 days of the end of pregnancy (miscarriage, termination or birth), irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management. It does not include accidental or incidental causes of death of a pregnant woman.

Maternities are all live births and all fetal deaths at 20 weeks gestation or beyond or weighing at least 400g if gestation is unknown. The maternal mortality ratio is calculated per 100,000 maternities.

Neonatal death is the death of any baby showing signs of life at 20 weeks gestation or beyond, or weighing at least 400g if gestation is unknown, that occurs up until midnight of the 27th day of life. **Early neonatal death** is a death that occurs up until midnight on the sixth day of life. **Late neonatal death** is a death that occurs between the seventh day and midnight of the 27th day of life.

Neonatal encephalopathy (NE) is a clinically defined syndrome of disturbed neurological function within the first week of life, manifested by difficulty in initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness and often seizures.

Perinatal mortality is fetal and early neonatal death from 20 weeks gestation (or weighing at least 400g if gestation is unknown) until midnight of the sixth day of life.

Perinatal related mortality is fetal deaths (including terminations of pregnancy and stillbirths) and neonatal deaths (up to midnight of the 27th day of life) per 1000 total babies born at 20 weeks gestation or beyond and weighing at least 400g if gestation was unknown.

Termination of pregnancy is the interruption of an ongoing pregnancy (whether the baby was stillborn or live born). This report only includes termination of pregnancy from 20 weeks gestation.

Ethnic Comparisons

Throughout this report, comparisons are made between prioritised ethnic groups. At times, outcomes for babies of wāhine Māori are compared with outcomes for babies of New Zealand European women. The Treaty of Waitangi underlies the health sector's obligations to Māori and Māori rights to monitor the Crown to ensure that these responsibilities are met and that there are equitable outcomes for Māori in the health sector. Treaty-based Māori rights are augmented by the broader rights of women and children to equitable outcomes regardless of their ethnicity. The presentation of comparisons between different ethnic groups is not to provide commentary on the deficits of any particular ethnic group but rather to highlight the deficits of a society that creates, maintains and tolerates these differences.

The National Maternity Collection

The National Maternity Collection (MAT) is based on the two sources of:

- primary maternity services provided under section 88 of the New Zealand Public Health and Disability Act 2000, which is sourced from lead maternity carer (LMC) claims for payment

- the National Minimum Dataset (NMDS), which contains information on inpatient and day patient health event data for the pregnancy, birth and postnatal period for the mother and baby.

While MAT should have a record of most births that occur in Aotearoa New Zealand, either through the NMDS for those who give birth in hospital or through LMC claims, antenatal data are not always reliably uploaded for women who are receiving care from providers other than LMC midwives, general practitioners (GPs) or obstetricians. In particular, women whose antenatal care is provided through their district health board (DHB) may not have their complete antenatal data entered into MAT.

Many DHBs, such as Counties Manukau, routinely provide primary antenatal care and, due to LMC workforce issues, this is becoming more common nationally. Due to technical issues, complete data from DHBs is not always uploaded into MAT, even when they are provided. The fourteenth report of the PMMRC presented an approximation of the effect of this with regard to smoking status and body mass index (BMI) and showed the substantial differences in those women whose antenatal records are in MAT compared with those whose records are not.[15]

Perinatal Society of Australia and New Zealand Death Classifications

All perinatal deaths are classified in accordance with either the Perinatal Society of Australia and New Zealand (PSANZ) perinatal death classification (PDC) or the neonatal death classification (NDC). In 2017, PSANZ revised these death classification systems to include new subcategories,[16] which were subsequently implemented in Aotearoa New Zealand in 2018.

The deaths presented in this report have been classified using the revised 2017 version of PSANZ death classification systems. Deaths from 1 January 2018 have been classified according to the 2017 version. Deaths before 2018, which were originally classified using the 2007 version, have been reclassified according to the 2017 revision.

Statistical Analysis

Data are largely presented descriptively, showing counts, proportions and rates.

Simple linear regression analysis has been used to investigate linear change across time. Autocorrelation and normality of the residuals were investigated for all models.

From each model, the change across time is estimated along with the 95 percent confidence interval (CI). A positive slope indicates an increase in rate during that period; a negative slope indicates a decrease over time. In tables, a single asterisk [*] indicates a p-value of <0.05, and a double asterisk [**] indicates a p-value <0.01.

[15] PMMRC. 2021. *Te Pūrongo ā-Tau Tekau mā Whā te Komiti Arotake Mate Pēpi, Mate Whaea Hoki | Fourteenth Annual Report of the Perinatal and Maternal Mortality Review Committee: Te tuku pūrongo mō te mate me te whakamate 2018 | Reporting mortality and morbidity 2021.* Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/PMMRC/Publications-resources/report-pmmrc-14th-v2.pdf (accessed 19 October 2022), p 20.

[16] A comparison of the PSANZ death classification systems can be found on the Stillbirth and Neonatal Death Alliance (PSANZ-SANDA) website. URL: sanda.psanz.com.au/assets/Uploads/Appendix-U-Changes-in-this-version-of-the-classifications.pdf (accessed 13 May 2020).

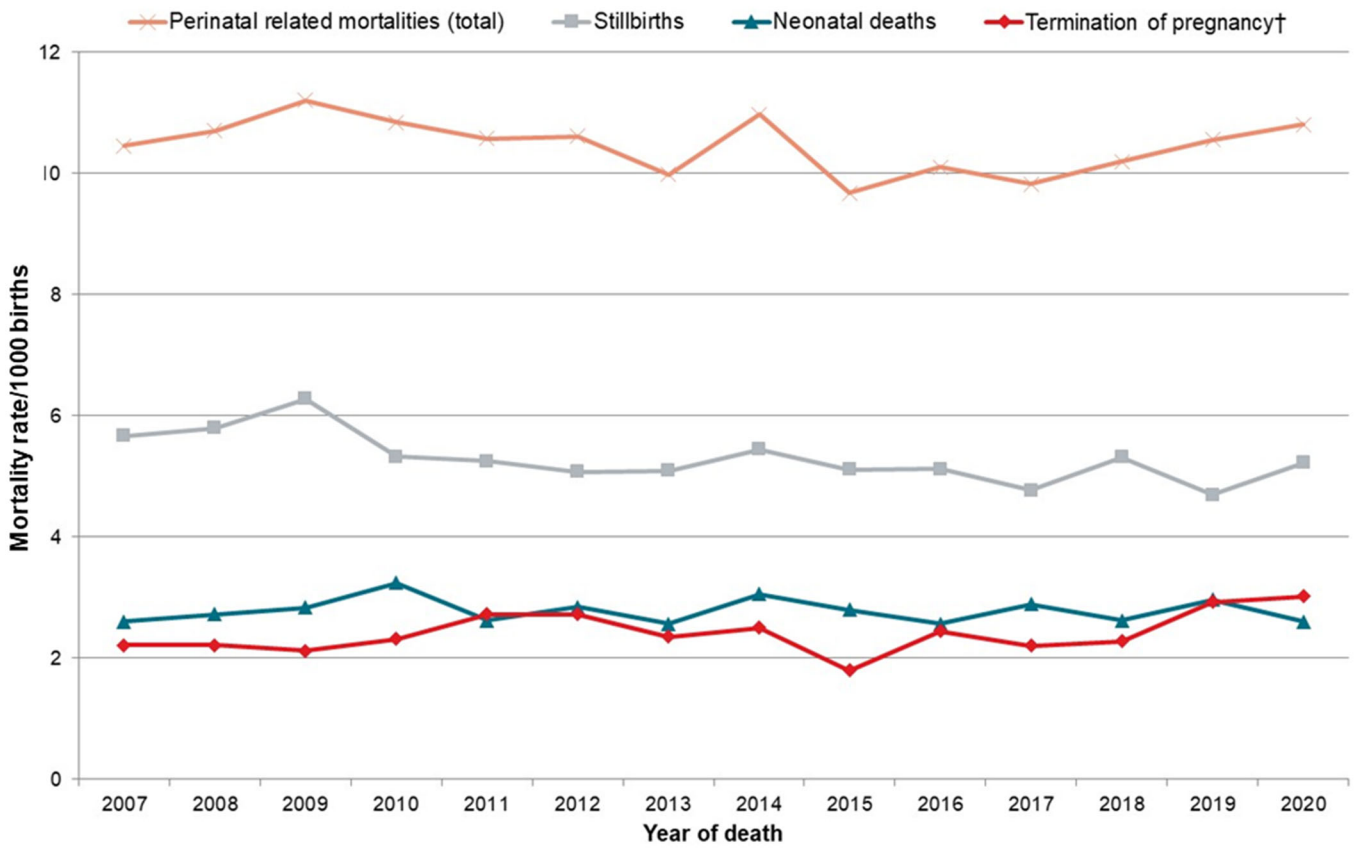
Perinatal Mortality | Te Mate Pēpi

Introduction

The PMMRC has collected data since 2007. Over the period 2007–2020, the overall perinatal related mortality rate (which includes both fetal and neonatal mortalities) did not significantly decrease (Figure 3.1). There was a reduction in the fetal death rate,[17] which is due to a significant decrease in the rate of stillbirths.[18] Overall, rates of termination of pregnancy and neonatal deaths did not change significantly over this period (Figure 3.1). The rates of perinatal deaths from 2007 to 2020 are shown in Table 3.1.

Ethnic, deprivation and age inequities persist. The health system continues to fail babies of Māori, Pacific and Indian mothers, mothers aged under 20 years and those living in areas of high deprivation, all of whom experience worse perinatal outcomes.

Figure 3.1: Perinatal related mortality rates (per 1000 births) using Aotearoa New Zealand definitions, 2007–2020



† In this report, 'Termination of pregnancy' refers to the interruption of an ongoing pregnancy from 20 weeks gestation onwards.

Sources: Numerator: PMMRC's perinatal data extract 2007–2020; Denominator: MAT births 2007–2020.

Over the period 2016–2020, when analysed by prioritised ethnic group, differences in perinatal related mortality rates were evident. There were significantly higher perinatal related mortality rates per 1000 births for babies with mothers of Pacific (12.40) or Indian (13.66) ethnicity, when compared with babies of New Zealand European mothers (10.36). Higher rates of stillbirths occurred in babies of Pacific and Indian mothers, compared with those born from New Zealand European mothers. Rates of neonatal deaths per 1000 births were higher for babies with mothers of Māori (3.82) and Pacific ethnicity (3.98), compared with those born to New Zealand European mothers (2.36).

[17] Regression for trend (95% confidence intervals) -0.062 (-0.118, -0.006), $p<0.05$.

[18] Regression for trend (95% confidence intervals) -0.090 (-0.129, -0.031), $p<0.01$.

Whilst there was a reduction in perinatal related mortality rates for babies with mothers of Indian ethnicity over the period 2011–2020, no other perinatal related mortality ethnicity indices improved, and there were worse outcomes for babies of Māori and Pacific mothers compared with those of New Zealand European, suggesting that these inequities are yet to be addressed.

It is also evident that socioeconomic deprivation is associated with worse perinatal outcomes. Mothers from New Zealand Index of Deprivation (NZDep) quintile 5 (most deprived) areas had higher perinatal mortality rates for almost all causes, compared with mothers living in quintile 1 (least deprived) areas. Perinatal related mortality rates increased with worsening quintiles of deprivation; and this was most evident in deaths due to spontaneous preterm labour or rupture of membranes. Over the period 2016–2020, the association of deprivation with perinatal mortality rates became even more marked.

Women aged under 20 years of age experienced the highest rate of neonatal death, at a rate of 5.46 deaths per 1000 births, compared with an average rate of 2.72 per 1000 live births for all maternal age groups.

Over the same period (2007–2020), using the international definition, there was evidence of a decrease in the rates of fetal deaths, stillbirths, neonatal deaths, perinatal mortalities and perinatal related mortalities. The mortality rates using international definitions for the period 2007–2020 are presented in Table 3.13 (appended).

Table 3.1: Summary of Aotearoa New Zealand perinatal related mortality rates using Aotearoa New Zealand definition (≥20 weeks or ≥400g if gestation is unknown), 2007–2020

	n													
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Total births	65,210	65,628	65,202	65,453	63,250	63,294	60,143	60,082	59,791	60,621	60,492	59,315	60,607	59,444
Fetal deaths (terminations of pregnancy and stillbirths)†	513	525	547	499	504	493	447	477	412	458	421	450	461	489
Terminations of pregnancy	144	145	138	151	172	172	141	150	107	148	133	135	177	179
Stillbirths	369	380	409	348	332	321	306	327	305	310	288	315	284	310
Early neonatal deaths <7 days	134	134	137	165	139	142	122	150	131	123	138	116	143	117
Late neonatal deaths 7–27 days	34	43	46	45	25	36	31	32	35	31	35	38	35	36
Neonatal deaths <28 days#	168	177	183	210	164	178	153	182	166	154	173	154	178	153
Perinatal mortalities+	647	659	684	664	643	635	569	627	543	581	559	566	604	606
Perinatal related mortalities^	681	702	730	709	668	671	600	659	578	612	594	604	639	642
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	463	482	513	464	444	441	414	447	397	413	405	414	430	449
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	483	510	544	495	460	463	432	466	415	434	430	440	453	474

	Rate														**2007–2020 Regression for trend (95% CI)**
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Total births															
Fetal deaths (terminations of pregnancy and stillbirths)†	7.87	8.00	8.39	7.62	7.97	7.79	7.43	7.94	6.89	7.56	6.96	7.59	7.61	8.23	-0.035 (-0.094, 0.025)
Terminations of pregnancy	2.21	2.21	2.12	2.31	2.72	2.72	2.34	2.50	1.79	2.44	2.20	2.28	2.92	3.01	0.033 (-0.013, 0.079)
Stillbirths	5.66	5.79	6.27	5.32	5.25	5.07	5.09	5.44	5.10	5.11	4.76	5.31	4.69	5.21	-0.067 ** (-0.112, -0.023)
Early neonatal deaths <7 days															
Late neonatal deaths 7–27 days															
Neonatal deaths <28 days#	2.60	2.72	2.83	3.23	2.61	2.83	2.56	3.05	2.80	2.56	2.88	2.62	2.96	2.60	-0.004 (-0.034, 0.027)
Perinatal mortalities+	9.92	10.04	10.49	10.14	10.17	10.03	9.46	10.44	9.08	9.58	9.24	9.54	9.97	10.19	-0.037 (-0.098, 0.023)
Perinatal related mortalities^	10.44	10.70	11.20	10.83	10.56	10.60	9.98	10.97	9.67	10.10	9.82	10.18	10.54	10.80	-0.038 (-0.101, 0.025)
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	7.10	7.34	7.87	7.09	7.02	6.97	6.88	7.44	6.64	6.81	6.70	6.98	7.09	7.55	-0.020 (-0.070, 0.030)
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	7.41	7.77	8.34	7.56	7.27	7.32	7.18	7.76	6.94	7.16	7.11	7.42	7.47	7.97	-0.019 (-0.074, 0.037)

** p-value <0.01.

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

• Lethal and terminated fetal abnormalities are all perinatal related deaths with Perinatal Society of Australia and New Zealand perinatal death classification (PSANZ-PDC) of congenital anomaly, and neonatal deaths with PSANZ neonatal death classification (PSANZ-NDC) of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract 2007–2020; Denominator: MAT births 2007–2020.

The classification of perinatal deaths is according to the 2017 revision of the Perinatal Society of Australia and New Zealand (PSANZ) perinatal death classification (PDC) or the PSANZ neonatal death classification (NDC).[19]

The leading causes of perinatal related death in 2020 were congenital anomalies, followed by unexplained antepartum fetal death (Table 3.2 and Table 3.3).

Table 3.2: Perinatal related deaths by perinatal death classification, 2020

Perinatal death classification (PSANZ-PDC)	Fetal deaths				Neonatal deaths		Perinatal related deaths (total)	
	Termination of pregnancy		Stillbirths					
	n=179		n=310		n=153		n=642	
	n	%	n	%	n	%	n	%
Congenital anomaly	112	62.6	19	6.1	34	22.2	165	25.7
Perinatal infection	4	2.2	7	2.3	3	2.0	14	2.2
Hypertension	3	1.7	20	6.5	3	2.0	26	4.0
Antepartum haemorrhage	3	1.7	37	11.9	27	17.6	67	10.4
Maternal conditions	39	21.8	13	4.2	5	3.3	57	8.9
Complications of multiple pregnancy	3	1.7	11	3.5	8	5.2	22	3.4
Specific perinatal conditions	3	1.7	26	8.4	4	2.6	33	5.1
Hypoxic peripartum death	-	-	11	3.5	5	3.3	16	2.5
Placental dysfunction or causative placental pathology	<3	x	31	10.0	<3	x	34	5.3
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	10	5.6	31	10.0	54	35.3	95	14.8
Unexplained antepartum fetal death	-	-	104	33.5	-	-	104	16.2
Neonatal death without obstetric antecedent	-	-	-	-	9	5.9	9	1.4

'x' indicates percentages have been suppressed due to small numbers.

Source: PMMRC's perinatal data extract 2020.

The causes of perinatal related death over the period 2011–2020 are presented in Table 3.3. The most frequent cause of death over this period was congenital anomalies, and the rate has not changed over time. The rate for unexplained antepartum fetal deaths increased significantly to 1.75 deaths per 1000 births,[20] driven by an increase in the rate of stillbirths due to unexplained antepartum death[21] (Table 3.3).

Perinatal related mortality rates for other causes had not substantially changed since 2011.

Fetal Deaths

In 2020, there were 489 fetal deaths, comprising 179 terminations of pregnancy (from 20 weeks gestation) and 310 stillbirths (Table 3.3).

Stillbirths

In 2020, just over one-third of stillbirths were classified as unexplained antepartum fetal death (Table 3.2). Antepartum haemorrhage was the next most recorded cause of stillbirth, resulting in 11.9 percent of stillbirths. Ten percent of stillbirths were classified as caused by placental dysfunction or causative

[19] For a description of the changes to the PSANZ death classification systems, see PSANZ. 2018. Appendix U: Changes to PSANZ perinatal death classification and PSANZ neonatal death classification. In *Perinatal Society of Australia and New Zealand Clinical Practice Guideline for Care Around Stillbirth and Neonatal Death, Third Edition.* Brisbane: Stillbirth and Neonatal Death Alliance (PSANZ-SANDA). URL: sanda.psanz.com.au/assets/Uploads/Appendix-U-Changes-in-this-version-of-the-classifications.pdf (accessed 3 May 2022).

[20] Regression for trend (95% confidence intervals) 0.041 (0.003, 0.078), p<0.05.

[21] Regression for trend (95% confidence intervals) 0.042 (0.003, 0.081), p<0.05.

placental pathology, and 10 percent were due to spontaneous preterm labour or rupture of membranes (Table 3.2).

When examined over the period 2011–2020, the most frequently classified cause of death for stillbirths was unexplained antepartum death (Table 3.3). There is evidence of an increase in the rate of unexplained antepartum death resulting in stillbirths over this time.[22]

In 2020, there were 11 stillbirths due to hypoxic peripartum deaths, which is higher than recorded in previous years, although not significantly (Table 3.2 and Table 3.3). Further analysis did not detect any association of these deaths with DHB of residence, place of birth, size for gestational age, birthweight, maternal ethnicity, BMI or smoking status, or NZDep quintile (data not shown).

There have not been any significant changes in the rates of stillbirth with any other classification since 2011 (Table 3.3).

[22] Regression for trend (95% confidence intervals) 0.042 (0.003, 0.081), $p<0.05$.

Table 3.3: Perinatal death classification specific stillbirth rates (per 1000 births), 2011–2020

Perinatal death classification (PSANZ-PDC)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2011–2020 Regression for trend (95% CI)
	N=63,250		N=63,294		N=60,143		N=60,082		N=59,791		N=60,621		N=60,492		N=59,315		N=60,607		N=59,444		
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	
Congenital anomaly	28	0.44	38	0.60	24	0.40	35	0.58	30	0.50	31	0.51	29	0.48	34	0.57	20	0.33	19	0.32	-0.015 (-0.039, 0.010)
Perinatal infection	10	0.16	9	0.14	10	0.17	12	0.20	12	0.20	10	0.16	17	0.28	11	0.19	12	0.20	7	0.12	0.002 (-0.010, 0.014)
Hypertension	12	0.19	9	0.14	8	0.13	9	0.15	16	0.27	8	0.13	10	0.17	10	0.17	9	0.15	20	0.34	0.009 (-0.008, 0.025)
Antepartum haemorrhage	48	0.76	31	0.49	44	0.73	33	0.55	46	0.77	38	0.63	37	0.61	29	0.49	21	0.35	37	0.62	-0.021 (-0.053, 0.012)
Maternal conditions	13	0.21	19	0.30	22	0.37	21	0.35	22	0.37	17	0.28	12	0.20	23	0.39	10	0.16	13	0.22	-0.008 (-0.029, 0.014)
Complications of multiple pregnancy	16	0.25	15	0.24	21	0.35	12	0.20	7	0.12	18	0.30	16	0.26	23	0.39	11	0.18	11	0.19	-0.003 (-0.025, 0.019)
Specific perinatal conditions	31	0.49	21	0.33	12	0.20	23	0.38	25	0.42	29	0.48	25	0.41	18	0.30	19	0.31	26	0.44	0.000 (-0.024, 0.025)
Hypoxic peripartum death	9	0.14	11	0.17	3	0.05	7	0.12	9	0.15	4	0.07	4	0.07	<3	s	<3	s	11	0.19	-0.006 (-0.022, 0.010)
Placental dysfunction or causative placental pathology	51	0.81	54	0.85	53	0.88	44	0.73	39	0.65	47	0.78	48	0.79	49	0.83	44	0.73	31	0.52	-0.021 (-0.044, 0.002)
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	36	0.57	40	0.63	28	0.47	52	0.87	24	0.40	31	0.51	21	0.35	40	0.67	39	0.64	31	0.52	-0.005 (-0.045, 0.036)
Unexplained antepartum fetal death	78	1.23	74	1.17	81	1.35	79	1.31	75	1.25	77	1.27	69	1.14	77	1.30	97	1.60	104	1.75	0.042 * (0.003, 0.081)
Neonatal death without obstetric antecedent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* p-value <0.05.

's' indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract, stillbirths only, 2011–2020; Denominator: MAT births 2011–2020.

Perinatal Related Mortality by Prioritised Ethnic Group

Perinatal related mortality over the period 2016–2020 differed significantly by prioritised ethnic group; these patterns were similar when analysed by maternal (Figure 3.2 below and Table 3.16 appended) or baby's (Figure 3.3 below and Table 3.17 appended) prioritised ethnicity. Of note, 3460 babies (1.15 percent) did not have ethnicity data recorded over the period 2016–2020, and paternal ethnicity data were not collected. For this reason, maternal prioritised ethnic grouping has been used to guide interpretation.

Mothers of Indian ethnicity experienced the highest rates of perinatal related deaths, statistically significantly higher than all other ethnic groups except mothers of Pacific ethnicity, who also have higher rates than New Zealand European mothers. The underlying causes of these inequities is the subject of ongoing research in Aotearoa New Zealand.[23,24] There were significantly fewer terminations of pregnancy in mothers of Māori or Pacific ethnicity compared with mothers of New Zealand European or Indian ethnicity.

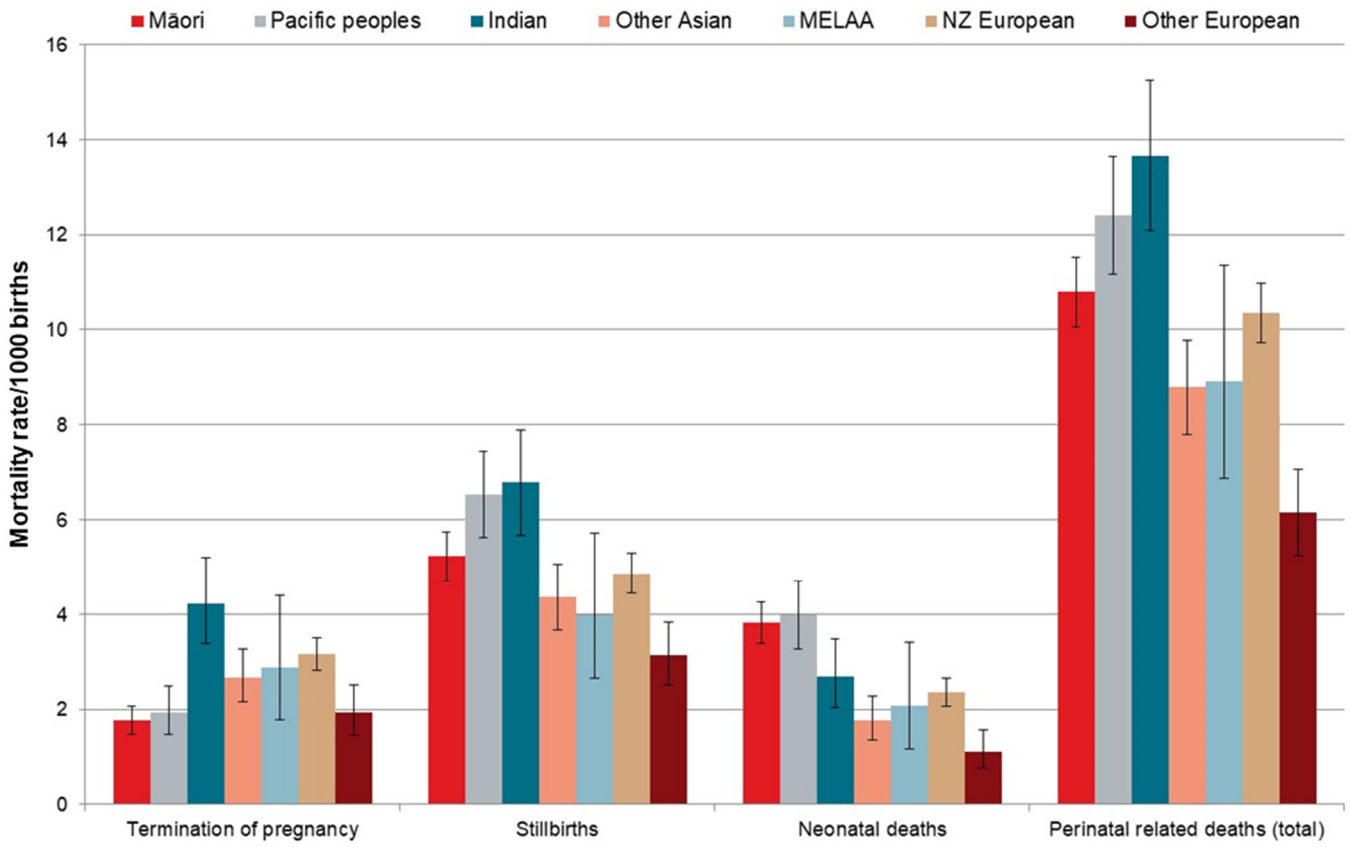
Over this period, higher rates of stillbirths occurred for babies of Pacific and Indian mothers, compared with babies of New Zealand European mothers. Similarly higher rates of neonatal deaths occurred in babies born to mothers of Māori and Pacific ethnicity, compared with those born to New Zealand European mothers.

These differences in mortality rates by prioritised ethnic group demonstrate persisting inequities in outcomes.

[23] Hickey S, Roe Y, Ireland S, et al. 2021. A call for action that cannot go to voicemail: research activism to urgently improve Indigenous perinatal health and wellbeing. *Women and Birth* 34(4): 303–5.

[24] Dawson P, Jaye C, Gauld R, et al. 2019. Barriers to equitable maternal health in Aotearoa New Zealand: an integrative review. *International Journal for Equity in Health* 18: 168.

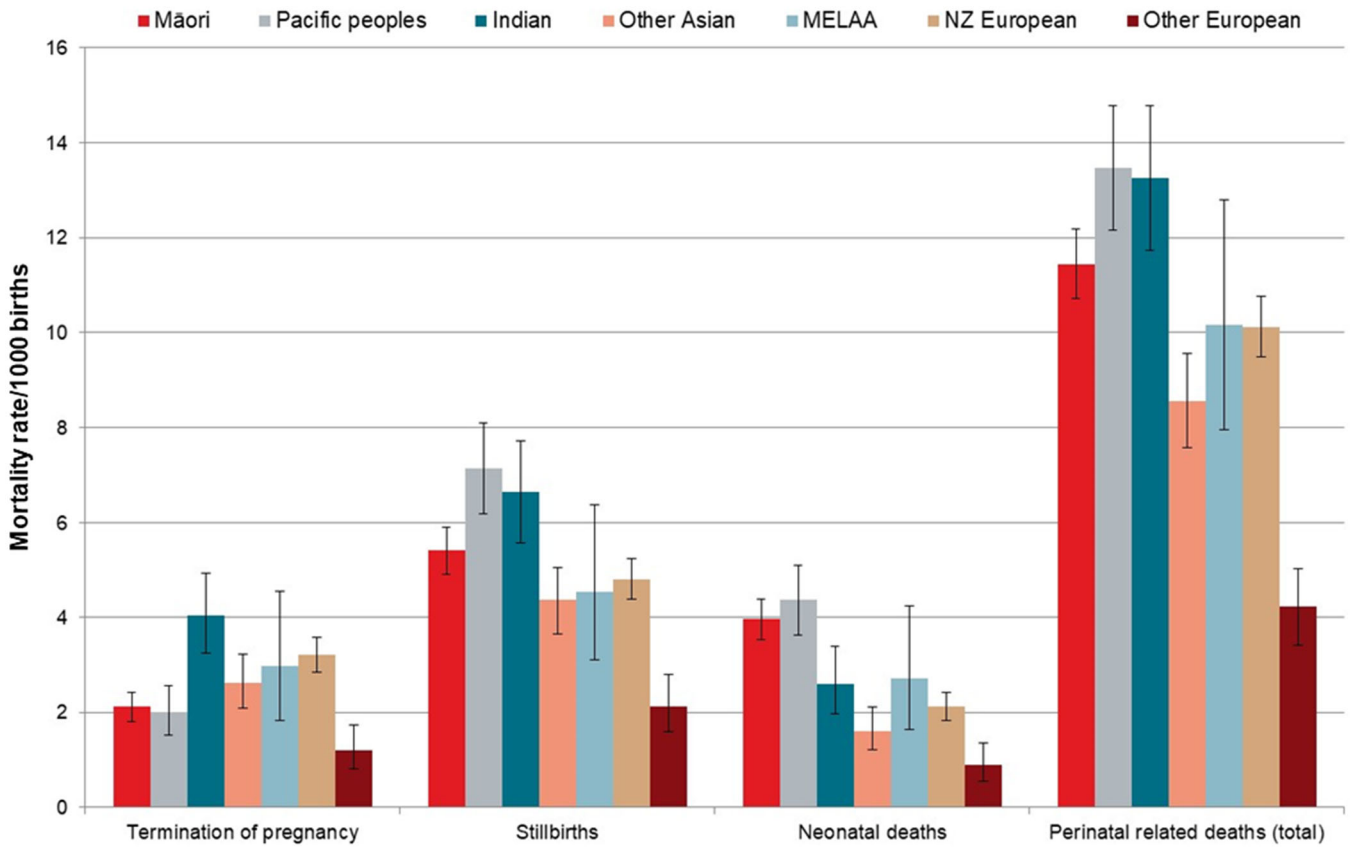
Figure 3.2: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal prioritised ethnicity, 2016–2020



MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Figure 3.3: Perinatal related mortality rates (per 1000 births, with 95% CIs) by baby prioritised ethnicity, 2016–2020



MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

From 2011 to 2020, rates of perinatal related mortality for most ethnic groups did not change significantly, except for a decreased rate observed in mothers of Indian ethnicity.[25] Perinatal related mortality rates by maternal prioritised ethnic group are presented in Table 3.18 (appended).

Mortality rates alone do not provide a complete picture of the burden of mortality in specific communities. For communities with high fertility rates, such as Pacific and Māori communities,[26] the burden of perinatal deaths is greater than in communities with lower fertility rates. Therefore, these deaths have a greater impact on the community.

Over the period 2016–2020, the leading classification of death for babies of mothers of Māori, Pacific or Indian ethnicity was spontaneous preterm labour or rupture of membranes. Unexplained antepartum fetal death was the leading cause of death for babies of mothers in the Other Asian, New Zealand European and Other European ethnic groups. Antepartum haemorrhage was another frequent cause of death across all ethnic groups and was one of the leading causes of death in the Middle Easter, Latin American and African (MELAA) prioritised ethnic group. Perinatal death classification specific perinatal related mortality rates by maternal prioritised ethnic group are presented in Table 3.4.

[25] Regression for trend (95% confidence intervals) -0.380 (-0.716, -0.043), p<0.05.

[26] Stats NZ. 2022. National ethnic population projections: 2022(base)–2073. URL stats.govt.nz/information-releases/national-population-projections-2022base2073/

Table 3.4: Perinatal death classification specific perinatal related mortality rates (excluding congenital anomalies) by maternal prioritised ethnic group,† 2016–2020

Perinatal death classification (PSANZ-PDC)	Māori			Pacific peoples			Asian									MELAA			European								
							Indian			Other Asian			Total Asian						New Zealand European			Other European			Total European		
	N=76,367			N=30,636			N=21,085			N=34,150			N=55,235			N=7298			N=101,720			N=29,085			N=130,805		
	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Perinatal infection	43	6.5	0.56	17	5.5	0.55	4	1.9	0.19	9	4.6	0.26	13	3.2	0.24	<3	x	s	25	3.5	0.25	6	5.7	0.21	31	3.8	0.24
Hypertension	31	4.7	0.41	17	5.5	0.55	6	2.9	0.28	8	4.1	0.23	14	3.4	0.25	-	-	-	21	3.0	0.21	<3	x	s	23	2.8	0.18
Antepartum haemorrhage	101	15.2	1.32	43	13.9	1.40	33	15.7	1.57	31	15.8	0.91	64	15.8	1.16	6	17.1	0.82	97	13.6	0.95	13	12.3	0.45	110	13.5	0.84
Maternal conditions	58	8.7	0.76	37	12.0	1.21	23	11.0	1.09	12	6.1	0.35	35	8.6	0.63	3	8.6	0.41	51	7.2	0.50	8	7.5	0.28	59	7.2	0.45
Complications of multiple pregnancy	26	3.9	0.34	12	3.9	0.39	13	6.2	0.62	9	4.6	0.26	22	5.4	0.40	<3	x	s	59	8.3	0.58	5	4.7	0.17	64	7.8	0.49
Specific perinatal conditions	18	2.7	0.24	21	6.8	0.69	15	7.1	0.71	13	6.6	0.38	28	6.9	0.51	6	17.1	0.82	66	9.3	0.65	12	11.3	0.41	78	9.5	0.60
Hypoxic peripartum death	22	3.3	0.29	<3	x	s	-	-	-	<3	x	s	<3	x	s	<3	x	s	26	3.7	0.26	<3	x	s	27	3.3	0.21
Placental dysfunction or causative placental pathology	56	8.4	0.73	35	11.3	1.14	32	15.2	1.52	21	10.7	0.61	53	13.1	0.96	4	11.4	0.55	87	12.2	0.86	12	11.3	0.41	99	12.1	0.76
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	175	26.4	2.29	66	21.4	2.15	47	22.4	2.23	39	19.9	1.14	86	21.2	1.56	6	17.1	0.82	120	16.9	1.18	20	18.9	0.69	140	17.1	1.07
Unexplained antepartum fetal death	112	16.9	1.47	55	17.8	1.80	35	16.7	1.66	48	24.5	1.41	83	20.4	1.50	5	14.3	0.69	149	21.0	1.46	26	24.5	0.89	175	21.4	1.34
Neonatal death without obstetric antecedent	21	3.2	0.27	4	1.3	0.13	<3	x	s	4	2.0	0.12	6	1.5	0.11	-	-	-	10	1.4	0.10	<3	x	s	11	1.3	0.08

'x' indicates percentages have been suppressed due to small numbers.

's' indicates rates have been suppressed due to small numbers.

† Excludes 138 unknown maternal ethnicity among total births (denominator) and 1 unknown maternal ethnicity perinatal related death (total) (numerator).

Sources: Numerator: PMMRC's perinatal data extract (excluding congenital anomalies) 2016–2020; Denominator: MAT births 2016–2020.

Neonatal Death

The leading cause of all neonatal deaths in 2020 was spontaneous preterm labour or rupture of membranes, followed by congenital anomaly (Table 3.2). Over the period 2011–2020, for extremely premature babies (aged less than 28 weeks gestation), extreme prematurity was the main cause of neonatal death (Table 3.15 appended). Of note, in 2020, the mortality rate for death due to extreme prematurity was the lowest recorded. This improvement coincides with the introduction of the consensus statement for Aotearoa New Zealand on the care of mother and baby(ies) at periviable gestations.[27]

For babies aged 28 weeks gestation and over, the predominant cause of neonatal death was congenital anomalies. Neurological conditions were the next most common cause of neonatal death for this gestational age group. Examining extremely premature babies (less than 28 weeks gestation) separately from babies aged 28 weeks gestation and longer revealed no change in the neonatal death classification specific rates over this period. The neonatal death classification specific death rates for 2011–2020 are presented in Table 3.15 (appended).

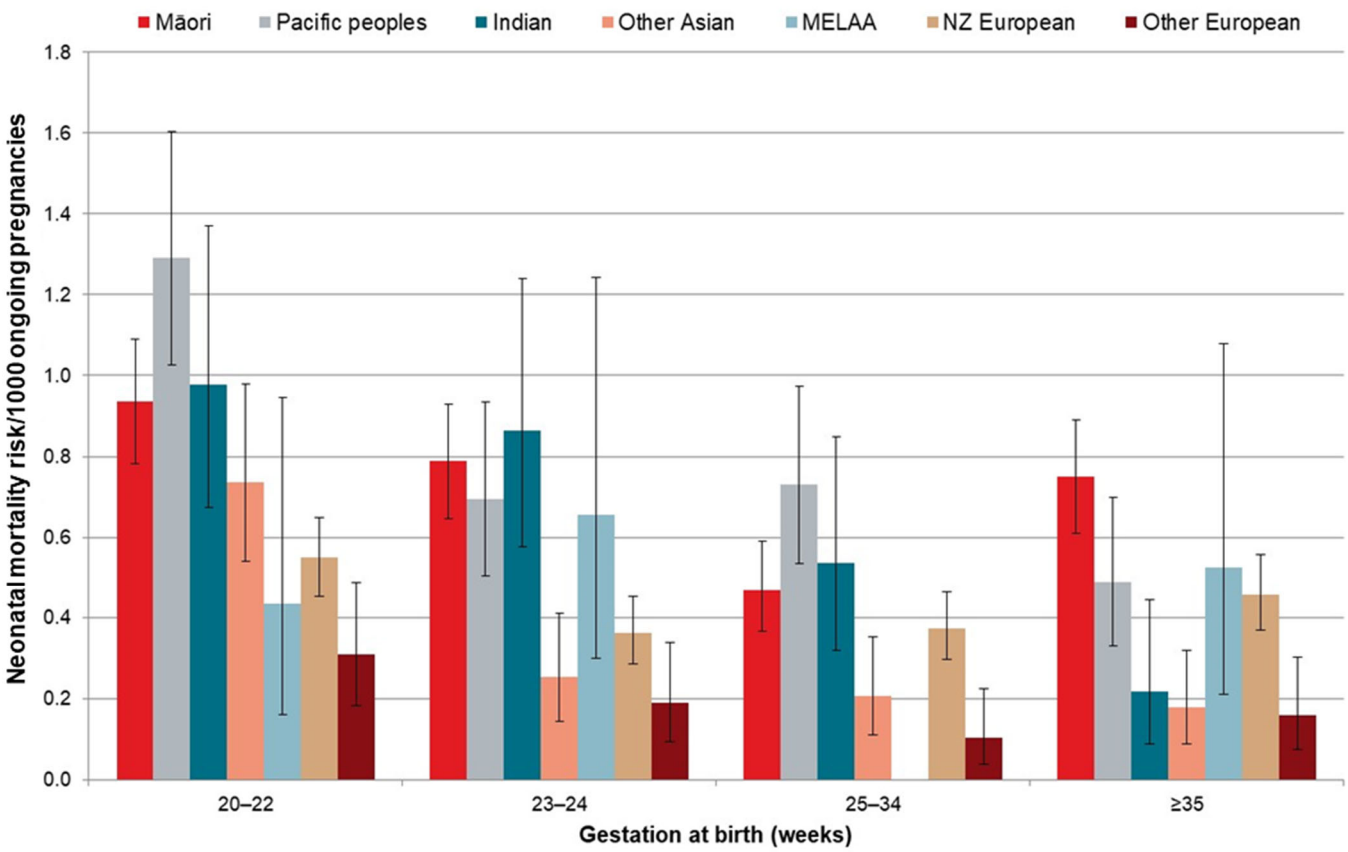
The majority of neonatal deaths (excluding congenital anomalies) occurred in babies born before 25 weeks gestation, as shown in Figure 3.4. For all prioritised ethnic groups (excluding MELAA[28]), neonatal mortality rates were highest in the youngest gestational age group of up to 22 weeks gestation. For babies aged up to 25 weeks gestation, those born to mothers of Māori, Pacific and Indian ethnicity had statistically higher neonatal mortality rates than babies born to mothers of New Zealand European ethnicity (Figure 3.4).

Further analysis of neonatal deaths in the extremely premature babies (less than 28 weeks gestation) showed that, over the period 2011–2019 and in 2020, there were much higher rates of deaths of babies who had mothers of Māori and Pacific prioritised ethnic groups (data not shown), although overall numbers were small.

[27] Starship. 30 September 2019. The New Zealand Consensus Statement on the care of mother and baby(ies) at periviable gestations. URL: starship.org.nz/guidelines/new-zealand-consensus-statement-on-the-care-of-mother-and-baby-ies-at/ (accessed 7 June 2022).

[28] Numbers too small to reliably interpret.

Figure 3.4: Neonatal death risk (per 1000 ongoing pregnancies) by gestation at birth and maternal ethnicity, excluding death with congenital anomalies, 2011–2020†



Note: MELAA death risk for 25–34 weeks gestation at birth has been suppressed due to small numbers.

† Unknown/Other ethnicity not represented.

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract excluding congenital anomalies 2011–2020; Denominator: MAT live births 2011–2020.

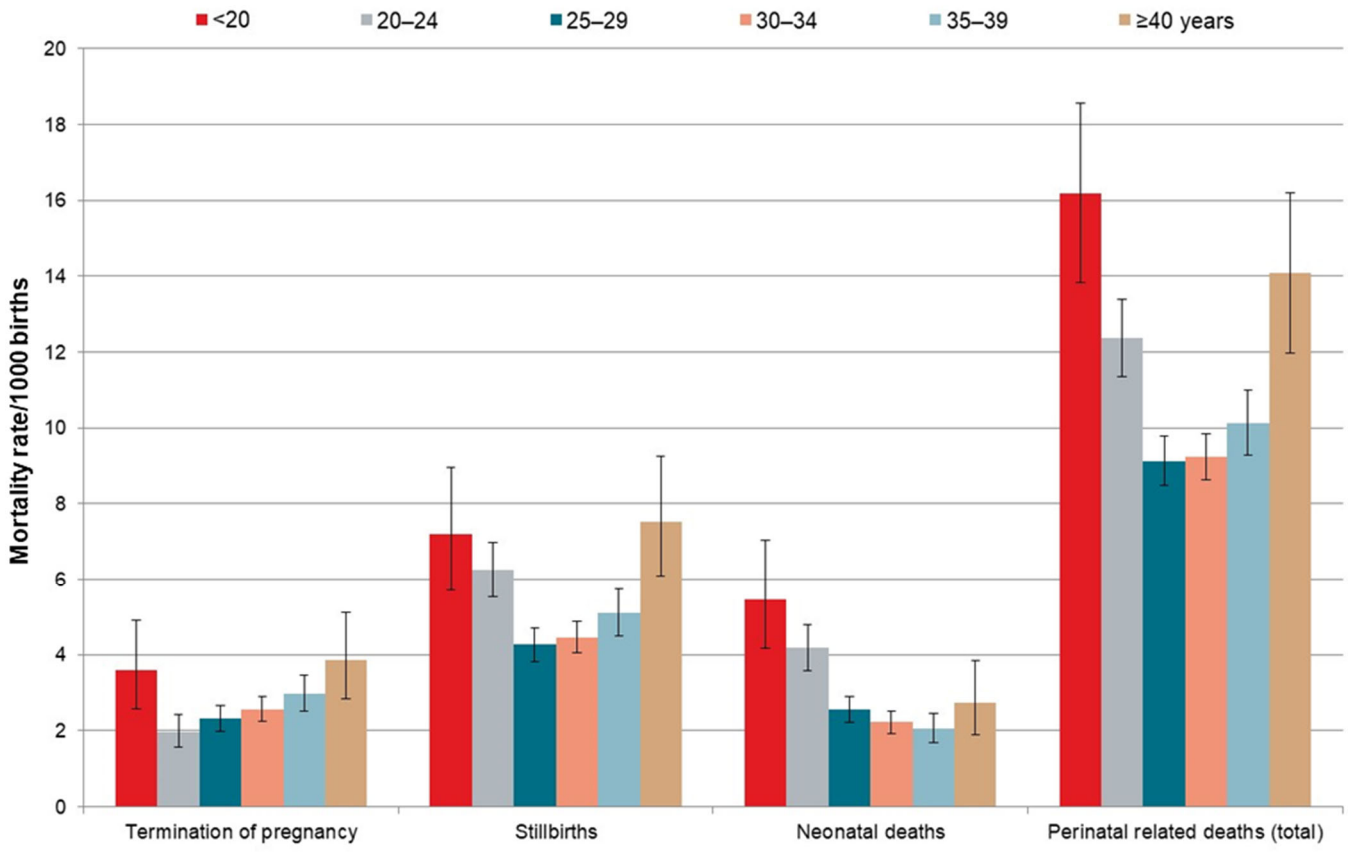
Maternal Age

Perinatal related mortality rates increase at the extremes of maternal age. When perinatal related mortality rates are examined by maternal age and prioritised ethnic group, a U-shaped trend is evident in women of Māori, Pacific and New Zealand European ethnicities (Figure 3.6). In Pacific women, mortality rates are statistically higher only for babies born to mothers aged 35 years and older, compared with mothers aged 25–29 years; that is, mortality rates in younger maternal age groups are not significantly higher. In contrast, for women of Indian ethnicity, perinatal mortality rates are significantly higher at younger maternal ages, with those aged 20–24 years having the highest rates (Figure 3.6).

Over the period 2016–2020, the U-shaped trend was most evident in rates of stillbirths, where the mortality rates were highest for babies born to mothers aged under 25 years or 40 years and older. The highest rate of neonatal deaths occurred in babies born to women aged under 20 years, at a rate significantly higher than those for mothers aged 25 years or older. These data are presented in Figure 3.5 (below) and Table 3.19 (appended).

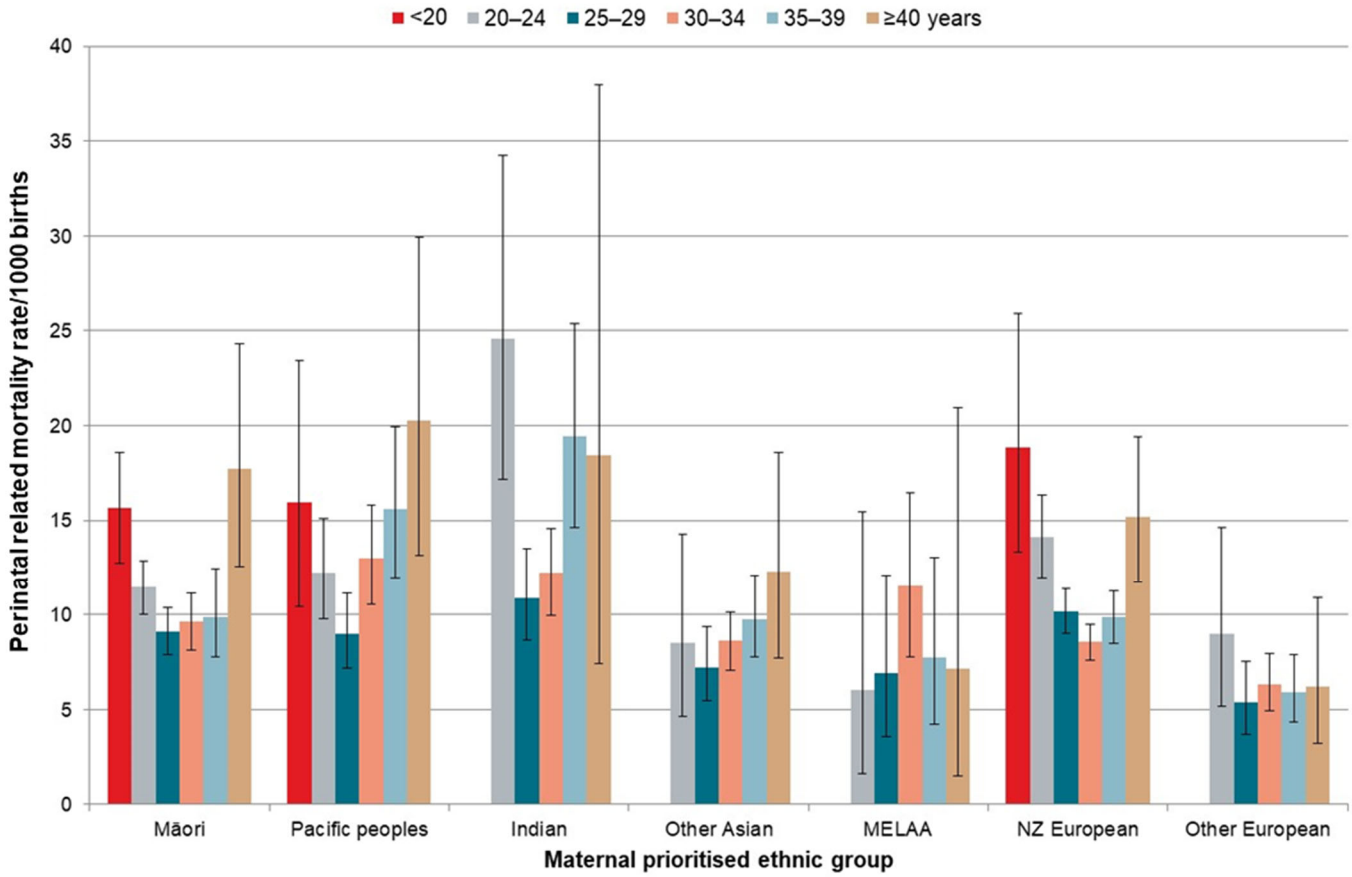
The rates of neonatal death in babies born to women under 20 years of age was 5.46 per 1000 births, compared with an average rate of 2.72 per 1000 live births for all maternal age groups. On further examination of these deaths of babies born to mothers aged under 20 years, it was evident that two-thirds of these deaths occurred in babies who were born both preterm (gestational age of less than 28 weeks) and with low birthweight (less than 1000g) (data not shown).

Figure 3.5: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal age 2016–2020



Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Figure 3.6: Perinatal related mortality rates (per 1000 births, with 95% CIs), by maternal age and maternal prioritised ethnic group, 2016–2020



Note: The rates for Indian, Other Asian, Middle Eastern, Latin American, and African (MELAA) and Other European mothers aged <20 years have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Over the period 2011–2020, there was an increase in the perinatal related mortality rate for babies born to mothers aged 20–24 years; an increase from 9.72 deaths to 13.08 deaths per 1000 births.[29] Since 2011, there have been no significant changes in other maternal age groups (Table 3.20 appended).

From 2016 to 2020, the most common causes of perinatal deaths were spontaneous preterm labour and rupture of membranes (ROM), unexplained antepartum fetal deaths, antepartum haemorrhage and placental dysfunction or causative placental pathology (Table 3.5).

The leading cause of death for babies born to mothers aged under 20 years and 20–24 years was spontaneous preterm labour or ROM. The perinatal related mortality rate due to this cause was highest in women aged under 20 years, and rates decreased with increasing maternal age. For women aged under 20 years, maternal conditions were the next most common death classification. Perinatal related deaths due to maternal conditions occurred at a much higher rate in mothers aged 20 years or younger, compared with mothers in other age groups. Similarly, mortality that was classified as caused by perinatal infection, antepartum haemorrhage and placental dysfunction or causative placental pathology occurred at the highest rates in the under-20-years age group (Table 3.5). Further research is needed to identify what interventions may reduce mortality rates in babies born to women under 20 years of age.

For babies born to mothers aged 25 years and older, the main cause of death was unexplained antepartum fetal deaths. The mortality rates for unexplained antepartum fetal deaths were similar to those for spontaneous preterm labour and ROM in the 25–39 years maternal age group. The highest rate of unexplained antepartum fetal deaths occurred in women aged 40 years and older, and this was the leading cause of death in this age group (Table 3.5).

[29] Regression for trend (95% confidence intervals) 0.354 (0.067, 0.641), p<0.05.

Table 3.5: Perinatal death classification specific perinatal related mortality rates (excluding congenital anomalies), by maternal age,† 2016–2020

Perinatal death classification (PSANZ-PDC)	Maternal age (years)														
	<20			20–24			25–34			35–39			≥40		
	N=11,119			N=45,247			N=180,133			N=51,702			N=12,210		
	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Perinatal infection	11	7.5	0.99	24	5.3	0.53	57	4.8	0.32	11	3.2	0.21	3	3.1	0.25
Hypertension	<3	x	s	18	4.0	0.40	45	3.8	0.25	13	3.7	0.25	8	8.2	0.66
Antepartum haemorrhage	21	14.4	1.89	63	13.8	1.39	182	15.4	1.01	46	13.3	0.89	12	12.4	0.98
Maternal conditions	25	17.1	2.25	39	8.6	0.86	98	8.3	0.54	20	5.8	0.39	10	10.3	0.82
Complications of multiple pregnancy	5	3.4	0.45	23	5.1	0.51	59	5.0	0.33	33	9.5	0.64	5	5.2	0.41
Specific perinatal conditions	4	2.7	0.36	24	5.3	0.53	77	6.5	0.43	35	10.1	0.68	11	11.3	0.90
Hypoxic peripartum death	<3	x	s	11	2.4	0.24	32	2.7	0.18	10	2.9	0.19	<3	x	s
Placental dysfunction or causative placental pathology	19	13.0	1.71	58	12.7	1.28	119	10.0	0.66	44	12.7	0.85	7	7.2	0.57
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	42	28.8	3.78	111	24.4	2.45	240	20.3	1.33	64	18.4	1.24	16	16.5	1.31
Unexplained antepartum fetal death†	16	11.0	1.44	75	16.5	1.66	250	21.1	1.39	66	19.0	1.28	23	23.7	1.88
Neonatal death without obstetric antecedent	<3	x	s	9	2.0	0.20	26	2.2	0.14	5	1.4	0.10	<3	x	s

‘x’ indicates percentage not calculated due to small numbers.

‘s’ indicates rate not calculated due to small numbers.

† Excludes one unknown maternal age.

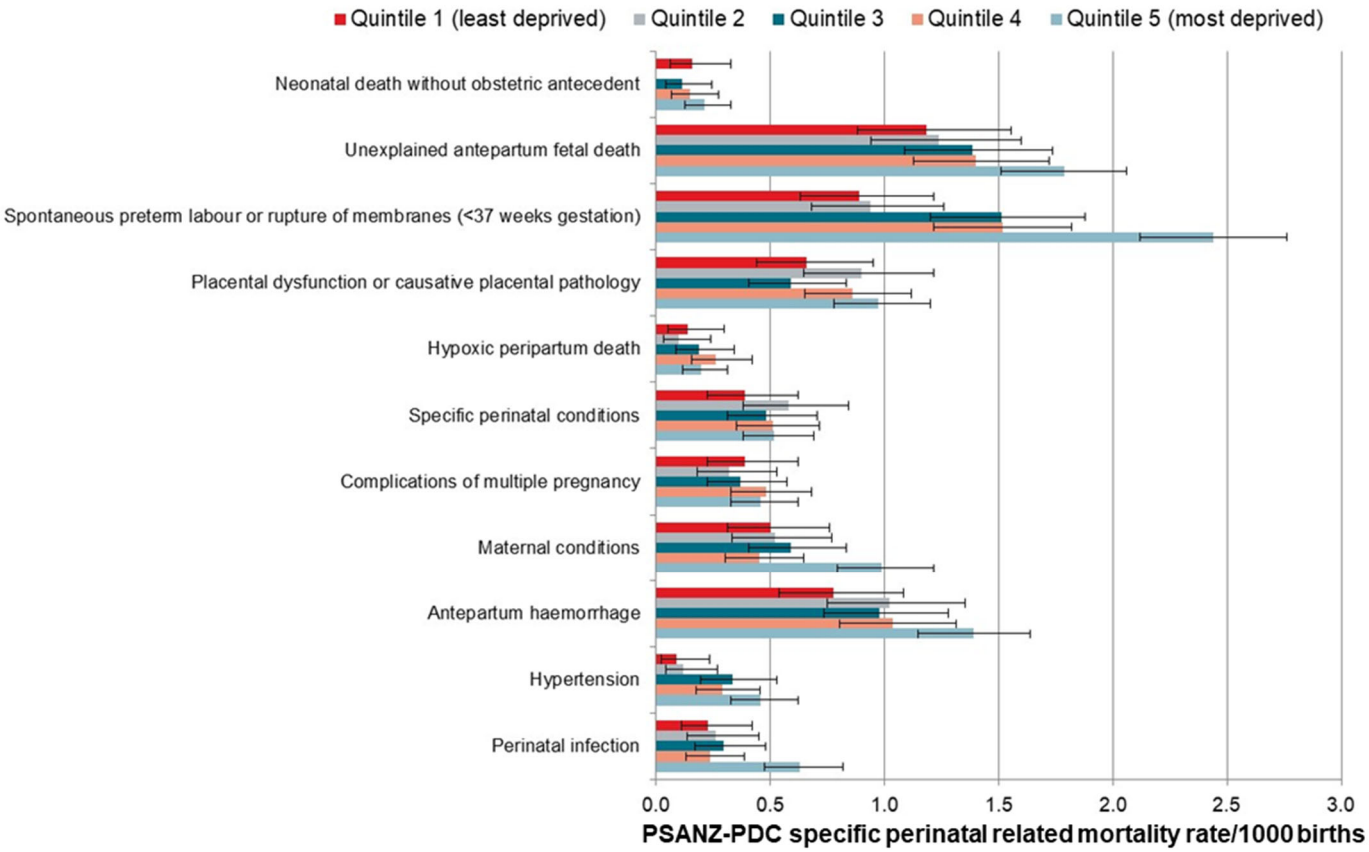
Sources: Numerator: PMMRC’s perinatal data extract (excluding congenital anomalies) 2016–2020; Denominator: MAT births 2016–2020.

Socioeconomic Deprivation

Socioeconomic deprivation is associated with increased rates of perinatal related mortality for many of the death classifications. For the period 2016–2020, babies of mothers who lived in NZDep quintile 5 (most deprived) areas had higher perinatal mortality rates for spontaneous preterm delivery, maternal conditions, antepartum haemorrhage, hypertension and perinatal infection compared with babies born to mothers living in quintile 1 (least deprived) areas. For most causes, mortality rates increased with increasing quintiles of deprivation – this was most evident in deaths due to spontaneous preterm labour. Of concern, babies born to mothers living in NZDep quintile 5 areas had significantly higher mortality rates for spontaneous preterm labour and perinatal infections when compared with all other deprivation levels. These data from 2016–2020 are shown in Figure 3.7.

The association of deprivation quintile with death classification specific perinatal related mortality rates became more marked in the period 2016–2020 – in the fourteenth report (2014–2018), only perinatal related deaths due to spontaneous preterm labour varied by deprivation quintile.

Figure 3.7: Perinatal death classification specific perinatal related mortality rates (per 1000 births, with 95% CIs) (excluding congenital anomalies) by NZDep quintile,† 2016–2020



Note: The rates for neonatal death without obstetric antecedent in quintile 2 have been suppressed due to small numbers.

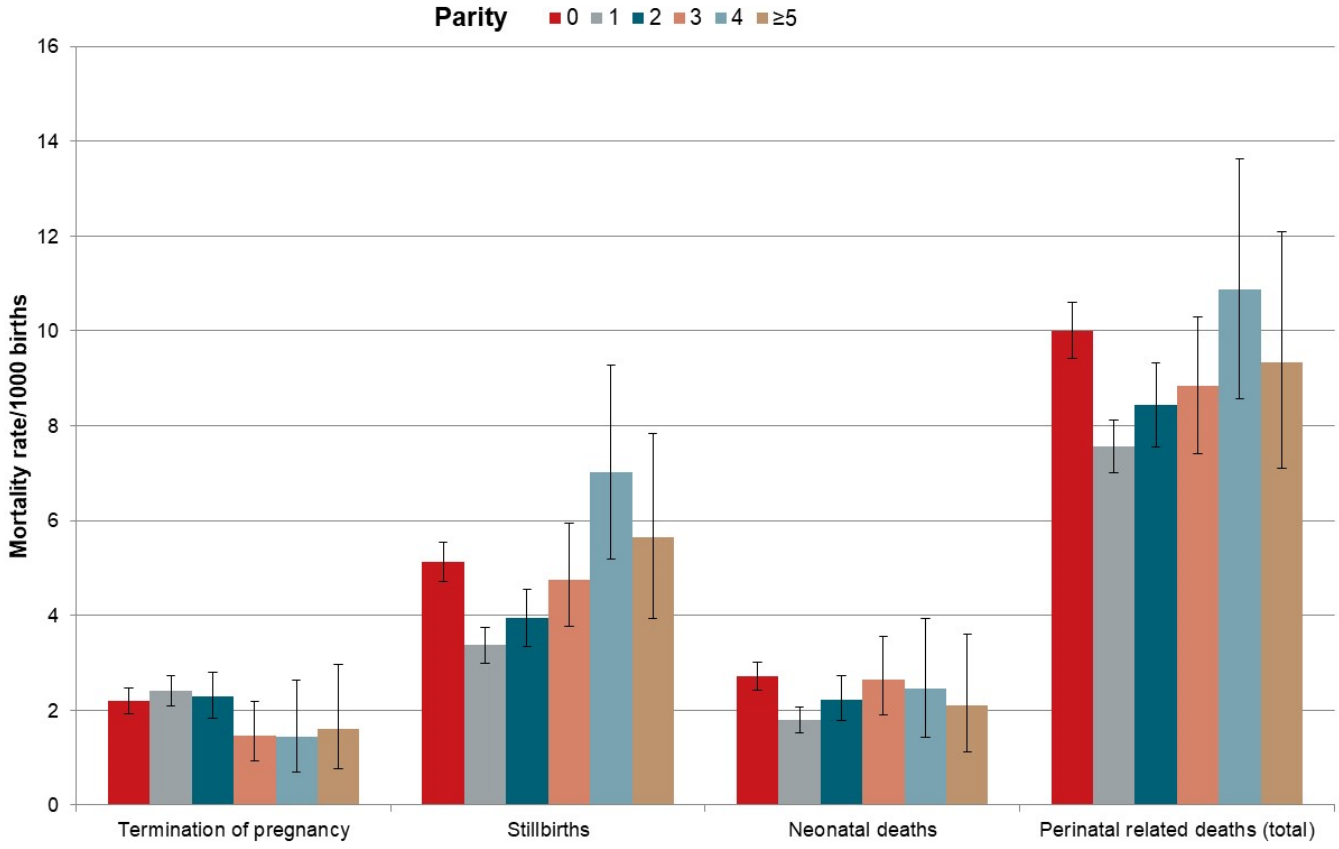
† Excludes 14 cases with unknown deprivation quintile.

Sources: Numerator: PMMRC's perinatal data extract (excluding congenital anomalies) 2016–2020; Denominator: MAT births.

Parity

Parity is associated with perinatal related mortality rates in an approximately U-shaped relationship. Total perinatal related mortality rates were highest for women who were having their first baby of 20 weeks or longer gestation (parity 0), compared with women who had one or two previous babies. There was a higher mortality rate for babies born to women who had already had four babies than for those born to women who had given birth to only one previous baby. This association was primarily driven by stillbirths; women with no previous births and multiparous women with four or more previous babies had significantly higher rates of stillbirth than women who had only one previous birth. Perinatal related mortality rates by maternal parity, for the period 2016–2020 are shown in Figure 3.8 (and Table 3.21 appended).

Figure 3.8: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal parity,† 2016–2020



† All data are limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Parity '0' indicates women having their first baby/babies of 20 weeks or longer gestation.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, 2016–2020; Denominator: MAT births 2016–2020.

DHB of Maternal Residence

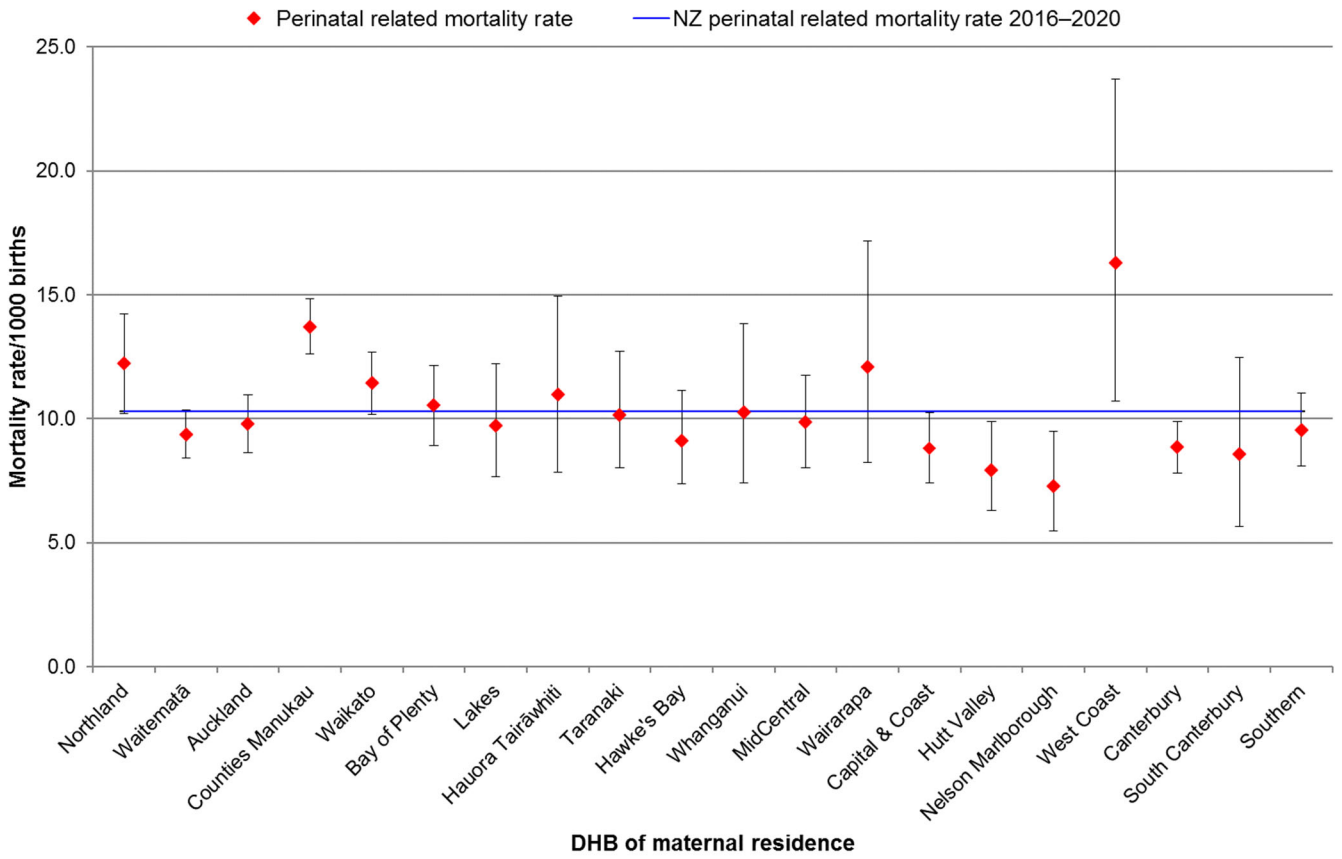
DHBs were responsible for providing health services to their districts, which differ in terms of population structure, geographic characteristics and models of service delivery. These factors independently influence perinatal mortality rates and make direct comparison of outcomes by DHB of residence inherently problematic. However, the objectives of DHBs included the reduction of health disparities by improving health outcomes for Māori and other population groups and the reduction of health outcome disparities

between various population groups – the role of the DHBs was to serve the unique needs of their population.[30]

The Aotearoa New Zealand health system is currently being restructured; the formation of Te Whatu Ora – Health New Zealand and Te Aka Whai Ora | Māori Health Authority means that DHBs no longer exist. However, analysis by district can help identify which geographical areas are experiencing worse outcomes. When comparing localities, it is important to note that each DHB contains diverse population groups, so the overall rates by DHB may not reflect outcomes for all subgroups.

Over the period 2016–2020, perinatal related mortality rates varied considerably by DHB of maternal residence, as shown in Figure 3.9 (below) and Table 3.22 (appended). Mortality rates in Counties Manukau and West Coast DHBs of residence were significantly higher than the national average rate of 10.25 per 1000 births. Lower than average perinatal mortality rates were recorded in Capital & Coast, Hutt Valley, Nelson Marlborough and Canterbury DHBs of residence (Figure 3.9 below and Table 3.22 appended).

Figure 3.9: Perinatal related mortality rates (per 1000 births, with 95% CIs) by DHB of maternal residence, compared with Aotearoa New Zealand perinatal related mortality, 2016–2020

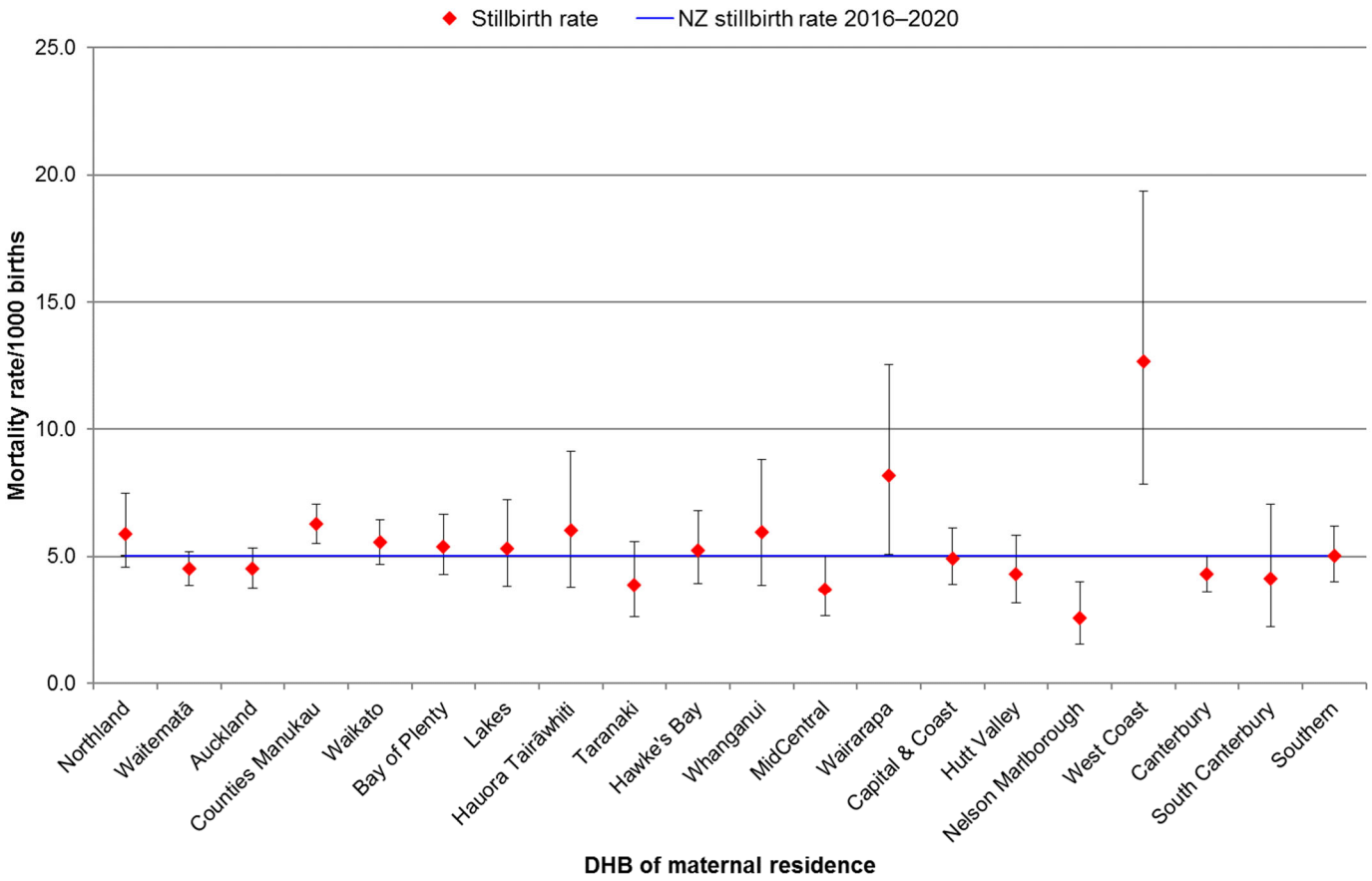


Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Similarly, stillbirth rates varied considerably by DHB of residence, as shown in Figure 3.10. Rates of stillbirth were significantly higher than the national average in Counties Manukau, Wairarapa and West Coast DHBs of residence. The rate of stillbirths in the West Coast DHB was 12.67 per 1000 births, substantially higher than the national rate of 5.01 per 1000 births. Conversely, the rate of stillbirths in Nelson Marlborough DHB was lower than the average stillbirth rate for Aotearoa New Zealand over this period.

[30] Ministry of Health. District health boards. URL: health.govt.nz/new-zealand-health-system/key-health-sector-organisations-and-people/district-health-boards (accessed 17 May 2022).

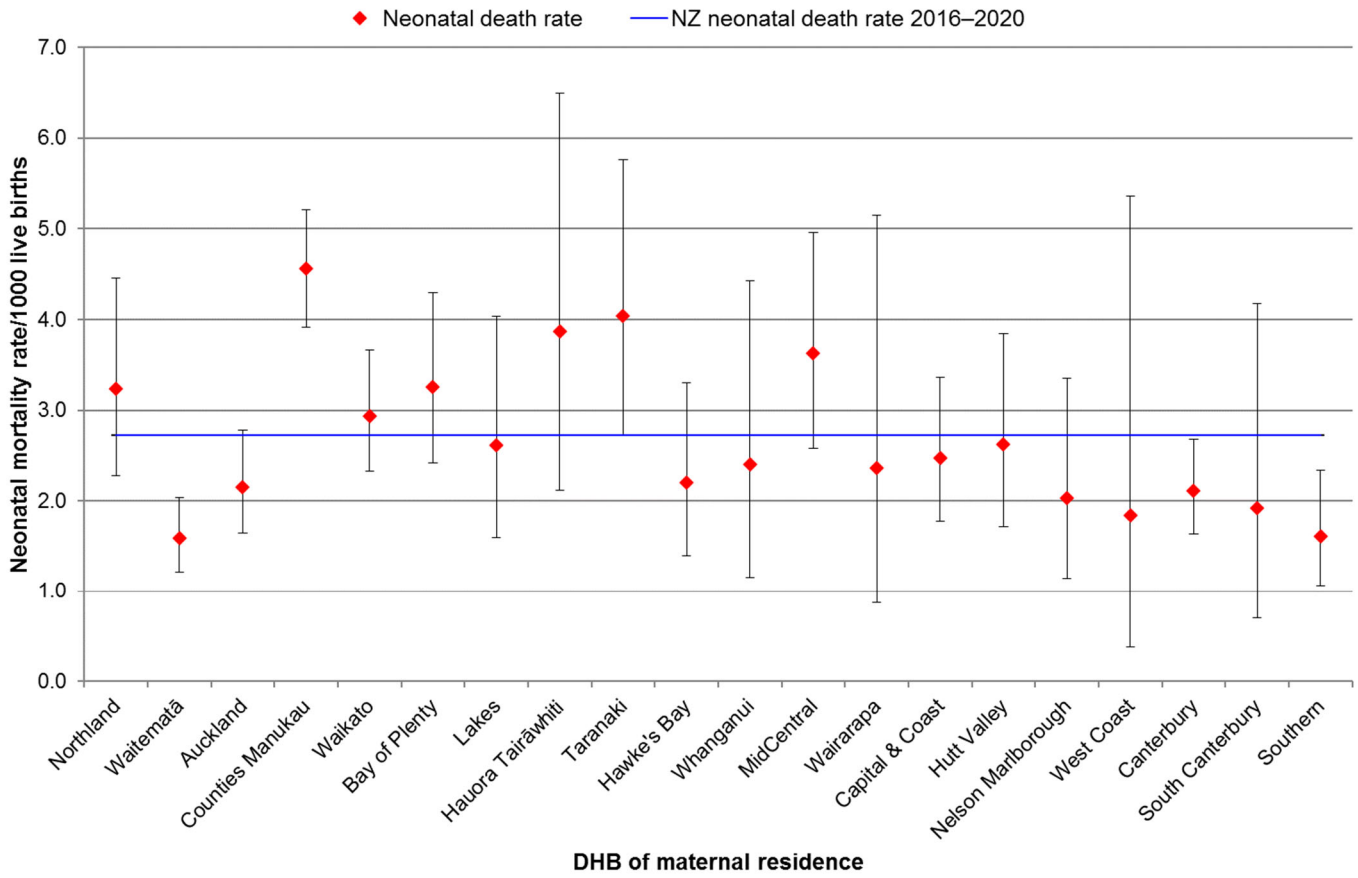
Figure 3.10: Stillbirth rates (per 1000 births, with 95% CIs) by DHB of maternal residence compared with average stillbirth rates, 2016–2020



Sources: Numerator: PMMRC's perinatal data extract stillbirths only, 2016–2020; Denominator: MAT births 2016–2020.

There were smaller numbers of neonatal deaths, hence the neonatal mortality rates by DHB of residence may vary more widely and should be interpreted with caution. Over the period 2016–2020, rates that were statistically higher than the national average rate of 2.70 per 1000 births were seen in Counties Manukau and Taranaki DHBs of residence (Figure 3.11). Statistically lower than average rates of neonatal deaths were observed in Waitematā, Canterbury and Southern DHBs of residence.

Figure 3.11: Neonatal mortality rates (per 1000 live births, with 95% CIs) by DHB of maternal residence compared with Aotearoa New Zealand neonatal mortality, 2016–2020



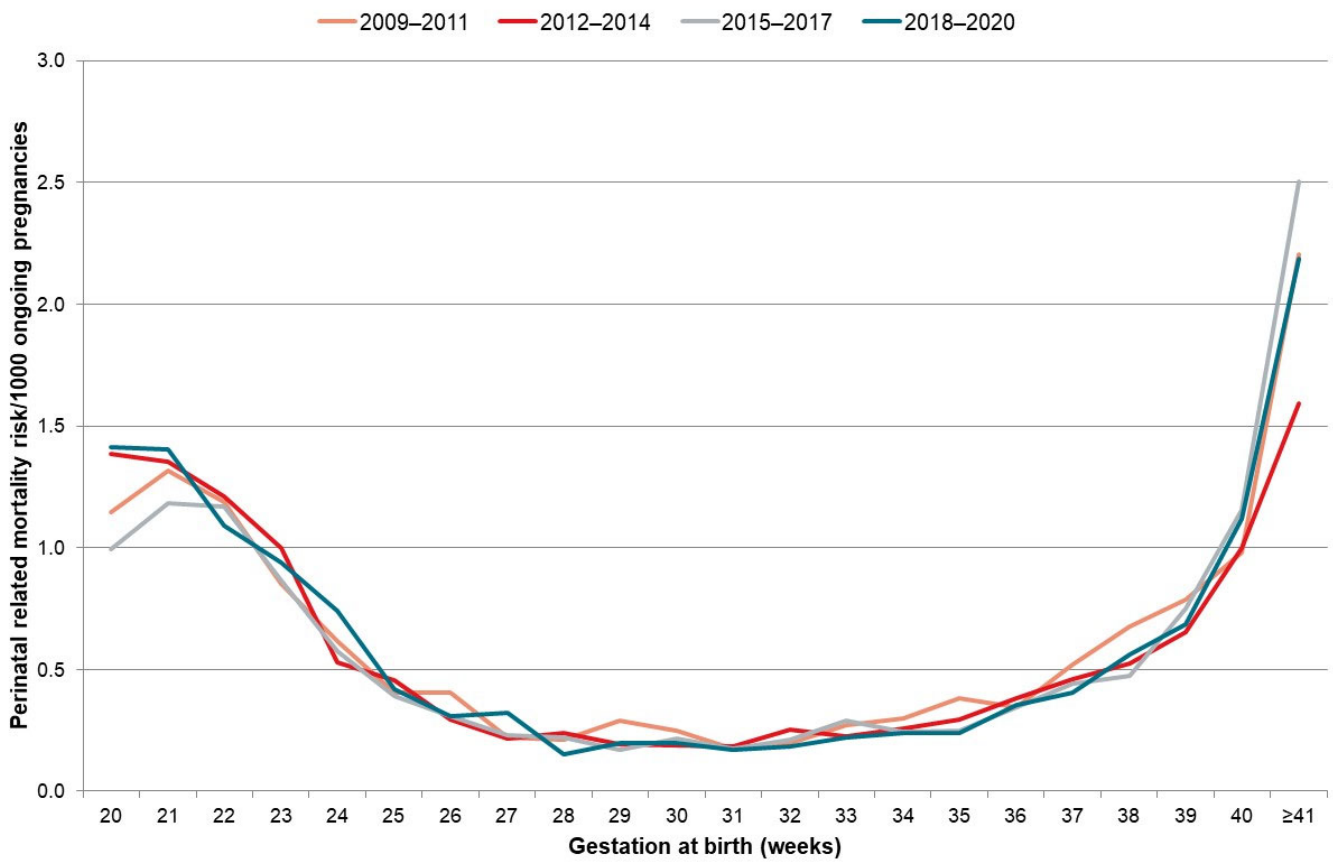
Sources: Numerator: PMMRC's perinatal data extract, neonatal deaths only, 2016–2020; Denominator: MAT births excluding fetal deaths 2016–2020.

Gestational Age and Birthweight

Figure 3.12 shows that the pattern of perinatal related mortality risk by gestational age (per 1000 ongoing pregnancies) has not changed substantially over the period 2009–2020.

Babies who were born at earlier gestations had a much higher death rate (689.87 per 1000 births at 23–24 weeks gestation), compared with those born at 37–40 weeks (2.20 deaths per 1000 births). Compared with babies born at 37–40 weeks, babies born at or after 41 weeks had a slightly higher mortality risk, at 2.80 deaths per 1000 births (Table 3.23 appended).

Figure 3.12: Perinatal related mortality risk (per 1000 ongoing pregnancies) by gestational age at birth and year, 2009–2020



Sources: Numerator: PMMRC's perinatal data extract 2010–2018; Denominator: MAT births 2010–2018.

Table 3.6 also shows there was no change in risk of death over the period 2011–2020 for any gestational age group.

In 2020, when examined per 1000 ongoing pregnancies, the highest risk of mortality occurred at the earliest gestational ages (20–22 weeks) at 3.80 deaths per 1000 ongoing pregnancies. The mortality risk then decreased with increasing gestational age until 37–38 weeks gestation, when the risk was 0.80 deaths per 1000 ongoing pregnancies. The mortality risk rose after 40 weeks gestation to 2.43 per 1000 ongoing pregnancies for babies of 41 weeks gestation, and the rate at 42 weeks or longer gestation could not be reliably calculated due to small numbers (Table 3.6).

Table 3.6: Perinatal related mortality risk (per 1000 ongoing pregnancies), 2011–2020

Gestation at birth (weeks)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n
20–22	230	236	231	248	215	217	245	253	169	175	206	216	211	210	230	238	216	232	220	223
23–24	129	95	119	94	123	85	137	98	117	92	126	84	110	82	125	89	134	99	158	109
25–27	185	52	218	70	192	55	187	49	206	52	189	50	213	64	184	45	226	72	232	68
28–31	511	58	506	50	471	49	462	46	459	41	483	48	481	49	485	43	484	36	505	48
32–36	3911	87	3943	73	3723	91	3729	85	3654	78	3825	79	3765	76	3695	74	3852	73	3750	65
37–38	13,169	64	13,470	65	13,400	38	13,687	56	13,614	42	14,517	59	14,758	45	14,687	53	15,273	54	14,848	43
39–40	33,858	59	33,623	51	32,215	51	32,170	60	32,148	69	32,115	56	32,093	51	31,233	48	31,797	52	30,703	57
41	9278	13	9059	20	8375	12	8024	12	7949	25	7715	14	7431	15	7275	12	7212	15	7230	20
≥42	1447	4	1277	-	1107	<3	1068	-	1126	4	1073	6	1047	<3	1028	<3	962	<3	987	3
Unknown	532	-	848	-	322	-	373	-	349	-	372	-	383	-	373	-	451	4	811	6

Gestation at birth (weeks)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2020 Regression for trend (95% CI)
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	
20–22	3.76	3.97	3.63	4.24	2.94	3.59	3.49	4.04	3.86	3.80	0.000 (-0.096, 0.096)
23–24	1.52	1.51	1.43	1.65	1.55	1.40	1.37	1.52	1.65	1.87	0.022 (-0.014, 0.057)
25–27	0.83	1.13	0.92	0.83	0.88	0.83	1.07	0.77	1.20	1.17	0.021 (-0.019, 0.061)
28–31	0.93	0.81	0.83	0.78	0.70	0.80	0.82	0.74	0.60	0.83	-0.016 (-0.036, 0.004)
32–36	1.41	1.19	1.55	1.45	1.33	1.33	1.29	1.28	1.24	1.13	-0.024 (-0.051, 0.003)
37–38	1.11	1.13	0.69	1.02	0.77	1.06	0.81	0.98	0.98	0.80	-0.017 (-0.056, 0.023)
39–40	1.32	1.16	1.22	1.45	1.67	1.37	1.26	1.21	1.30	1.46	0.008 (-0.033, 0.049)
41	1.21	1.93	1.27	1.32	2.75	1.59	1.77	1.45	1.84	2.43	0.069 (-0.056, 0.194)
≥42	2.76	-	s	-	3.55	5.59	s	s	s	3.04	0.155 (-0.270, 0.579)
Unknown	-	-	-	-	-	-	-	-	-	-	-

‘s’ indicates rate not calculated due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract 2011–2020; Denominator: MAT births 2011–2020.

Over the period 2011–2020, there was some evidence of a significant decrease in stillbirths at 28–31 weeks gestation.[31] These data are shown in Table 3.24 (appended), which shows the risk of stillbirth per 1000 ongoing pregnancies by year. Table 3.25 (appended) shows the risk of neonatal death (per 1000 ongoing pregnancies), by gestational age group, from 2011 to 2020. There were no significant changes in neonatal death risk, by gestational age, over this period.

From 2011–2020, there was evidence of a statistically significant decrease in the risk of intrapartum stillbirth for babies born at 23–27 weeks gestation[32] and a statistically significant decrease in intrapartum stillbirth risk for those born at 28–36 weeks gestation.[33] This is shown in Table 3.7. There was no change for babies born at term (Table 3.7). Figure 3.13 shows intrapartum stillbirth risk by gestation at birth, from 2007 to 2020.

[31] Regression for trend (95% confidence intervals) -0.017 (-0.033, -0.002), p<0.05.

[32] Regression for trend (95% confidence intervals) -0.016 (-0.025, -0.008), p<0.01.

[33] Regression for trend (95% confidence intervals) -0.004 (-0.006, 0.001), p<0.05.

Table 3.7: Intrapartum stillbirth rates (per 1000 ongoing pregnancies) by gestation excluding congenital anomalies, 2011–2020

Gestation at birth (weeks)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N
23–27	16	314	10	337	10	315	8	324	8	323	6	315	4	323	8	309	6	360	3	390
28–36	4	4422	3	4449	<3	4194	3	4191	<3	4113	<3	4308	3	4246	<3	4180	<3	4336	<3	4255
≥37	9	57,752	12	57,429	3	55,097	10	54,949	17	54,837	12	55,420	10	55,329	8	54,223	11	55,244	16	53,768

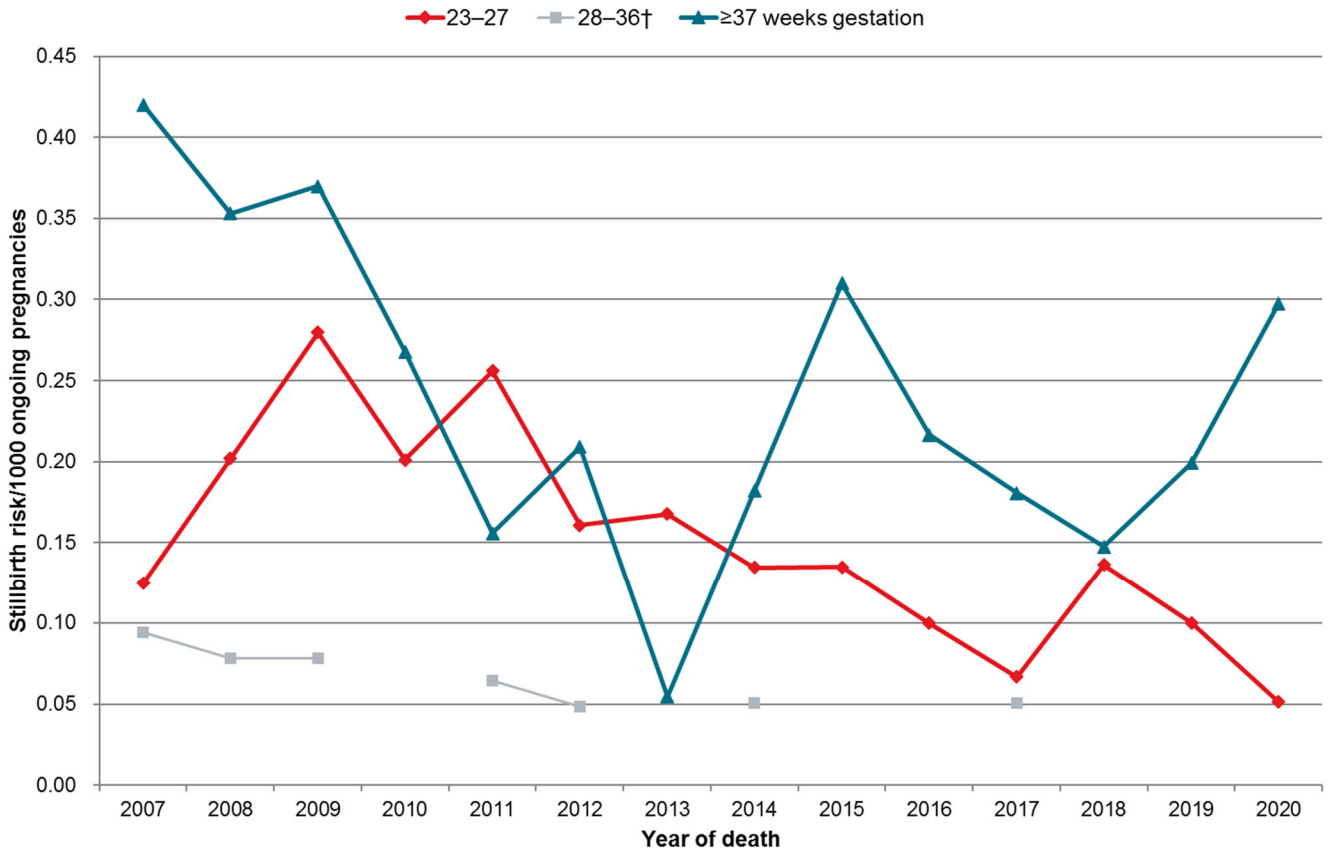
Gestation at birth (weeks)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2010–2019 Regression for trend (95% CI)
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	
23–27	0.26	0.16	0.17	0.13	0.13	0.10	0.07	0.14	0.10	0.05	-0.016 ** (-0.025, -0.008)
28–36	0.06	0.05	s	0.05	s	s	0.05	s	s	s	-0.004 ** (-0.006, -0.001)
≥37	0.16	0.21	0.05	0.18	0.31	0.22	0.18	0.15	0.20	0.30	0.010 (-0.009, 0.028)

** p-value <0.01.

's' indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract, stillbirths only (excluding congenital anomalies) 2011–2020; Denominator: MAT births 2011–2020.

Figure 3.13: Intrapartum stillbirth risks (per 1000 ongoing pregnancies) by gestation at birth (weeks) excluding congenital anomalies, 2007–2020

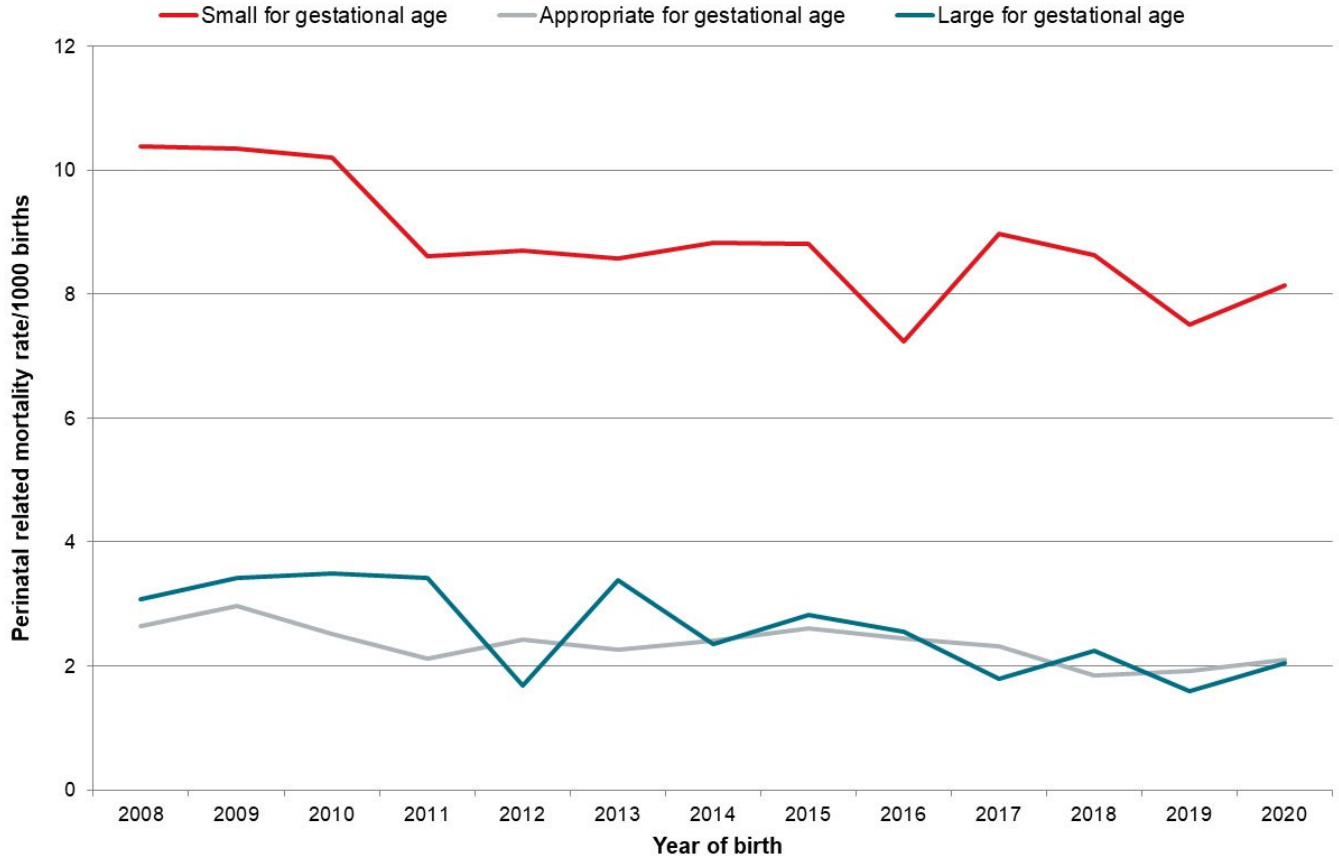


† 28–36 weeks gestation risks have been suppressed due to small numbers for the years 2010, 2013, 2015, 2016, 2018, 2019 and 2020.
Sources: Numerator: PMMRC's perinatal data extract, stillbirths only (excluding congenital anomalies), 2011–2020; Denominator: MAT births 2011–2020.

Mortality by Customised Birthweight Centile

The perinatal related mortality rates for singleton babies born from 26 weeks gestation who are appropriate or large for gestational age have remained relatively stable since 2011. The mortality rates for babies who were small for gestational age are trending down. With large amounts of missing data, this trend should be interpreted with caution, and the issue of the missing data needs to be addressed for future analyses. These data are shown in Figure 3.14 (below) and Table 3.26 (appended).

Figure 3.14: Perinatal related mortality rates by customised centile group among singleton births† from 26 weeks gestation without congenital anomalies, 2008–2020

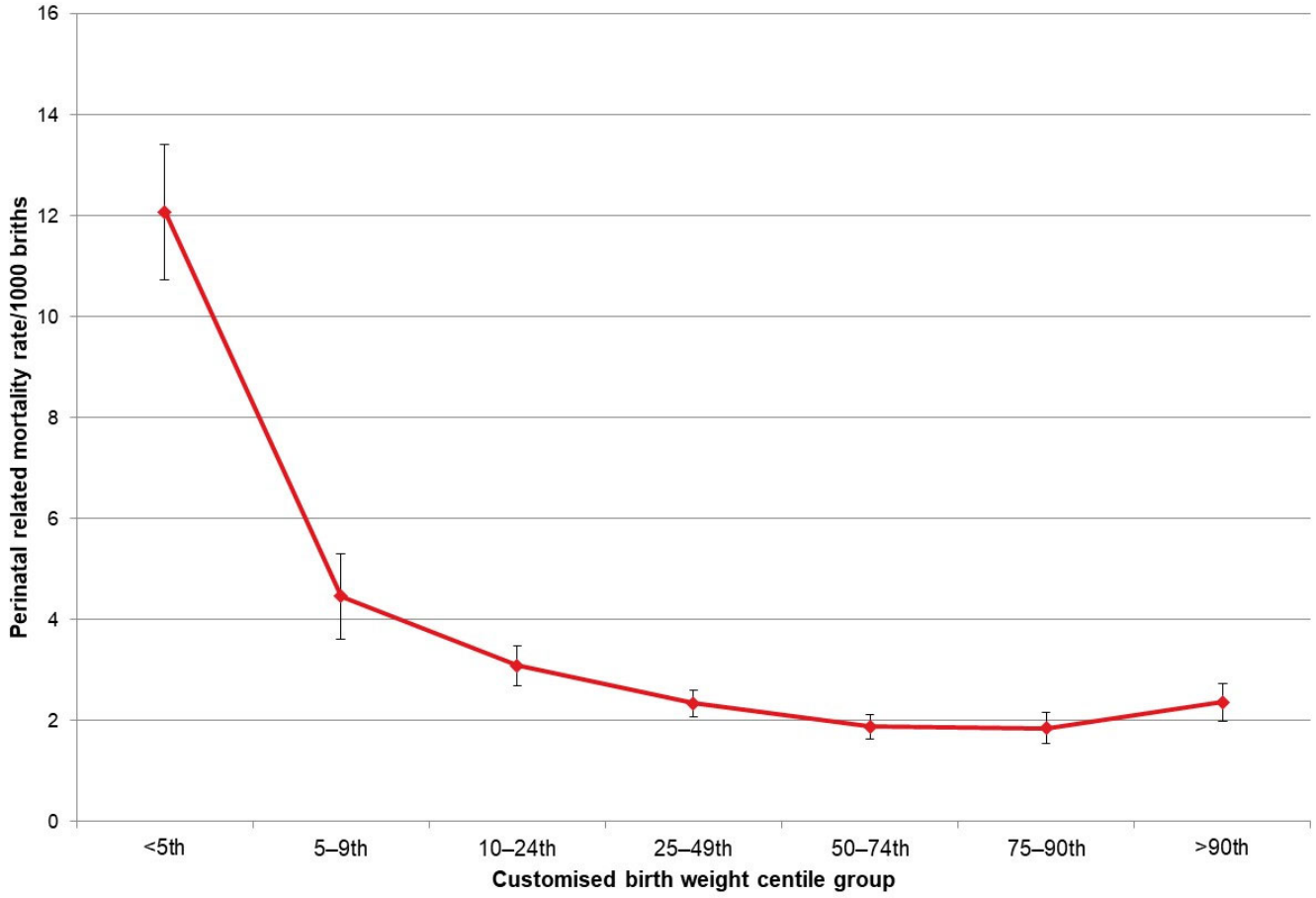


† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, from 26 weeks gestation without congenital anomalies 2008–2020; Denominator: MAT births among singleton births from 26 weeks gestation 2008–2020.

Singleton babies born from 26 weeks with a customised birthweight under the 5th centile had substantially higher mortality rates than all other birthweight centile groups. Those with a birthweight in the 5th–9th centile group were at lower risk than the <5th centile birthweight group but still had significantly higher rates of mortality compared with babies with customised birthweights in higher centile groups (Figure 3.15).

Figure 3.15: Perinatal related mortality rates (with 95% CIs) by customised birthweight centile group among singleton births from 26 weeks gestation without congenital anomalies, 2011–2020†



† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, among singleton births from 26 weeks gestation without congenital anomalies 2011–2020; Denominator: MAT births among singleton births from 26 weeks gestation 2011–2020.

Multiple Pregnancies

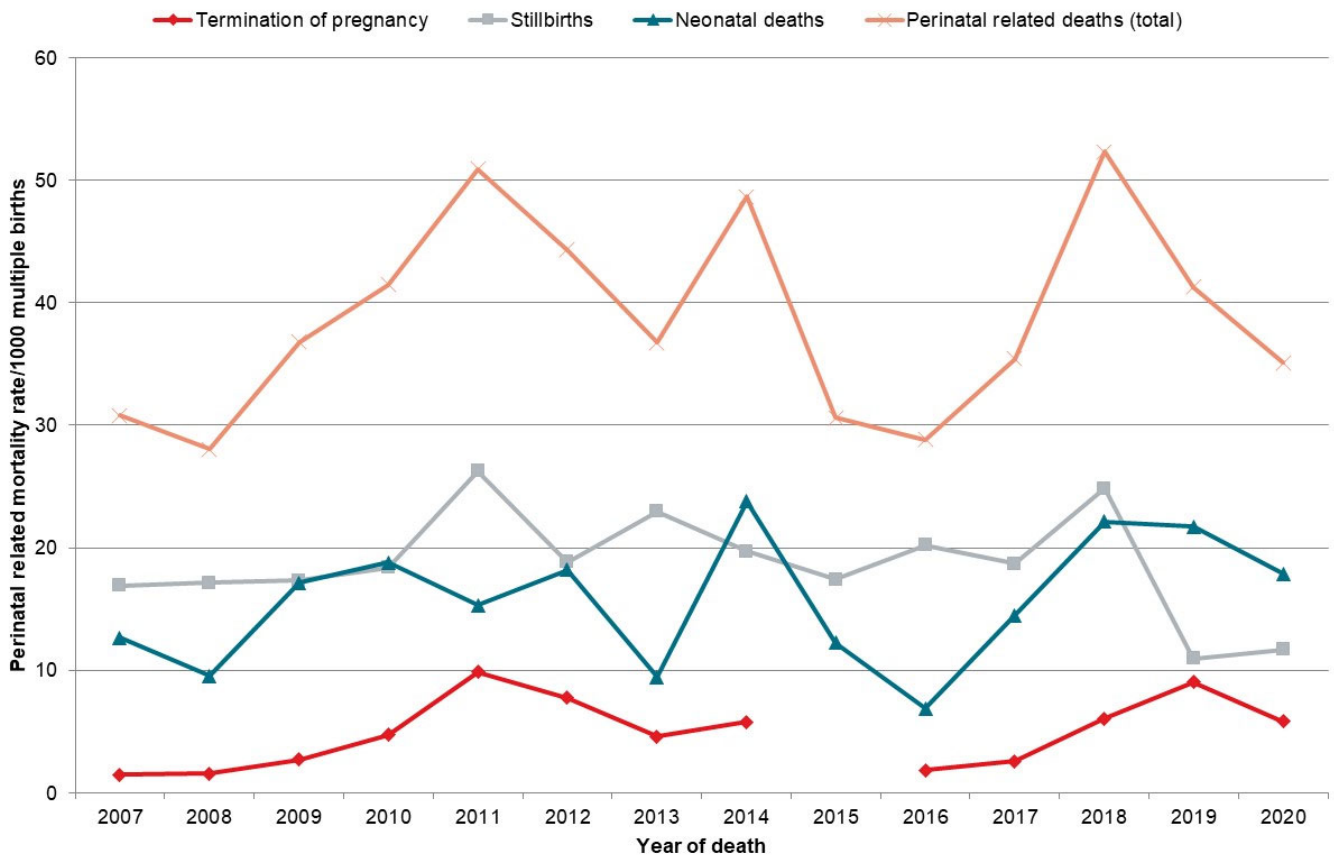
Babies that are born in multiple pregnancies have much higher mortality rates than singletons. In 2020, the perinatal related death rate for babies in multiple pregnancies was 35.09 deaths per 1000 births, compared with the total rate of 10.80 deaths per 1000 births (unadjusted for gestational age).

Over the period 2011–2020, there was a reduction in the stillbirth rate for babies born in multiple pregnancies[34] but no significant change in the rates of terminations or neonatal or total perinatal related deaths (Table 3.27 appended). This reduction in stillbirth rate is consistent with the reduction in stillbirths that occurred in all pregnancies over the period 2007–2020 (Table 3.1).

Perinatal related mortality rates among babies born in multiple pregnancies from 2007 to 2020 are shown in Figure 3.16.

[34] Regression for trend (95% confidence intervals): -1.074 (-2.096, -0.052), p<0.05.

Figure 3.16: Perinatal related mortality rates† (per 1000 births) among babies born in multiple pregnancies, 2007–2020



† Termination of pregnancy 2015 rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract among babies born in multiple pregnancies 2007–2020; Denominator: MAT births among babies born in multiple pregnancies 2007–2020.

Perinatal Mortality Appended Tables

Table 3.8: Perinatal related death and perinatal death classification 2020

Refer to Table 3.11 for the full code list.

	Perinatal death classification (PSANZ-PDC)	2020 n=642	
		n	Rate
1	**Congenital anomaly**		
1.1	Structural anomaly	4	0.07
1.11	Nervous system	27	0.45
1.12	Cardiovascular system	27	0.45
1.13	Genitourinary system	11	0.19
1.15	Musculoskeletal	10	0.17
1.151	Congenital diaphragmatic Hernia	<3	s
1.16	Respiratory system (include congenital pulmonary airway malformation (CPAM))	<3	s
1.18	Multiple congenital anomaly (no chromosomal/genetic cause or not tested)	20	0.34
1.19	Other congenital anomaly		
1.192	Idiopathic hydrops fetalis	4	0.07
1.193	Fetal tumour (include sacro-coccygeal teratoma)	5	0.08
1.198	Other specified	3	0.05
1.199	Congenital anomaly, unspecified	<3	s
1.2	Chromosomal anomaly		
1.21	Trisomy 21 (Down syndrome)	5	0.08
1.22	Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)	14	0.24
1.23	Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)	3	0.05
1.24	Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions, eg, 22q11.2 deletion syndrome (DiGeorge syndrome), Wolff-Hirschorn syndrome, Cri-du-chat syndrome	5	0.08
1.25	Turner syndrome (monosomy X)	3	0.05
1.26	Other sex chromosome abnormalities (eg, Klinefelter syndrome)	<3	s
1.28	Other chromosomal abnormalities, not elsewhere specified (includes triploidy)	3	0.05
1.29	Unspecified	<3	s
1.3	Genetic condition		
1.31	Genetic condition, specified (includes inborn errors of metabolism (eg, Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (eg, Kabuki syndrome, Fraser syndrome)	7	0.12
1.32	Syndrome/association with demonstrated chromosomal/gene anomaly	4	0.07
1.39	Genetic condition, unspecified	<3	s
2	**Perinatal infection**		
2.1	Bacterial	<3	s
2.12	E coli	<3	s
2.14	Spirochaetal, eg, Syphilis	3	0.05
2.18	Other bacterial	3	0.05
2.2	Viral		
2.21	Cytomegalovirus	<3	s
2.3	Protozoal, eg, Toxoplasma	3	0.05
2.9	Other unspecified organism or no organism identified	<3	s
3	**Hypertension**		
3.1	Chronic hypertension: essential	3	0.05
3.3	Chronic hypertension: unspecified	3	0.05
3.4	Gestational hypertension	<3	s
3.5	Pre-eclampsia	16	0.27
3.6	Pre-eclampsia superimposed on chronic hypertension	3	0.05
4	**Antepartum haemorrhage (APH)**		
4.1	Placental abruption	29	0.49
4.2	Placenta praevia	<3	s
4.3	Vasa praevia	<3	s
4.9	APH of undetermined origin	36	0.61

5	**Maternal conditions**		
5.1	Termination of pregnancy for maternal psychosocial indications	38	0.64
5.2	Diabetes		
5.21	Gestational diabetes	<3	s
5.22	Pre-existing diabetes	7	0.12
5.3	Maternal injury		
5.31	Accidental	<3	s
5.4	Maternal sepsis	<3	s
5.5	Antiphospholipid syndrome	<3	s
5.8	Other specified maternal conditions		
5.88	Other specified maternal medical or surgical conditions	6	0.10
6	**Complications of multiple pregnancy**		
6.1	Monochorionic twins		
6.11	Twin to twin transfusion syndrome (TTTS)	7	0.12
6.12	Selective fetal growth restriction (FGR) (ie, affecting only one twin)	4	0.07
6.13	Monoamniotic twins (including cord entanglement)		
6.18	Other	4	0.07
6.19	Unknown or unspecified	<3	s
6.2	Dichorionic twins		
6.21	Early fetal death in a multiple pregnancy (<20 weeks gestation)	<3	s
6.28	Other	<3	s
6.3	Complications of higher order multiples (3 or more fetuses)		
6.31	Twin to twin transfusion syndrome (TTTS)	<3	s
6.34	Early fetal death in a multiple pregnancy (<20 weeks gestation)	<3	s
6.38	Other	<3	s
7	**Specific perinatal conditions**		
7.1	Fetomaternal haemorrhage	11	0.19
7.2	Antepartum cord or fetal vessel complications (excludes monochorionic twins or higher order multiples)	<3	s
7.21	Cord vessel haemorrhage	<3	s
7.22	Cord occlusion (True knot with evidence of occlusion or other)	7	0.12
7.28	Other cord complications	6	0.10
7.29	Unspecified cord complications	<3	s
7.3	Uterine abnormalities		
7.38	Other	<3	s
7.5	Fetal antenatal intracranial injury		
7.53	Fetal antenatal haemorrhagic brain injury	<3	s
7.6	Other specific perinatal conditions		
7.63	Amniotic band	<3	s
7.68	Other	3	0.05
8	**Hypoxic peripartum death**		
8.1	With intrapartum complications (sentinel events)		
8.11	Uterine rupture	<3	s
8.12	Cord prolapse	<3	s
8.13	Shoulder dystocia	<3	s
8.2	Evidence of significant fetal compromise (excluding other complications)	6	0.10
8.3	No intrapartum complications and no evidence of significant fetal compromise identified	<3	s
8.9	Unspecified hypoxic peripartum death	4	0.07
9	**Placental dysfunction or causative placental pathology**		
9.1	Maternal vascular malperfusion	16	0.27
9.2	Fetal vascular malperfusion	<3	s
9.3	High grade villitis of unknown etiology (VUE)	<3	s
9.4	Massive perivillous fibrin deposition/maternal floor infarction	<3	s
9.5	Severe chronic intervillositis (Histiocytic intervillositis)	<3	s
9.6	Placental hypoplasia (small-for gestation placenta)	7	0.12
9.7	No causal placental pathology demonstrated, with antenatal evidence of poor placental function identified (such as abnormal fetal umbilical artery Doppler)	<3	s
9.9	Other placental pathology (eg, Multiple pathologies with evidence of loss of placental function leading to death)	<3	s

10	**Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)**		
10.1	Spontaneous preterm	3	0.05
10.11	With histological chorioamnionitis	41	0.69
10.12	Without histological chorioamnionitis	18	0.30
10.13	With clinical evidence of chorioamnionitis, no examination of placenta	3	0.05
10.17	No clinical signs of chorioamnionitis, no examination of placenta	10	0.17
10.19	Unspecified or not known whether placenta examined	<3	s
10.2	Spontaneous preterm preceded by premature cervical shortening	18	0.30
11	**Unexplained antepartum fetal death**		
11.1	Unexplained antepartum fetal death despite full investigation	41	0.69
11.2	Unclassifiable antepartum fetal death with incomplete investigation	60	1.01
11.3	Unclassifiable antepartum fetal death due to unknown level of investigation	3	0.05
12	**Neonatal death without obstetric antecedent**		
12.1	Neonatal death with no obstetric antecedent factors despite full investigation	<3	s
12.2	Neonatal death unclassifiable as to obstetric antecedent with incomplete investigation	5	0.08
12.3	Neonatal death unclassifiable as to obstetric antecedent due to unknown level of investigation	<3	s

‘s’ indicates rates have been suppressed due to small numbers.

Categories where no deaths occurred have been removed from the table (refer to full code list).

Sources: Numerator: PMMRC’s perinatal data extract 2020; Denominator: MAT births 2020.

Table 3.9: Neonatal death and primary neonatal death classification, 2020

Refer to Table 3.12 for the full code list.

	Neonatal death classification (PSANZ-NDC)	2020 n=153	
		n	Rate
1	**Congenital anomaly**		
1.1	Structural anomaly		
1.11	Nervous system	3	0.05
1.12	Cardiovascular system	9	0.15
1.13	Genitourinary system	3	0.05
1.15	Musculoskeletal	<3	s
1.151	Congenital diaphragmatic Hernia	<3	s
1.16	Respiratory system (include congenital pulmonary airway malformation (CPAM))	<3	s
1.17	Haematological		
1.18	Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)	<3	s
1.19	Other congenital anomaly		
1.192	Idiopathic hydrops fetalis	<3	s
1.193	Fetal tumour (include sacro-coccygeal teratoma)	<3	s
1.2	Chromosomal anomaly		
1.22	Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)	<3	s
1.23	Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)	<3	s
1.3	Genetic condition		
1.31	Genetic condition, specified(includes inborn errors of metabolism (eg, Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (eg, Kabuki syndrome, Fraser syndrome)	5	0.08
1.32	Syndrome/association with demonstrated chromosomal/gene anomaly	<3	s
1.39	Genetic condition, unspecified	<3	s
2	**Periviable infants (typically <24 weeks)**		
2.1	Not resuscitated (including infants where there is an antenatal plan for no resuscitation at birth)	40	0.68
2.2	Unsuccessful resuscitation	3	0.05
3	**Cardio-respiratory disorders**		
3.1	Hyaline membrane disease/Respiratory distress syndrome (RDS)	7	0.12
3.4	Pulmonary hypoplasia	4	0.07
3.5	Pulmonary haemorrhage	3	0.05
3.9	Other		
3.91	Neonatal anaemia/hypovolaemia	<3	s
4	**Neonatal infection**		
4.1	Congenital/Perinatal bacterial infection (early onset<48 hours)	<3	s
4.11	Blood stream infection/septicaemia	<3	s
4.111	Positive culture of a pathogen	<3	s
4.112	Clinical signs of sepsis + ancillary evidence but culture negative	3	0.05
4.4	Acquired bacterial infection [late onset>48hrs].		
4.41	Blood stream infection/septicaemia	<3	s
4.411	Positive culture of a pathogen	5	0.08
4.49	Unspecified acquired infection	<3	s
4.6	Acquired fungal, protozoan, parasitic infection	<3	s
5	**Neurological**		
5.1	Hypoxic ischaemic encephalopathy/Perinatal asphyxia	16	0.27
5.2	Cranial haemorrhage		
5.21	Intraventricular Haemorrhage	15	0.25
5.24	Subdural Haemorrhage	<3	s
6	**Gastrointestinal**		
6.1	Necrotising enterocolitis (NEC)	<3	s

7	Other		
7.1	Sudden unexpected death in infancy (SUDI)		
7.12	Unclassified Sudden Infant Death in the neonatal period		
7.121	Bed sharing/unsafe sleep	5	0.08
7.122	Not bed sharing	<3	s
7.13	Unclassified Sudden Infant Death in the neonatal period		
7.131	Bed sharing/unsafe sleep	<3	s
7.2	Multisystem failure		
7.28	Other specified	<3	s
7.3	Trauma		
7.31	Accidental	<3	s
7.5	Unsuccessful resuscitation in infants of 28 weeks gestation or more without an obvious sentinel event	<3	s
	Not stated	<3	s

‘s’ indicates rates have been suppressed due to small numbers.

Categories where no deaths occurred have been removed from the table (refer to full code list).

Sources: Numerator: PMMRC’s perinatal data extract, neonatal deaths only, 2020; Denominator: MAT births excluding fetal deaths 2020.

Table 3.10: Summary of Aotearoa New Zealand perinatal related mortality rates using Aotearoa New Zealand definition (≥20 weeks or ≥400g if gestation unknown), babies of ngā māmā Māori and New Zealand European mothers, 2007–2020

Māori

Maternal prioritised ethnic group: Māori	n													
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total births	17,245	17,444	17,290	17,171	16,567	16,466	15,294	14,907	15,150	15,405	15,301	14,983	15,244	15,434
Fetal deaths (terminations of pregnancy and stillbirths)†	126	111	140	124	126	111	106	108	91	120	94	119	97	104
Terminations of pregnancy	20	11	29	19	31	34	24	20	20	35	21	21	28	30
Stillbirths	106	100	111	105	95	77	82	88	71	85	73	98	69	74
Early neonatal deaths <7 days	42	45	49	53	39	43	44	47	38	48	49	34	47	46
Late neonatal deaths 7–27 days	11	14	20	16	11	9	6	11	14	14	11	13	13	15
Neonatal deaths <28 days#	53	59	69	69	50	52	50	58	52	62	60	47	60	61
Perinatal mortalities+	168	156	189	177	165	154	150	155	129	168	143	153	144	150
Perinatal related mortalities^	179	170	209	193	176	163	156	166	143	182	154	166	157	165
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	137	131	155	146	119	112	111	127	101	124	116	132	119	118
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	145	144	168	158	127	120	116	135	110	136	126	143	127	131

Maternal prioritised ethnic group: Māori	Rate														2007–2020 Regression for trend (95% CI)
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Total births															
Fetal deaths (terminations of pregnancy and stillbirths)†	7.31	6.36	8.10	7.22	7.61	6.74	6.93	7.24	6.01	7.79	6.14	7.94	6.36	6.74	-0.036 (-0.153, 0.080)
Terminations of pregnancy	1.16	0.63	1.68	1.11	1.87	2.06	1.57	1.34	1.32	2.27	1.37	1.40	1.84	1.94	0.046 (-0.022, 0.114)
Stillbirths	6.15	5.73	6.42	6.11	5.73	4.68	5.36	5.90	4.69	5.52	4.77	6.54	4.53	4.79	-0.082 (-0.187, 0.023)
Early neonatal deaths <7 days															
Late neonatal deaths 7–27 days															
Neonatal deaths <28 days#	3.10	3.40	4.02	4.05	3.04	3.18	3.29	3.92	3.45	4.06	3.95	3.16	3.96	3.98	0.029 (-0.038, 0.096)
Perinatal mortalities+	9.74	8.94	10.93	10.31	9.96	9.35	9.81	10.40	8.51	10.91	9.35	10.21	9.45	9.72	-0.010 (-0.132, 0.112)
Perinatal related mortalities^	10.38	9.75	12.09	11.24	10.62	9.90	10.20	11.14	9.44	11.81	10.06	11.08	10.30	10.69	-0.007 (-0.144, 0.130)
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	7.94	7.51	8.96	8.50	7.18	6.80	7.26	8.52	6.67	8.05	7.58	8.81	7.81	7.65	-0.003 (-0.129, 0.123)
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	8.41	8.25	9.72	9.20	7.67	7.29	7.58	9.06	7.26	8.83	8.23	9.54	8.33	8.49	-0.001 (-0.140, 0.139)

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

• Lethal and terminated fetal abnormalities are all perinatal related deaths with PSANZ-PDC of congenital anomaly and neonatal deaths with PSANZ-NDC of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract 2011–2020; Denominator: MAT births 2011–2020.

Table 3.10: Summary of Aotearoa New Zealand perinatal related mortality rates using Aotearoa New Zealand definition (≥20 weeks or ≥400g if gestation unknown), babies of ngā māmā Māori and New Zealand European mothers, 2007–2020 (contd.)

New Zealand European

Maternal prioritised ethnic group: NZ European	n													
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total births	26,912	26,815	26,476	26,039	24,775	23,971	22,840	22,272	21,868	21,335	20,862	20,132	20,129	19,262
Fetal deaths (terminations of pregnancy and stillbirths)†	235	237	234	201	205	189	179	203	172	168	137	158	169	184
Terminations of pregnancy	78	87	69	74	77	66	59	70	58	56	51	54	82	78
Stillbirths	157	150	165	127	128	123	120	133	114	112	86	104	87	106
Early neonatal deaths <7 days	54	59	43	55	51	47	35	53	41	34	31	47	47	27
Late neonatal deaths 7–27 days	11	16	15	15	7	14	16	6	11	5	15	12	8	12
Neonatal deaths <28 days#	65	75	58	70	58	61	51	59	52	39	46	59	55	39
Perinatal mortalities+	289	296	277	256	256	236	214	256	213	202	168	205	216	211
Perinatal related mortalities^	300	312	292	271	263	250	230	262	224	207	183	217	224	223
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	200	195	191	166	171	166	153	172	146	139	113	138	135	151
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	205	203	202	176	175	173	164	176	150	143	124	146	140	158

Maternal prioritised ethnic group: NZ European	Rate														2007–2020 Regression for trend (95% CI)
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Total births															
Fetal deaths (terminations of pregnancy and stillbirths)†	8.73	8.84	8.84	7.72	8.27	7.88	7.84	9.11	7.87	7.87	6.57	7.85	8.40	9.55	-0.083 (-0.183, 0.017)
Terminations of pregnancy	2.90	3.24	2.61	2.84	3.11	2.75	2.58	3.14	2.65	2.62	2.44	2.68	4.07	4.05	0.013 (-0.059, 0.086)
Stillbirths	5.83	5.59	6.23	4.88	5.17	5.13	5.25	5.97	5.21	5.25	4.12	5.17	4.32	5.50	-0.097 * (-0.175, -0.018)
Early neonatal deaths <7 days															
Late neonatal deaths 7–27 days															
Neonatal deaths <28 days#	2.44	2.82	2.21	2.71	2.36	2.56	2.25	2.67	2.40	1.84	2.22	2.95	2.76	2.04	0.001 (-0.051, 0.054)
Perinatal mortalities+	10.74	11.04	10.46	9.83	10.33	9.85	9.37	11.49	9.74	9.47	8.05	10.18	10.73	10.95	-0.080 (-0.220, 0.059)
Perinatal related mortalities^	11.15	11.64	11.03	10.41	10.62	10.43	10.07	11.76	10.24	9.70	8.77	10.78	11.13	11.58	-0.082 (-0.209, 0.044)
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	7.43	7.27	7.21	6.38	6.90	6.93	6.70	7.72	6.68	6.52	5.42	6.85	6.71	7.84	-0.071 (-0.155, 0.014)
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	7.62	7.57	7.63	6.76	7.06	7.22	7.18	7.90	6.86	6.70	5.94	7.25	6.96	8.20	-0.067 (-0.142, 0.008)

* p-value <0.05.

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

• Lethal and terminated fetal abnormalities are all perinatal related deaths with PSANZ-PDC of congenital anomaly and neonatal deaths with PSANZ-NDC of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract 2007–2020; Denominator: MAT births 2007–2020.

Table 3.11: Perinatal Society of Australia and New Zealand Perinatal Death Classification Version 2017 full code list

1 Congenital anomaly

1.1 Structural anomaly
- 1.11 Nervous system
- 1.12 Cardiovascular system
- 1.13 Genitourinary system
- 1.14 Gastrointestinal system
- 1.15 Musculoskeletal
  - 1.151 Congenital diaphragmatic hernia
  - 1.152 Gastroschisis/omphalocele
- 1.16 Respiratory system (include congenital pulmonary airway malformation (CPAM))
- 1.17 Haematological
- 1.18 Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)
- 1.19 Other congenital anomaly
  - 1.192 Idiopathic hydrops fetalis
  - 1.193 Fetal tumour (include sacro-coccygeal teratoma)
  - 1.198 Other specified
  - 1.199 Congenital anomaly, unspecified

1.2 Chromosomal anomaly
- 1.21 Trisomy 21 (Down syndrome)
- 1.22 Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)
- 1.23 Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)
- 1.24 Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions, eg, 22q11.2 deletion syndrome (diGeorge syndrome), Wolff-Hirschorn syndrome, Cri-du-chat syndrome
- 1.25 Turner syndrome (monosomy X)
- 1.26 Other sex chromosome abnormalities (eg, Klinefelter syndrome)
- 1.28 Other chromosomal abnormalities, not elsewhere specified (includes triploidy)
- 1.29 Unspecified

1.3 Genetic condition
- 1.31 Genetic condition, specified (includes inborn errors of metabolism (eg, Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (eg, Kabuki syndrome, Fraser syndrome)
- 1.32 Syndrome/association with demonstrated chromosomal/gene anomaly
- 1.39 Genetic condition, unspecified

2 Perinatal infection

2.1 Bacterial
- 2.11 Group B Streptococcus
- 2.12 E coli
- 2.13 Listeria monocytogenes
- 2.14 Spirochaetal, eg, Syphilis
- 2.18 Other bacterial
- 2.19 Unspecified bacterial

2.2 Viral
- 2.21 Cytomegalovirus
- 2.22 Parvovirus
- 2.23 Herpes simplex virus
- 2.24 Rubella virus
- 2.25 Zika virus
- 2.28 Other viral
- 2.29 Unspecified viral

2.3 Protozoal, eg, Toxoplasma

2.5 Fungal

2.8 Other specified organism

2.9 Other unspecified organism or no organism identified

3 Hypertension

3.1 Chronic hypertension: essential

3.2 Chronic hypertension: secondary, eg, renal disease

3.3 Chronic hypertension: unspecified

3.4 Gestational hypertension

3.5 Pre-eclampsia

3.6 Pre-eclampsia superimposed on chronic hypertension

3.9 Unspecified hypertension

4 Antepartum haemorrhage (APH)

4.1 Placental abruption

4.2 Placenta praevia

4.3 Vasa praevia

4.9 APH of undetermined origin

5 Maternal Conditions

5.1 Termination of pregnancy for maternal psychosocial indications

5.2 Diabetes
- 5.21 Gestational diabetes
- 5.22 Pre-existing diabetes

5.3 Maternal injury
- 5.31 Accidental
- 5.32 Non-accidental

5.4 Maternal sepsis

5.5 Antiphospholipid syndrome

5.6 Obstetric cholestasis

5.8 Other specified maternal conditions
- 5.81 Maternal suicide
- 5.88 Other specified maternal medical or surgical conditions

6 Complications of multiple pregnancy

6.1 Monochorionic twins
- 6.11 Twin to twin transfusion syndrome (TTTS)
- 6.12 Selective fetal growth restriction (FGR) (ie, affecting only one twin)
- 6.13 Monoamniotic twins (including cord entanglement)
- 6.18 Other
- 6.19 Unknown or unspecified

6.2 Dichorionic twins
- 6.21 Early fetal death in a multiple pregnancy (<20 weeks gestation)
- 6.22 Selective fetal growth restriction (FGR)
- 6.28 Other
- 6.29 Unknown or unspecified

6.3 Complications of higher order multiples (3 or more fetuses)
- 6.31 Twin to twin transfusion syndrome (TTTS)
- 6.32 Selective fetal growth restriction (FGR)
- 6.33 Monoamniotic multiples (including cord entanglement)
- 6.34 Early fetal death in a multiple pregnancy (<20 weeks gestation)
- 6.38 Other
- 6.39 Unknown or unspecified

6.4 Complications where chorionicity is unknown

6.8 Other

6.9 Unspecified

7 Specific perinatal conditions

7.1 Fetomaternal haemorrhage

7.2 Antepartum cord or fetal vessel complications (excludes monochorionic twins or higher order multiples)
- 7.21 Cord vessel haemorrhage
- 7.22 Cord occlusion (True knot with evidence of occlusion or other)
- 7.28 Other cord complications
- 7.29 Unspecified cord complications

7.3 Uterine abnormalities
- 7.31 Developmental anatomical abnormalities (eg, bicornuate uterus)
- 7.38 Other

	7.39	Unspecified
7.4	Alloimmune disease	
	7.41	Rhesus isoimmunisation
	7.42	Other red cell antibody
	7.43	Alloimmune thrombocytopenia
	7.48	Other
	7.49	Unspecified
7.5	Fetal antenatal intracranial injury	
	7.51	Subdural haematoma
	7.52	Fetal antenatal ischaemic brain injury
	7.53	Fetal antenatal haemorrhagic brain injury
7.6	Other specific perinatal conditions	
	7.61	Rupture of membranes after amniocentesis
	7.62	Termination of pregnancy for suspected but unconfirmed congenital anomaly.
	7.63	Amniotic band
	7.68	Other
7.8	Unspecified	
8	**Hypoxic peripartum death**	
8.1	With intrapartum complications (sentinel events)	
	8.11	Uterine rupture
	8.12	Cord prolapse
	8.13	Shoulder dystocia
	8.14	Complications of breech presentation
	8.15	Birth trauma
	8.16	Intrapartum haemorrhage
	8.18	Other
8.2	Evidence of significant fetal compromise (excluding other complications)	
8.3	No intrapartum complications and no evidence of significant fetal compromise identified	
8.9	Unspecified hypoxic peripartum death	
9	**Placental dysfunction or causative placental pathology**	
9.1	Maternal vascular malperfusion	
9.2	Fetal vascular malperfusion	
9.3	High grade villitis of unknown etiology (VUE)	
9.4	Massive perivillous fibrin deposition/maternal floor infarction	
9.5	Severe chronic intervillositis (Histiocytic intervillositis)	
9.6	Placental hypoplasia (small-for gestation placenta)	
9.7	No causal placental pathology demonstrated, with antenatal evidence of poor placental function identified (such as abnormal fetal umbilical artery Doppler)	
9.8	Placental pathological examination was not performed, with antenatal evidence of poor placental function was identified (such as abnormal fetal umbilical artery Doppler)	
9.9	Other placental pathology (eg, Multiple pathologies with evidence of loss of placental function leading to death)	
10	**Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)**	
10.1	Spontaneous preterm	
	10.11	With histological chorioamnionitis
	10.12	Without histological chorioamnionitis
	10.13	With clinical evidence of chorioamnionitis, no examination of placenta
	10.17	No clinical signs of chorioamnionitis, no examination of placenta
	10.19	Unspecified or not known whether placenta examined
10.2	Spontaneous preterm preceded by premature cervical shortening	
11	**Unexplained antepartum fetal death**	
11.1	Unexplained antepartum fetal death despite full investigation	
11.2	Unclassifiable antepartum fetal death with incomplete investigation	
11.3	Unclassifiable antepartum fetal death due to unknown level of investigation	
12	**Neonatal death without obstetric antecedent**	
12.1	Neonatal death with no obstetric antecedent factors despite full investigation	
12.2	Neonatal death unclassifiable as to obstetric antecedent with incomplete investigation	
12.3	Neonatal death unclassifiable as to obstetric antecedent due to unknown level of investigation	

Table 3.12: Perinatal Society of Australia and New Zealand Neonatal Death Classification Version 2017 full code list

1	**Congenital anomaly**	
1.1	Structural anomaly	
	1.11	Nervous system
	1.12	Cardiovascular system
	1.13	Genitourinary system
	1.14	Gastrointestinal system
	1.15	Musculoskeletal
		1.151 Congenital diaphragmatic Hernia
		1.152 Gastroschisis/omphalocele
	1.16	Respiratory system (include congenital pulmonary airway malformation (CPAM))
	1.17	Haematological
	1.18	Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)
	1.19	Other congenital anomaly
		1.192 Idiopathic hydrops fetalis
		1.193 Fetal tumour (include sacro-coccygeal teratoma)
		1.198 Other specified
		1.199 Congenital anomaly, unspecified
1.2	Chromosomal anomaly	
	1.21	Trisomy 21 (Down syndrome)
	1.22	Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)
	1.23	Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)
	1.24	Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions, eg, 22q11.2 deletion syndrome (diGeorge syndrome), Wolff-Hirschorn syndrome, Cri-du-chat syndrome
	1.25	Turner syndrome (monosomy X)
	1.26	Other sex chromosome abnormalities (eg, Klinefelter syndrome)
	1.28	Other chromosomal abnormalities, not elsewhere specified (includes triploidy)
	1.29	Unspecified
1.3	Genetic condition	
	1.31	Genetic condition, specified(includes inborn errors of metabolism (eg, Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (eg, Kabuki syndrome, Fraser syndrome)
	1.32	Syndrome/association with demonstrated chromosomal/gene anomaly
	1.39	Genetic condition, unspecified
2	**Periviable infants (typically <24 weeks)**	
2.1	Not resuscitated (including infants where there is an antenatal plan for no resuscitation at birth or in the circumstance of re-directed care)	
2.2	Unsuccessful resuscitation	
2.9	Unspecified or not known whether resuscitation attempted	
3	**Cardio-respiratory disorders**	
3.1	Hyaline membrane disease/Respiratory distress syndrome (RDS)	
3.2	Meconium aspiration syndrome	
3.3	Primary persistent pulmonary hypertension	
3.4	Pulmonary hypoplasia	
3.5	Pulmonary haemorrhage	
3.6	Air leak syndromes	
	3.6.1	Pneumothorax
	3.6.2	Pulmonary interstitial emphysema
	3.6.3	Other

3.7 Patent ductus arteriosus

3.8 Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)

3.9 Other

3.9.1 Neonatal anaemia/hypovolaemia

4 Neonatal infection

4.1 Congenital/Perinatal bacterial infection (early onset<48 hrs)

4.11 Blood stream infection/septicaemia

4.111 Positive culture of a pathogen

4.112 Clinical signs of sepsis + ancillary evidence but culture negative

4.12 Bacterial meningitis

4.13 Bacterial pneumonia

4.15 Multiple site bacterial infection

4.18 Other congenital bacterial infection, eg, gastroenteritis, osteomyelitis, cerebral abscess

4.19 Unspecified congenital infection

4.2 Congenital/Perinatal viral infection

4.3 Congenital fungal, protozoan, parasitic infection

4.4 Acquired bacterial infection [late onset>48hrs]

4.41 Blood stream infection/septicaemia

4.411 Positive culture of a pathogen

4.412 Clinical signs of sepsis + ancillary evidence but culture negative

4.42 Bacterial meningitis

4.43 Bacterial pneumonia

4.48 Other acquired bacterial infection, eg, gastroenteritis, osteomyelitis

4.49 Unspecified acquired infection

4.5 Acquired viral infection

4.6 Acquired fungal, protozoan, parasitic infection

5 Neurological

5.1 Hypoxic ischaemic encephalopathy/Perinatal asphyxia

5.2 Cranial haemorrhage

5.21 Intraventricular haemorrhage

5.22 Subgaleal haemorrhage

5.23 Subarachnoid haemorrhage

5.24 Subdural haemorrhage

5.28 Other intracranial haemorrhage

5.3 Post haemorrhagic hydrocephalus

5.4 Periventricular leukomalacia

5.8 Other

6 Gastrointestinal

6.1 Necrotising enterocolitis (NEC)

6.2 Short gut syndrome

6.3 Gastric or intestinal perforation (excluding NEC)

6.4 Gastrointestinal haemorrhage

6.8 Other

7 Other

7.1 Sudden unexpected death in infancy (SUDI)

7.11 Sudden Infant Death Syndrome (SIDS)

7.112 SIDS Category IA: Classic features of SIDS present and completely documented.

7.113 SIDS Category IB: Classic features of SIDS present but incompletely documented.

7.114 SIDS Category II: Infant deaths that meet category I except for one or more features.

7.12 Unknown/Undetermined

7.13 Unclassified Sudden Infant Death in the neonatal period

7.131 Bed sharing/unsafe sleep

7.132 Not bed sharing

7.2 Multisystem failure

7.21 Secondary to intrauterine growth restriction

7.28 Other specified

7.29 Unspecified/undetermined primary cause or trigger event

7.3 Trauma

7.31 Accidental

7.32 Non accidental

7.39 Unspecified

7.4 Treatment complications

7.41 Surgical

7.42 Medical

7.5 Unsuccessful resuscitation in infants of 28 weeks gestation or more without an obvious sentinel event

7.8 Other specified

Table 3.13: Aotearoa New Zealand perinatal related mortality rates (per 1000 births) using the international definition (≥1000g or ≥28 weeks if birthweight unknown), 2007–2020

	n													
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Total births	64,659	65,080	64,628	64,890	62,702	62,732	59,610	59,516	59,330	60,109	59,963	58,763	60,051	58,853
Fetal deaths (terminations of pregnancy and stillbirths)†	211	207	231	199	191	166	155	162	164	171	158	151	155	161
Terminations of pregnancy	6	14	9	17	24	13	12	13	7	15	16	7	19	22
Stillbirths	205	193	222	182	167	153	143	149	157	156	142	144	136	139
Early neonatal deaths <7 days	58	67	59	68	65	54	45	59	57	53	46	40	54	49
Late neonatal deaths 7–27 days	28	35	30	31	18	24	24	23	28	23	22	20	23	20
Neonatal deaths <28 days#	86	102	89	99	83	78	69	82	85	76	68	60	77	69
Perinatal mortalities+	269	274	290	267	256	220	200	221	221	224	204	191	209	210
Perinatal related mortalities^	297	309	320	298	274	244	224	244	249	247	226	211	232	230
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	224	215	237	202	179	166	156	167	174	167	156	149	152	166
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	238	235	253	219	188	176	167	177	185	180	169	157	164	176

	Rate														
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2007–2020 Regression for trend (95% CI)**
Total births															
Fetal deaths (terminations of pregnancy and stillbirths)†	3.26	3.18	3.57	3.07	3.05	2.65	2.60	2.72	2.76	2.84	2.63	2.57	2.58	2.74	-0.057 ** (-0.086, -0.029)
Terminations of pregnancy	0.09	0.22	0.14	0.26	0.38	0.21	0.20	0.22	0.12	0.25	0.27	0.12	0.32	0.37	0.008 (-0.005, 0.021)
Stillbirths	3.17	2.97	3.44	2.80	2.66	2.44	2.40	2.50	2.65	2.60	2.37	2.45	2.26	2.36	-0.065 ** (-0.095, -0.035)
Early neonatal deaths <7 days															
Late neonatal deaths 7–27 days															
Neonatal deaths <28 days#	1.33	1.57	1.38	1.53	1.33	1.25	1.16	1.38	1.44	1.27	1.14	1.02	1.29	1.18	-0.024 * (-0.041, -0.006)
Perinatal mortalities+	4.16	4.21	4.49	4.11	4.08	3.51	3.36	3.71	3.72	3.73	3.40	3.25	3.48	3.57	-0.072 ** (-0.106, -0.037)
Perinatal related mortalities^	4.59	4.75	4.95	4.59	4.37	3.89	3.76	4.10	4.20	4.11	3.77	3.59	3.86	3.91	-0.081 ** (-0.117, -0.044)
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	3.46	3.30	3.67	3.11	2.85	2.65	2.62	2.81	2.93	2.78	2.60	2.54	2.53	2.82	-0.066 ** (-0.100, -0.032)
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	3.68	3.61	3.91	3.37	3.00	2.81	2.80	2.97	3.12	2.99	2.82	2.67	2.73	2.99	-0.072 ** (-0.109, -0.035)

* p-value <0.05.

** p-value <0.01.

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

• Lethal and terminated fetal abnormalities are all perinatal related deaths with PSANZ-PDC of congenital anomaly and neonatal deaths with PSANZ-NDC of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract using the international definition (≥1000g or ≥28 weeks if birthweight unknown) 2007–2020; Denominator: MAT births using the international definition (≥1000g or ≥28 weeks if birthweight unknown) 2007–2020.

Table 3.14: Perinatal death classification specific perinatal related mortality rates (per 1000 births) using Aotearoa New Zealand definition, 2011–2020

Perinatal death classification (PSANZ-PDC)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2011–2020 Regression for trend
	N=63,250		N=63,294		N=60,143		N=60,082		N=59,791		N=60,621		N=60,492		N=59,315		N=60,607		N=59,444		
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	(95% CI)
Congenital anomaly	206	3.26	206	3.25	164	2.73	191	3.18	163	2.73	177	2.92	163	2.69	162	2.73	183	3.02	165	2.78	-0.044 (-0.095, 0.008)
Perinatal infection	21	0.33	19	0.30	20	0.33	24	0.40	22	0.37	26	0.43	28	0.46	21	0.35	17	0.28	14	0.24	-0.004 (-0.022, 0.014)
Hypertension	21	0.33	19	0.30	13	0.22	13	0.22	21	0.35	9	0.15	13	0.21	19	0.32	18	0.30	26	0.44	0.008 (-0.014, 0.029)
Antepartum haemorrhage	78	1.23	60	0.95	75	1.25	69	1.15	79	1.32	72	1.19	78	1.29	59	0.99	49	0.81	67	1.13	-0.018 (-0.060, 0.024)
Maternal conditions	16	0.25	26	0.41	30	0.50	29	0.48	24	0.40	26	0.43	18	0.30	31	0.52	15	0.25	18	0.30	-0.007 (-0.034, 0.020)
Complications of multiple pregnancy	23	0.36	25	0.39	26	0.43	25	0.42	10	0.17	21	0.35	21	0.35	31	0.52	30	0.49	22	0.37	0.007 (-0.018, 0.033)
Specific perinatal conditions	38	0.60	27	0.43	25	0.42	27	0.45	33	0.55	32	0.53	31	0.51	28	0.47	27	0.45	33	0.56	0.001 (-0.016, 0.018)
Hypoxic peripartum death	20	0.32	21	0.33	11	0.18	17	0.28	17	0.28	13	0.21	13	0.21	6	0.10	7	0.12	16	0.27	-0.016 (-0.033, 0.001)
Placental dysfunction or causative placental pathology	56	0.89	57	0.90	57	0.95	45	0.75	43	0.72	53	0.87	54	0.89	56	0.94	50	0.82	34	0.57	-0.017 (-0.046, 0.012)
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	95	1.50	115	1.82	88	1.46	122	2.03	77	1.29	87	1.44	85	1.41	101	1.70	107	1.77	95	1.60	0.000 (-0.061, 0.061)
Unexplained antepartum fetal death	80	1.26	77	1.22	81	1.35	80	1.33	77	1.29	79	1.30	71	1.17	77	1.30	100	1.65	104	1.75	0.041 * (0.003, 0.078)
Neonatal death without obstetric antecedent	4	0.06	9	0.14	6	0.10	7	0.12	7	0.12	6	0.10	8	0.13	<3	s	17	0.28	9	0.15	0.009 (-0.007, 0.025)
Other	10	0.16	10	0.16	4	0.07	10	0.17	5	0.08	11	0.18	11	0.18	11	0.19	19	0.31	39	0.66	0.038 * (0.005, 0.071)

* p-value <0.05.

's' indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2011–2020; Denominator: MAT births 2011–2020.

Table 3.15: Neonatal death classification specific neonatal death rates (per 1000 live births), 2011–2020

Perinatal death classification (PSANZ-PDC)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2011–2020 Regression for trend (95% CI)
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	
Gestation <28 weeks	**N=241**		**N=254**		**N=257**		**N=274**		**N=255**		**N=251**		**N=283**		**N=258**		**N=277**		**N=296**		
Congenital anomaly	<3	s	<3	s	<3	s	<3	s	3	11.76	<3	s	4	14.13	<3	s	<3	s	3	10.14	0.204 (-0.729, 1.137)
Extreme prematurity	54	224.07	67	263.78	63	245.14	69	251.82	51	200.00	55	219.12	70	247.35	63	244.19	68	245.49	43	145.27	-5.068 (-13.432, 3.296)
Cardio-respiratory disorders	7	29.05	10	39.37	5	19.46	12	43.80	10	39.22	6	23.90	9	31.80	10	38.76	13	46.93	12	40.54	1.222 (-0.954, 3.398)
Infection	7	29.05	10	39.37	5	19.46	7	25.55	<3	s	4	15.94	8	28.27	7	27.13	8	28.88	11	37.16	0.329 (-2.198, 2.855)
Neurological	8	33.20	6	23.62	8	31.13	12	43.80	11	43.14	8	31.87	9	31.80	3	11.63	8	28.88	15	50.68	0.299 (-2.667, 3.266)
Gastrointestinal	<3	s	<3	s	<3	s	<3	s	<3	s	3	11.95	4	14.13	6	23.26	3	10.83	<3	s	0.801 (-0.600, 2.202)
Other	-	-	<3	s	<3	s	<3	s	4	15.69	<3	s	<3	s	-	-	3	10.83	-	-	0.059 (-1.333, 1.451)
Gestation ≥28 weeks	**N=61,973**		**N=61,699**		**N=59,117**		**N=58,958**		**N=58,775**		**N=59,540**		**N=59,405**		**N=58,234**		**N=59,422**		**N=57,854**		
Congenital anomaly	48	0.77	36	0.58	31	0.52	43	0.73	42	0.71	33	0.55	28	0.47	34	0.58	33	0.56	33	0.57	-0.016 (-0.039, 0.007)
Extreme prematurity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<3	s	-	-	0.001 (-0.001, 0.002)
Cardio-respiratory disorders	4	0.06	4	0.06	<3	s	4	0.07	6	0.10	5	0.08	7	0.12	4	0.07	4	0.07	3	0.05	0.002 (-0.005, 0.009)
Infection	8	0.13	7	0.11	7	0.12	8	0.14	5	0.09	10	0.17	7	0.12	5	0.09	<3	s	4	0.07	-0.007 (-0.016, 0.001)
Neurological	15	0.24	19	0.31	17	0.29	12	0.20	20	0.34	16	0.27	14	0.24	13	0.22	15	0.25	17	0.29	-0.001 (-0.013, 0.010)
Gastrointestinal	-	-	<3	s	-	-	<3	s	<3	s	<3	s	-	-	3	0.05	<3	s	-	-	0.001 (-0.003, 0.006)
Other	9	0.15	13	0.21	13	0.22	9	0.15	10	0.17	8	0.13	12	0.20	4	0.07	18	0.30	10	0.17	0.002 (-0.015, 0.018)

‘s’ indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract, neonatal deaths only, 2011–2020; Denominator: MAT births excluding fetal deaths 2011–2020.

Table 3.16: Perinatal related mortality rates (per 1000 births) by maternal prioritised ethnic group, 2016–2020

Prioritised ethnic group (mother)	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,479†		n=772			n=1507†			n=812			n=3091†		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Māori	76,367	25.4	135	17.5	1.77	399	26.5	5.22	290	35.7	3.82	824	26.7	10.79
Pacific peoples	30,636	10.2	59	7.6	1.93	200	13.3	6.53	121	14.9	3.98	380	12.3	12.40
Asian	55,235	18.4	180	23.3	3.26	292	19.4	5.29	116	14.3	2.12	588	19.0	10.65
Indian	21,085	7.0	89	11.5	4.22	143	9.5	6.78	56	6.9	2.69	288	9.3	13.66
Other Asian	34,150	11.4	91	11.8	2.66	149	9.9	4.36	60	7.4	1.77	300	9.7	8.78
MELAA	7298	2.4	21	2.7	2.88	29	1.9	3.97	15	1.8	2.07	65	2.1	8.91
European	130,805	43.5	377	48.8	2.88	586	38.9	4.48	270	33.3	2.08	1233	39.9	9.43
NZ European	101,720	33.9	321	41.6	3.16	495	32.8	4.87	238	29.3	2.36	1054	34.1	10.36
Other European	29,085	9.7	56	7.3	1.93	91	6.0	3.13	32	3.9	1.11	179	5.8	6.15

† Includes 138 unknown maternal ethnicity among total births and 1 unknown maternal ethnicity perinatal related deaths (total).

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Table 3.17: Perinatal related mortality rates (per 1000 births) by baby prioritised ethnic group, 2016–2020

Prioritised ethnic group (mother)	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,479†		n=772†			n=1507†			n=812†			n=3091†		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Māori	83,857	27.9	177	22.9	2.11	454	30.1	5.41	329	40.5	3.95	960	31.1	11.45
Pacific peoples	30,084	10.0	60	7.8	1.99	215	14.3	7.15	130	16.0	4.36	405	13.1	13.46
Asian	55,844	18.6	177	22.9	3.17	294	19.5	5.26	111	13.7	2.00	582	18.8	10.42
Indian	22,119	7.4	89	11.5	4.02	147	9.8	6.65	57	7.0	2.60	293	9.5	13.25
Other Asian	33,725	11.2	88	11.4	2.61	147	9.8	4.36	54	6.7	1.61	289	9.3	8.57
MELAA	7082	2.4	21	2.7	2.97	32	2.1	4.52	19	2.3	2.70	72	2.3	10.17
European	120,152	40.0	336	43.5	2.80	511	33.9	4.25	223	27.5	1.87	1070	34.6	8.91
NZ European	95,304	31.7	306	39.6	3.21	458	30.4	4.81	201	24.8	2.13	965	31.2	10.13
Other European	24,848	8.3	30	3.9	1.21	53	3.5	2.13	22	2.7	0.89	105	3.4	4.23

† Includes 3460 unknown baby's ethnicity total births and 2 unknown baby's ethnicity perinatal related deaths (total).

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Table 3.18: Perinatal related mortality rates (per 1000 births) by maternal prioritised ethnic group† and year, 2011–2020

Maternal ethnicity	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N
Māori	176	16,567	163	16,466	156	15,294	166	14,907	143	15,150	182	15,405	154	15,301	166	14,983	157	15,244	165	15,434
Pacific peoples	80	7273	94	7085	84	6545	83	6307	71	6188	73	5976	82	6096	72	6102	77	6294	76	6168
Asian	86	7254	100	8590	83	8231	95	9361	96	9325	107	10,669	121	10,709	95	10,728	131	11,604	134	11,525
Indian	35	2159	38	2370	37	2447	45	2768	43	3118	53	3504	58	3866	46	4221	69	4633	62	4861
Other Asian	51	5095	62	6220	46	5784	50	6593	53	6207	54	7165	63	6843	49	6507	62	6971	72	6664
MELAA	13	1313	16	1270	10	1322	15	1312	15	1360	8	1399	17	1564	10	1441	14	1498	16	1396
European	313	30,788	296	29,839	267	28,714	299	28,160	253	27,739	241	27,143	220	26,794	261	26,028	260	25,939	251	24,901
NZ European	263	24,775	250	23,971	230	22,840	262	22,272	224	21,868	207	21,335	183	20,862	217	20,132	224	20,129	223	19,262
Other European	50	6013	46	5868	37	5874	37	5888	29	5871	34	5808	37	5932	44	5896	36	5810	28	5639

Maternal ethnicity	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2020 Regression for trend (95% CI)
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	
Māori	10.62	9.90	10.20	11.14	9.44	11.81	10.06	11.08	10.30	10.69	0.042 (-0.141, 0.226)
Pacific peoples	11.00	13.27	12.83	13.16	11.47	12.22	13.45	11.80	12.23	12.32	0.007 (-0.211, 0.224)
Asian	11.86	11.64	10.08	10.15	10.29	10.03	11.30	8.86	11.29	11.63	-0.045 (-0.304, 0.214)
Indian	16.21	16.03	15.12	16.26	13.79	15.13	15.00	10.90	14.89	12.75	-0.380 * (-0.716, -0.043)
Other Asian	10.01	9.97	7.95	7.58	8.54	7.54	9.21	7.53	8.89	10.80	0.008 (-0.309, 0.326)
MELAA	9.90	12.60	7.56	11.43	11.03	5.72	10.87	6.94	9.35	11.46	-0.114 (-0.715, 0.486)
European	10.17	9.92	9.30	10.62	9.12	8.88	8.21	10.03	10.02	10.08	-0.023 (-0.219, 0.172)
NZ European	10.62	10.43	10.07	11.76	10.24	9.70	8.77	10.78	11.13	11.58	0.046 (-0.191, 0.282)
Other European	8.32	7.84	6.30	6.28	4.94	5.85	6.24	7.46	6.20	4.97	-0.212 (-0.462, 0.037)

* p-value <0.05.

† Excludes 338 unknown maternal ethnicity total births and 4 unknown maternal ethnicity perinatal related deaths (total).

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2011–2020; Denominator: MAT births 2011–2020.

Table 3.19: Perinatal related mortality rates (per 1000 births) by maternal age, 2016–2020

Maternal age (years)	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,479		n=772			n=1507			n=812			n=3,091		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
<20	11,119	3.7	40	5.2	3.60	80	5.3	7.19	60	7.4	5.46	180	5.8	16.19
20–24	45,247	15.1	89	11.5	1.97	283	18.8	6.25	188	23.2	4.19	560	18.1	12.38
25–29	83,208	27.7	193	25.0	2.32	355	23.6	4.27	211	26.0	2.55	759	24.6	9.12
30–34	96,925	32.3	249	32.3	2.57	432	28.7	4.46	214	26.4	2.22	895	29.0	9.23
35–39	51,702	17.2	154	19.9	2.98	264	17.5	5.11	106	13.1	2.07	524	17.0	10.14
≥40	12,210	4.1	47	6.1	3.85	92	6.1	7.53	33	4.1	2.73	172	5.6	14.09
Unknown	68	0.0	-	-	-	<3	x	-	-	-	-	<3	x	-

'x' indicates percentages have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Table 3.20: Perinatal related mortality rates (per 1000 births) by maternal age and year, 2011–2020

Maternal age (years)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N
<20	65	4128	63	3966	65	3382	51	3047	45	2828	54	2491	32	2330	38	2164	28	2132	28	2002
20–24	116	11,939	126	11,696	115	11,011	116	10,476	86	10,140	125	9783	104	9497	108	8845	113	8712	110	8410
25–29	147	15,867	149	16,270	139	15,599	165	16,016	150	15,993	143	16,895	154	16,948	159	16,568	161	16,714	142	16,083
30–34	161	17,611	163	17,858	147	17,128	175	17,985	158	18,294	169	18,749	174	19,039	156	19,127	193	19,914	203	20,096
35–39	145	11,027	119	10,677	89	10,320	111	9941	107	9981	90	10,204	100	10,104	108	10,246	109	10,636	117	10,512
≥40	34	2652	50	2806	45	2681	40	2596	32	2534	30	2484	30	2554	35	2352	35	2491	42	2329
Unknown	-	26	<3	21	-	22	<3	21	-	21	<3	15	-	20	-	13	-	8	-	12

Maternal age (years)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2020 Regression for trend (95% CI)
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	
<20	15.75	15.89	19.22	16.74	15.91	21.68	13.73	17.56	13.13	13.99	-0.283 (-0.950, 0.384)
20–24	9.72	10.77	10.44	11.07	8.48	12.78	10.95	12.21	12.97	13.08	0.354 * (0.067, 0.641)
25–29	9.26	9.16	8.91	10.30	9.38	8.46	9.09	9.60	9.63	8.83	-0.010 (-0.147, 0.126)
30–34	9.14	9.13	8.58	9.73	8.64	9.01	9.14	8.16	9.69	10.10	0.055 (-0.097, 0.207)
35–39	13.15	11.15	8.62	11.17	10.72	8.82	9.90	10.54	10.25	11.13	-0.125 (-0.458, 0.209)
≥40	12.82	17.82	16.78	15.41	12.63	12.08	11.75	14.88	14.05	18.03	-0.003 (-0.635, 0.628)
Unknown	-	-	-	-	-	-	-	-	-	-	-

* p-value <0.05.

Sources: Numerator: PMMRC's perinatal data extract 2011–2020; Denominator: MAT births 2011–2020.

Table 3.21: Perinatal related mortality rates (per 1000 births) by parity,† 2016–2020

Parity	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=278,058		n=613			n=1222			n=637			n=2472		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
0	114,081	41.0	250	40.8	2.19	584	47.8	5.12	308	48.4	2.72	1142	46.2	10.01
1	93,522	33.6	226	36.9	2.42	315	25.8	3.37	166	26.1	1.79	707	28.6	7.56
2	40,751	14.7	93	15.2	2.28	161	13.2	3.95	90	14.1	2.22	344	13.9	8.44
3	16,384	5.9	24	3.9	1.46	78	6.4	4.76	43	6.8	2.64	145	5.9	8.85
4	6985	2.5	10	1.6	1.43	49	4.0	7.02	17	2.7	2.45	76	3.1	10.88
≥5	6204	2.2	10	1.6	1.61	35	2.9	5.64	13	2.0	2.11	58	2.3	9.35
Unknown	131	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Data not supplied to MAT			-7			10			-3			-		

† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Parity '0' indicates women having their first baby/babies at 20 weeks or longer gestation.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, 2016–2020; Denominator: MAT births 2016–2020.

Table 3.22: Perinatal related mortality rates (per 1000 births) by DHB of maternal residence, 2016–2020

DHB of maternal residence	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,479		n=772			n=1507			n=812			n=3,091		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Northland	11,535	3.8	36	4.7	3.12	68	4.5	5.90	37	4.6	3.24	141	4.6	12.22
Waitematā	38,822	12.9	127	16.5	3.27	176	11.7	4.53	61	7.5	1.58	364	11.8	9.38
Auckland	28,041	9.3	88	11.4	3.14	127	8.4	4.53	60	7.4	2.16	275	8.9	9.81
Counties Manukau	42,029	14.0	123	15.9	2.93	264	17.5	6.28	190	23.4	4.56	577	18.7	13.73
Waikato	27,447	9.1	81	10.5	2.95	153	10.2	5.57	80	9.9	2.94	314	10.2	11.44
Bay of Plenty	15,459	5.1	30	3.9	1.94	83	5.5	5.37	50	6.2	3.26	163	5.3	10.54
Lakes	7702	2.6	14	1.8	1.82	41	2.7	5.32	20	2.5	2.62	75	2.4	9.74
Tairāwhiti	3644	1.2	4	0.5	1.10	22	1.5	6.04	14	1.7	3.87	40	1.3	10.98
Taranaki	7473	2.5	17	2.2	2.27	29	1.9	3.88	30	3.7	4.04	76	2.5	10.17
Hawke's Bay	10,525	3.5	18	2.3	1.71	55	3.6	5.23	23	2.8	2.20	96	3.1	9.12
Whanganui	4189	1.4	8	1.0	1.91	25	1.7	5.97	10	1.2	2.41	43	1.4	10.26
MidCentral	10,824	3.6	28	3.6	2.59	40	2.7	3.70	39	4.8	3.63	107	3.5	9.89
Wairarapa	2561	0.9	4	0.5	1.56	21	1.4	8.20	6	0.7	2.37	31	1.0	12.10
Capital & Coast	16,658	5.5	24	3.1	1.44	82	5.4	4.92	41	5.0	2.48	147	4.8	8.82
Hutt Valley	9951	3.3	10	1.3	1.00	43	2.9	4.32	26	3.2	2.63	79	2.6	7.94
Nelson Marlborough	7419	2.5	20	2.6	2.70	19	1.3	2.56	15	1.8	2.03	54	1.7	7.28
West Coast	1658	0.6	3	0.4	1.81	21	1.4	12.67	3	0.4	1.84	27	0.9	16.28
Canterbury	31,954	10.6	78	10.1	2.44	138	9.2	4.32	67	8.3	2.11	283	9.2	8.86
South Canterbury	3151	1.0	8	1.0	2.54	13	0.9	4.13	6	0.7	1.92	27	0.9	8.57
Southern	16,944	5.6	50	6.5	2.95	85	5.6	5.02	27	3.3	1.61	162	5.2	9.56
Other†	2493	0.8	<3	x	s	<3	x	s	7	0.9	s	10	0.3	s
Total	**300,479**	**100.0**	**772**	**100.0**	**2.57**	**1507**	**100.0**	**5.02**	**812**	**100.0**	**2.72**	**3091**	**100.0**	**10.29**

† Other includes overseas, unknown and other.

'x' indicates percentages have been suppressed due to small numbers.

's' indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2016–2020; Denominator: MAT births 2016–2020.

Table 3.23: Perinatal related mortality rates (per 1000 births) by gestation and birthweight, 2020

	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=59,444		n=179			n=310			n=153			n=642		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Gestation at birth (weeks)														
20–22	220	0.4	101	56.4	†	90	29.0	†	32	20.9	†	223	34.7	†
23–24	158	0.3	40	22.3	253.16	32	10.3	202.53	37	24.2	430.23	109	17.0	689.87
25–27	232	0.4	23	12.8	99.14	28	9.0	120.69	17	11.1	93.92	68	10.6	293.10
28–31	505	0.8	11	6.1	21.78	24	7.7	47.52	13	8.5	27.66	48	7.5	95.05
32–36	3750	6.3	3	1.7	0.80	44	14.2	11.73	18	11.8	4.86	65	10.1	17.33
37–40	45,551	76.6	<3	x	s	71	22.9	1.56	28	18.3	0.62	100	15.6	2.20
≥41	8217	13.8	-	-	-	15	4.8	1.83	8	5.2	0.98	23	3.6	2.80
Unknown	811	1.4	-	-	-	6	1.9	-	-	-	-	6	0.9	-
Birthweight (g)														
<500	236	0.4	100	55.9	†	108	34.8	†	29	19.0	†	237	36.9	†
500–999	344	0.6	56	31.3	162.79	59	19.0	171.51	55	35.9	240.17	170	26.5	494.19
1000–1499	333	0.6	13	7.3	39.04	15	4.8	45.05	7	4.6	22.95	35	5.5	105.11
1500–1999	679	1.1	6	3.4	8.84	9	2.9	13.25	17	11.1	25.60	32	5.0	47.13
2000–2499	2249	3.8	<3	x	s	27	8.7	12.01	10	6.5	4.50	39	6.1	17.34
2500–2999	8174	13.8	-	-	-	23	7.4	2.81	13	8.5	1.59	36	5.6	4.40
3000–3499	18,313	30.8	-	-	-	31	10.0	1.69	11	7.2	0.60	42	6.5	2.29
3500–3999	17,092	28.8	-	-	-	22	7.1	1.29	8	5.2	0.47	30	4.7	1.76
4000–4499	6545	11.0	-	-	-	8	2.6	1.22	3	2.0	0.46	11	1.7	1.68
≥4500	1317	2.2	-	-	-	3	1.0	2.28	-	-	-	3	0.5	2.28
Unknown	4162	7.0	<3	x	s	5	1.6	-	-	-	-	7	1.1	-

† Denominator data unreliable and therefore rates have not been calculated.

'x' indicates percentages have been suppressed due to small numbers.

's' indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2020; Denominator: MAT births 2020.

Table 3.24: Stillbirth risk (per 1000 ongoing pregnancies), 2011–2020

Gestation at birth (weeks)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n
Stillbirths																				
20–22	230	90	231	86	215	88	245	110	169	73	206	83	211	72	230	100	216	84	220	90
23–24	129	37	119	28	123	29	137	28	117	32	126	29	110	27	125	29	134	32	158	32
25–27	185	24	218	36	192	25	187	25	206	31	189	26	213	30	184	23	226	28	232	28
28–31	511	34	506	30	471	32	462	31	459	29	483	22	481	31	485	27	484	19	505	24
32–36	3911	55	3943	54	3723	63	3729	58	3654	48	3825	60	3765	48	3695	56	3852	48	3750	44
37–40	47,027	83	47,093	78	45,615	60	45,857	72	45,762	72	46,632	76	46,851	68	45,920	69	47,070	60	45,551	71
≥41	10,725	9	10,336	9	9482	9	9092	3	9075	20	8788	14	8478	12	8303	11	8174	10	8217	15
Unknown	532	-	848	-	322	-	373	-	349	-	372	-	383	-	373	-	451	3	811	6

Gestation at birth (weeks)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2020 Regression for trend (95% CI)
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	
Stillbirths											
20–22	1.43	1.38	1.47	1.84	1.23	1.38	1.20	1.70	1.40	1.53	0.002 (-0.051, 0.055)
23–24	0.59	0.45	0.49	0.47	0.54	0.48	0.45	0.49	0.53	0.55	0.001 (-0.012, 0.013)
25–27	0.38	0.58	0.42	0.42	0.52	0.43	0.50	0.39	0.47	0.48	0.001 (-0.016, 0.017)
28–31	0.55	0.48	0.54	0.52	0.49	0.37	0.52	0.46	0.32	0.41	-0.017 * (-0.033, -0.002)
32–36	0.89	0.88	1.07	0.99	0.82	1.01	0.81	0.97	0.81	0.76	-0.015 (-0.040, 0.010)
37–40	1.44	1.36	1.09	1.31	1.31	1.37	1.23	1.27	1.09	1.32	-0.013 (-0.042, 0.016)
≥41	0.84	0.87	0.95	0.33	2.20	1.59	1.42	1.32	1.22	1.83	0.096 (-0.027, 0.219)
Unknown	-	-	-	-	-	-	-	-	-	-	-

* p-value <0.05.

Sources: Numerator: PMMRC's perinatal data extract, stillbirths only, 2011–2020; Denominator: MAT births 2011–2020.

Table 3.25: Neonatal death risk (per 1000 ongoing pregnancies), 2011–2020

Gestation at birth (weeks)	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n
Neonatal deaths																				
20–22	32	38	27	44	44	46	44	52	30	36	36	46	58	57	43	51	39	55	29	32
23–24	63	29	59	34	62	24	78	39	58	33	65	23	58	30	70	34	61	26	86	37
25–27	146	13	168	20	151	14	152	14	167	13	150	11	167	18	145	6	177	23	181	17
28–31	466	13	471	15	434	12	424	8	427	9	447	12	445	13	456	14	456	8	470	13
32–36	3848	24	3886	16	3656	24	3666	22	3603	27	3763	17	3712	23	3636	15	3796	17	3703	18
37–40	46,943	39	47,015	38	45,554	28	45,779	38	45,690	39	46,556	39	46,782	27	45,850	31	47,006	42	45,479	28
≥41	10,716	8	10,327	11	9473	5	9089	9	9055	9	8774	6	8466	5	8292	3	8164	7	8202	8
Unknown	532	-	848	-	322	-	373	-	349	-	372	-	383	-	373	-	447	-	805	-

Gestation at birth (weeks)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011–2020 Regression for trend (95% CI)
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	
Neonatal deaths											
20–22	0.61	0.71	0.77	0.88	0.61	0.77	0.95	0.87	0.92	0.55	0.011 (-0.026, 0.048)
23–24	0.47	0.55	0.40	0.66	0.56	0.38	0.50	0.58	0.44	0.64	0.006 (-0.019, 0.031)
25–27	0.21	0.32	0.24	0.24	0.22	0.18	0.30	0.10	0.39	0.29	0.004 (-0.017, 0.025)
28–31	0.21	0.24	0.20	0.14	0.15	0.20	0.22	0.24	0.13	0.22	-0.001 (-0.012, 0.010)
32–36	0.39	0.26	0.41	0.38	0.46	0.29	0.39	0.26	0.29	0.31	-0.008 (-0.026, 0.009)
37–40	0.68	0.66	0.51	0.69	0.71	0.70	0.49	0.57	0.76	0.52	-0.006 (-0.032, 0.020)
≥41	0.75	1.07	0.53	0.99	0.99	0.68	0.59	0.36	0.86	0.98	-0.011 (-0.073, 0.052)
Unknown	-	-	-	-	-	-	-	-	-	-	-

Sources: Numerator: PMMRC's perinatal data extract specific neonatal deaths 2011–2020; Denominator: MAT births excluding fetal deaths 2011–2020.

Table 3.26: Perinatal related mortality rates by customised birthweight centile group among singleton births† from 26 weeks gestation without congenital anomalies, 2011–2020

Year of death	Small for gestational age			Appropriate for gestational age			Large for gestational age			Unknown/missing data			Total		
	N=49,672	N=417		N=389,306	N=873		N=65,446	N=155		N=24,340	N=132		N=528,764	N=1577	
	N	n	Rate	N	n	Rate	N	n	Rate	N	n	Rate	N	n	Rate
2011	5114	44	8.60	37,949	80	2.11	6139	21	3.42	2742	13	4.74	51,944	158	3.04
2012	5054	44	8.71	39,191	95	2.42	6541	11	1.68	2230	6	2.69	53,016	156	2.94
2013	4902	42	8.57	37,984	86	2.26	6211	21	3.38	2364	7	2.96	51,461	156	3.03
2014	4983	44	8.83	38,678	93	2.40	6393	15	2.35	2271	5	2.20	52,325	157	3.00
2015	4879	43	8.81	39,224	102	2.60	6386	18	2.82	2471	6	2.43	52,960	169	3.19
2016	4981	36	7.23	39,613	97	2.45	6671	17	2.55	2405	16	6.65	53,670	166	3.09
2017	4792	43	8.97	39,838	92	2.31	6722	12	1.79	2274	10	4.40	53,626	157	2.93
2018	4989	43	8.62	38,910	72	1.85	6676	15	2.25	2259	10	4.43	52,834	140	2.65
2019	5061	38	7.51	39,640	76	1.92	6883	11	1.60	2447	25	10.22	54,031	150	2.78
2020	4917	40	8.14	38,279	80	2.09	6824	14	2.05	2877	34	11.82	52,897	168	3.18
Data not supplied to MAT		78			-38			-55			-2			-17	

† MAT data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, among singleton births from 26 weeks gestation without congenital anomalies 2011–2020; Denominator: MAT births among singleton births from 26 weeks gestation 2011–2020.

Table 3.27: Perinatal related mortality rates among babies born in multiple pregnancies, 2011–2020

Year of death	Total multiple births	Fetal deaths				Neonatal deaths		Perinatal related deaths (total)	
		Termination of pregnancy		Stillbirths					
		n=102		n=435		n=342		n=879	
		n	Rate	n	Rate	n	Rate	n	Rate
2011	1827	18	9.85	48	26.27	27	15.33	93	50.90
2012	1806	14	7.75	34	18.83	32	18.20	80	44.30
2013	1741	8	4.60	40	22.98	16	9.45	64	36.76
2014	1727	10	5.79	34	19.69	40	23.77	84	48.64
2015	1665	<3	s	29	17.42	20	12.24	51	30.63
2016	1631	3	1.84	33	20.23	11	6.90	47	28.82
2017	1552	4	2.58	29	18.69	22	14.48	55	35.44
2018	1491	9	6.04	37	24.82	32	22.15	78	52.31
2019	1550	14	9.03	17	10.97	33	21.72	64	41.29
2020	1539	9	5.85	18	11.70	27	17.86	54	35.09
2011–2020 Regression for trend (95% CI)		-0.175 (-0.956, 0.606)		-1.074 * (-2.096, -0.052)		0.471 (-0.985, 1.927)		-0.770 (-2.937, 1.397)	

* p-value <0.05.

‘s’ indicates rates have been suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract among babies born in multiple pregnancies 2011–2020; Denominator: MAT births among babies born in multiple pregnancies 2011–2020.

Neonatal Encephalopathy | Te Māuiui Roro i ngā Pēpi Whānau Hou

Introduction

Neonatal encephalopathy (NE) is a clinically defined syndrome of disturbed neurological function within the first week after birth in an infant born from 35 weeks gestation, manifested by difficulty in initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness and often seizures. The severity of the encephalopathy is measured by the Sarnat stage 1, 2 or 3 or as mild, moderate or severe.[35]

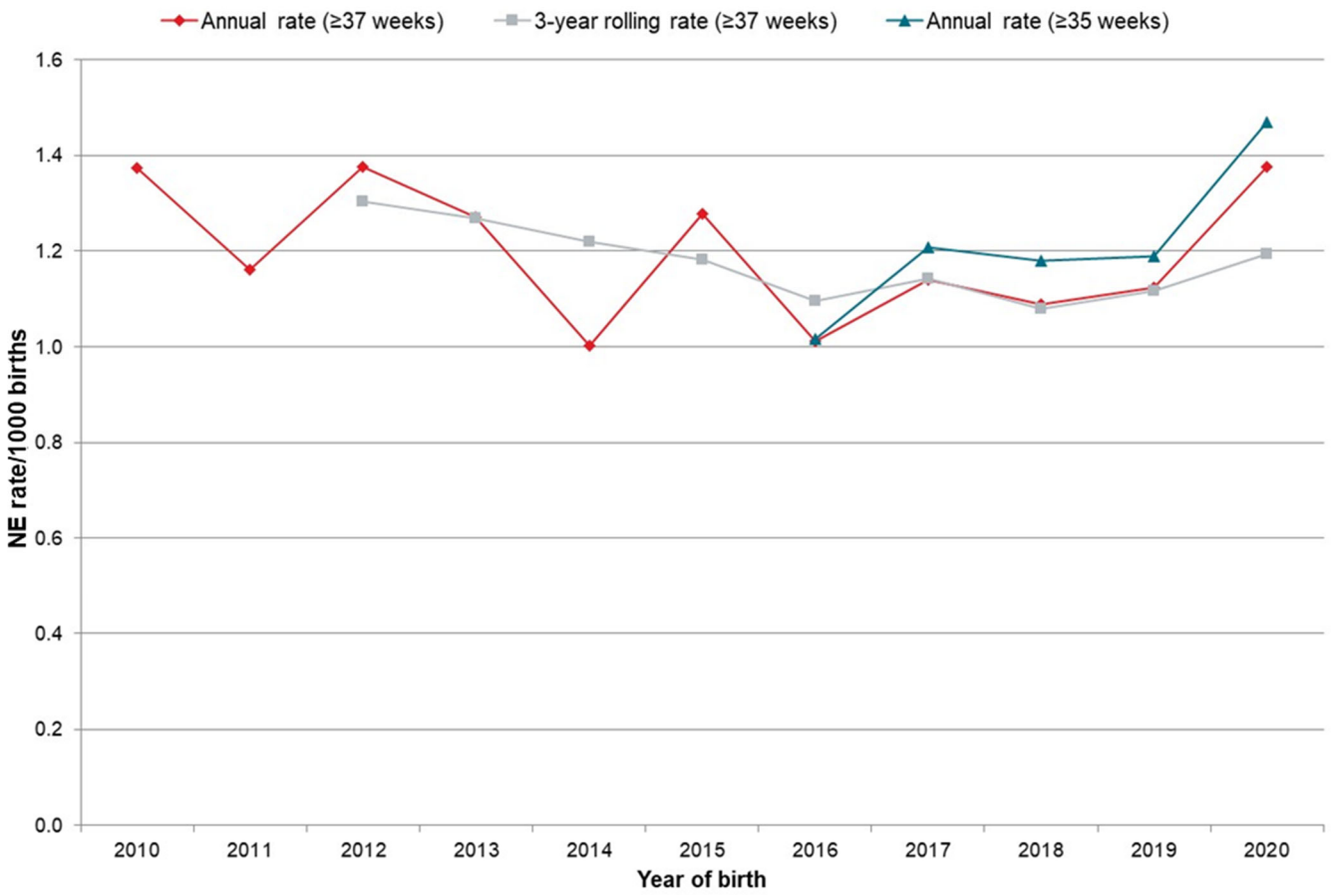
The PMMRC collects data on babies who present with moderate or severe NE in the first seven days after birth. Data have been collected on babies with NE from 37 weeks gestation onwards since 2010. In 2016, due to a change in the international definition of hypoxic ischemic encephalopathy (HIE), which included 35 and 36 weeks gestational ages,[36] the PMMRC started collecting data on babies from 35 weeks gestation.

As we have five years of collected NE data incorporating 35–36 weeks gestations, this report now includes data on babies born at 35 weeks gestation onwards and tables cover the 2016–2020 period only.

[35] Nelson KB, Leviton A. 1991. How much of neonatal encephalopathy is due to birth asphyxia? *American Journal of Diseases of Children* 145(11): 1325–31.

[36] American College of Obstetricians and Gynecologists' Task Force on Neonatal Encephalopathy. 2014. Executive summary: Neonatal encephalopathy and neurologic outcome, second edition. Report of the American College of Obstetricians and Gynecologists' Task Force on Neonatal Encephalopathy. *Obstetrics & Gynecology* 123(4): 896–901. DOI: 10.1097/01.AOG.0000445580.65983.d2 (accessed 7 November 2022).

Figure 4.1: Neonatal encephalopathy annual and three-year rolling rates† (per 1000 term births for 2010–2020 and all births at ≥35 weeks gestation annual rate from 2016 to 2020)



† Rolling three-year NE ratio represented at final year of triennium.

Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2020 and ≥35 weeks 2016–2020; Denominator: MAT births ≥37 weeks 2010–2019 and ≥35 weeks 2016–2020.

International Comparisons

It is difficult to compare NE rates for Aotearoa New Zealand with those for other countries due to differences in definitions of terms and in inclusion and exclusion criteria, as well as data quality issues. A previous meta-analysis estimated the NE incidence in high-income regions to be 1.6 per 1000 live births.[37] The Aotearoa New Zealand rate of 1.21 per 1000 live births over the period 2016–2020 is therefore internationally comparable.

Findings

Over the period 2016–2020, including gestations from 35 weeks, the number of NE cases ranged from 56 to 74 per year. The rate of NE cases per 1000 of these births also varied from year to year, with a low of 1.02 per 1000 live births ≥35 weeks in 2016 and a high of 1.47 in 2020. However, there was no statistically significant trend in either direction for either 2010–2018 for ≥37 weeks or 2016–2020 for ≥35 weeks gestations (Figure 4.1).[38] With the addition of >35 weeks, since 2016 there has been a slight increase of NE rates, but the pattern remains the same as when >35 weeks were excluded.

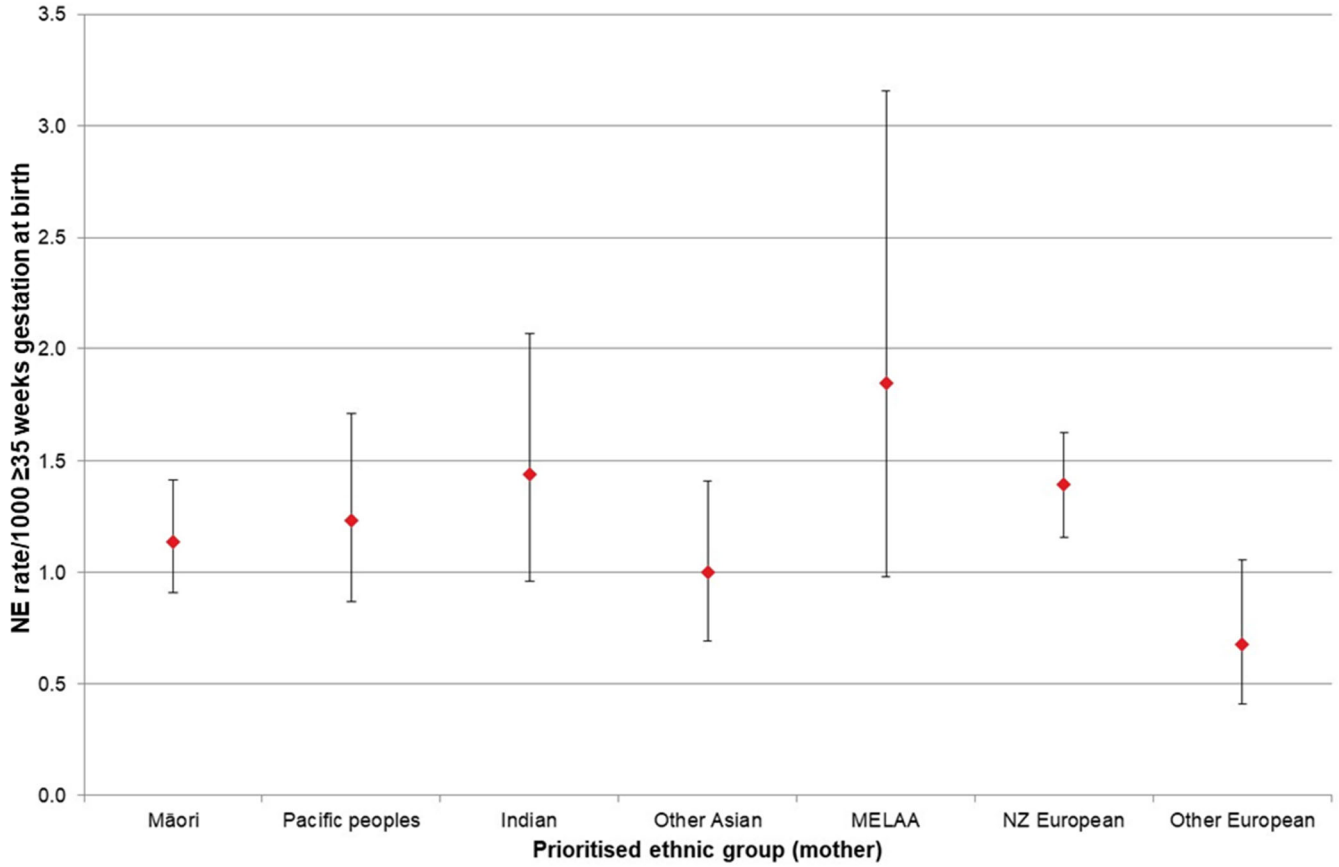
No ethnicity group reached a statistically significant difference, but again, Other European mothers continued to have the lowest rates (Figure 4.2 below and Table 4.12 appended).

[37] Lee ACC, Kozuki N, Blencowe H, et al. 2013. Intrapartum-related neonatal encephalopathy incidence and impairment at regional and global levels for 2010 with trends from 1990. *Pediatric Research* 74(a1): 50–72.

[38] Regression for trend 2016–2020=0.089 (95% CI -0.007, 0.185); 2010–2020=-0.11 (95%CI -0.42-0.020).

NE rates varied by NZDep quintile. While babies whose mothers lived in quintiles 4 and 5 were more likely to develop NE than those living in quintile 1, this was not statistically significant (Figure 4.3 below and Table 4.12 appended).[39]

Figure 4.2: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation, with 95% CIs) by maternal prioritised ethnic group, 2016–2020

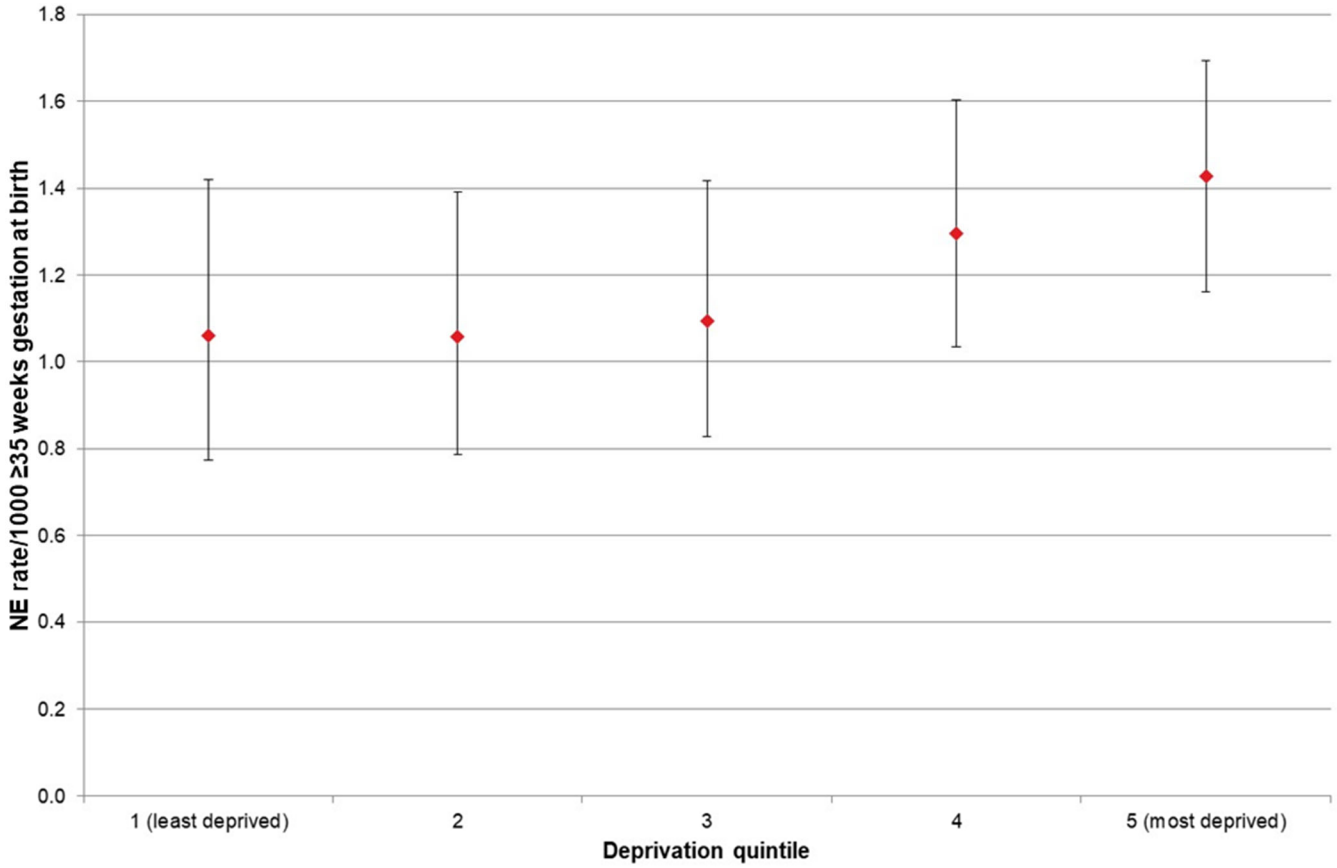


MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

[39] The rate ratio comparing quintile 5 with quintile 1 was 1.34 (95% CI 0.95-1.90). For quintile 4 compared with quintile 1, the rate ratio was 1.22 (95% CI 0.85-1.75).

Figure 4.3: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation, with 95% CIs) by NZDep quintile, 2016–2020



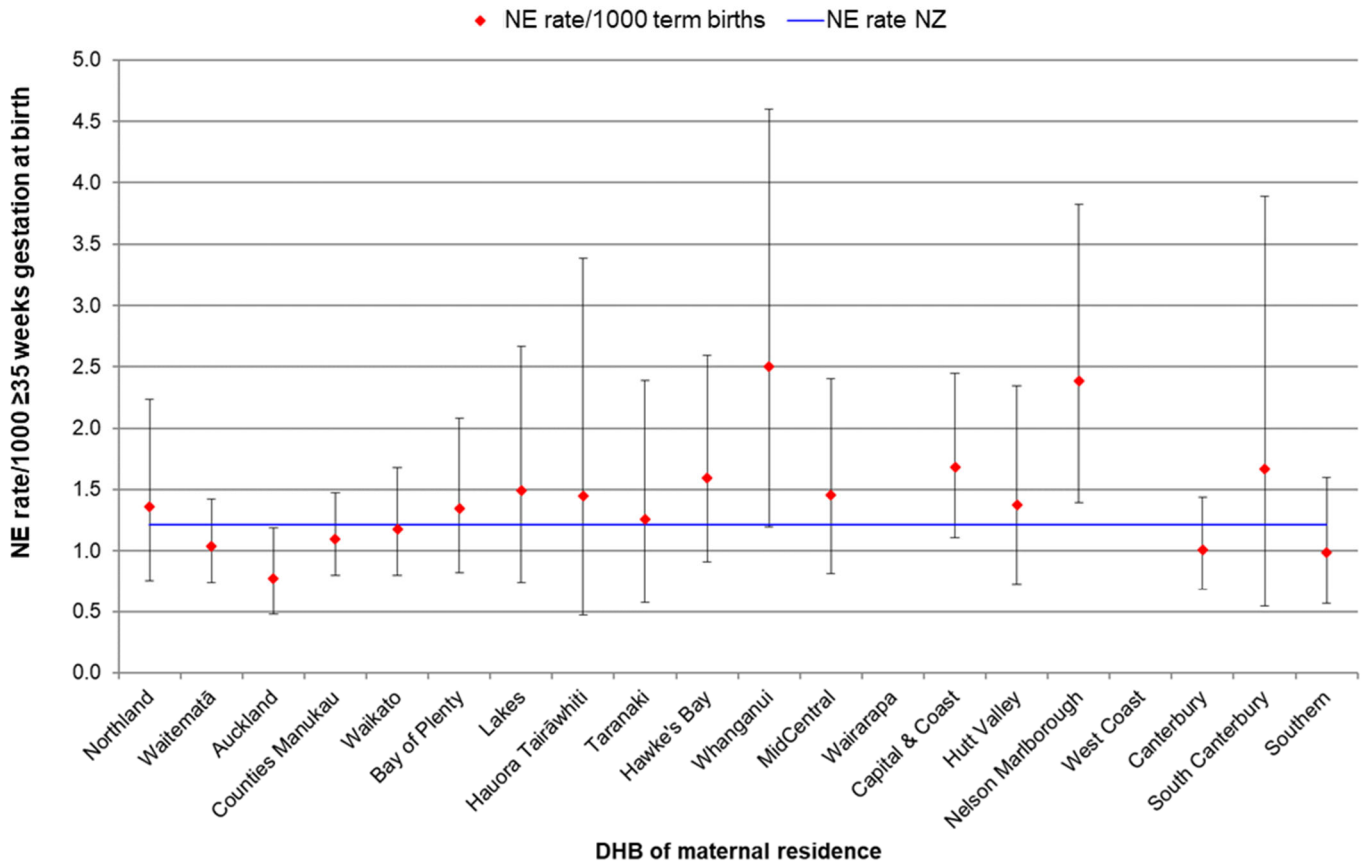
Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

NE rates also varied considerably by the DHB region in which the mother lived. The rates in most DHBs were not statistically significantly different to the national rate of 1.21 per 1000 ≥35 weeks gestation births. However, over the five-year reporting period, 2016–2020, Auckland DHB had significantly lower rates than the national average, while Nelson Marlborough DHB had significantly higher rates than the national average (Figure 4.4 below and Table 4.13 appended).

Because the frequency of cases was statistically low, it was not possible to identify any trends of an increasing or decreasing rate for individual DHBs, and differing local arrangements for reporting might have influenced numbers.

In ongoing research, members of the Neonatal Encephalopathy Working Group will compare reporting with that of the Australian and New Zealand Neonatal Network (ANZNN) and the PMMRC in terms of establishing mortality and morbidity and frequency of cases.

Figure 4.4: Neonatal encephalopathy rates† (per 1000 births at ≥35 weeks gestation, with 95% CIs) by DHB of maternal residence (compared with Aotearoa New Zealand NE rate), 2016–2020

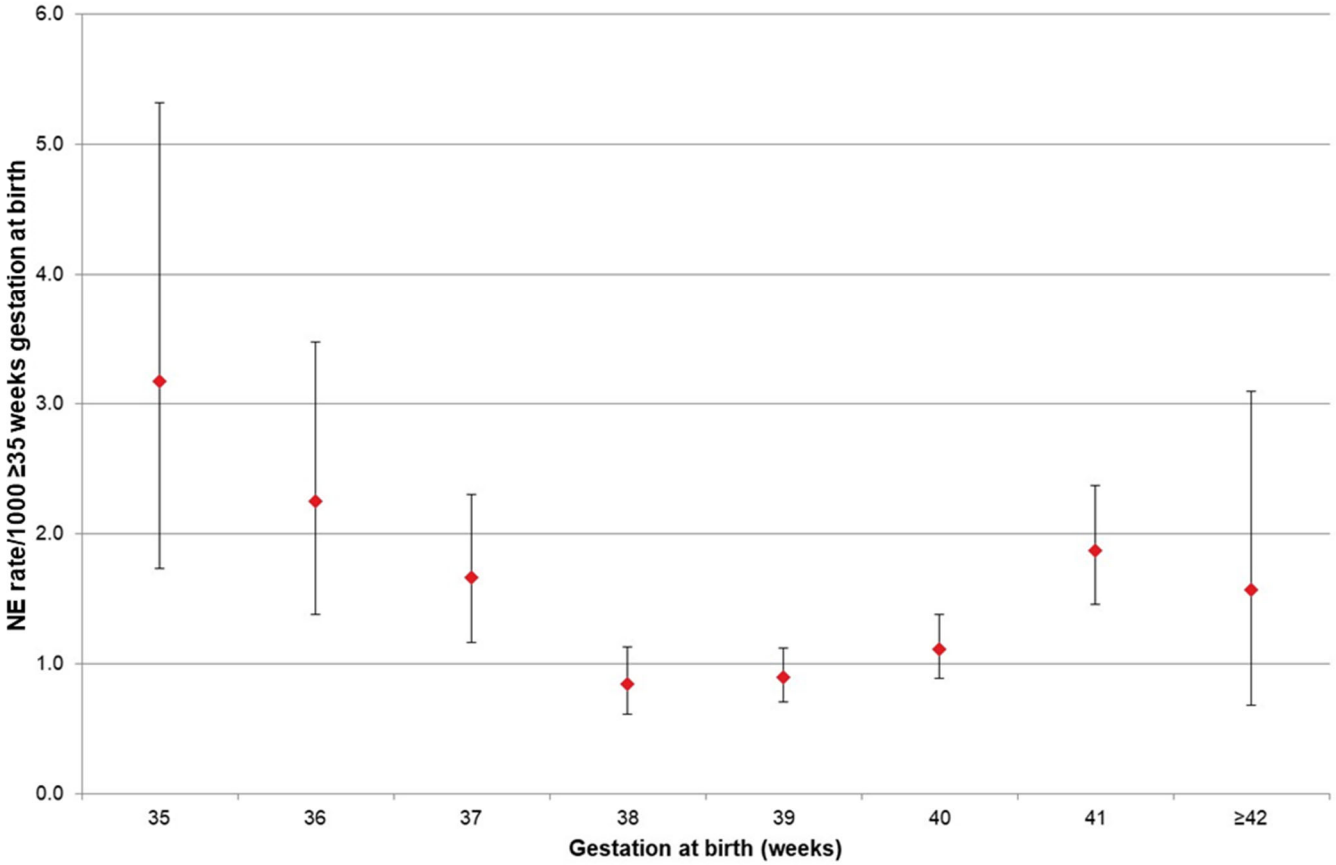


† Rates for Wairarapa and West Coast have been suppressed due to small numbers.

Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Rates of NE varied by gestational age, and the inclusion of 35 and 36 weeks gestations in this report demonstrates higher rates in that gestational age group. As in past reports, the ≥41 weeks gestation group also had higher rates (Table 4.1 and Figure 4.5). These findings are likely due to a number of interrelated factors, and further review would be required to analyse this fully.

Figure 4.5: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation), 2016–2020



Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Differences in the sex of babies with NE were not statistically significant. Babies with lower or higher birthweight had significantly higher rates of NE, with both those under 2500g and ≥4500g demonstrating this. Babies who were multiples had a slightly higher incidence rate than singletons. However, this difference was not statistically significant (Table 4.1).

Table 4.1: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation) by gestation, sex, birthweight and plurality, 2016–2020

	MAT births ≥35 weeks		NE babies		Rate (per 1000 births at ≥35 weeks gestation)	
	N=287,289		n=348			
	N	%	n	%	/1000	95% CI
Gestation at birth (weeks)						
35	4417	1.5	14	4.0	3.17	1.73–5.32
36	8888	3.1	20	5.7	2.25	1.37–3.48
37	21,661	7.5	36	10.3	1.66	1.16–2.30
38	52,422	18.2	44	12.6	0.84	0.61–1.13
39	84,160	29.3	75	21.6	0.89	0.70–1.12
40	73,781	25.7	82	23.6	1.11	0.88–1.38
41	36,863	12.8	69	19.8	1.87	1.46–2.37
≥42	5097	1.8	8	2.3	1.57	0.68–3.09
Sex						
Male	147,067	51.2	183	52.6	1.24	1.06–1.42
Female	140,212	48.8	165	47.4	1.18	1.00–1.36
Undetermined/unknown	10	0.0	-	-	-	-
Birthweight (g)						
<2500	9864	3.4	24	6.9	2.43	1.56–3.62
2500–3999	224,397	78.1	276	79.3	1.23	1.08–1.38
4000–4499	32,784	11.4	33	9.5	1.01	0.69–1.41
≥4500	6639	2.3	15	4.3	2.26	1.26–3.73
Unknown	13,605	4.7	-	-	-	-
Customised birthweight centiles						
Small for gestational age	25,021	8.7	81	23.3	3.24	2.57–4.02
Appropriate for gestational age	196,071	68.2	232	66.7	1.18	1.03–1.34
Large for gestational age	32,847	11.4	35	10.1	1.07	0.74–1.48
Unknown	33,350	11.6	-	-	-	-
Plurality						
Singleton	280,046	97.5	343	98.6	1.22	1.10–1.35
Multiple	5473	1.9	5	1.4	0.91	0.30–2.13
Unknown	1770	0.6	-	-	-	-

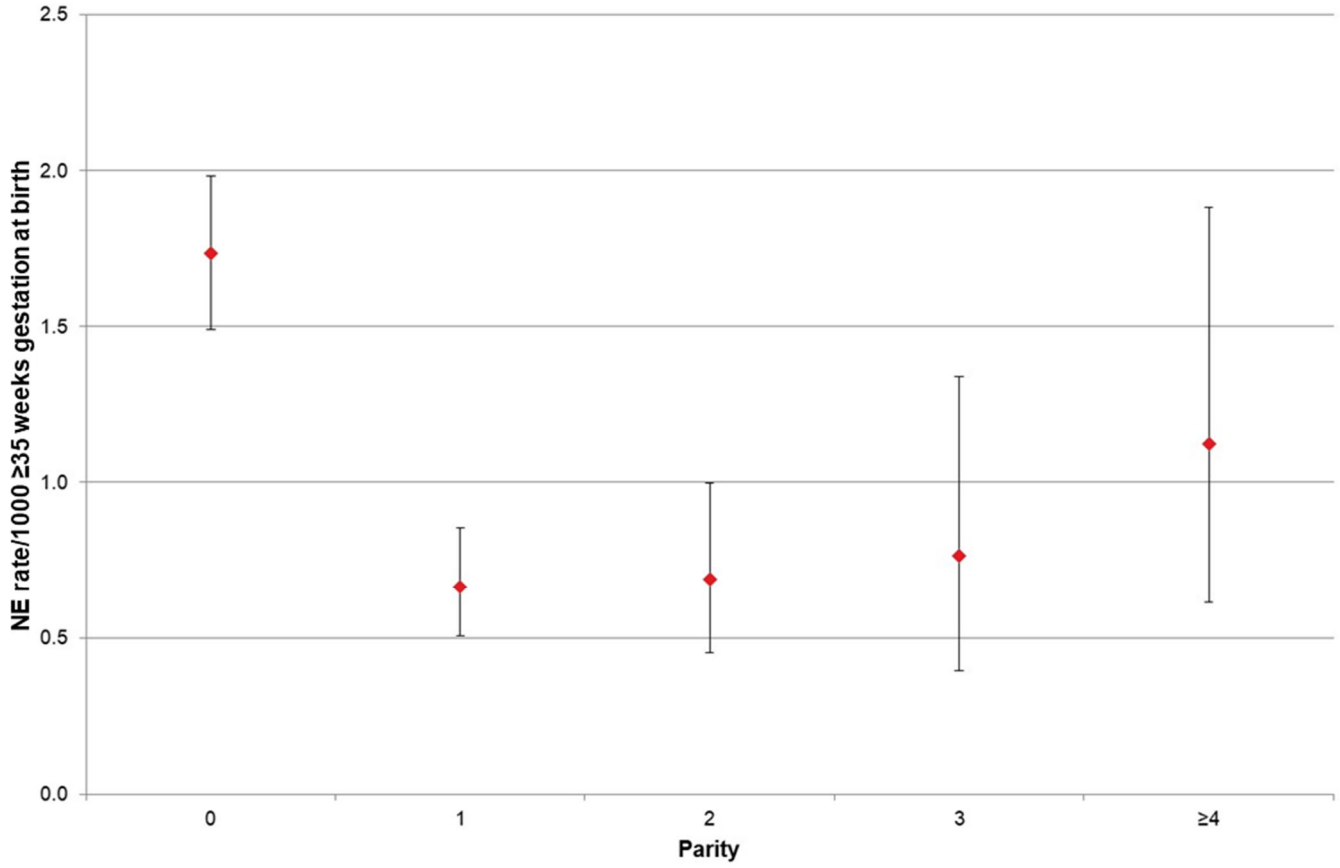
Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

The babies of primiparous women (women having their first baby after 20 weeks gestation, also referred to as 'parity 0') had the highest rates of NE. This was statistically significantly higher than babies of multiparous women regardless of parity (Figure 4.6). The rate ratio for NE in babies of nulliparous compared with multiparous women was 2.20 (95 percent CI 1.92–3.06).

While women having their first baby made up 40.9 percent of the population birthing at ≥35 weeks, they gave birth to 62.7 percent of babies with NE (Table 4.2 and Figure 4.6). Between 2016 and 2020, babies of ≥35 weeks gestation who were small for gestational age (SGA) were three times more likely to have moderate to severe NE than babies who were the appropriate size for their gestational age (AGA).[40] This is congruent with the international literature. SGA is a risk for NE, and this finding supports national guidance and referral recommendations regarding detection and management of SGA babies.

[40] The rate ratio for small for gestational age infants compared with appropriate for gestational age infants was 2.74 (95% CI 2.13–3.52).

Figure 4.6: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation, with 95% CIs) by parity before index birth,† 2016–2020



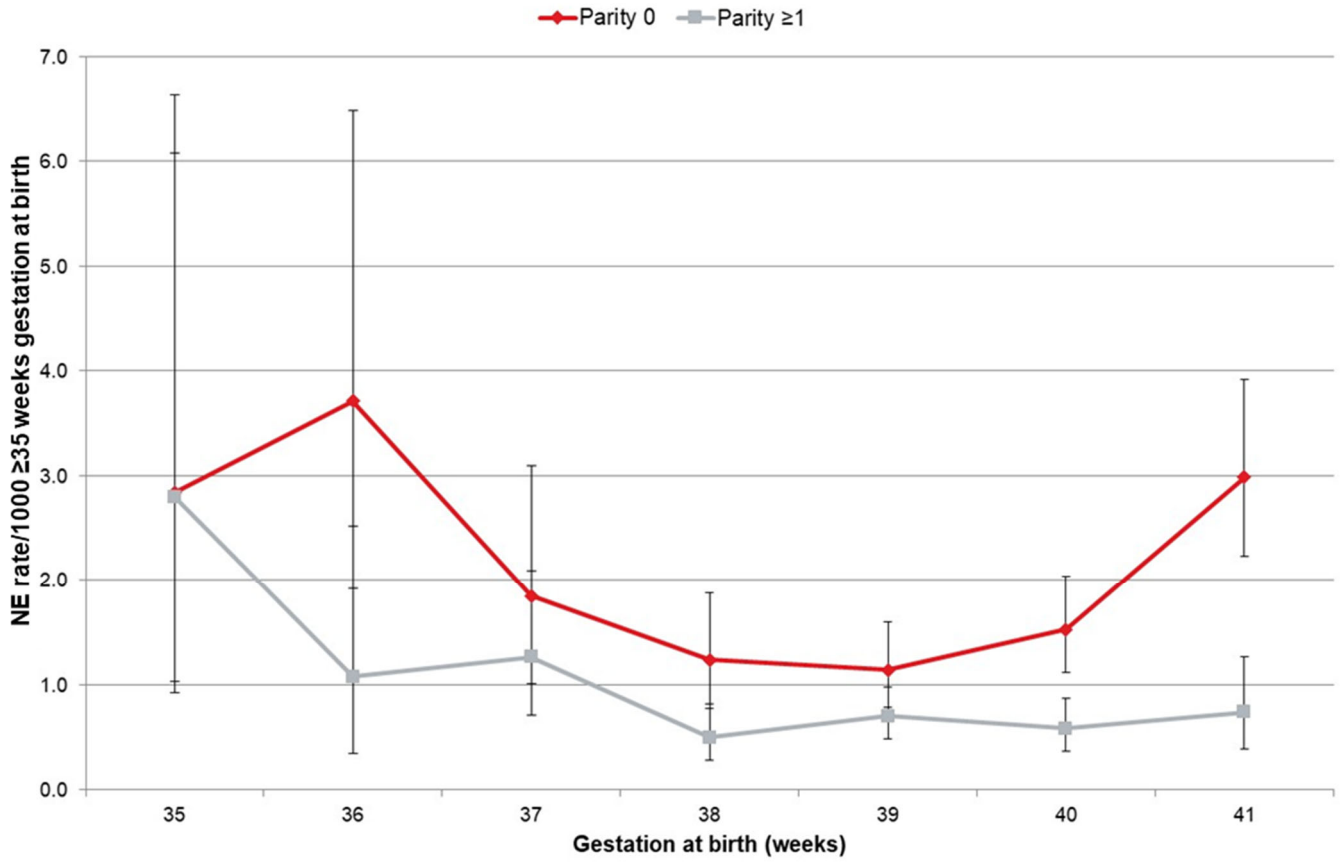
† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Parity '0' indicates women having their first baby/babies of 20 weeks or longer gestation.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Rates of NE were higher at 41 weeks gestation than at other gestations previously reported on. However, considering the data included for the first time, rates of NE were highest in babies born at 35–36 weeks gestation, although it is notable that these confidence intervals were wide. Rates were elevated in primiparous women, regardless of gestational age, with statistically higher rates at 36 weeks gestation and from 39 weeks onwards (Figure 4.7).

Figure 4.7: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation, with 95% CIs) by parity and gestation,† 2016–2020



† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

NE rates did not differ significantly for babies of mothers who smoked compared with babies of those who did not smoke. However, smoking is a risk factor for late stillbirth[41] and small for gestational age.[42] There were statistically significantly higher NE rates in babies of women who had BMIs of 35 or higher compared with women with BMIs of less than 25. This finding continues to support the Ministry of Health's *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)*, which state that referral for obstetric consultation should be recommended for all women with BMIs of 35 or over.[43]

NE rates did not vary significantly by gestational age at first antenatal visit. The proportion of those booking in the first trimester has improved over time, with 65.9 percent of NE cases in the period 2010–2019 booking at ≥14 weeks,[44] compared with 71 percent in the period 2016–2020, despite the addition of 35 and 36 weeks gestations in the latter cohort. Still, 29 percent of mothers whose babies developed NE did not have antenatal care in the first trimester, but this is similar to the 27 percent of all mothers who did not register with an LMC in the first trimester.

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[41] Cronin RS, Li M, Thompson J, et al. 2019. An individual participant data meta-analysis of maternal going-to-sleep position, interactions with fetal vulnerability, and the risk of late stillbirth. *eClinicalMedicine* 10: 49–57.

[42] McCowan L, Horgan RP. 2009. Risk factors for small for gestational age infants. *Best Practice & Research: Clinical Obstetrics & Gynaecology* 23(6): 779–93.

[43] Ministry of Health. 2012. *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)*. Wellington: Ministry of Health.

[44] PMMRC. 2021. *Te Pūrongo ā-Tau Tekau mā Whā te Komiti Arotake Mate Pēpi, Mate Whaea Hoki | Fourteenth Annual Report of the Perinatal and Maternal Mortality Review Committee: Te tuku pūrongo mō te mate me te whakamate 2018 | Reporting mortality and morbidity 2021*. Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/PMMRC/Publications-resources/report-pmmrc-14th-v2.pdf (accessed 19 October 2022).

While the Accident Compensation Corporation (ACC) funded the implementation of the Growth Assessment Programme (GAP) in DHBs as part of its NE prevention programme, nationwide roll-out of the programme is still in progress. The Neonatal Encephalopathy Working Group anticipates that an evaluation of the effectiveness of this programme will follow once it has been fully established throughout Aotearoa New Zealand. The development of the national SGA guideline will guide practice and the provision of the GAP.

Table 4.2: Maternal smoking, body mass index, gestation at first antenatal visit, customised birthweight centiles and parity among neonatal encephalopathy babies,† 2016–2020

	MAT births ≥37 weeks		NE cases		Rate (/1000 births at ≥35 weeks gestation)	
	N=267,595		n=303			
	N	%	n	%	/1000	95% CI
Currently smoking						
Yes	32,882	12.3	41	13.5	1.25	0.89–1.69
No	234,707	87.7	262	86.5	1.12	0.98–1.25
Unknown	6	0.0	-	-	-	-
Maternal BMI (kg/m^2)						
<18.50	6789	2.5	8	2.6	1.18	0.51–2.32
18.50–24.99	122,539	45.8	112	37.0	0.91	0.74–1.08
25.00–29.99	69,967	26.1	83	27.4	1.19	0.94–1.47
30.00–34.99	38,100	14.2	47	15.5	1.23	0.91–1.64
35.00–39.99	18,418	6.9	30	9.9	1.63	1.10–2.33
≥40	11,433	4.3	23	7.6	2.01	1.28–3.02
Missing data for height and/or weight	349	0.1	-	-	-	-
Gestation first antenatal visit (weeks)						
≤14	195,298	73.0	215	71.0	1.10	0.95–1.25
15–27	57,990	21.7	75	24.8	1.29	1.02–1.62
≥28	10,598	4.0	11	3.6	1.04	0.52–1.86
Postnatal registration	3706	1.4	<3	x	s	0.07–1.95
Unknown	3	0.0	-	-	-	-
Parity						
0	109,509	40.9	190	62.7	1.74	1.49–1.98
1	90,606	33.9	60	19.8	0.66	0.51–0.85
2	39,310	14.7	27	8.9	0.69	0.45–1.00
3	15,678	5.9	12	4.0	0.77	0.40–1.34
≥4	12,482	4.7	14	4.6	1.12	0.61–1.88
Unknown	10	0.0	-	-	-	-

† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

'x' indicates percentages have been suppressed due to small numbers.

's' indicates rates have been suppressed due to small numbers.

BMI = body mass index.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

A number of antenatal complications were recorded in pregnancies where babies developed NE. These included antepartum haemorrhage and hypertension, encompassing gestational hypertension and pre-eclampsia. Both nulliparous and multiparous mothers of babies with NE experienced antenatal complications. A number of women were induced through a variety of means and had epidural

anaesthesia. Without accurate, matched denominator data, we can only make limited comment on whether these factors indicated increased risk to babies. However, available Ministry of Health data in annual maternity reports[45] suggest these interventions in the NE group are similar to or lower than general birthing. For example, the average induction percentage reported in the 2016–2019 period for the whole birthing population was 25.8 percent, while the 2016–2020 proportion for NE babies in this report was 23.9 percent.

Most women whose babies developed NE did not experience significant adverse maternal outcomes. However, 17 women either survived with serious morbidity or died (Table 4.3).

Table 4.3: Antenatal complications, obstetric interventions and maternal outcome among neonatal encephalopathy cases by parity and Sarnat stage, 2016–2020

	NE cases		Primiparous§		Multiparous#		Sarnat stage			
							Moderate		Severe	
	n=348		n=209		n=135		n=237		n=111	
	n	%	n	%	n	%	n	%	n	%
Antenatal complications										
APH (≥20 weeks vaginal bleeding)	29	8.3	20	9.6	9	6.7	16	6.8	13	11.7
Hypertension	39	11.2	27	12.9	12	8.9	27	11.4	12	10.8
Maternal trauma (antenatal)†	7	2.0	<3	x	5	3.7	4	1.7	3	2.7
Induction/augmentation of labour										
Induction of labour	83	23.9	36	17.2	26	19.3	59	24.9	24	21.6
Induced or augmented labour (any method)	135	38.8	93	44.5	41	30.4	97	40.9	38	34.2
Oxytocin for induction or augmentation	69	19.8	55	26.3	13	9.6	50	21.1	19	17.1
Epidural anaesthesia	78	22.4	60	28.7	17	12.6	63	26.6	15	13.5
Maternal outcome										
Deceased or alive with serious morbidity	17	4.9	12	5.7	5	3.7	11	4.6	6	5.4
Alive and well	331	95.1	197	94.3	130	96.3	226	95.4	105	94.6
Unknown										

'x' indicates percentages have been suppressed due to small numbers.

† Vehicular, violent personal injury, other.

§ Primiparous: parity = 0 defined before current birth.

Multiparous: parity ≥1 defined before current birth.

APH = antepartum haemorrhage.

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

Nearly one-third of babies with NE had an acute peripartum event, including abruption (10.3 percent) and shoulder dystocia (8.6 percent). Table 4.4 shows the incidence of antenatal and intrapartum factors that may create risk for NE in babies. This table indicates areas that could be focused on in future.

[45] Ministry of Health. 2022. Report on Maternity web tool. URL: minhealthnz.shinyapps.io/report-on-maternity-web-tool/ (accessed 20 October 2020).

Table 4.4: Peripartum complications and mode of birth among neonatal encephalopathy cases, 2016–2020

	Total NE cases	
	n=348	
	n	%
Acute peripartum events	101	29.0
Cord prolapse	15	4.3
Abruption	36	10.3
Uterine rupture	8	2.3
Shoulder dystocia	30	8.6
Breech complication	12	3.4
Other complication	11	3.2
Liquor		
Blood stained	34	9.8
Thick meconium	77	22.1
Thin meconium	43	12.4
Purulent	<3	x
Clear	154	44.3
Unknown	39	11.2
Mode of birth		
Normal vaginal birth	123	35.3
Operative vaginal birth	56	16.1
Forceps	25	7.2
Ventouse	29	8.3
Both	<3	x
Unknown	<3	x
Vaginal breech birth	10	2.9
Caesarean section birth	159	45.7
Elective caesarean section	5	1.4
Prelabour emergency	56	16.1
Antepartum haemorrhage/Abruption	9	2.6
Suspected fetal distress	37	10.6
Other	9	2.6
Unknown	<3	x
In labour emergency	95	27.3
Antepartum haemorrhage/Abruption	7	2.0
Suspected fetal distress	65	18.7
Failure to progress/Cephalopelvic disproportion	7	2.0
Other	15	4.3
Unknown	<3	x
Attempt at operative vaginal birth before caesarean	**8**	**2.3**

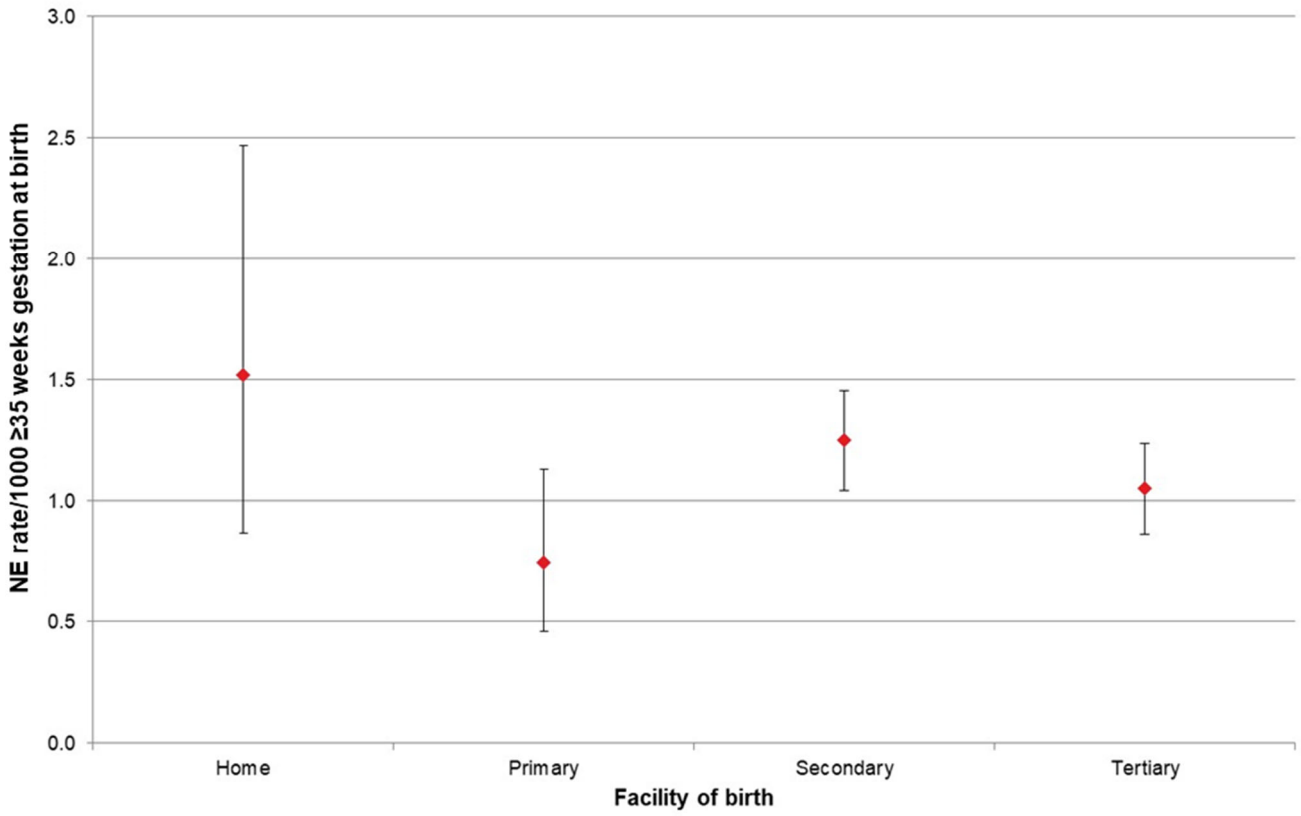
'x' indicates percentages have been suppressed due to small numbers.

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

Rates of NE continue to vary by the facility of birth (Figure 4.8 and Table 4.5). Caution should be exercised when examining the rates of NE by the facility of birth, as it is important to also consider contextual information. These numbers do not provide information on several aspects, including where the intended place of birth was and, if transferred, at what stage in the pregnancy or birthing process the transfer occurred. There is also some suggestion that homebirth rates increased during COVID-19 lockdowns.[46]

[46] Crowther S, Maude R, Zhao IY, et al. 2022. New Zealand maternity and midwifery services and the COVID-19 response: a systematic scoping review. *Women and Birth* 35(3): 213–22. DOI: 10.1016/j.wombi.2021.05.008 (accessed 20 October 2022).

Figure 4.8: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation, with 95% CIs) by place of birth,† 2016–2020



† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Table 4.5: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation) by place of birth,† 2016–2020

Facility of birth	MAT births ≥35 weeks		NE cases		Rate (/1000 term births)	
	N=267,595		n=303			
	n	%	n	%	Rate	95% CI
Home	10,536	3.9	16	5.3	1.52	0.87–2.47
Primary	28,416	10.6	21	6.9	0.74	0.46–1.13
Secondary	112,931	42.2	141	46.5	1.25	1.04–1.45
Tertiary	113,440	42.4	119	39.3	1.05	0.86–1.24
Unknown	2272	0.8	6	2.0	2.64	-

† All data limited to mothers who were registered for care with an LMC (a midwife, obstetrician or GP) claiming from the section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Measured by Apgar scores, neonatal wellbeing just after birth was consistently poor at 1 minute. In those babies with moderate to severe NE, 75.6 percent had an Apgar score less than 7 at 5 minutes. The percentage of babies who had cord blood gases recorded fluctuated. In the 2016–2020 period, 18.4 percent of babies with NE did not have cord blood gases recorded, which is consistent with previous reports. Of all babies who developed NE, 65.6 percent had abnormal gases, and 15.2 percent of babies with clinically significant NE had normal blood gases, which is in line with previous reports (Table 4.6). Immediate wellbeing of all NE babies over the 2010–2020 period is shown in Table 4.11 (appended).

Table 4.6: Immediate newborn wellbeing among neonatal encephalopathy babies, 2016–2020

	2016		2017		2018		2019		2020		Total	
	n=59		n=70		n=67		n=69		n=83		n=348	
	n	%	n	%	n	%	n	%	n	%	n	%
Apgar scores												
Apgar score <3 at 1 minute	40	67.8	42	60.0	43	64.2	47	68.1	56	67.5	228	65.5
Apgar score <7 at 1 minute	54	91.5	63	90.0	62	92.5	62	89.9	72	86.7	313	89.9
Apgar score <7 at 5 minutes	49	83.1	48	68.6	50	74.6	56	81.2	60	72.3	263	75.6
Apgar score <7 at 10 minutes	36	61.0	32	45.7	37	55.2	38	55.1	45	54.2	188	54.0
Cord blood gases: summary data												
Normal (none of pH ≤7, BE ≤−12, lactate ≥6)	6	10.2	12	17.1	9	13.4	14	20.3	12	14.5	53	15.2
Abnormal (any of pH ≤7, BE ≤−12, lactate ≥6)	45	76.3	44	62.9	50	74.6	40	58.0	52	62.7	231	66.4
No gases reported	8	13.6	14	20.0	8	11.9	15	21.7	19	22.9	64	18.4
No gases and Apgar <7 at 1 minute	6	10.2	10	14.3	7	10.4	11	15.9	12	14.5	46	13.2
No gases and Apgar ≥7 at 1 minute	<3	x	3	4.3	<3	x	3	4.3	6	7.2	15	4.3
No gases and unknown Apgar	-	-	<3	x	-	-	<3	x	<3	x	3	0.9

'x' indicates percentages have been suppressed due to small numbers.

BE = base excess.

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

Table 4.7 shows cooling therapy in babies with NE by year of birth (2016–2020). The number and percentage of babies who were cooled in 2020 increased on previous years.

Table 4.7: Induced cooling therapy among neonatal encephalopathy babies, 2016–2020

Cooling	2016		2017		2018		2019		2020		Total	
	n=59		n=70		n=57		n=69		n=83		n=348	
	n	%	n	%	n	%	n	%	n	%	N	%
Yes	47	79.7	48	68.6	52	77.6	54	78.3	70	84.3	271	77.9
No	12	20.3	22	31.4	15	22.4	15	21.7	13	15.7	77	22.1
Unknown	-	-	-	-	-	-	-	-	-	-	-	-
Age at cooling	**n=47**		**n=48**		**n=52**		**n=54**		**n=70**		**n=271**	
≤6 hours	36	76.6	40	83.3	38	73.1	38	70.4	58	82.9	210	77.5
>6 hours	11	23.4	7	14.6	10	19.2	14	25.9	11	15.7	53	19.6
Unknown time	-	-	<3	x	4	7.7	<3	x	<3	x	8	3.0

'x' indicates percentages have been suppressed due to small numbers.

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

Most babies with NE were resuscitated at birth (93.1 percent). Resuscitation methods ranged from giving oxygen only through to cardiac massage and adrenaline. Around 70 percent of babies were given anticonvulsants. A small percentage (3.4 percent) of babies had a positive blood culture (Table 4.8).

Table 4.8: Neonatal resuscitation and early neonatal management by Sarnat stage among neonatal encephalopathy babies, 2016–2020

	NE babies		Sarnat stage			
			Moderate		Severe	
	n=348		n=237		n=111	
	n	%	n	%	n	%
Resuscitation at birth						
Yes	324	93.1	222	93.7	102	91.9
No	23	6.6	14	5.9	9	8.1
Unknown	<3	x	<3	x	-	-
Type of resuscitation at birth†						
Oxygen only	6	1.7	6	2.5	-	-
IPPV with mask	256	73.6	180	75.9	76	68.5
IPPV with ETT	143	41.1	74	31.2	69	62.2
Cardiac massage	136	39.1	75	31.6	61	55.0
Adrenaline	49	14.1	16	6.8	33	29.7
Respiratory and ventilation management†						
Mechanical ventilation	248	71.3	149	62.9	99	89.2
Nitric oxide	80	23.0	47	19.8	33	29.7
Infection†						
Positive blood culture	12	3.4	11	4.6	<3	x
Antibiotics	316	90.8	222	93.7	94	84.7
Anticonvulsant therapy†	243	69.8	159	67.1	84	75.7
Phenobarbitone	210	60.3	136	57.4	74	66.7
Phenytoin	91	26.1	52	21.9	39	35.1
Benzodiazepines	88	25.3	48	20.3	40	36.0
Other	107	30.7	68	28.7	39	35.1

'x' indicates percentages have been suppressed due to small numbers.

† Categories not mutually exclusive.

IPPV = intermittent positive pressure ventilation.

ETT = endotracheal tube.

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

Overall, 77.9 percent of babies were cooled, with the proportion being higher for babies with moderate rather than severe NE. Mortality was much higher in babies with severe NE, at 56.8 percent compared with 3.4 percent of babies with moderate NE (Table 4.9).

There was no statistically significant difference between the rates of cooling or mortality for babies of Māori mothers and those for babies of New Zealand European mothers.[47]

[47] The rate ratio for cooling of infants of Māori mothers compared with New Zealand European mothers was 1.03 (95% CI 0.89–1.19).

Table 4.9: Use of cooling and outcomes of encephalopathy by Sarnat stage among neonatal encephalopathy babies, 2016–2020

	NE babies		Sarnat stage			
			Moderate		Severe	
	n=348		n=237		n=111	
	n	%	n	%	n	%
Induced cooling						
Yes	271	77.9	191	80.6	80	72.1
No	77	22.1	46	19.4	31	27.9
Unknown	-	-	-	-	-	-
Deceased						
Yes	71	20.4	8	3.4	63	56.8
No	277	79.6	229	96.6	48	43.2
Unknown	-	-	-	-	-	-

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

Of surviving NE babies, 45.9 percent of those with moderate NE had a normal physical examination on discharge or transfer, compared with 10.4 percent of those with severe NE. Nearly all babies (97.9 percent) with severe NE had an MRI before discharge (Table 4.10). Although the PMMRC has previously recommended all babies with moderate and severe NE receive an MRI scan,[48] about 12 percent of babies with moderate NE did not receive an MRI over the 2016–2020 period.

Table 4.10: Investigations and neonatal outcome by Sarnat stage of neonatal encephalopathy survivors, 2016–2020

Investigations	Total NE survivors		Sarnat stage			
			Moderate		Severe	
	n=277		n=229		n=48	
	n	%	n	%	n	%
Examination on discharge/transfer						
Normal	110	39.7	105	45.9	5	10.4
Mild or moderate abnormality	118	42.6	93	40.6	25	52.1
Severe abnormality	29	10.5	11	4.8	18	37.5
Not examined	9	3.2	9	3.9	-	-
Examined but finding unknown	6	2.2	6	2.6	-	-
Missing data	5	1.8	5	2.2	-	-
MRI (investigation done)	248	89.5	201	87.8	47	97.9
No MRI or unknown	29	10.5	28	12.2	<3	x
Results of MRI						
Moderately/Severely abnormal	100	36.1	67	29.3	33	68.8
Normal or only mildly abnormal	144	52.0	130	56.8	14	29.2
Unknown result	33	11.9	32	14.0	<3	x

'x' indicates percentages have been suppressed due to small numbers.

MRI = magnetic resonance imaging (of the brain).

Source: PMMRC's NE data extract ≥35 weeks 2016–2020.

[48] PMMRC. 2013. *Seventh Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2011*. Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/PMMRC/Publications-resources/Seventh-PMMRC-Report-FINAL-June-2013.pdf (accessed 3 June 2022).

Neonatal Encephalopathy Appended Tables

Table 4.11: Immediate newborn wellbeing among neonatal encephalopathy babies, 2010–2020

	≥37 weeks gestation												≥35 weeks gestation											
	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		Total	
	n=82		n=67		n=79		n=70		n=55		n=70		n=59		n=70		n=67		n=69		n=83		n=770	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Apgar scores																								
Apgar score <3 at 1 minute	48	58.5	41	61.2	47	59.5	40	57.1	37	67.3	39	55.7	40	67.8	42	60.0	43	64.2	47	68.1	56	67.5	480	62.3
Apgar score <7 at 1 minute	73	89.0	61	91.0	70	88.6	65	92.9	53	96.4	59	84.3	54	91.5	63	90.0	62	92.5	62	89.9	72	86.7	694	90.1
Apgar score <7 at 5 minutes	61	74.4	54	80.6	62	78.5	57	81.4	43	78.2	50	71.4	49	83.1	48	68.6	50	74.6	56	81.2	60	72.3	590	76.6
Apgar score <7 at 10 minutes	39	47.6	38	56.7	49	62.0	32	45.7	29	52.7	35	50.0	36	61.0	32	45.7	37	55.2	38	55.1	45	54.2	410	53.2
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	6	10.2	12	17.1	9	13.4	14	20.3	12	14.5	118	15.3
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	45	76.3	44	62.9	50	74.6	40	58.0	52	62.7	509	66.1
No gases reported	23	28.0	12	17.9	13	16.5	9	12.9	8	14.5	15	21.4	8	13.6	14	20.0	8	11.9	15	21.7	19	22.9	143	18.6
No gases and Apgar <7 at 1 minute	14	17.1	8	11.9	8	10.1	6	8.6	8	14.5	6	8.6	6	10.2	10	14.3	7	10.4	11	15.9	12	14.5	96	12.5
No gases and Apgar ≥7 at 1 minute	8	9.8	4	6.0	5	6.3	3	4.3	-	-	9	12.9	<3	x	3	4.3	<3	x	3	4.3	6	7.2	44	5.7
No gases and unknown Apgar	<3	x	-	-	-	-	-	-	-	-	-	-	-	-	<3	x	-	-	<3	x	<3	x	4	0.5

BE = base excess.

Source: PMMRC's NE data extract ≥37 weeks 2010–2015 and ≥35 weeks 2016–2020.

Table 4.12: Neonatal encephalopathy rates (per 1000 births at ≥35 weeks gestation) by maternal prioritised ethnic group, maternal age and NZDep2013 quintile, 2016–2020

	MAT births ≥35 weeks		NE cases		Rate (per 1000 births at ≥35 weeks gestation)	
	N=287,289†		n=348			
	n	%	n	%	/1000	95% CI
Maternal prioritised ethnic group						
Māori	72,024	25.1	82	23.6	1.14	0.91–1.41
Pacific peoples	29,185	10.2	36	10.3	1.23	0.86–1.71
Asian	53,116	18.5	62	17.8	1.17	0.89–1.50
Indian	20,166	7.0	29	8.3	1.44	0.96–2.07
Other Asian	32,950	11.5	33	9.5	1.00	0.69–1.41
MELAA	7044	2.5	13	3.7	1.85	0.98–3.16
European	125,897	43.8	155	44.5	1.23	1.04–1.42
NZ European	97,783	34.0	136	39.1	1.39	1.16–1.62
Other European	28,114	9.8	19	5.5	0.68	0.41–1.06
Other	-	-	-	-	-	-
Maternal age (years)						
<20	10,430	3.6	12	3.4	1.15	0.59–2.01
20–34	216,027	75.2	266	76.4	1.23	1.08–1.38
35–39	49,455	17.2	55	15.8	1.11	0.84–1.45
≥40	11,365	4.0	15	4.3	1.32	0.74–2.18
Unknown	12	0.0	-	-	-	-
Deprivation quintile						
1 (least deprived)	42,403	14.8	45	12.9	1.06	0.77–1.42
2	48,231	16.8	51	14.7	1.06	0.79–1.39
3	52,119	18.1	57	16.4	1.09	0.83–1.42
4	65,621	22.8	85	24.4	1.30	1.03–1.60
5 (most deprived)	77,084	26.8	110	31.6	1.43	1.16–1.69
Unknown	1831	0.6	-	-	-	-

† Includes 23 unknown maternal ethnicity among MAT births.

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Table 4.13: Neonatal encephalopathy rates (per 1000 births ≥35 weeks gestation) by DHB of maternal residence, 2016–2020

DHB of residence	MAT births ≥35 weeks	Total NE cases	Rate (per 1000 births at ≥35 weeks gestation)	
	N=287,289	n=348		
	n	n	/1000	95% CI
Northland	11,054	15	1.36	0.76–2.24
Waitematā	37,483	39	1.04	0.74–1.42
Auckland	27,028	21	0.78	0.48–1.19
Counties Manukau	39,989	44	1.10	0.80–1.48
Waikato	26,261	31	1.18	0.80–1.68
Bay of Plenty	14,832	20	1.35	0.82–2.08
Lakes	7379	11	1.49	0.74–2.67
Tairāwhiti	3451	5	1.45	0.47–3.38
Taranaki	7157	9	1.26	0.58–2.39
Hawke's Bay	10,026	16	1.60	0.91–2.59
Whanganui	4001	10	2.50	1.20–4.60
MidCentral	10,292	15	1.46	0.82–2.40
Wairarapa	2440	<3	s	s
Capital & Coast	16,044	27	1.68	1.11–2.45
Hutt Valley	9477	13	1.37	0.73–2.35
Nelson Marlborough	7125	17	2.39	1.39–3.82
West Coast	1581	<3	s	s
Canterbury	30,690	31	1.01	0.69–1.43
South Canterbury	3001	5	1.67	0.54–3.89
Southern	16,233	16	0.99	0.56–1.60
Other†	1745	-	-	-

† Other includes overseas, unknown and other.

's' indicates rate and CI not calculated due to small numbers.

Sources: Numerator: PMMRC's NE data extract ≥35 weeks 2016–2020; Denominator: MAT births ≥35 weeks 2016–2020.

Maternal Mortality | Te Mate o ngā Whaea

Definitions

Maternal death is the death of a woman while pregnant or within 42 days of the end of pregnancy (miscarriage, termination or birth), irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.[49]

The cause of maternal death is sub-classified into the following categories based on *The WHO Application of ICD-10 to Deaths during Pregnancy, Childbirth and Puerperium: ICD MM*.[50]

- **Direct maternal deaths**: Those resulting from obstetric complications of the pregnant state (pregnancy, labour or puerperium) from interventions, omissions, incorrect treatment or a chain of events resulting from the above. In 2018, the PMMRC adopted the World Health Organization (WHO) revision to include deaths by suicide with direct maternal deaths. This was then applied retrospectively to data from previous years.
- **Indirect maternal deaths**: Those resulting from previous existing disease or disease that developed during pregnancy and was not due to direct obstetric causes but that was aggravated by the physiologic effects of pregnancy.
- **Unknown/Undetermined (or unclassifiable) maternal death**: A death during pregnancy, childbirth and the puerperium where the underlying cause is unknown or was not determined.
- **Coincidental maternal deaths**: Deaths from unrelated causes that happen to occur in pregnancy or the puerperium.

Over the period 2006–2020, the PMMRC collected information on a total of 169 maternal deaths during pregnancy or within 42 days postpartum, including 29 coincidental deaths. Unless stated otherwise, data relating to coincidental maternal deaths have been excluded.

Findings

The number of maternal deaths fluctuated substantially over the period 2006–2020. The annual maternal mortality ratio varied from being too small to meaningfully calculate[51] up to a maximum of 24.4 deaths per 100,000 maternities. While there was a general downward pattern in the total number of maternal deaths over this period (Figure 5.1 and Table 5.1), the trend is not statistically significant.

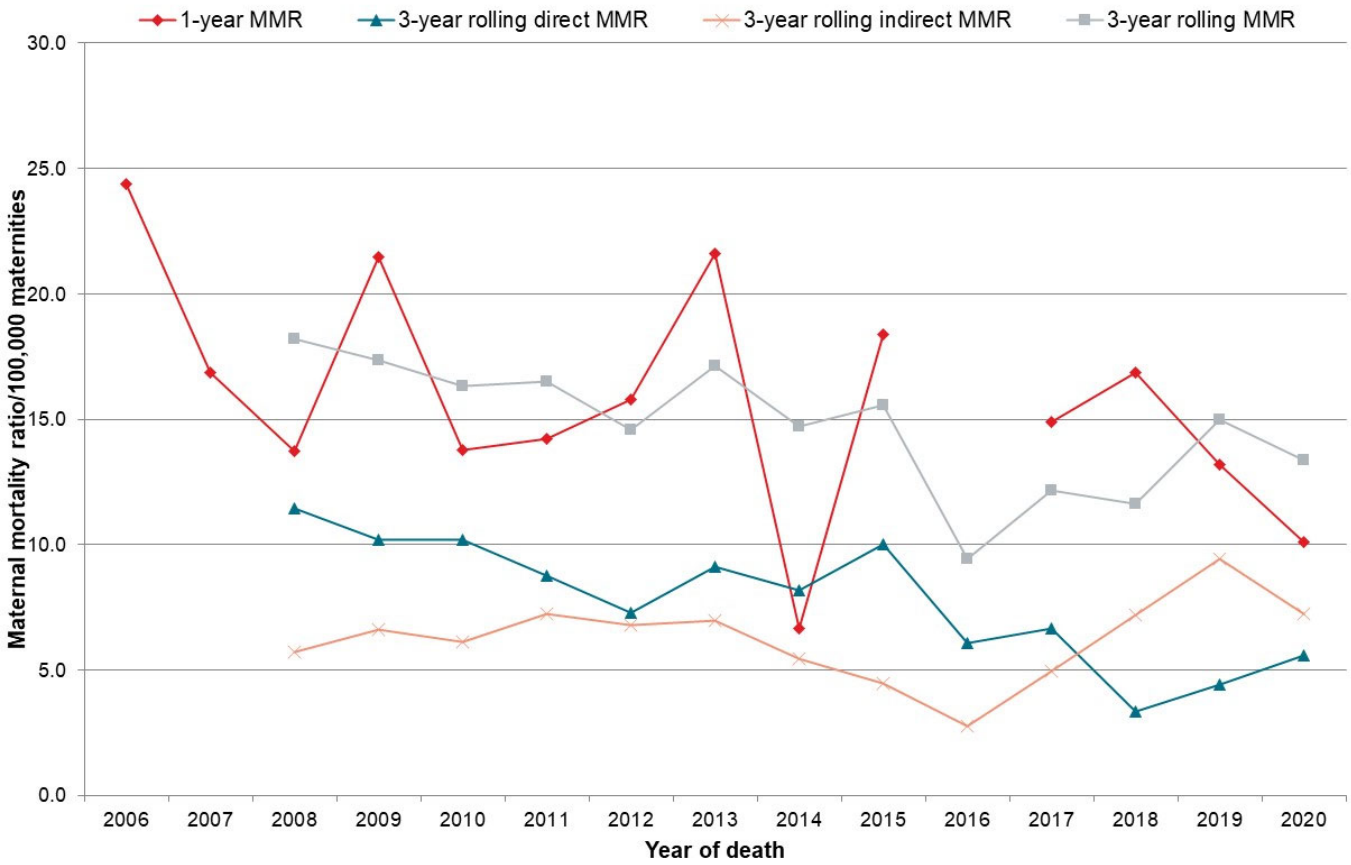
The rate of direct maternal death in Aotearoa New Zealand from 2011 to 2020 was 6.75 deaths per 100,000 maternities. This is a much higher rate than the rate in the United Kingdom (UK) from 2011 to 2019, which was 3.78 deaths per 100,000 maternities (Figure 5.4).

[49] World Health Organization. nd. Maternal mortality ratio (per 100 000 live births). URL: who.int/data/gho/indicator-metadata-registry/imr-details/26 (accessed 20 October 2022).

[50] World Health Organization. 2012. *The WHO Application of ICD-10 to Deaths during Pregnancy, Childbirth and the Puerperium: ICD-MM*. France: World Health Organization. URL: apps.who.int/iris/bitstream/handle/10665/70929/9789241548458_eng.pdf;jsessionid=CC029155D5B4A0E7BB4AE0129A0A6CEB?sequence=1 (accessed 20 October 2022).

[51] Where the numerator is fewer than three deaths.

Figure 5.1: Maternal mortality ratios (per 100,000 maternities) (rolling one-year and three-year),† 2006–2020



Note: The number of deaths in 2016 was too small to calculate a reliable rate for this year.

† Rolling three-year maternal mortality ratio represented at final year of triennium.

MMR = maternal mortality ratio.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2020; Denominator: MAT data 2006–2020.

Table 5.1: Single-year and three-year rolling maternal mortality ratios (per 100,000 maternities), 2006–2020

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2006–2020			2006–2020 Regression for trend (95% CI)
	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	%	Cause specific ratio /100,000 maternities	
Total maternal deaths	**15**	**11**	**9**	**14**	**9**	**9**	**10**	**13**	**4**	**11**	**<3**	**9**	**10**	**8**	**6**	**140**	**100.0**	**15.05**	
Single-year MMR	24.39	16.87	13.71	21.47	13.75	14.23	15.80	21.62	6.66	18.40	s	14.88	16.86	13.20	10.09	-	-	-	-0.589 (-1.243, 0.065)
Three-year rolling MMR	**-**	**-**	**06–08**	**07–09**	**08–10**	**09–11**	**10–12**	**11–13**	**12–14**	**13–15**	**14–16**	**15–17**	**16–18**	**17–19**	**18–20**	**-**	**-**	-	
			18.20	17.34	16.30	16.50	14.58	17.14	14.71	15.55	9.42	12.16	11.64	14.97	13.38	-	-	-	

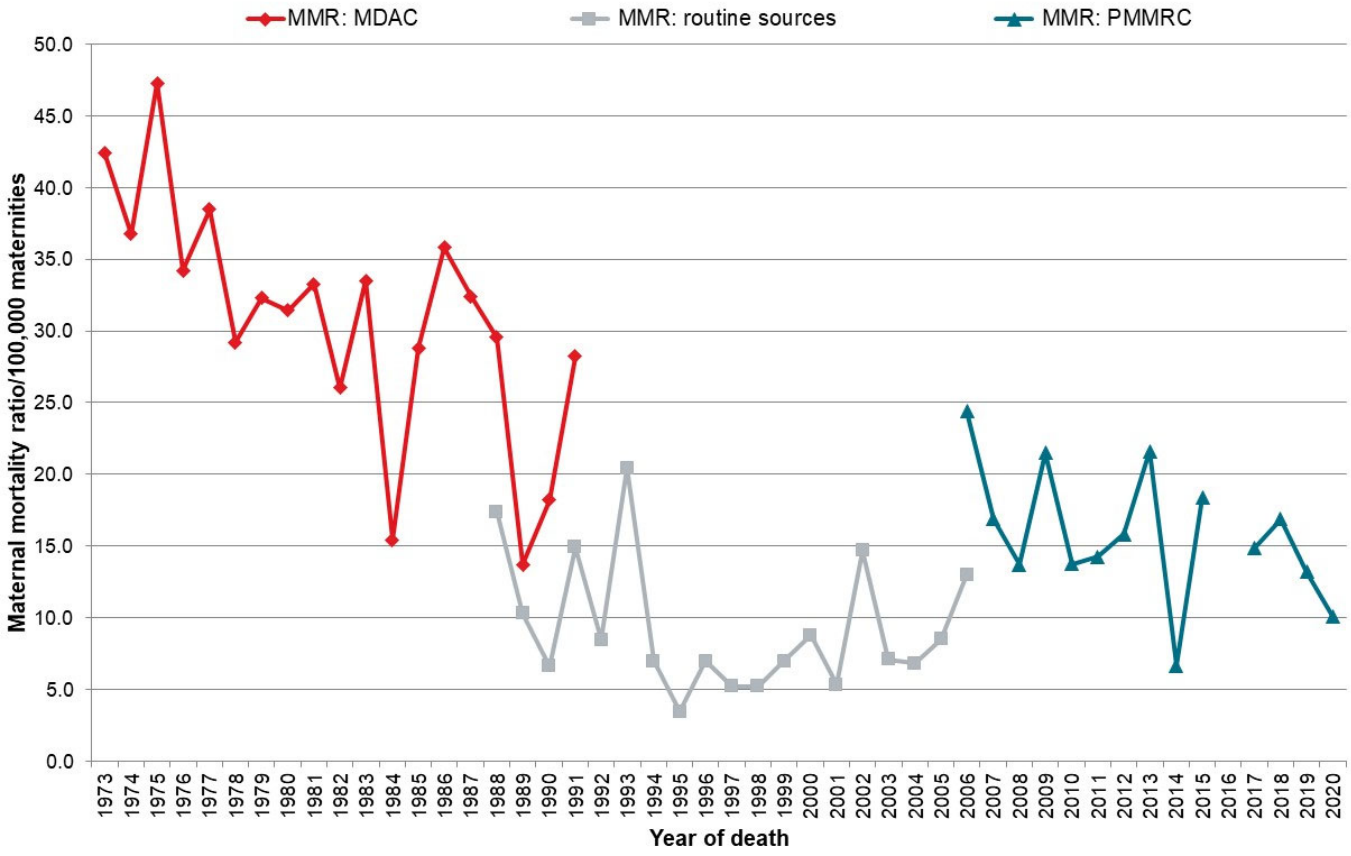
‘s’ indicates rate not calculated due to small numbers.

MMR = maternal mortality ratio.

Sources: Numerator: PMMRC’s maternal mortality data extract 2006–2018; Denominator: MAT data 2006–2020.

There has been a considerable decrease in maternal death rates over the last 50 years. Figure 5.2 shows an overall reduction in the maternal mortality ratio over time and by the different data sources that were available at various periods. Historically, routine datasets were unlikely to have reliably recorded all maternal deaths, so the ratios calculated from these sources appear lower. Since 2006, use of the PMMRC data has involved the active review of cases, resulting in better case detection and consequently slightly higher ratios.

Figure 5.2: Aotearoa New Zealand maternal mortality ratio (per 100,000 maternities) by mortality data source, 1973–2020



Note: The number of deaths in 2016 was too small to calculate a reliable rate for this year.

MMR = maternal mortality ratio.

MDAC = Maternal Deaths Assessment Committee.

Sources:

MMR: MDAC: Data from the MDAC, including maternal deaths to three months postpartum.

MMR: routine sources: Data from routine Aotearoa New Zealand datasets (ie, the Births, Deaths and Marriages (BDM) Mortality Collection and the National Minimum Dataset), including maternal deaths to six weeks postpartum.

MMR: PMMRC: PMMRC's maternal mortality data extract 2006–2020, including maternal deaths to six weeks postpartum; Denominator: MAT data 2006–2020.

A maternal age of 40 years or over was associated with the highest risk of maternal death among all age groups, with an incidence of 36.83 maternal deaths per 100,000 maternities (Table 5.2). Wāhine Māori and Pacific women had rates of 23.32 and 22.46 deaths per 100,000 maternities respectively, which were significantly higher than the rate for New Zealand European women of 12.59 per 100,000 maternities (Table 5.2).

Higher rates of maternal deaths were also associated with increasing levels of deprivation (examined by NZDep quintile). There was a general pattern of increasing mortality with increasing deprivation, with women in quintiles 4 and 5 having significantly higher incidence of maternal mortality (p=0.013) (Table 5.2).

Table 5.2: Demographic characteristics among maternal deaths, 2006–2020

	Maternities		Maternal mortality 2006–2020						Chi-squared test (p)
	N=930,021		n=140		Maternal mortality ratio	95% CI	RR	95% CI	
	N	%	n	%	/100,000 maternities				
Maternal age (years)									
<20	52,988	5.7	6	4.3	11.32	4.16–24.65	0.98	0.41–2.34	
20–24	158,880	17.1	20	14.3	12.59	7.69–19.44	1.09	0.62–1.90	
25–29	241,674	26.0	40	28.6	16.55	11.82–22.54	1.43	0.90–2.28	0.006
30–34	276,797	29.8	32	22.9	11.56	7.91–16.32	1.00	-	
35–39	161,355	17.3	28	20.0	17.35	11.53–25.08	1.50	0.90–2.49	
≥40	38,012	4.1	14	10.0	36.83	20.14–61.80	3.19	1.70–5.97	
Unknown	315	0.0	-	-	-	-	-	-	
Prioritised ethnic group (mother)									
Māori	240,175	25.8	56	40.0	23.32	17.61–30.28	1.85	1.25–2.75	
Pacific peoples	102,418	11.0	23	16.4	22.46	14.24–33.70	1.78	1.08–2.95	
Asian	128,680	13.8	14	10.0	10.88	5.95–18.25	0.86	0.47–1.58	
Indian	43,449	4.7	5	3.6	11.51	3.74–26.86	0.91	0.36–2.31	
Other Asian	85,231	9.2	9	6.4	10.56	4.83–20.05	0.84	0.41–1.72	0.00007
MELAA	19,561	2.1	-	-	-	-	-	-	
European	438,567	47.2	47	33.6	10.72	7.87–14.25	0.85	0.56–1.28	
NZ European	349,509	37.6	44	31.4	12.59	9.15–16.90	1.00	0.66–1.52	
Other European	89,058	9.6	3	2.1	3.37	0.69–9.84	0.27	0.08–0.86	
Unknown	620	0.1	-	-	-	-	-	-	
Deprivation quintile									
1 (least deprived)	131,797	14.2	12	8.6	9.10	4.70–15.90	1.00	-	
2	144,848	15.6	13	9.3	8.97	4.78–15.35	0.99	0.45–2.16	
3	168,463	18.1	23	16.4	13.65	8.65–20.49	1.50	0.75–3.01	0.013
4	214,162	23.0	40	28.6	18.68	13.34–25.43	2.05	1.08–3.91	
5 (most deprived)	261,984	28.2	52	37.1	19.85	14.82–26.03	2.18	1.16–4.08	
Unknown	8767	0.9	-	-	-	-	-	-	

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2020; Denominator: MAT data 2006–2020.

There is a trend of higher mortality in women with parity greater than 2, however parity was unknown in 71,307 women (7.7 percent) over this period (Table 5.3) due to a technical issue in the MAT dataset.

High maternal BMI is a recognised risk factor for adverse outcomes in pregnancy, for both the mother[52] and baby.[53] Accurate and complete records of BMI were not available for 18.8 percent of women over the 2006–2020 period (Table 5.3). Given the importance of body mass as a risk factor, the considerable amounts of missing data are of concern. Consequently, it has not been possible to produce meaningful analyses on how BMI is associated with maternal death from these data.

[52] McCall SJ, Li Z, Kurinczuk JJ, et al. 2017. Binational cohort study comparing the management and outcomes of pregnant women with a BMI >50–59.9 kg/m^2 and those with a BMI ≥60 kg/m^2. *British Medical Journal Open* 8:e021055. DOI: 10.1136/bmjopen-2017-021055 (accessed 7 November 2022).

[53] PMMRC. 2018. *Twelfth Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2016.* Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/PMMRC/Publications-resources/12th-PMMRC-report-final.pdf (accessed 7 November 2022).

Table 5.3: Characteristics among maternal deaths, by parity and body mass index, 2006–2020

	Maternities		Maternal mortality	
	N=930,021		n=140	
	N	%	n	%
Parity†				
0	343,140	36.9	36	25.7
1–3	470,324	50.6	72	51.4
4+	45,250	4.9	29	20.7
Unknown	71,307	7.7	3	2.1
Maternal BMI (kg/m^2)#				
<18.50	20,368	2.2	3	2.1
18.50–24.99	360,959	38.8	41	29.3
25.00–29.99	196,141	21.1	26	18.6
30.00–34.99	102,302	11.0	26	18.6
35.00–39.99	47,411	5.1	19	13.6
≥40	28,454	3.1	20	14.3
Missing data for height and or weight	174,386	18.8	5	3.6

† Mortality rates by parity not calculated as denominator data unreliable.

Mortality rates by BMI not calculated as denominator data unreliable.

BMI = body mass index.

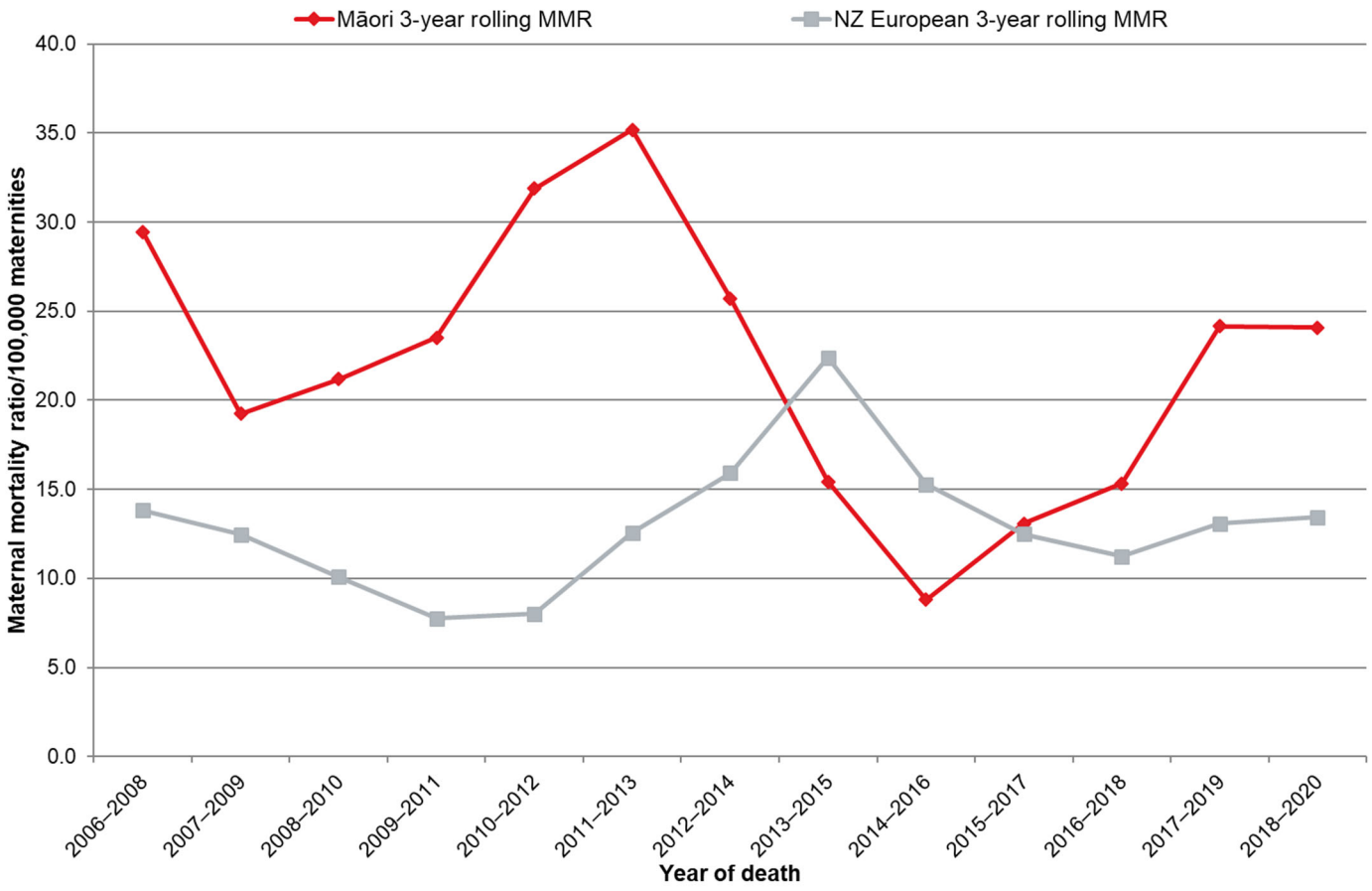
Sources: Numerator: PMMRC's maternal mortality data extract 2006–2020; Denominator: MAT data 2006–2020.

When analysed by prioritised ethnic group, the mortality rates for wāhine Māori are higher than those for New Zealand European women. Over the period 2006–2020, there was no statistically significant change in three-year rolling maternal mortality ratios for wāhine Māori[54] or for New Zealand European women[55] (Figure 5.3).

[54] Regression for trend (95% confidence intervals) -1.046 (-2.919, 0.826).

[55] Regression for trend (95% confidence intervals) -0.029 (-1.103, 1.045).

Figure 5.3: Maternal three-year rolling mortality ratios (per 100,000 maternities) by prioritised ethnic group (Māori and New Zealand European) and year, 2006–2020



MMR = maternal mortality ratio.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2020; Denominator: MAT data 2006–2020.

Table 5.4: Maternal mortality ratios (per 100,000 maternities) and cause of maternal death,† 2006–2020

	2006–2020		
	n=140		Cause specific ratio
	n	%	/100,000 maternities
Maternities	**930,021**		
Direct maternal death	**76**	**54.3**	**8.17**
Suicide	31	22.1	3.33
Pregnancies with abortive outcome (ectopic and miscarriage)‡	4	2.9	0.43
Hypertensive disorders	5	3.6	0.54
Obstetric haemorrhage	4	2.9	0.43
Pregnancy-related infection	9	6.4	0.97
Other obstetric complications	23	16.4	2.47
Amniotic fluid embolism	14	10.0	1.51
Venous thrombo-embolism	6	4.3	0.65
Other	3	2.1	0.32
Indirect maternal death	**57**	**40.7**	**6.13**
Cardiac	15	10.7	1.61
Neurological	15	10.7	1.61
Infections not a direct result of pregnancy	10	7.1	1.08
Other non-obstetric complications	14	10.0	1.51
Psychiatric causes – Drugs/alcohol/other	<3	x	s
Unknown	<3	x	s
Unknown/undetermined	**7**	**5.0**	**-**

'x' indicates percentages have been suppressed due to small numbers.

's' indicates rates have been suppressed due to small numbers.

† Other causes with small numbers have been suppressed.

‡ The WHO category that includes first trimester pregnancy complications such as miscarriages and ectopic pregnancy.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2020; Denominator: MAT data 2006–2020.

Over the period 2006–2020, there were 76 direct maternal deaths and 57 indirect maternal deaths recorded. Suicide was the largest single cause of maternal death in Aotearoa New Zealand, resulting in 31 deaths (22.1 percent). Cardiac and neurological complications resulting in indirect maternal deaths were the second most common causes of mortality, responsible for 15 deaths each (10.7 percent) (Table 5.4).

During this period, the obstetric complication resulting in the most maternal deaths was amniotic fluid embolism (AFE), which caused 14 deaths (10.0 percent) (Table 5.4). There was a reduction in maternal deaths due to AFE from nine maternal deaths for the 2008–2010 period to less than three over the 2016–2018 period (data not shown), and there have been no further deaths due to AFE recorded since 2018.

National consensus guidelines for treating postpartum haemorrhage (PPH) were established in 2013 and have recently been updated. These guidelines were introduced to ensure the recognition and treatment of PPH, regardless of cause.[56] Improvements in managing coagulopathy and massive blood loss, including the early use of tranexamic acid and the use of cryoprecipitate may have contributed to the reduction in deaths due to AFE.[57]

Maternal suicide

Death by suicide has disproportionately affected wāhine Māori. Over the period 2006–2020, wāhine Māori were 2.91 times more likely to die by suicide than women of New Zealand European ethnicity, with wāhine Māori having both the highest number of deaths and highest rate of death due to suicide (Table 5.5). These

[56] Ministry of Health. 2022. *National Consensus Guideline for Treatment of Postpartum Haemorrhage*. Wellington: Ministry of Health. URL: health.govt.nz/publication/national-consensus-guideline-treatment-postpartum-haemorrhage-and-treating-postpartum-haemorrhage(accessed 29 April 2022).

[57] McDonnell N, Knight M, Peek M, et al. 2015. Amniotic fluid embolism: an Australian-New Zealand population-based study. *BMC Pregnancy and Childbirth* 15: 352. DOI: 10.1186/s12884-015-0792-9 (accessed 20 October 2022).

data should be considered with caution due to the small number of maternal mortalities and the unadjusted nature of analysis. There is also a background of high suicide rates in Aotearoa New Zealand, particularly among rangatahi Māori.[58]

Maternal suicide prevention is a critical equity issue in Aotearoa New Zealand. A previous review of maternal deaths due to suicide in wāhine Māori in the PMMRC's eleventh annual report identified risk factors such as mental health issues, alcohol and drug use, or reports of previous self-harm or suicide attempts. For many, risk factors also included exposure to significant stressors, including relationship difficulties, experience of violence or abuse, and financial, housing and transport difficulties. The eleventh annual report identified early recognition of risk factors as being critical for effective provision of health services for assessment and follow-up.[59]

The Royal Australian and New Zealand College of Psychiatrists (RANZCP) recommends a minimum of one eight-bedded mother-baby unit for every 15,000 deliveries to provide adequate perinatal mental health services.[60]

Prevention of maternal suicide requires not only individual interventions but a systems-level response, addressing the wider political and social systems that create the structural determinants of health – this includes poverty, housing, employment and institutional racism.[61]

Maternal suicide continues to be a significant issue in Aotearoa New Zealand.[62]

Table 5.5: Maternal suicide by prioritised ethnic group,† 2006–2020

Maternal prioritised ethnic group	N	n	Rate	RR	95% CI
Māori	240,175	18	7.49	2.91	1.31–6.48
NZ European	349,509	9	2.58	1.00	-

† Excludes four cases that were in the 'Pacific peoples' and 'Other Asian' ethnic groups. There were no deaths due to suicide in Indian; Middle Eastern, Latin American, or African (MELAA); Other European; or other ethnic groups.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2020; Denominator: MAT data 2006–2020.

Figure 5.4 shows that the rate of direct maternal death in Aotearoa New Zealand from 2011 to 2020 was 6.75 deaths per 100,000 maternities, which is much higher than the rate in the UK from 2012 to 2019 (3.78 deaths per 100,000 maternities). There were no significant differences between rates in Aotearoa New Zealand and the UK for most direct causes of maternal deaths other than suicide. In Aotearoa New Zealand, the rate of maternal death due to suicide was much higher than the rate in the UK, and more coincidental maternal deaths were also recorded (Figure 5.4).

In 2021, in response to the PMMRC's recommendations, the Ministry of Health completed a stocktake of maternal mental health services provided by DHBs. Key findings were that current service delivery is inequitable, with unmet need and gaps in the continuum of care. The PMMRC recommended that the maternal mental health workforce be expanded and kaupapa Māori models of care provided to improve maternal mental health.[63]

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[58] Ngā Pou Arawhenua, Child and Youth Mortality Review Committee, Suicide Mortality Review Committee. 2020. *Te Mauri – the life force*. Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/SuMRC/Publications-resources/TeMauriTheLifeForce_final.pdf (accessed 29 April 2022).

[59] PMMRC. 2017. *Eleventh Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2015.* Wellington: Health Quality & Safety Commission. URL: hqsc.govt.nz/assets/Our-work/Mortality-review-committee/PMMRC/Publications-resources/2017_PMMRC_Eleventh_Annual_Report.pdf (accessed 8 November 2022).

[60] RANZCP. 2021. Position statement 57: Perinatal mental health services. URL: ranzcp.org/news-policy/policy-and-advocacy/position-statements/perinatal-mental-health-services (accessed 6 July 2022).

[61] Dawson P, Jaye C, Gauld R, et al. 2019. Barriers to equitable maternal health in Aotearoa New Zealand: an integrative review. *International Journal for Equity in Health* 18: 168.

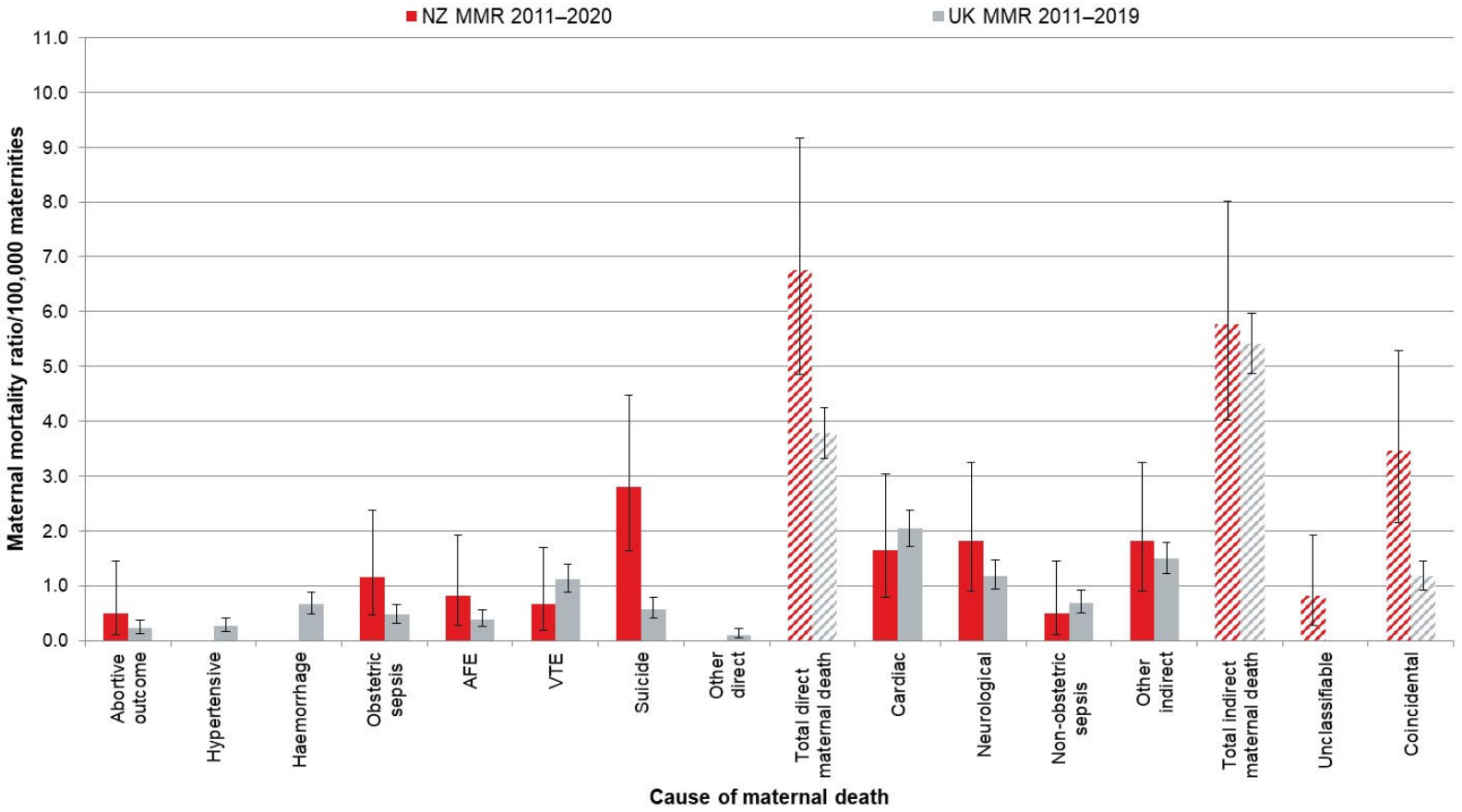
[62] Holden G, Corter AL, Hatters-Friedman S, et al. 2020. Brief report. A qualitative study of maternal mental health services in New Zealand: perspectives of Māori and Pacific mothers and midwives. *Asia-Pacific Psychiatry* 12(2): e12369.

[63] Ministry of Health. 2021. *Maternal Mental Health Service Provision in New Zealand: Stocktake of district health board services*. Wellington: Ministry of Health.URL:

The health and disability system in Aotearoa New Zealand is currently undergoing a transformation, with the establishment of Te Aka Whai Ora | Māori Health Authority and Te Whatu Ora – Health New Zealand. It is anticipated that the recommendations will be progressed by these new entities.

health.govt.nz/system/files/documents/publications/maternal_mental_health_service_provision_in_new_zealand-19_nov.pdf (accessed 29 April 2022).

Figure 5.4: Cause-specific maternal mortality ratios† (per 100,000 maternities, with 95% CIs) in Aotearoa New Zealand, 2011–2020, and the UK, 2011–2019



Note: The rates of hypertensive, haemorrhage and 'other direct' for NZ MMR 2011–2020 have been suppressed due to small numbers.

† Includes coincidental deaths.

MMR = maternal mortality ratio.

AFE = amniotic fluid embolism.

VTE = venous thromboembolism.

'Other direct' includes cardiomyopathy.

'Other indirect' includes endocrine, respiratory, neoplasm, other pre-existing medical.

'Coincidental' includes motor vehicle accidents, external causes of accidental injury, assault, malignancy not related to pregnancy.

The shaded bars represent total of direct, indirect, unclassifiable and coincidental deaths.

Sources: NZ MMR: Numerator: PMMRC's maternal mortality data extract 2011–2020; Denominator: MAT data 2011–2020. UK MMR: Numerator: Maternal Deaths and Morbidity, includes surveillance data on women who died during or up to one year after pregnancy 2011–2019 in the UK; Denominator: The number of pregnancies that result in a live birth at any gestation or stillbirths occurring at or after 24 completed weeks of gestation, supplied by organisations such as the Office for National Statistics (ONS), the Scotland General Registrar Office (GRO), Northern Ireland Statistical Research Agency (NISRA) and Hospital Episode Statistics (HES) 2011–2019. UK MMR: Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK) November 2021, *Saving Lives, Improving Mothers Care: Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2017–19*, Maternal, Newborn and Infant Clinical Outcome Review Programme.

Report Recommendations

(Provisional)

Similar to the fourteenth annual report published in February 2021, the PMMRC again insists that prioritised and accelerated focus be applied to implement previous recommendations.

Furthermore, the PMMRC highlights some key previous recommendations that need to be prioritised *immediately*, with an overarching emphasis on achieving equity for Māori whānau and other groups where inequities persist in both prevention and bereavement care pathways/services. These key previous recommendations are as follows.

1. **Regulatory bodies to mandate cultural safety education** for all individuals working across all areas of the maternity and neonatal workforce.
2. **Government agencies to recognise and address the impact of socioeconomic deprivation on perinatal death**, specifically on preterm birth, which is the leading cause of perinatal death after congenital abnormality.
3. **Te Whatu Ora – Health New Zealand districts to develop evidence-based solutions in consultation with young mothers** and maternity services that meet the needs of, and are acceptable to, mothers under 20 years of age and adequately resource these services.
4. **Health practitioners to identify women with modifiable risk factors for perinatal related death** and work individually and collectively to ensure that care is accessible and appropriate to the needs of these women. Modifiable risk factors that require particular focus include:
    - pre-pregnancy care for known medical diseases such as diabetes
    - access to antenatal care
    - antenatal recognition and management of threatened preterm labour
    - following evidence-based recommendations for indications for induction of labour
    - advice to women on and appropriate management of decreased fetal movements.

Further urgent work is needed on implementing recommendations commenced since the fourteenth annual report release, including the following recommendations.

1. **Expedite and embed a national bereavement pathway/service** to improve access and reduce local inconsistencies in care and services received by parents.
2. **Strengthen services based on the findings of the *Maternal Mental Health Service Provision in New Zealand: Stocktake of district health board services.***[64] The stocktake recommended that the maternal mental health workforce be expanded and kaupapa Māori models of care provided to improve maternal mental health, having found that current service delivery is inequitable, with unmet need and gaps in the continuum of care.

[64] Ministry of Health. 2021. *Maternal Mental Health Service Provision in New Zealand: Stocktake of district health board services*. Wellington: Ministry of Health. URL: health.govt.nz/publication/maternal-mental-health-service-provision-new-zealand-stocktake-district-health-board-services (accessed 7 November 2022).

Perinatal and Maternal Mortality Review Committee

He matenga ohorere, he wairua uiui, wairua mutungakore

Health Quality & Safety Commission New Zealand

Kupu Taurangi Hauora o Aotearoa

Appendix A: Reporting Mortality and Morbidity 2019 | Āpitihanga A: Te Tuku Pūrongo mō te Mate me te Whakamate 2019

December 2022 | Hakihea 2022

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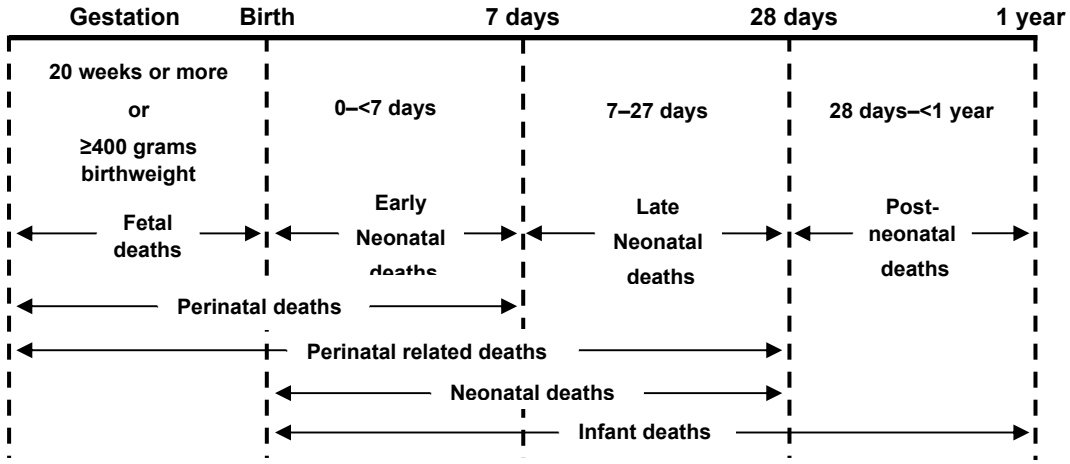
Figures | Ngā Tatau

Tables | Ngā Tūtohi

A2 Methods | Te Tikanga

See the Methods and Definitions for Perinatal and Maternal Mortality Review Committee Reporting document at www.hqsc.govt.nz/resources/resource-library/fifteenth-annual-report-of-the-perinatal-and-maternal-mortality-review-committee-reporting-mortality-and-morbidity-2020.

Definitions Used by the PMMRC – Perinatal Related and Infant Deaths



(Adapted from New Zealand Health Information Service 2007 and Ministry of Health 2010.)

Fetal death is the death of a fetus at 20 weeks gestation or beyond (≥20 weeks) or weighing at least 400 g if gestation is unknown. Fetal death includes stillbirth and termination of pregnancy.

Termination of pregnancy is the interruption of an ongoing pregnancy (whether the baby was stillborn or live born). This report only includes termination of pregnancy from 20 weeks gestation.

Neonatal death is the death of any baby showing signs of life at 20 weeks gestation or beyond or weighing at least 400 g if gestation is unknown that occurs up until midnight of the 27th day of life. **Early neonatal death** is a death that occurs up until midnight on the sixth day of life. **Late neonatal death** is a death that occurs between the seventh day and midnight of the 27th day of life.

Perinatal mortality is fetal and early neonatal death from 20 weeks gestation (or weighing at least 400 g if gestation is unknown) until midnight of the sixth day of life.

Perinatal related mortality is fetal deaths (including terminations of pregnancy and stillbirths) and neonatal deaths (up to midnight of the 27th day of life) per 1000 total babies born at 20 weeks gestation or beyond and weighing at least 400 g if gestation was unknown.

A **maternal death** is the death of a woman while pregnant or within 42 days of termination of pregnancy (miscarriage, termination or birth), irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management. It does not include accidental or incidental causes of death of a pregnant woman.

Maternities are all live births and all fetal deaths at 20 weeks gestation or beyond or weighing at least 400 g if gestation is unknown. The maternal mortality ratio is calculated per 100,000 maternities.

Neonatal encephalopathy (NE) is a clinically defined syndrome of disturbed neurological function within the first week of life, manifested by difficulty in initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness and often seizures.

Ethnic Comparisons

Throughout the report, comparisons are made between prioritised ethnic groups. At times, outcomes for babies of Māori women are compared with outcomes for babies of New Zealand European women. The Treaty of Waitangi underlies the health sector's obligations to Māori, and Māori rights to monitor the Crown to ensure that these responsibilities and met and that there are equitable outcomes for Māori in the health sector. Treaty-based Māori rights are augmented by the broader rights of women and children to equitable outcomes regardless of their ethnicity. The presentation of comparisons between different ethnic groups is not to provide commentary on the deficits of any particular ethnic group but rather to highlight the deficits of a society that creates, maintains and tolerates these differences.

The National Maternity Collection (MAT)

MAT is based upon two sources:

- primary maternity services provided under Section 88 of the New Zealand Public Health and Disability Act 2000, which is sourced from lead maternity carer (LMC) claims for payment
- the national minimum dataset (NMDS), which contains information on inpatient and day patient health event data during pregnancy, birth and the postnatal period for the mother and baby.

While MAT should have a record of most births that occur in Aotearoa New Zealand, either through the NMDS for those who give birth in hospital or through LMC claims, antenatal data are not routinely uploaded for women who are receiving care from providers other than LMC midwives, general practitioners (GPs) or obstetricians. In particular, antenatal data for women whose primary antenatal care is provided through their district health board (DHB) will not be entered into MAT. Many DHBs, such as Counties Manukau, routinely provide antenatal care, and LMC workforce issues mean this is becoming more common nationally. Due to technical issues, complete data from DHBs are not always uploaded into MAT, even when they are provided. The 13th report of the PMMRC presented an approximation of the effect of this with regard to smoking status and body mass index (BMI) and showed the substantial differences between women whose antenatal records are in MAT and those whose records are not.[65]

Perinatal Society of Australia and New Zealand (PSANZ) Death Classifications

All perinatal deaths are classified in accordance with either the PSANZ perinatal death classification (PDC) or the neonatal death classification (NDC). In 2017, PSANZ revised these death classification systems to include new subcategories,[66] which were subsequently implemented in New Zealand in 2018.

The deaths presented in this report have been classified using the revised 2017 version of PSANZ death classification systems. Deaths from 1 January 2018 have been classified according to the 2017 version. Deaths prior to 2018, which were originally classified using the 2007 version, have been reclassified according to the 2017 revision.

Statistical Analysis

Simple linear regression analysis has been used to investigate linear change across time. From each model, the change across time is estimated along with the 95 percent confidence interval (95% CI). A positive slope indicates an increase in rate during that time period, whereas a negative slope indicates a

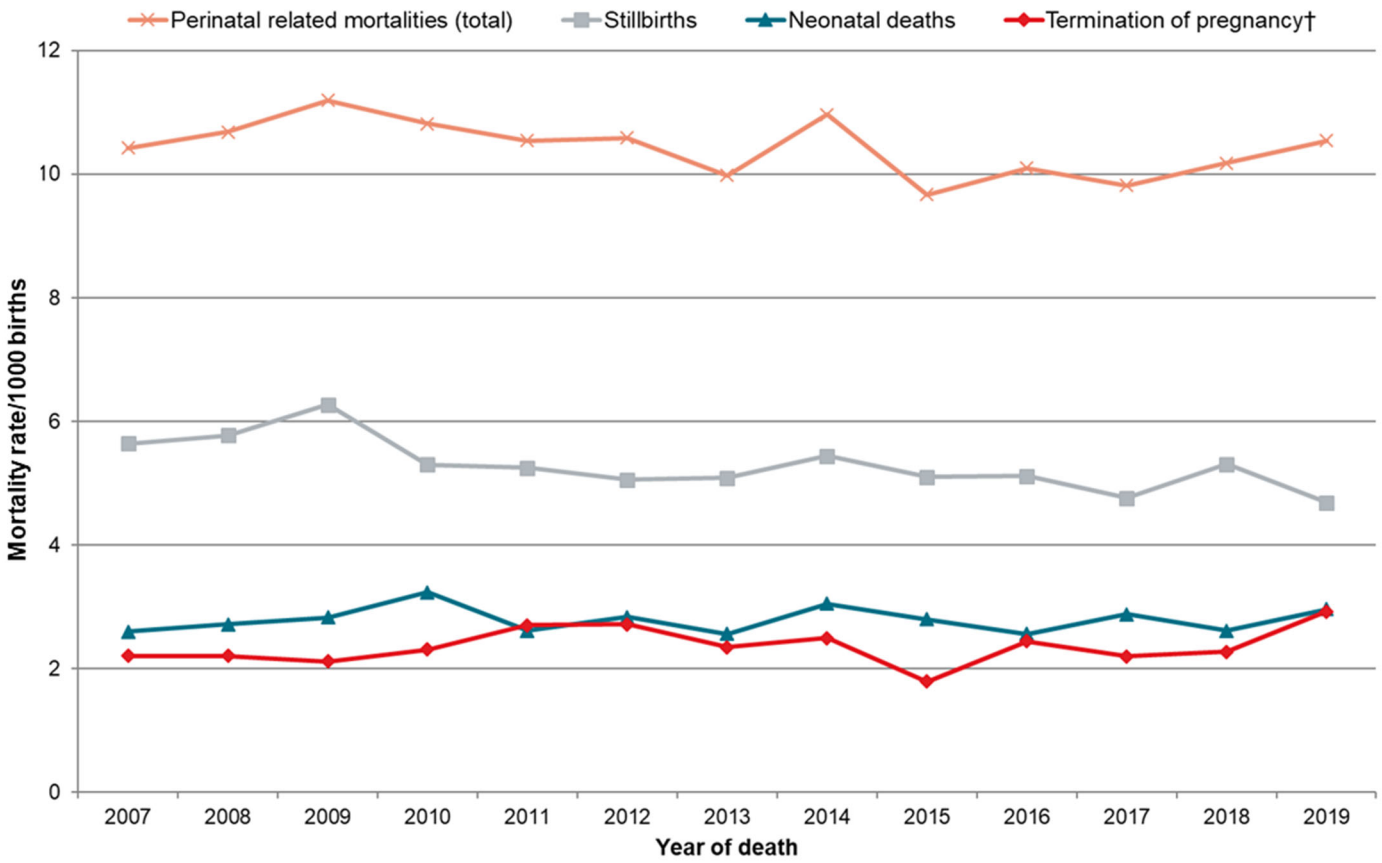
[65] PMMRC. 2019. *Te Pūrongo ā-Tau Tekau mā Toru o te Komiti Arotake Mate Pēpi, Mate Whaea Hoki | Thirteenth Annual Report of the Perinatal and Maternal Mortality Review Committee: Te tuku pūrongo mō te mate me te whakamate 2017 | Reporting mortality and morbidity 2017.* p. 16. URL: https://www.hqsc.govt.nz/resources/resource-library/te-purongo-a-tau-tekau-ma-toru-o-te-komiti-arotake-mate-pepi-mate-whaea-hoki-thirteenth-annual-report-of-the-perinatal-and-maternal-mortality-review-committee/.

[66] A comparison of the PSANZ death classification systems can be found on the Stillbirth and Neonatal Death Alliance (PSANZ-SANDA) website. URL: https://sanda.psanz.com.au/assets/Uploads/Appendix-U-Changes-in-this-version-of-the-classifications.pdf (accessed 13 May 2020)

decrease over time. In tables, a single asterisk [*] indicates a p-value of <0.05, and a double asterisk [**] indicates a p-value <0.01.

A3 Perinatal Mortality | Te Mate Pēpi

Figure A3.1: Perinatal related mortality rates (per 1000 births) using New Zealand definitions 2007–2019



† In this report, 'Termination of pregnancy' refers to the interruption of an ongoing pregnancy from 20 weeks gestation onwards.

Sources: Numerator: PMMRC's perinatal data extract 2007–2019; Denominator: MAT births 2007–2019.

Table A3.1: Summary of New Zealand perinatal related mortality rates using New Zealand definition (≥20 weeks or ≥400 g if gestation is unknown) by year 2007–2019

	n												
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total births	65,210	65,630	65,204	65,453	63,248	63,294	60,141	60,083	59,791	60,611	60,490	59,315	60,604
Fetal deaths (terminations of pregnancy and stillbirths)†	512	524	547	498	503	492	447	477	412	458	421	450	461
Terminations of pregnancy	144	145	138	151	171	172	141	150	107	148	133	135	177
Stillbirths	368	379	409	347	332	320	306	327	305	310	288	315	284
Early neonatal deaths <7 days	134	134	137	165	139	142	122	150	131	123	138	116	143
Late neonatal deaths 7–27 days	34	43	46	45	25	36	31	32	35	31	35	38	35
Neonatal deaths <28 days#	168	177	183	210	164	178	153	182	166	154	173	154	178
Perinatal mortalities+	646	658	684	663	642	634	569	627	543	581	559	566	604
Perinatal related mortalities^	680	701	730	708	667	670	600	659	578	612	594	604	639
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	462	481	513	463	443	440	414	447	397	413	405	414	430
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	482	509	544	494	459	462	432	466	415	434	430	440	453
	Rate												
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total births													
Fetal deaths (terminations of pregnancy and stillbirths)†	7.85	7.98	8.39	7.61	7.95	7.77	7.43	7.94	6.89	7.56	6.96	7.59	7.61
Terminations of pregnancy	2.21	2.21	2.12	2.31	2.70	2.72	2.34	2.50	1.79	2.44	2.20	2.28	2.92
Stillbirths	5.64	5.77	6.27	5.30	5.25	5.06	5.09	5.44	5.10	5.11	4.76	5.31	4.69
Early neonatal deaths <7 days													
Late neonatal deaths 7–27 days													
Neonatal deaths <28 days#	2.60	2.72	2.83	3.23	2.61	2.83	2.56	3.05	2.80	2.56	2.88	2.62	2.96
Perinatal mortalities+	9.91	10.03	10.49	10.13	10.15	10.02	9.46	10.44	9.08	9.59	9.24	9.54	9.97
Perinatal related mortalities^	10.43	10.68	11.20	10.82	10.55	10.59	9.98	10.97	9.67	10.10	9.82	10.18	10.54
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	7.08	7.33	7.87	7.07	7.00	6.95	6.88	7.44	6.64	6.81	6.68	6.98	7.10
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	7.39	7.76	8.34	7.55	7.26	7.30	7.18	7.76	6.94	7.16	7.09	7.42	7.46

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

* Lethal and terminated fetal abnormalities are all perinatal related deaths with Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC) of congenital anomaly, and neonatal deaths with PSANZ Neonatal Death Classification (PSANZ-NDC) of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract 2007–2019; Denominator: MAT births 2007–2019.

Perinatal Death Classification

Table A3.2: Perinatal related deaths by perinatal death classification (PSANZ-PDC) 2019

Perinatal death classification (PSANZ-PDC)	Fetal deaths				Neonatal deaths		Perinatal related deaths (total)	
	Termination of pregnancy		Stillbirths					
	n = 177		n = 284		n = 178		n = 639	
	n	%	n	%	n	%	n	%
Congenital anomaly	126	71.2	20	7.0	37	20.8	183	28.6
Perinatal infection	3	1.7	12	4.2	<3	x	17	2.7
Hypertension	3	1.7	9	3.2	6	3.4	18	2.8
Antepartum haemorrhage	3	1.7	21	7.4	25	14.0	49	7.7
Maternal conditions	19	10.7	10	3.5	5	2.8	34	5.3
Complications of multiple pregnancy	7	4.0	11	3.9	12	6.7	30	4.7
Specific perinatal conditions	4	2.3	19	6.7	4	2.2	27	4.2
Hypoxic peripartum death	-	-	<3	x	5	2.8	7	1.1
Placental dysfunction or causative placental pathology	<3	x	44	15.5	5	2.8	50	7.8
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	8	4.5	39	13.7	60	33.7	107	16.7
Unexplained antepartum fetal death	3	1.7	97	34.2	-	-	100	15.6
Neonatal death without obstetric antecedent	-	-	-	-	17	9.6	17	2.7

'x' indicates percentage suppressed due to small numbers.

Source: PMMRC's perinatal data extract 2019.

Table A3.3: Perinatal death classification (PSANZ-PDC) specific stillbirth rates (per 1000 births) by year 2010–2019

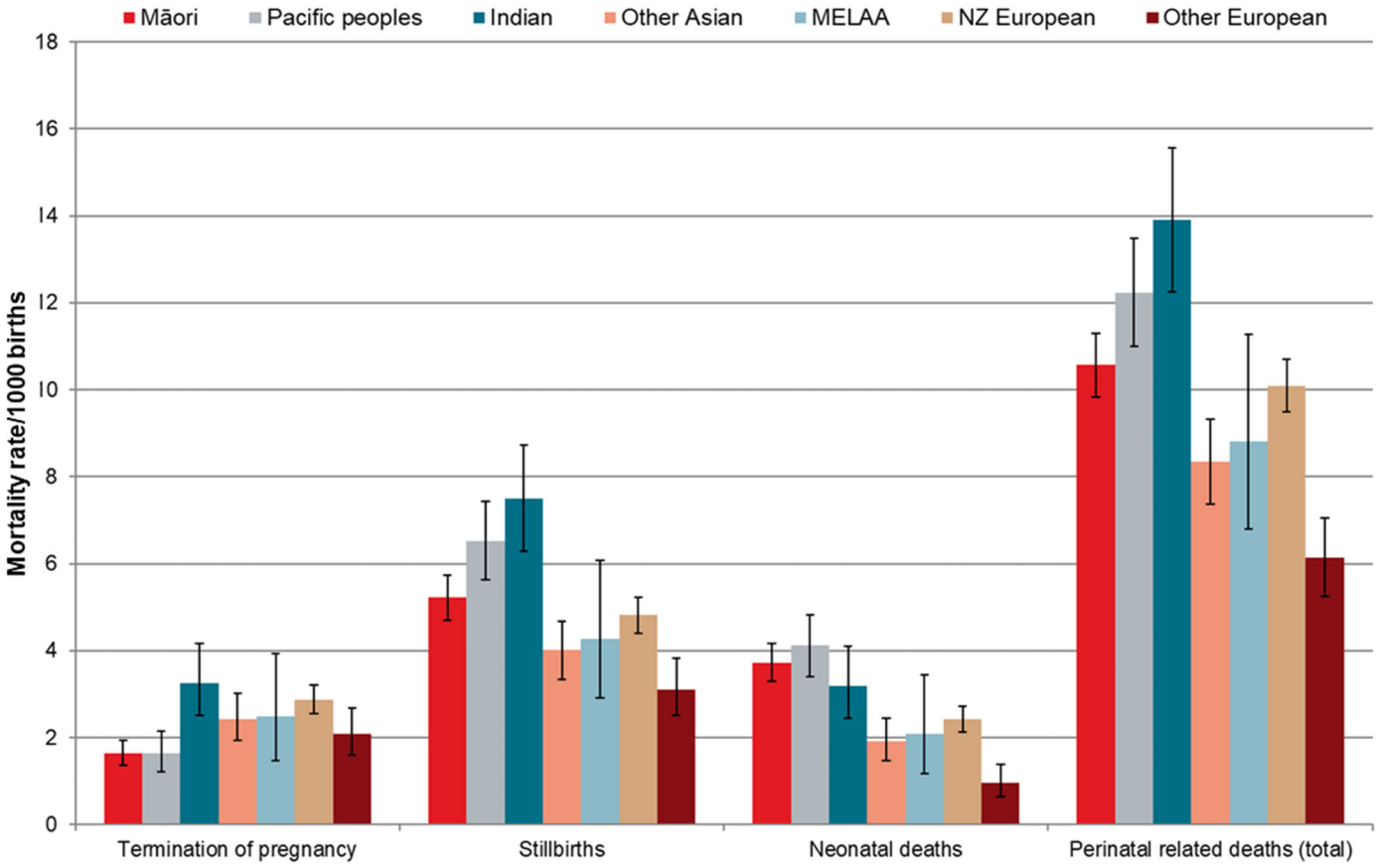
Perinatal death classification (PSANZ-PDC)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	N=65,453		N=63,248		N=63,294		N=60,141		N=60,083		N=59,791		N=60,611		N=60,490		N=59,315		N=60,604	
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
Congenital anomaly	39	0.60	28	0.44	38	0.60	24	0.40	35	0.58	30	0.50	31	0.51	29	0.48	34	0.57	20	0.33
Perinatal infection	17	0.26	10	0.16	9	0.14	10	0.17	12	0.20	12	0.20	10	0.16	17	0.28	11	0.19	12	0.20
Hypertension	18	0.28	12	0.19	9	0.14	8	0.13	9	0.15	16	0.27	8	0.13	10	0.17	10	0.17	9	0.15
Antepartum haemorrhage	46	0.70	48	0.76	31	0.49	44	0.73	33	0.55	46	0.77	38	0.63	37	0.61	29	0.49	21	0.35
Maternal conditions	23	0.35	13	0.21	19	0.30	22	0.37	21	0.35	22	0.37	17	0.28	12	0.20	23	0.39	10	0.17
Complications of multiple pregnancy	11	0.17	16	0.25	15	0.24	21	0.35	12	0.20	7	0.12	18	0.30	16	0.26	23	0.39	11	0.18
Specific perinatal conditions	31	0.47	31	0.49	21	0.33	12	0.20	23	0.38	25	0.42	29	0.48	25	0.41	18	0.30	19	0.31
Hypoxic peripartum death	7	0.11	9	0.14	11	0.17	3	0.05	7	0.12	9	0.15	4	0.07	4	0.07	<3	s	<3	s
Placental dysfunction or causative placental pathology	43	0.66	51	0.81	54	0.85	53	0.88	44	0.73	39	0.65	47	0.78	48	0.79	49	0.83	44	0.73
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	44	0.67	36	0.57	40	0.63	28	0.47	52	0.87	24	0.40	31	0.51	21	0.35	40	0.67	39	0.64
Unexplained antepartum fetal death	68	1.04	78	1.23	73	1.15	81	1.35	79	1.31	75	1.25	77	1.27	69	1.14	77	1.30	97	1.60
Neonatal death without obstetric antecedent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

‘s’ indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract, stillbirths only, 2010–2019; Denominator: MAT births 2010–2019.

Perinatal Related Mortality by Prioritised Ethnic Group

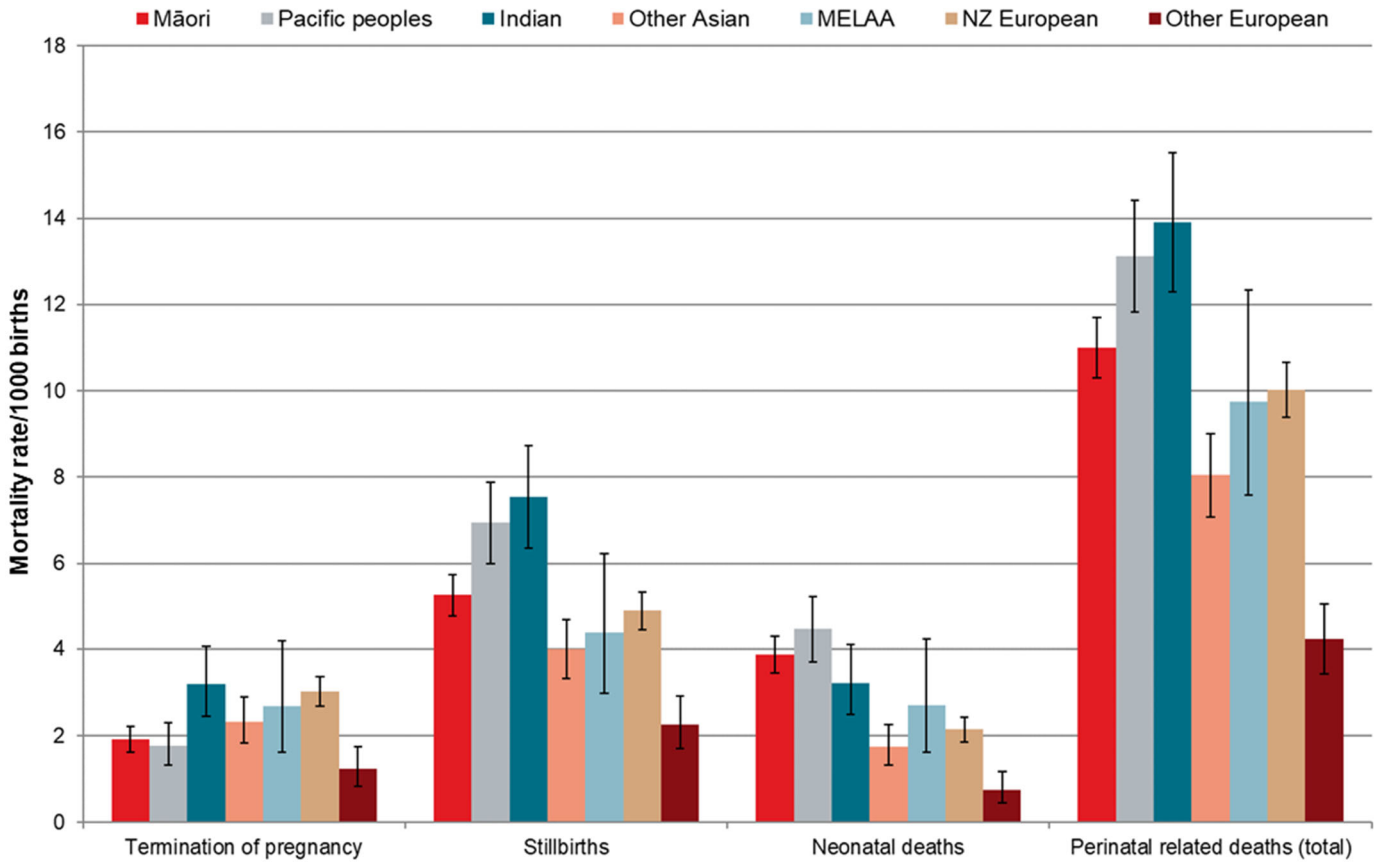
Figure A3.2: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal prioritised ethnic group 2015–2019



MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Figure A3.3: Perinatal related mortality rates (per 1000 births, with 95% CIs) by baby prioritised ethnic group 2015–2019



MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Table A3.4: Perinatal death classification (PSANZ-PDC) specific perinatal related mortality rates (excluding congenital anomalies) by maternal prioritised ethnic group† 2015–2019

Perinatal death classification (PSANZ-PDC)	Māori			Pacific peoples			Asian								
							Indian			Other Asian			Total Asian		
	N=75,919			N=30,648			N=19,339			N=33,699			N=53,038		
	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Perinatal infection	41	6.4	0.54	20	6.7	0.65	8	3.9	0.41	11	6.1	0.33	19	4.9	0.36
Hypertension	29	4.5	0.38	12	4.0	0.39	6	2.9	0.31	6	3.3	0.18	12	3.1	0.23
Antepartum haemorrhage	108	16.8	1.42	45	15.1	1.47	35	17.0	1.81	33	18.2	0.98	68	17.6	1.28
Maternal conditions	54	8.4	0.71	37	12.4	1.21	15	7.3	0.78	7	3.9	0.21	22	5.7	0.41
Complications of multiple pregnancy	23	3.6	0.30	12	4.0	0.39	10	4.9	0.52	7	3.9	0.21	17	4.4	0.32
Specific perinatal conditions	21	3.3	0.28	17	5.7	0.55	15	7.3	0.78	11	6.1	0.33	26	6.7	0.49
Hypoxic peripartum death	20	3.1	0.26	3	1.0	0.10	<3	x	s	<3	x	s	<3	x	s
Placental dysfunction or causative placental pathology	56	8.7	0.74	28	9.4	0.91	34	16.5	1.76	25	13.8	0.74	59	15.2	1.11
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	158	24.6	2.08	66	22.1	2.15	45	21.8	2.33	32	17.7	0.95	77	19.9	1.45
Unexplained antepartum fetal death	112	17.4	1.48	53	17.7	1.73	35	17.0	1.81	45	24.9	1.34	80	20.7	1.51
Neonatal death without obstetric antecedent	20	3.1	0.26	6	2.0	0.20	<3	x	s	3	1.7	0.09	5	1.3	0.09

	MELAA			European								
				NZ European			Other European			Total European		
	N=7254			N=104,521			N=29,285			N=133,806		
	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Perinatal infection	<3	x	s	27	3.8	0.26	5	5.0	0.17	32	4.0	0.24
Hypertension	<3	x	s	23	3.3	0.22	<3	x	s	25	3.1	0.19
Antepartum haemorrhage	6	15.4	0.83	95	13.5	0.91	15	14.9	0.51	110	13.7	0.82
Maternal conditions	3	7.7	0.41	42	6.0	0.40	7	6.9	0.24	49	6.1	0.37
Complications of multiple pregnancy	<3	x	s	55	7.8	0.53	5	5.0	0.17	60	7.5	0.45
Specific perinatal conditions	10	25.6	1.38	66	9.4	0.63	11	10.9	0.38	77	9.6	0.58
Hypoxic peripartum death	<3	x	s	29	4.1	0.28	<3	x	s	30	3.7	0.22
Placental dysfunction or causative placental pathology	<3	x	s	99	14.1	0.95	12	11.9	0.41	111	13.8	0.83
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	7	17.9	0.96	129	18.3	1.23	19	18.8	0.65	148	18.4	1.11
Unexplained antepartum fetal death	5	12.8	0.69	130	18.5	1.24	23	22.8	0.79	153	19.0	1.14
Neonatal death without obstetric antecedent	-	-	-	8	1.1	0.08	<3	x	s	9	1.1	0.07

† Excludes 146 unknown maternal ethnicity among total births (denominator) and 1 unknown maternal ethnicity perinatal related deaths (total) (numerator).

'x' indicates percentage suppressed due to small numbers.

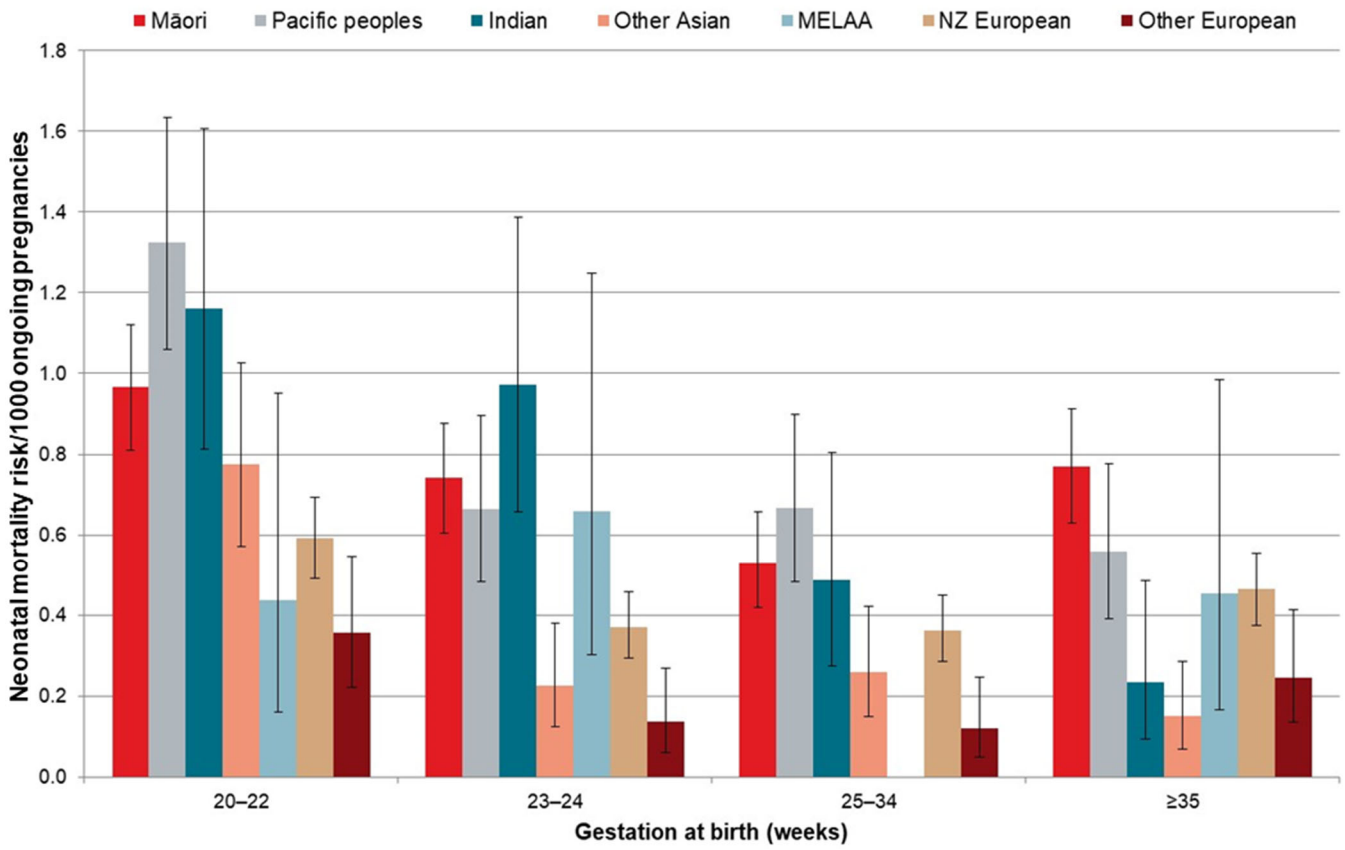
's' indicates rate suppressed due to small numbers.

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract (excluding congenital anomalies) 2015–2019; Denominator: MAT births 2015–2019

Neonatal Death

Figure A3.4: Neonatal death risk (per 1000 ongoing pregnancies) by gestation at birth and maternal ethnicity excluding death with congenital anomalies 2010–2019†



Note: MELAA death risk for 25–34 weeks gestation at birth supressed due to small numbers.

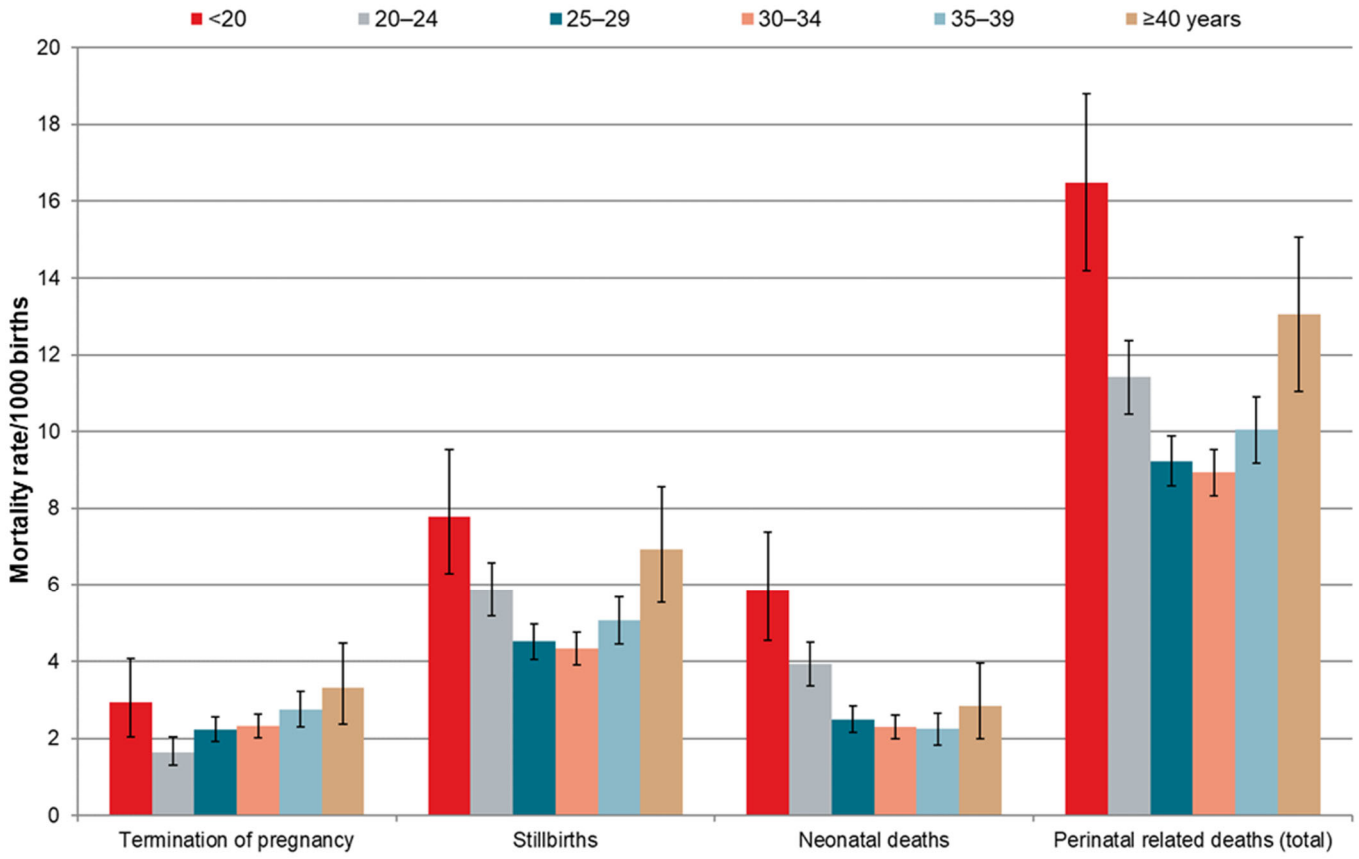
† Unknown/Other ethnicity not represented.

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract excluding congenital anomalies 2010–2019; Denominator: MAT live births 2010–2019.

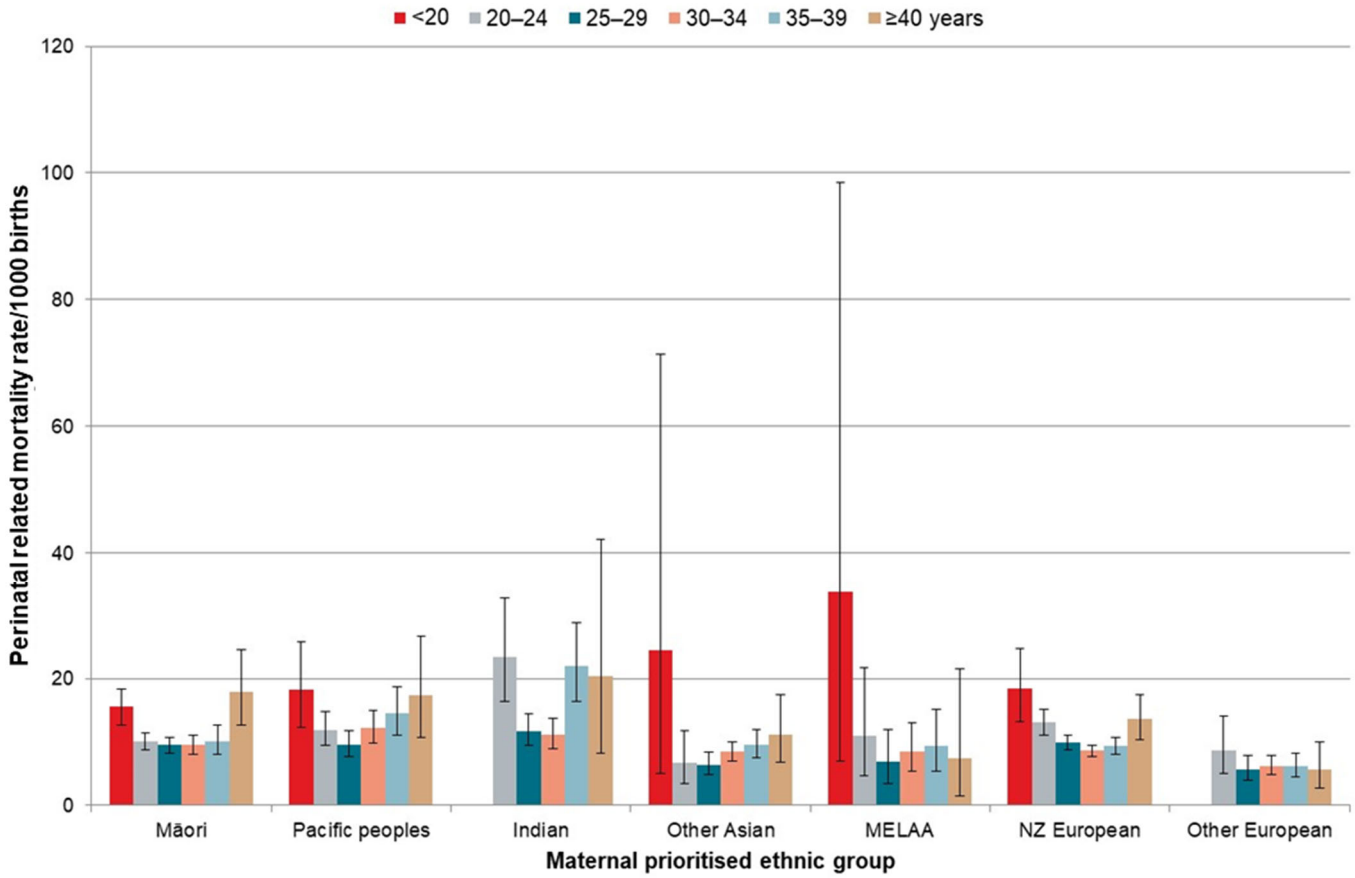
Maternal Age

Figure A3.5: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal age 2015–2019



Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Figure A3.6: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal age and maternal prioritised ethnic group 2015–2019



Note: The rates for Indian and Other European mothers aged <20 years supressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Table A3.5: Perinatal death classification (PSANZ-PDC) specific perinatal related mortality rates (excluding congenital anomalies) by maternal age† 2015–2019

Perinatal death classification (PSANZ-PDC)	Maternal age (years)														
	<20			20–24			25–34			35–39			≥40		
	N=11,946			N=46,972			N=178,234			N=51,171			N=12,408		
	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Perinatal infection	11	7.1	0.92	26	6.0	0.55	61	5.3	0.34	14	4.2	0.27	<3	x	s
Hypertension	<3	x	s	18	4.2	0.38	44	3.8	0.25	11	3.3	0.21	6	6.9	0.48
Antepartum haemorrhage	26	16.7	2.18	63	14.6	1.34	188	16.2	1.05	44	13.1	0.86	16	18.4	1.29
Maternal conditions	21	13.5	1.76	31	7.2	0.66	82	7.1	0.46	21	6.2	0.41	10	11.5	0.81
Complications of multiple pregnancy	4	2.6	0.33	20	4.6	0.43	57	4.9	0.32	29	8.6	0.57	3	3.4	0.24
Specific perinatal conditions	3	1.9	0.25	27	6.3	0.57	82	7.1	0.46	31	9.2	0.61	8	9.2	0.64
Hypoxic peripartum death	4	2.6	0.33	7	1.6	0.15	33	2.8	0.19	11	3.3	0.21	<3	x	s
Placental dysfunction or causative placental pathology	18	11.5	1.51	59	13.7	1.26	129	11.1	0.72	43	12.8	0.84	7	8.0	0.56
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	46	29.5	3.85	98	22.7	2.09	227	19.6	1.27	68	20.2	1.33	17	19.5	1.37
Unexplained antepartum fetal death	21	13.5	1.76	73	16.9	1.55	232	20.0	1.30	61	18.1	1.19	16	18.4	1.29
Neonatal death without obstetric antecedent	<3	x	s	9	2.1	0.19	25	2.2	0.14	4	1.2	0.08	<3	x	s

† Excludes one baby where maternal age was unknown.

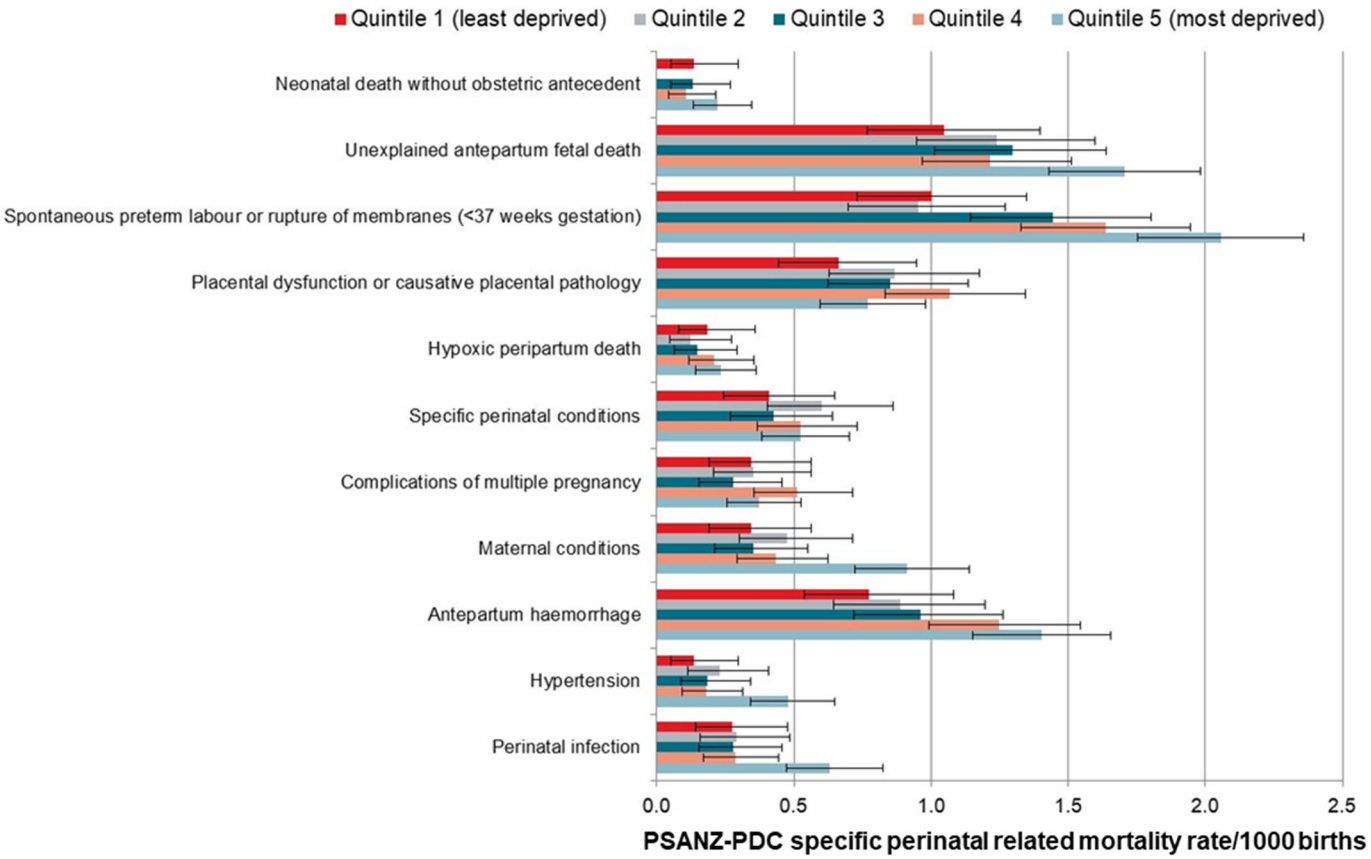
'x' indicates percentage not calculated due to small numbers.

's' indicates rate not calculated due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract (excluding congenital anomalies) 2015–2019; Denominator: MAT births 2015–2019.

Socioeconomic Deprivation

Figure A3.7: Perinatal death classification (PSANZ-PDC) specific perinatal related mortality rates (per 1000 births, with 95% CIs) (excluding congenital anomalies) by NZDep quintile† 2015–2019



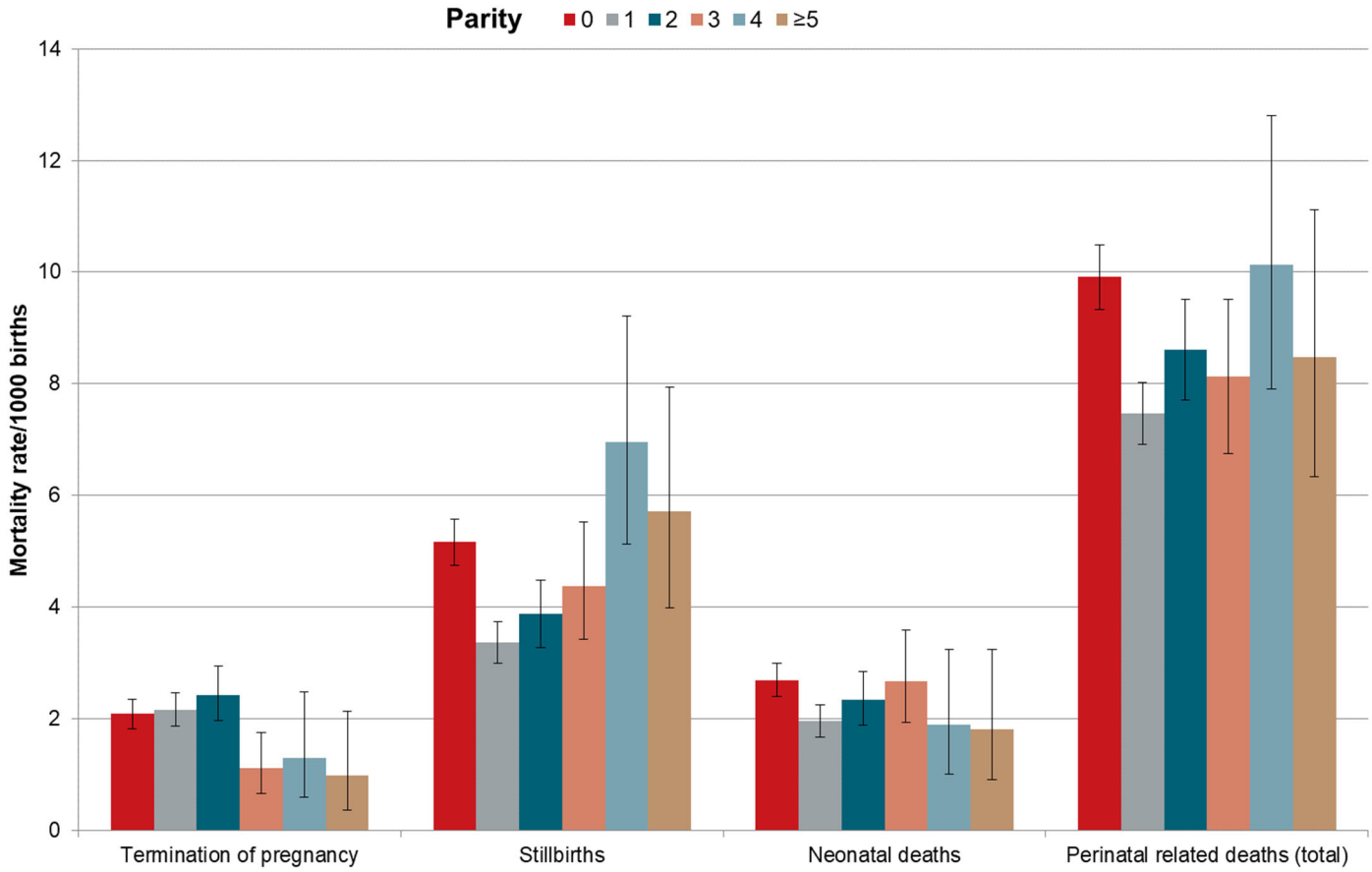
Note: The rate for Neonatal death without obstetric antecedent in Quintile 2 supressed due to small numbers.

† Excludes 13 unknown deprivation quintile.

Sources: Numerator: PMMRC's perinatal data extract (excluding congenital anomaly) 2015–2019; Denominator: MAT births 2015–2019.

Parity

Figure A3.8: Perinatal related mortality rates (per 1000 births, with 95% CIs) by maternal parity† 2015–2019



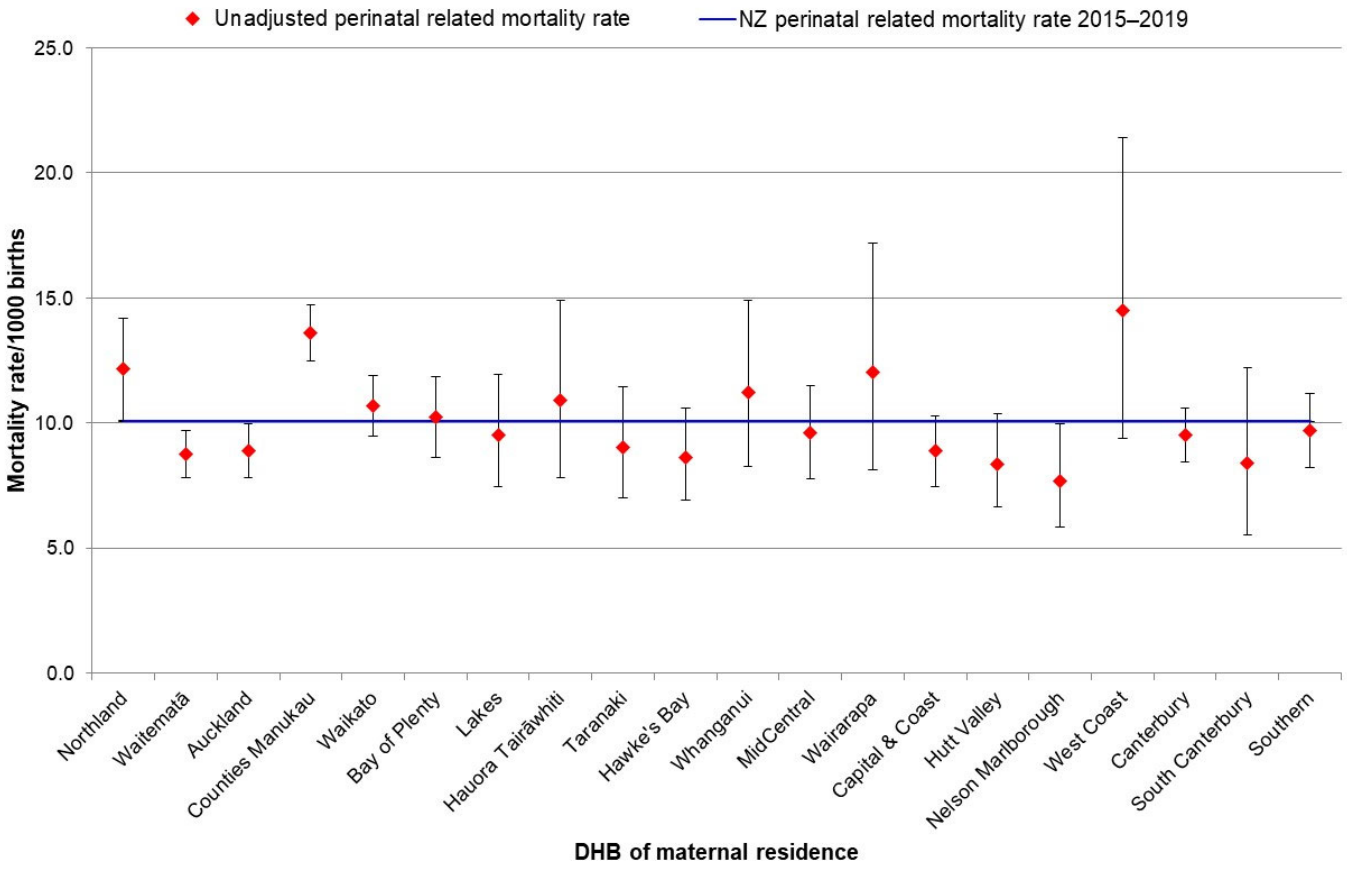
† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Parity '0' indicates women having their first baby/babies of 20 weeks or greater gestation.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, 2015–2019; Denominator: MAT births 2015-2019.

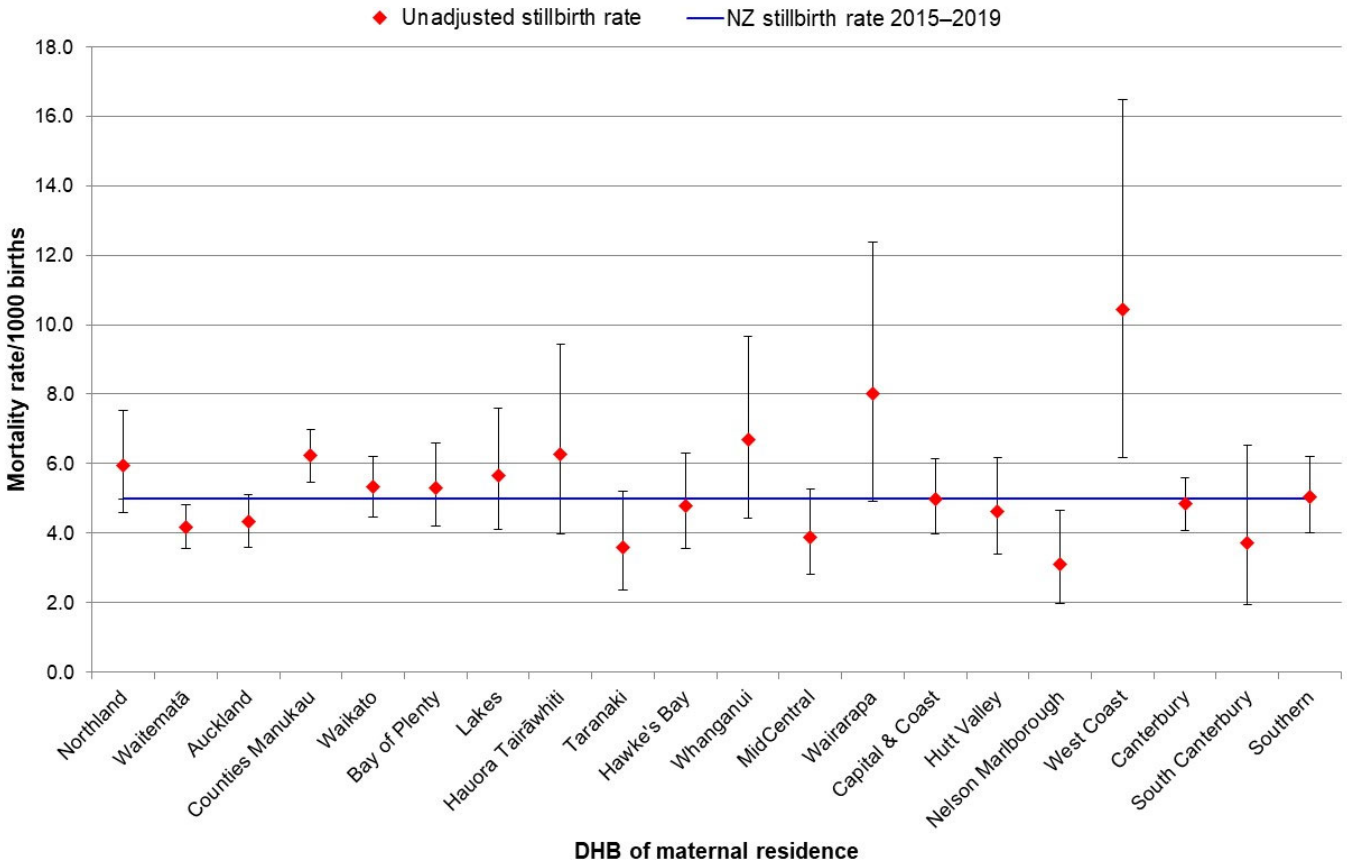
DHB of Residence

Figure A3.9: Perinatal related mortality rates (per 1000 births, with 95% CIs) by DHB of maternal residence compared with New Zealand perinatal related mortality 2015–2019



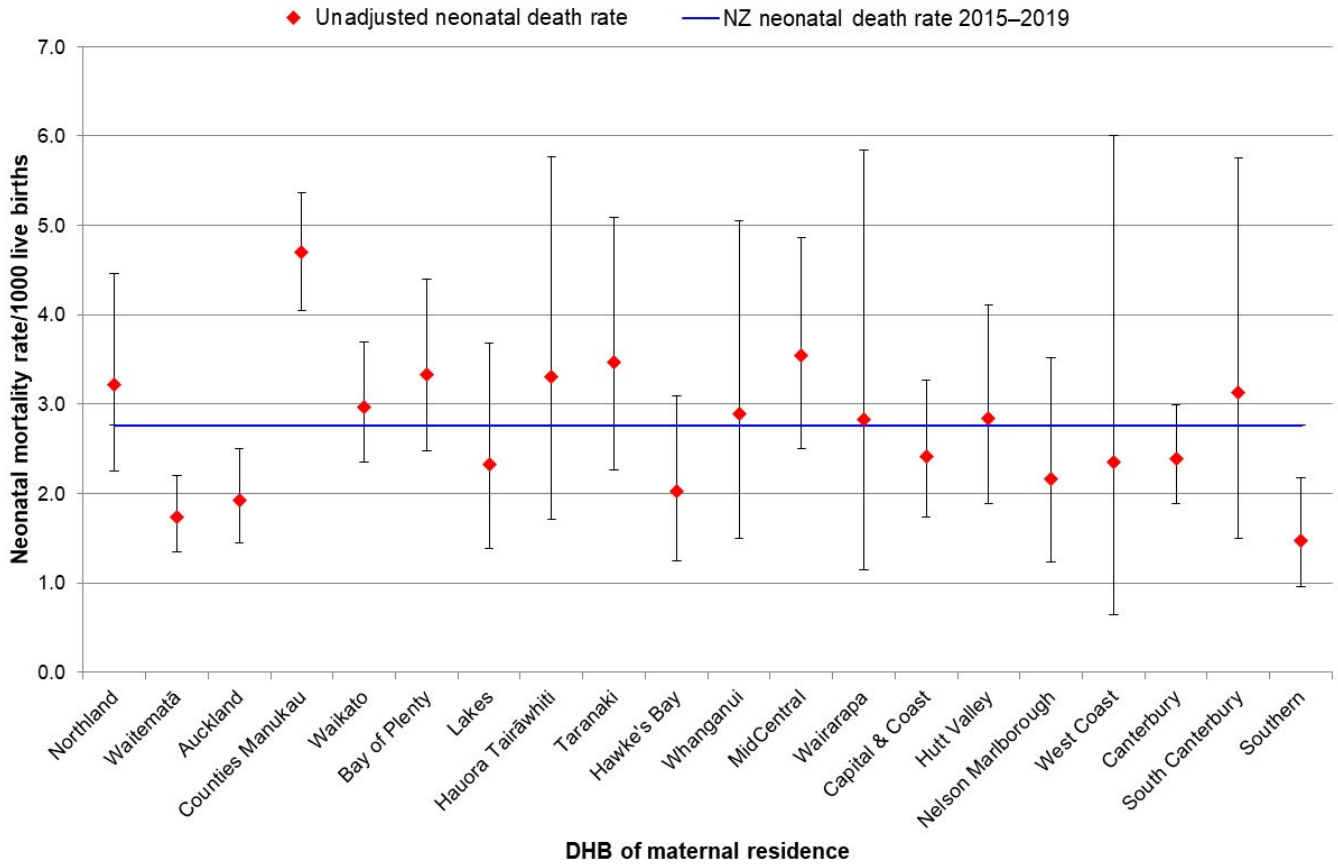
Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Figure A3.10: Stillbirth rates (per 1000 births, with 95% CIs) by DHB of maternal residence compared with average stillbirth rates 2015–2019



Sources: Numerator: PMMRC's perinatal data extract stillbirths only, 2015–2019; Denominator: MAT births 2015–2019.

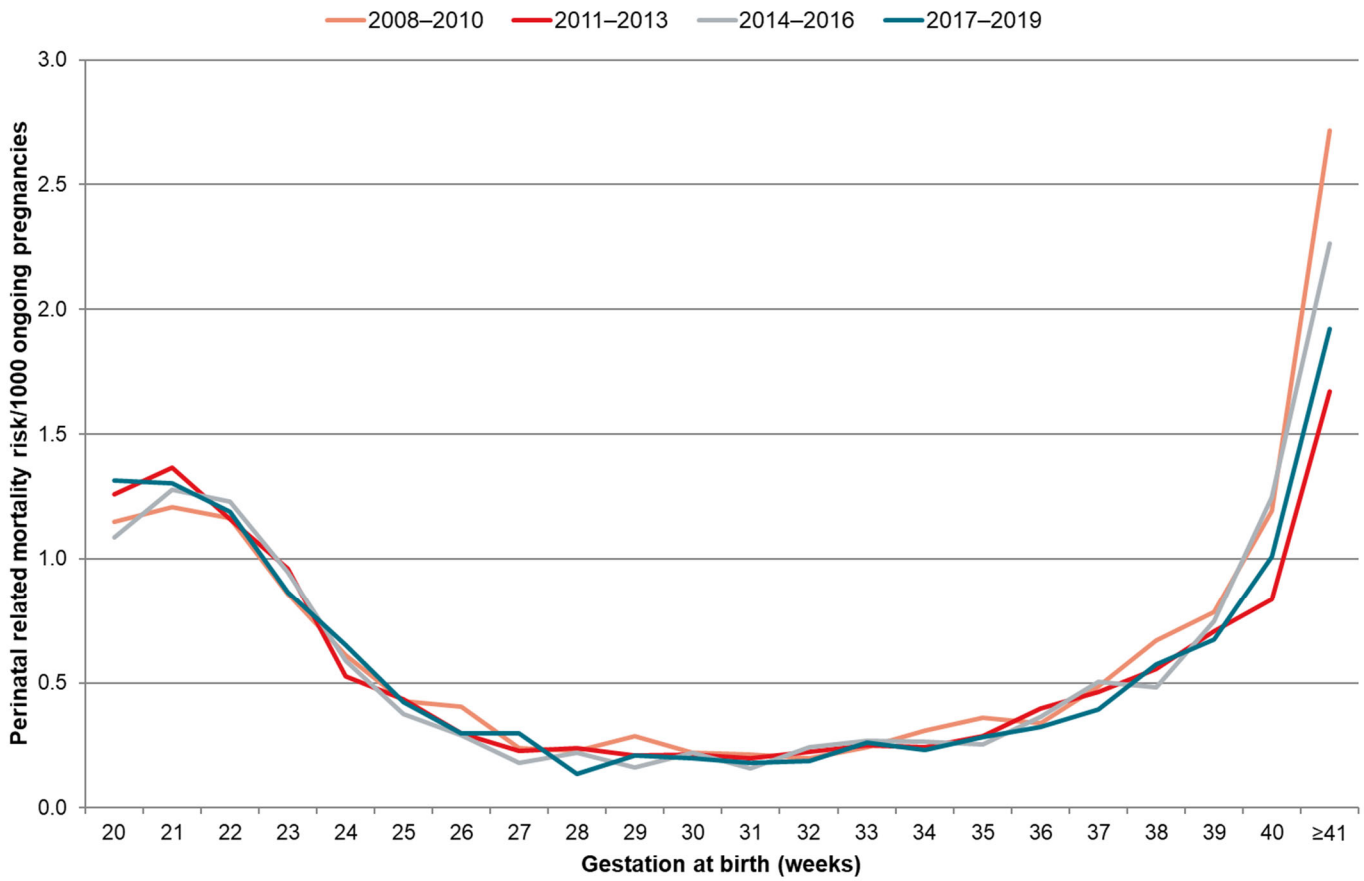
Figure A3.11: Neonatal mortality rates (per 1000 live births, with 95% CIs) by DHB of maternal residence compared with New Zealand neonatal mortality 2015–2019



Sources: Numerator: PMMRC's perinatal data extract, neonatal deaths only, 2015–2019; Denominator: MAT births excluding fetal deaths 2015–2019.

Gestational Age and Birthweight

Figure A3.12: Perinatal related mortality risk (per 1000 ongoing pregnancies) by gestational age at birth and year 2008–2019



Sources: Numerator: PMMRC's perinatal data extract 2008–2019; Denominator: MAT births 2008–2019.

Table A3.6: Perinatal related mortality risk (per 1000 ongoing pregnancies) by year 2010–2019

Gestation at birth (weeks)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n
20–22	231	248	230	235	231	247	215	217	245	253	169	175	206	216	211	210	230	238	216	232
23–24	122	81	129	95	119	94	123	85	137	98	117	92	126	84	110	82	125	89	133	99
25–27	225	73	187	52	218	70	192	55	187	49	206	52	189	50	213	64	185	45	226	72
28–31	562	52	509	58	505	50	471	49	462	46	458	41	483	48	481	49	485	43	481	36
32–36	4004	101	3907	87	3933	73	3724	91	3729	85	3653	78	3827	79	3759	76	3691	74	3830	73
37–38	13,611	62	13,175	64	13,445	65	13,398	38	13,684	56	13,611	42	14,519	59	14,752	45	14,666	53	15,237	54
39–40	34,595	65	33,876	59	33,598	51	32,209	51	32,163	60	32,145	69	32,109	56	32,076	51	31,196	48	31,748	52
≥41	11,550	26	10,729	17	10,325	20	9480	14	9093	12	9076	29	8788	20	8478	17	8304	14	8183	17
Unknown	553	-	506	-	920	-	329	-	383	-	356	-	364	-	410	-	433	-	550	4

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk
20–22	3.82	3.75	3.96	3.63	4.24	2.94	3.59	3.50	4.04	3.86
23–24	1.25	1.52	1.51	1.43	1.65	1.55	1.40	1.35	1.52	1.65
25–27	1.13	0.83	1.13	0.92	0.83	0.88	0.83	1.07	0.77	1.21
28–31	0.81	0.93	0.81	0.83	0.78	0.70	0.80	0.82	0.74	0.61
32–36	1.58	1.41	1.19	1.55	1.45	1.33	1.33	1.29	1.28	1.24
37–38	1.04	1.11	1.13	0.69	1.02	0.77	1.06	0.81	0.98	0.96
39–40	1.41	1.32	1.16	1.22	1.45	1.67	1.37	1.26	1.22	1.30
≥41	2.25	1.58	1.94	1.48	1.32	3.20	2.28	2.01	1.69	2.08
Unknown	-	-	-	-	-	-	-	-	-	-

Sources: Numerator: PMMRC's perinatal data extract 2010–2019; Denominator: MAT births 2010–2019.

Table A3.7: Intrapartum stillbirth risk (per 1000 ongoing pregnancies) by gestation excluding congenital anomalies by year 2010–2019

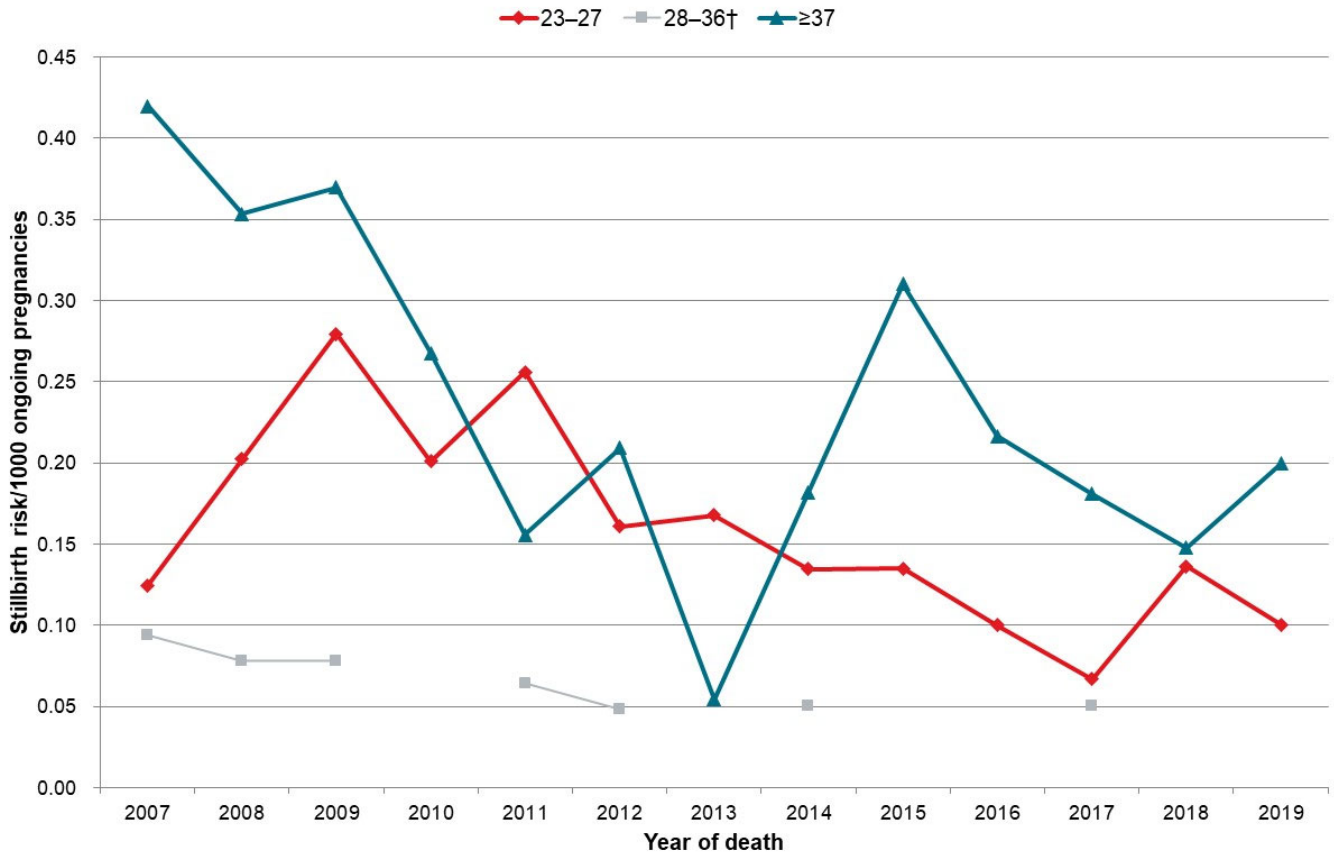
Gestation at birth (weeks)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N
23–27	13	347	16	316	10	337	10	315	8	324	8	323	6	315	4	323	8	310	6	359
28–36	<3	4566	4	4416	3	4438	<3	4195	3	4191	<3	4111	<3	4310	3	4240	<3	4176	<3	4311
≥37	16	59,756	9	57,780	12	57,368	3	55,087	10	54,940	17	54,832	12	55,416	10	55,306	8	54,166	11	55,168

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk
23–27	0.20	0.26	0.16	0.17	0.13	0.13	0.10	0.07	0.14	0.10
28–36	s	0.06	0.05	s	0.05	s	s	0.05	s	s
≥37	0.27	0.16	0.21	0.05	0.18	0.31	0.22	0.18	0.15	0.20

‘s’ indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract, stillbirths only (excluding congenital anomalies) 2010–2019; Denominator: MAT births 2010–2019.

Figure A3.13: Intrapartum stillbirth risks (per 1000 ongoing pregnancies) by gestation at birth (weeks) excluding congenital anomalies 2007–2019

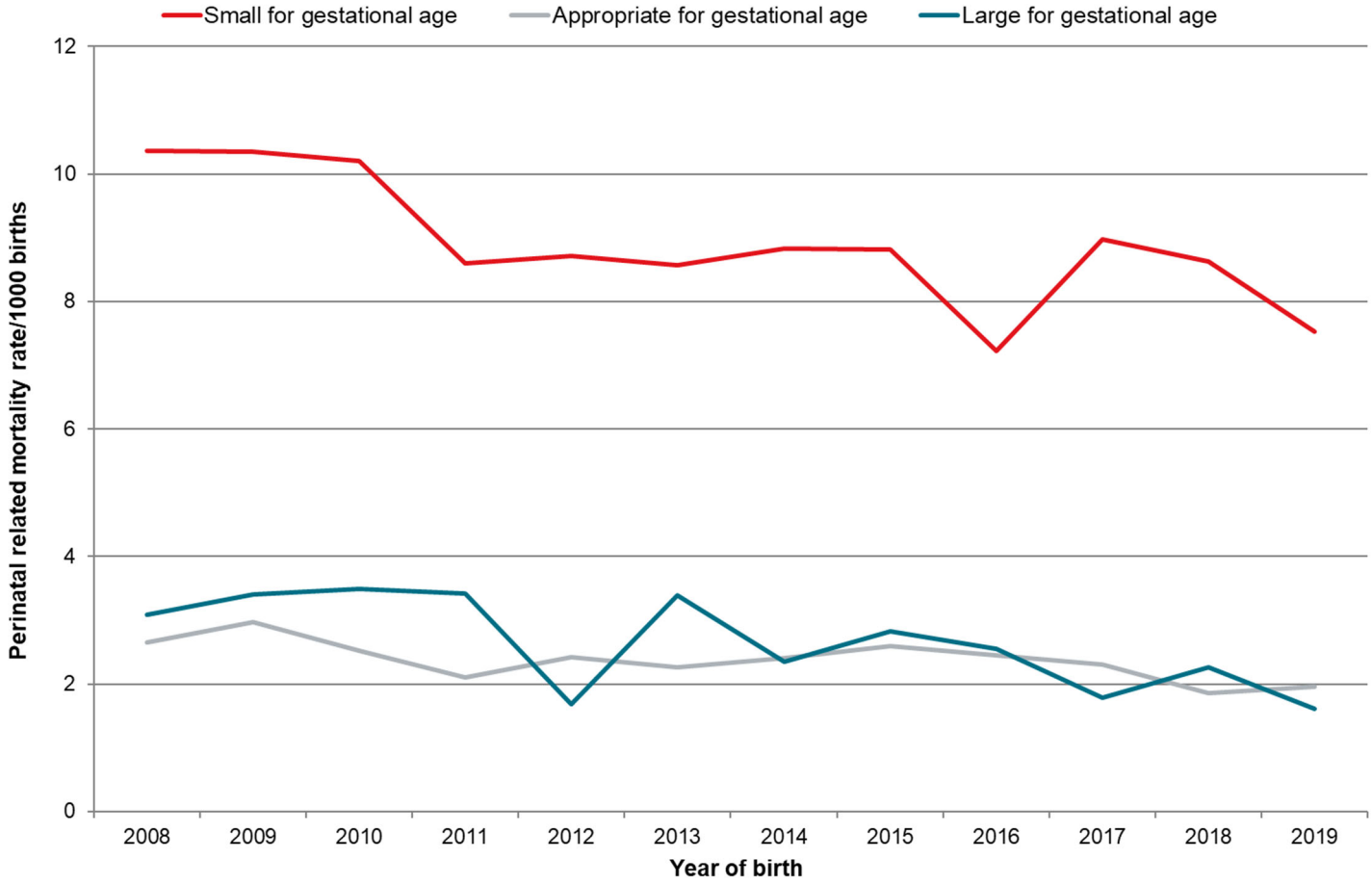


† 28–36 weeks gestation risks suppressed due to small numbers for the years 2010, 2013, 2015, 2016, 2018 and 2019.

Sources: Numerator: PMMRC's perinatal data extract, stillbirths only (excluding congenital anomalies), 2007–2019; Denominator: MAT births 2007–2019.

Mortality by Customised Birthweight Centile

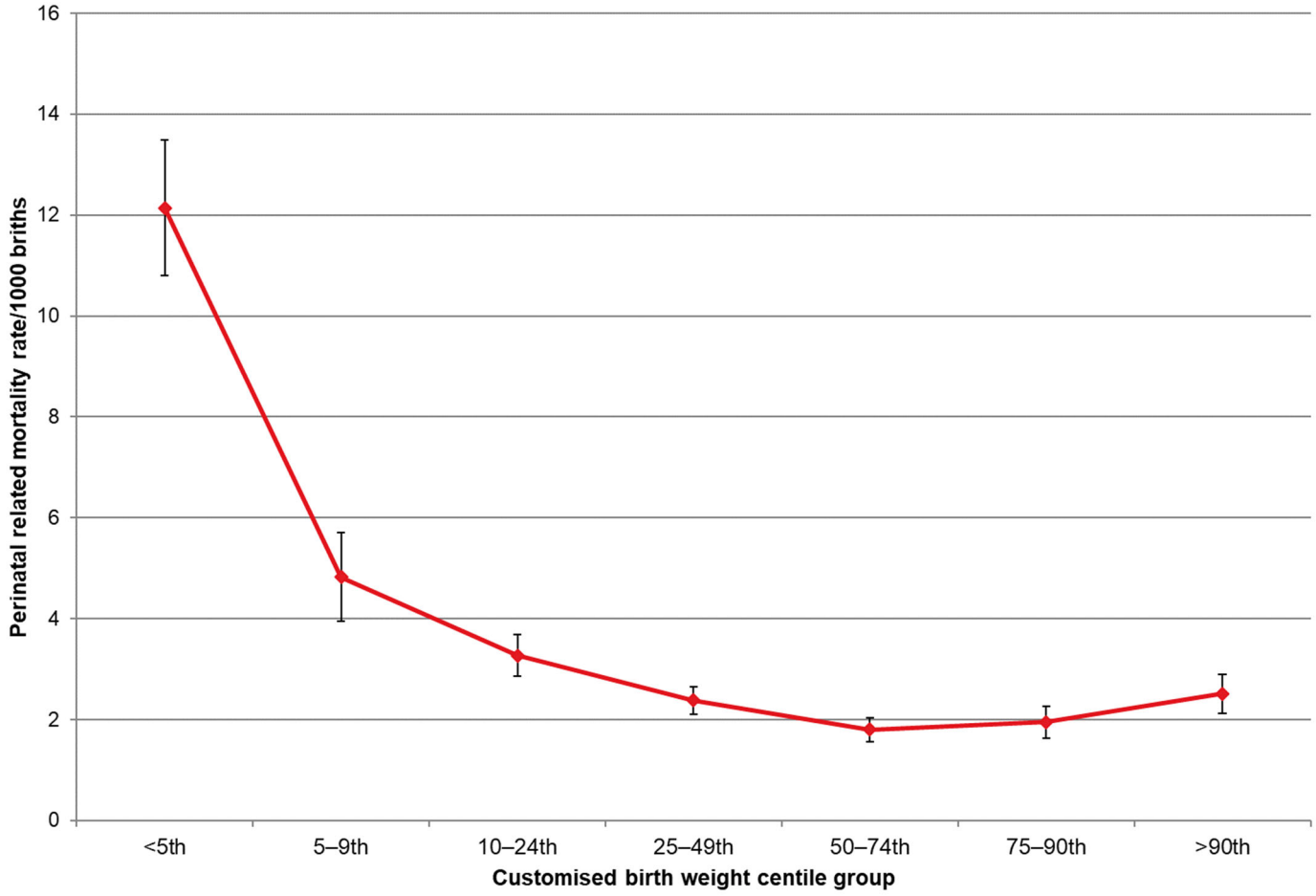
Figure A3.14: Perinatal related mortality rates by customised centile group among singleton births† from 26 weeks gestation without congenital anomalies 2008–2019



† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, among singleton births from 26 weeks gestation without congenital anomalies 2008–2019; Denominator: MAT births among singleton births from 26 weeks gestation 2008–2019.

Figure A3.15: Perinatal related mortality rates (with 95% CIs) by customised birthweight centile group among singleton births from 26 weeks gestation without congenital anomalies 2010–2019†

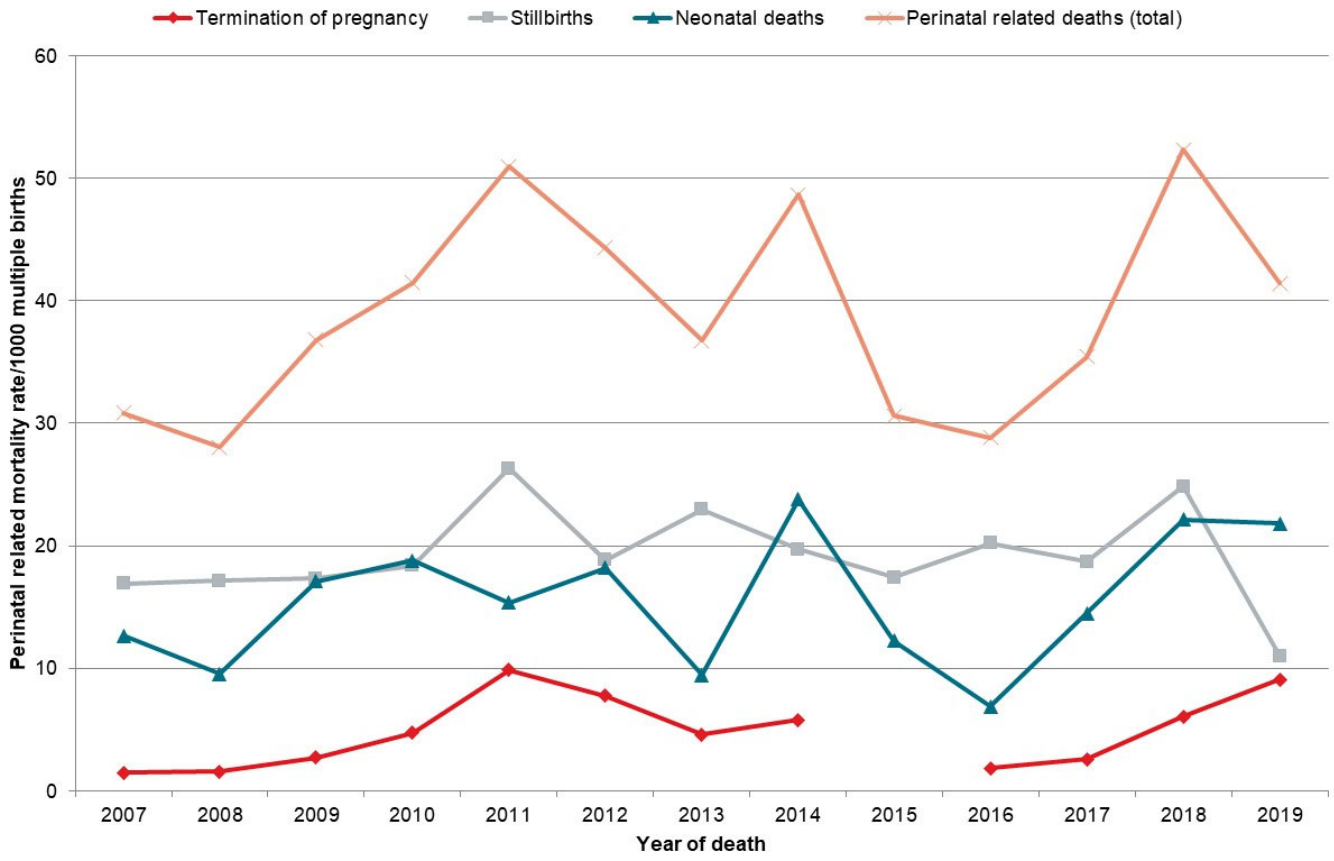


† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, among singleton births from 26 weeks gestation without congenital anomalies 2010–2019; Denominator: MAT births among singleton births from 26 weeks gestation 2010–2019.

Multiple Pregnancies

Figure A3.16: Perinatal related mortality rates† (per 1000 births) among babies born in multiple pregnancies 2007–2019



† Termination of pregnancy 2015 rate supressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract among babies born in multiple pregnancies 2007–2019; Denominator: MAT births among babies born in multiple pregnancies 2007–2019.

Perinatal Mortality Appended Tables

Table A3.8: Perinatal related death and perinatal death classification (PSANZ-PDC) 2019

Refer to Table 3.11 for the full code list

Perinatal death classification (PSANZ-PDC)		2019 n=639	
		n	Rate
1	**Congenital anomaly**		
1.1	Structural anomaly	<3	s
1.11	Nervous system	36	0.59
1.12	Cardiovascular system	15	0.25
1.13	Genitourinary system	15	0.25
1.14	Gastrointestinal system	3	0.05
1.15	Musculoskeletal	7	0.12
1.151	Congenital diaphragmatic Hernia	6	0.10
1.152	Gastroschisis/omphalocele	<3	s
1.16	Respiratory system (include congenital pulmonary airway malformation (CPAM))	3	0.05
1.17	Haematological	<3	s
1.18	Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)	16	0.26
1.19	Other congenital anomaly	<3	s
1.192	Idiopathic hydrops fetalis	3	0.05
1.193	Fetal tumour (include sacro-coccygeal teratoma)	<3	s
1.198	Other specified	3	0.05
1.199	Congenital anomaly, unspecified	<3	s
1.2	Chromosomal anomaly		
1.21	Trisomy 21 (Down syndrome)	14	0.23
1.22	Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)	26	0.43
1.23	Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)	6	0.10
1.24	Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions e.g. 22q11.2 deletion syndrome (diGeorge syndrome), Wolff-Hirschhorn syndrome, Cri-du-chat syndrome	4	0.07
1.25	Turner syndrome (monosomy X)	<3	s
1.28	Other chromosomal abnormalities, not elsewhere specified (includes triploidy)	3	0.05
1.3	Genetic condition	<3	s
1.31	Genetic condition, specified (includes inborn errors of metabolism (e.g. Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (e.g. Kabuki syndrome, Fraser syndrome)	6	0.10
1.32	Syndrome/association with demonstrated chromosomal/gene anomaly	5	0.08
1.39	Genetic condition, unspecified	<3	s
2	**Perinatal infection**		
2.1	Bacterial		
2.11	Group B Streptococcus	<3	s
2.12	E coli	<3	s
2.13	Listeria monocytogenes	4	0.07
2.18	Other bacterial	<3	s
2.19	Unspecified bacterial	<3	s
2.2	Viral		
2.21	Cytomegalovirus	3	0.05
2.22	Parvovirus	<3	s
2.28	Other viral	<3	s
2.3	Protozoal e.g. Toxoplasma	<3	s
3	**Hypertension**		

	Perinatal death classification (PSANZ-PDC)	2019 n=639	
		n	Rate
3.1	Chronic hypertension: essential	<3	s
3.2	Chronic hypertension: secondary, e.g. renal disease	<3	s
3.4	Gestational hypertension	<3	s
3.5	Pre-eclampsia	11	0.18
3.6	Pre-eclampsia superimposed on chronic hypertension	4	0.07
4	**Antepartum haemorrhage (APH)**		
4.1	Placental abruption	14	0.23
4.2	Placenta praevia	<3	s
4.9	APH of undetermined origin	34	0.56
5	**Maternal Conditions**		
5.1	Termination of pregnancy for maternal psychosocial indications	13	0.21
5.2	Diabetes		
5.21	Gestational diabetes	3	0.05
5.22	Pre-existing diabetes	9	0.15
5.3	Maternal injury		
5.32	Non-accidental	<3	s
5.4	Maternal sepsis	3	0.05
5.8	Other specified maternal conditions		
5.88	Other specified maternal medical or surgical conditions	5	0.08
6	**Complications of multiple pregnancy**		
6.1	Monochorionic twins	<3	s
6.11	Twin to twin transfusion syndrome (TTTS)	13	0.21
6.18	Other	3	0.05
6.19	Unknown or unspecified	3	0.05
6.3	Complications of higher order multiples (3 or more fetuses)		
6.31	Twin to twin transfusion syndrome (TTTS)	<3	s
6.32	Selective fetal growth restriction (FGR)	<3	s
6.38	Other	8	0.13
7	**Specific perinatal conditions**		
7.1	Fetomaternal haemorrhage	4	0.07
7.2	Antepartum cord or fetal vessel complications (excludes monochorionic twins or higher order multiples)		
7.22	Cord occlusion (True knot with evidence of occlusion or other)	5	0.08
7.28	Other cord complications	8	0.13
7.3	Uterine abnormalities		
7.38	Other	<3	s
7.5	Fetal antenatal intracranial injury	<3	s
7.51	Subdural haematoma	<3	s
7.52	Fetal antenatal ischaemic brain injury	3	0.05
7.6	Other specific perinatal conditions		
7.62	Termination of pregnancy for suspected but unconfirmed congenital anomaly	<3	s
7.63	Amniotic band	<3	s
7.68	Other specified	<3	s
8	**Hypoxic peripartum death**		
8.1	With intrapartum complications (sentinel events)		
8.12	Cord prolapse	<3	s
8.14	Complications of breech presentation	<3	s
8.18	Other	<3	s
8.2	Evidence of significant fetal compromise (excluding other complications)	<3	s
8.9	Unspecified hypoxic peripartum death	<3	s
9	**Placental dysfunction or causative placental pathology**		

Perinatal death classification (PSANZ-PDC)		2019 n=639	
		n	Rate
9.1	Maternal vascular malperfusion	15	0.25
9.2	Fetal vascular malperfusion	7	0.12
9.3	High grade villitis of unknown etiology (VUE)	7	0.12
9.4	Massive perivillous fibrin deposition/maternal floor infarction	<3	s
9.5	Severe chronic intervillositis (Histiocytic intervillositis)	<3	s
9.6	Placental hypoplasia (small-for gestation placenta)	7	0.12
9.7	No causal placental pathology demonstrated, with antenatal evidence of poor placental function identified (such as abnormal fetal umbilical artery Doppler)	<3	s
9.9	Other placental pathology (e.g. Multiple pathologies with evidence of loss of placental function leading to death)	10	0.17
10	**Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)**		
10.1	Spontaneous preterm	<3	s
10.11	With histological chorioamnionitis	49	0.81
10.12	Without histological chorioamnionitis	12	0.20
10.13	With clinical evidence of chorioamnionitis, no examination of placenta	5	0.08
10.17	No clinical signs of chorioamnionitis, no examination of placenta	15	0.25
10.2	Spontaneous preterm preceded by premature cervical shortening	24	0.40
11	**Unexplained antepartum fetal death**		
11.1	Unexplained antepartum fetal death despite full investigation	41	0.68
11.2	Unclassifiable antepartum fetal death with incomplete investigation	57	0.94
11.3	Unclassifiable antepartum fetal death due to unknown level of investigation	<3	s
12	**Neonatal death without obstetric antecedent**		
12.1	Neonatal death with no obstetric antecedent factors despite full investigation	10	0.17
12.2	Neonatal death unclassifiable as to obstetric antecedent with incomplete investigation	3	0.05
12.3	Neonatal death unclassifiable as to obstetric antecedent due to unknown level of investigation	4	0.07

Categories where no deaths occurred have been removed from the table (refer to appendix for full code list)

‘s’ indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract 2019; Denominator: MAT births 2019.

Table A3.9: Neonatal death and primary neonatal death classification (PSANZ-NDC) 2019

Refer to Table 3.12 for the full code list.

	Neonatal death classification (PSANZ-NDC)	2019 n=178	
		n	Rate
1	**Congenital anomaly**		
1.1	Structural anomaly		
1.11	Nervous system	4	0.07
1.12	Cardiovascular system	3	0.05
1.13	Genitourinary system	<3	s
1.15	Musculoskeletal		
1.151	Congenital diaphragmatic Hernia	<3	s
1.16	Respiratory system (include congenital pulmonary airway malformation (CPAM))	<3	s
1.18	Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)	4	0.07
1.19	Other congenital anomaly		
1.192	Idiopathic hydrops fetalis	<3	s
1.2	Chromosomal anomaly		
1.21	Trisomy 21 (Down syndrome)	<3	s
1.22	Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)	7	0.12
1.23	Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)	<3	s
1.3	Genetic condition		
1.31	Genetic condition, specified (includes inborn errors of metabolism (e.g. Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (e.g. Kabuki syndrome, Fraser syndrome)	3	0.05
1.32	Syndrome/association with demonstrated chromosomal/gene anomaly	3	0.05
2	**Periviable infants (typically <24 weeks)**		
2.1	Not resuscitated (including infants where there is an antenatal plan for no resuscitation at birth)	62	1.03
2.2	Unsuccessful resuscitation	4	0.07
2.9	Unspecified or not known whether resuscitation attempted	3	0.05
3	**Cardio-respiratory disorders**		
3.1	Hyaline membrane disease / Respiratory distress syndrome (RDS)	4	0.07
3.2	Meconium aspiration syndrome	<3	s
3.3	Primary persistent pulmonary hypertension		
3.4	Pulmonary hypoplasia	5	0.08
3.5	Pulmonary haemorrhage	3	0.05
3.6	Air leak syndromes		
3.61	Pneumothorax	<3	s
3.8	Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)	<3	s
3.9	Other	<3	s
3.91	Neonatal anaemia/hypovolaemia	<3	s
4	**Neonatal infection**		
4.1	Congenital/Perinatal bacterial infection (early onset <48 hrs)		
4.11	Blood stream infection/septicaemia		
4.111	Positive culture of a pathogen	<3	s
4.112	Clinical signs of sepsis + ancillary evidence but culture negative	<3	s
4.19	Unspecified congenital infection	<3	s
4.4	Acquired bacterial infection [late onset >48 hrs].		
4.41	Blood stream infection/septicaemia		
4.411	Positive culture of a pathogen	4	0.07
4.43	Bacterial pneumonia	<3	s
4.5	Acquired viral infection	<3	s
5	**Neurological**		

Neonatal death classification (PSANZ-NDC)		2019 n=178	
		n	Rate
5.1	Hypoxic ischaemic encephalopathy / Perinatal asphyxia	17	0.28
5.2	Cranial haemorrhage		
5.21	Intraventricular Haemorrhage	5	0.08
5.28	Other Intracranial Haemorrhage	<3	s
6	**Gastrointestinal**		
6.1	Necrotising enterocolitis (NEC)	<3	s
6.3	Gastric or intestinal perforation (excluding NEC)	<3	s
6.8	Other	<3	s
7	**Other**		
7.1	Sudden unexpected death in infancy (SUDI)		
7.12	Unclassified Sudden Infant Death in the neonatal period	<3	s
7.121	Bed sharing/unsafe sleep	7	0.12
7.2	Multisystem failure	<3	s
7.21	Secondary to intrauterine growth restriction	<3	s
7.28	Other specified	<3	s
7.29	Unspecified/undetermined primary cause or trigger event	3	0.05
7.3	Trauma		
7.31	Accidental	<3	s
7.32	Non accidental	<3	s
7.39	Unspecified	<3	s
7.4	Treatment complications		
7.41	Surgical	<3	s
7.8	Other specified	<3	s
	Not stated	<3	s

Categories where no deaths occurred have been removed from the table (refer to appendix for full code list)

's' indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract, neonatal deaths only, 2019; Denominator: MAT births excluding fetal deaths 2019.

Table A3.10: Summary of New Zealand perinatal related mortality rates using New Zealand definition (≥20 weeks or ≥400 g if gestation unknown), babies of ngā māmā Māori and of New Zealand European mothers, by year 2007–2019 (continues over page)

Maternal prioritised ethnic group: Māori	n												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total births	17,210	17,404	17,256	17,143	16,541	16,421	15,253	14,884	15,133	15,376	15,267	14,958	15,185
Fetal deaths (terminations of pregnancy and stillbirths)†	126	111	140	124	126	111	106	108	91	120	94	119	97
Terminations of pregnancy	20	11	29	19	31	34	24	20	20	35	21	21	28
Stillbirths	106	100	111	105	95	77	82	88	71	85	73	98	69
Early neonatal deaths <7 days	42	45	49	53	39	43	44	47	38	48	49	34	47
Late neonatal deaths 7–27 days	11	14	20	16	11	9	6	11	14	14	11	13	13
Neonatal deaths <28 days	53	59	69	69	50	52	50	58	52	62	60	47	60
Perinatal mortalities+	168	156	189	177	165	154	150	155	129	168	143	153	144
Perinatal related mortalities^	179	170	209	193	176	163	156	166	143	182	154	166	157
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	137	131	155	146	119	112	111	127	101	124	116	132	119
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	145	144	168	158	127	120	116	135	110	136	126	143	127
	Rate												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total births													
Fetal deaths (terminations of pregnancy and stillbirths)†	7.32	6.38	8.11	7.23	7.62	6.76	6.95	7.26	6.01	7.80	6.16	7.96	6.39
Terminations of pregnancy	1.16	0.63	1.68	1.11	1.87	2.07	1.57	1.34	1.32	2.28	1.38	1.40	1.84
Stillbirths	6.16	5.75	6.43	6.12	5.74	4.69	5.38	5.91	4.69	5.53	4.78	6.55	4.54
Early neonatal deaths <7 days													
Late neonatal deaths 7–27 days													
Neonatal deaths <28 days#	3.10	3.41	4.03	4.05	3.05	3.19	3.30	3.93	3.46	4.06	3.95	3.17	3.98
Perinatal mortalities+	9.76	8.96	10.95	10.32	9.98	9.38	9.83	10.41	8.52	10.93	9.37	10.23	9.48
Perinatal related mortalities^	10.40	9.77	12.11	11.26	10.64	9.93	10.23	11.15	9.45	11.84	10.09	11.10	10.34
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	7.96	7.53	8.98	8.52	7.19	6.82	7.28	8.53	6.67	8.06	7.60	8.82	7.84
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	8.43	8.27	9.74	9.22	7.68	7.31	7.61	9.07	7.27	8.84	8.25	9.56	8.36

Maternal prioritised ethnic group: NZ European	n												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total births	26,952	26,868	26,507	26,071	24,794	24,007	22,881	22,292	21,876	21,366	20,901	20,173	20,205
Fetal deaths (terminations of pregnancy and stillbirths)†	235	237	234	201	205	189	179	203	172	168	137	158	169
Terminations of pregnancy	78	87	69	74	77	66	59	70	58	56	51	54	82
Stillbirths	157	150	165	127	128	123	120	133	114	112	86	104	87
Early neonatal deaths <7 days	54	59	43	55	51	47	35	53	41	34	31	47	47
Late neonatal deaths 7–27 days	11	16	15	15	7	14	16	6	11	5	15	12	8
Neonatal deaths <28 days#	65	75	58	70	58	61	51	59	52	39	46	59	55
Perinatal mortalities+	289	296	277	256	256	236	214	256	213	202	168	205	216
Perinatal related mortalities^	300	312	292	271	263	250	230	262	224	207	183	217	224
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	200	195	191	166	171	166	153	172	146	139	113	138	135
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	205	203	202	176	175	173	164	176	150	143	124	146	140
	Rate												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total births													
Fetal deaths (terminations of pregnancy and stillbirths)†	8.72	8.82	8.83	7.71	8.27	7.87	7.82	9.11	7.86	7.86	6.55	7.83	8.36
Terminations of pregnancy	2.89	3.24	2.60	2.84	3.11	2.75	2.58	3.14	2.65	2.62	2.44	2.68	4.06
Stillbirths	5.83	5.58	6.22	4.87	5.16	5.12	5.24	5.97	5.21	5.24	4.11	5.16	4.31
Early neonatal deaths <7 days													
Late neonatal deaths 7–27 days													
Neonatal deaths <28 days#	2.43	2.82	2.21	2.71	2.36	2.56	2.25	2.67	2.40	1.84	2.22	2.95	2.75
Perinatal mortalities+	10.72	11.02	10.45	9.82	10.33	9.83	9.35	11.48	9.74	9.45	8.04	10.16	10.69
Perinatal related mortalities^	11.13	11.61	11.02	10.39	10.61	10.41	10.05	11.75	10.24	9.69	8.76	10.76	11.09
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	7.42	7.26	7.21	6.37	6.90	6.91	6.69	7.72	6.67	6.51	5.41	6.84	6.68
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	7.61	7.56	7.62	6.75	7.06	7.21	7.17	7.90	6.86	6.69	5.93	7.24	6.93

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

• Lethal and terminated fetal abnormalities are all perinatal related deaths with Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC) of congenital anomaly, and neonatal deaths with PSANZ Neonatal Death Classification (PSANZ-NDC) of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract 2007–2019; Denominator: MAT births 2007–2019.

Table A3.11: Perinatal Society of Australia and New Zealand Perinatal Death Classification (PSANZ-PDC) Version 2018 full code list

1	**Congenital anomaly**
1.1	Structural anomaly
1.11	Nervous system
1.12	Cardiovascular system
1.13	Genitourinary system
1.14	Gastrointestinal system
1.15	Musculoskeletal
1.151	Congenital diaphragmatic Hernia
1.152	Gastroschisis/omphalocele
1.16	Respiratory system (include congenital pulmonary airway malformation (CPAM))
1.17	Haematological
1.18	Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)
1.19	Other congenital anomaly
1.192	Idiopathic hydrops fetalis
1.193	Fetal tumour (include sacro-coccygeal teratoma)
1.198	Other specified
1.199	Congenital anomaly, unspecified
1.2	Chromosomal anomaly
1.21	Trisomy 21 (Down syndrome)
1.22	Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)
1.23	Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)
1.24	Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions e.g. 22q11.2 deletion syndrome (diGeorge syndrome), Wolff-Hirschhorn syndrome, Cri-du-chat syndrome
1.25	Turner syndrome (monosomy X)
1.26	Other sex chromosome abnormalities (e.g. Klinefelter syndrome)
1.28	Other chromosomal abnormalities, not elsewhere specified (includes triploidy)
1.29	Unspecified
1.3	Genetic condition
1.31	Genetic condition, specified (includes inborn errors of metabolism (e.g. Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (e.g. Kabuki syndrome, Fraser syndrome)
1.32	Syndrome/association with demonstrated chromosomal/gene anomaly
1.39	Genetic condition, unspecified
2	**Perinatal infection**
2.1	Bacterial
2.11	Group B Streptococcus
2.12	E coli
2.13	Listeria monocytogenes
2.14	Spirochaetal e.g. Syphilis
2.18	Other bacterial
2.19	Unspecified bacterial
2.2	Viral
2.21	Cytomegalovirus
2.22	Parvovirus
2.23	Herpes simplex virus
2.24	Rubella virus
2.25	Zika virus
2.28	Other viral
2.29	Unspecified viral
2.3	Protozoal e.g. Toxoplasma
2.5	Fungal
2.8	Other specified organism
2.9	Other unspecified organism or no organism identified
3	**Hypertension**
3.1	Chronic hypertension: essential
3.2	Chronic hypertension: secondary, e.g. renal disease
3.3	Chronic hypertension: unspecified
3.4	Gestational hypertension
3.5	Pre-eclampsia
3.6	Pre-eclampsia superimposed on chronic hypertension
3.9	Unspecified hypertension
4	**Antepartum haemorrhage (APH)**
4.1	Placental abruption
4.2	Placenta praevia
4.3	Vasa praevia
4.9	APH of undetermined origin
5	**Maternal Conditions**
5.1	Termination of pregnancy for maternal psychosocial indications
5.2	Diabetes
5.21	Gestational diabetes
5.22	Pre-existing diabetes
5.3	Maternal injury
5.31	Accidental
5.32	Non-accidental
5.4	Maternal sepsis
5.5	Antiphospholipid syndrome
5.6	Obstetric cholestasis
5.8	Other specified maternal conditions
5.81	Maternal suicide

5.88 Other specified maternal medical or surgical conditions

6 Complications of multiple pregnancy

6.1 Monochorionic twins
- 6.11 Twin to twin transfusion syndrome (TTTS)
- 6.12 Selective fetal growth restriction (FGR) (i.e affecting only one twin)
- 6.13 Monoamniotic twins (including cord entanglement)
- 6.18 Other
- 6.19 Unknown or unspecified

6.2 Dichorionic twins
- 6.21 Early fetal death in a multiple pregnancy (<20 weeks gestation)
- 6.22 Selective fetal growth restriction (FGR)
- 6.28 Other
- 6.29 Unknown or unspecified

6.3 Complications of higher order multiples (3 or more fetuses)
- 6.31 Twin to twin transfusion syndrome (TTTS)
- 6.32 Selective fetal growth restriction (FGR)
- 6.33 Monoamniotic multiples (including cord entanglement)
- 6.34 Early fetal death in a multiple pregnancy (<20 weeks gestation)
- 6.38 Other
- 6.39 Unknown or unspecified

6.4 Complications where chorionicity is unknown

6.8 Other

6.9 Unspecified

7 Specific perinatal conditions

7.1 Fetomaternal haemorrhage

7.2 Antepartum cord or fetal vessel complications (excludes monochorionic twins or higher order multiples)
- 7.21 Cord vessel haemorrhage
- 7.22 Cord occlusion (True knot with evidence of occlusion or other)
- 7.28 Other cord complications
- 7.29 Unspecified cord complications

7.3 Uterine abnormalities
- 7.31 Developmental anatomical abnormalities (e.g. bicornuate uterus)
- 7.38 Other
- 7.39 Unspecified

7.4 Alloimmune disease
- 7.41 Rhesus isoimmunisation
- 7.42 Other red cell antibody
- 7.43 Alloimmune thrombocytopenia
- 7.48 Other
- 7.49 Unspecified

7.5 Fetal antenatal intracranial injury
- 7.51 Subdural haematoma
- 7.52 Fetal antenatal ischaemic brain injury
- 7.53 Fetal antenatal haemorrhagic brain injury

7.6 Other specific perinatal conditions
- 7.61 Rupture of membranes after amniocentesis
- 7.62 Termination of pregnancy for suspected but unconfirmed congenital anomaly.
- 7.63 Amniotic band
- 7.68 Other

7. 8 Unspecified

8 Hypoxic peripartum death

8.1 With intrapartum complications (sentinel events)
- 8.11 Uterine rupture
- 8.12 Cord prolapse
- 8.13 Shoulder dystocia
- 8.14 Complications of breech presentation
- 8.15 Birth trauma
- 8.16 Intrapartum haemorrhage
- 8.18 Other

8.2 Evidence of significant fetal compromise (excluding other complications)

8.3 No intrapartum complications and no evidence of significant fetal compromise identified

8.9 Unspecified hypoxic peripartum death

9 Placental dysfunction or causative placental pathology

9.1 Maternal vascular malperfusion

9.2 Fetal vascular malperfusion

9.3 High grade villitis of unknown etiology (VUE)

9.4 Massive perivillous fibrin deposition/maternal floor infarction

9.5 Severe chronic intervillositis (Histiocytic intervillositis)

9.6 Placental hypoplasia (small-for gestation placenta)

9.7 No causal placental pathology demonstrated, with antenatal evidence of poor placental function identified (such as abnormal fetal umbilical artery Doppler)

9.8 Placental pathological examination was not performed, with antenatal evidence of poor placental function was identified (such as abnormal fetal umbilical artery Doppler)

9.9 Other placental pathology (e.g. Multiple pathologies with evidence of loss of placental function leading to death)

10 Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)

10.1 Spontaneous preterm
- 10.11 With histological chorioamnionitis
- 10.12 Without histological chorioamnionitis
- 10.13 With clinical evidence of chorioamnionitis, no examination of placenta
- 10.17 No clinical signs of chorioamnionitis, no examination of placenta
- 10.19 Unspecified or not known whether placenta examined

10.2 Spontaneous preterm preceded by premature cervical shortening

11 Unexplained antepartum fetal death

11.1 Unexplained antepartum fetal death despite full investigation

11.2 Unclassifiable antepartum fetal death with incomplete investigation

11.3 Unclassifiable antepartum fetal death due to unknown level of investigation

12 Neonatal death without obstetric antecedent

12.1 Neonatal death with no obstetric antecedent factors despite full investigation

12.2 Neonatal death unclassifiable as to obstetric antecedent with incomplete investigation

12.3 Neonatal death unclassifiable as to obstetric antecedent due to unknown level of investigation

Table A3.12: PSANZ Neonatal Death Classification (PSANZ-NDC) Version 2018 full code list

1 Congenital anomaly

1.1 Structural anomaly

- 1.11 Nervous system
- 1.12 Cardiovascular system
- 1.13 Genitourinary system
- 1.14 Gastrointestinal system
- 1.15 Musculoskeletal
  - 1.151 Congenital diaphragmatic Hernia
  - 1.152 Gastroschisis/omphalocele
- 1.16 Respiratory system (include congenital pulmonary airway malformation (CPAM))
- 1.17 Haematological
- 1.18 Multiple Congenital anomaly (no chromosomal/genetic cause or not tested)
- 1.19 Other congenital anomaly
  - 1.192 Idiopathic hydrops fetalis
  - 1.193 Fetal tumour (include sacro-coccygeal teratoma)
  - 1.198 Other specified
  - 1.199 Congenital anomaly, unspecified

1.2 Chromosomal anomaly

- 1.21 Trisomy 21 (Down syndrome)
- 1.22 Trisomy 18 (Edward syndrome) and Trisomy 13 (Patau syndrome)
- 1.23 Other trisomies and partial trisomies of the autosomes, not elsewhere classified (includes pathogenic duplications, unbalanced translocations and insertions)
- 1.24 Monosomies and deletions from the autosomes, not elsewhere classified (includes pathogenic deletions e.g. 22q11.2 deletion syndrome (diGeorge syndrome), Wolff-Hirschhorn syndrome, Cri-du-chat syndrome
- 1.25 Turner syndrome (monosomy X)
- 1.26 Other sex chromosome abnormalities (e.g. Klinefelter syndrome)
- 1.28 Other chromosomal abnormalities, not elsewhere specified (includes triploidy)
- 1.29 Unspecified

1.3 Genetic condition

- 1.31 Genetic condition, specified (includes inborn errors of metabolism (e.g. Tay-Sachs disease, Fragile X syndrome, imprinting syndromes) and other syndromes with demonstrated genetic mutations (e.g. Kabuki syndrome, Fraser syndrome)
- 1.32 Syndrome/association with demonstrated chromosomal/gene anomaly
- 1.39 Genetic condition, unspecified

2 Periviable infants (typically <24 weeks)

2.1 Not resuscitated (including infants where there is an antenatal plan for no resuscitation at birth or in the circumstance of re-directed care)

2.2 Unsuccessful resuscitation

2.9 Unspecified or not known whether resuscitation attempted

3 Cardio-respiratory disorders

3.1 Hyaline membrane disease / Respiratory distress syndrome (RDS)

3.2 Meconium aspiration syndrome

3.3 Primary persistent pulmonary hypertension

3.4 Pulmonary hypoplasia

3.5 Pulmonary haemorrhage

3.6 Air leak syndromes

- 3.6.1 Pneumothorax
- 3.6.2 Pulmonary interstitial emphysema
- 3.6.3 Other

3.7 Patent ductus arteriosus

3.8 Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)

3.9 Other

- 3.9.1 Neonatal anaemia/hypovolaemia

4 Neonatal infection

4.1 Congenital/Perinatal bacterial infection (early onset<48 hrs)

- 4.11 Blood stream infection/septicaemia
  - 4.111 Positive culture of a pathogen
  - 4.112 Clinical signs of sepsis + ancillary evidence but culture negative
- 4.12 Bacterial meningitis
- 4.13 Bacterial pneumonia
- 4.15 Multiple site bacterial infection
- 4.18 Other congenital bacterial infection e.g. gastroenteritis, osteomyelitis, cerebral abscess
- 4.19 Unspecified congenital infection

4.2 Congenital/Perinatal viral infection

4.3 Congenital fungal, protozoan, parasitic infection

4.4 Acquired bacterial infection [late onset>48hrs]

- 4.41 Blood stream infection/septicaemia
  - 4.411 Positive culture of a pathogen
  - 4.412 Clinical signs of sepsis + ancillary evidence but culture negative
- 4.42 Bacterial meningitis
- 4.43 Bacterial pneumonia
- 4.48 Other acquired bacterial infection e.g. gastroenteritis, osteomyelitis
- 4.49 Unspecified acquired infection

4.5 Acquired viral infection

4.6 Acquired fungal, protozoan, parasitic infection

5 Neurological

5.1 Hypoxic ischaemic encephalopathy / Perinatal asphyxia

5.2 Cranial haemorrhage

- 5.21 Intraventricular Haemorrhage
- 5.22 Subgaleal Haemorrhage
- 5.23 Subarachnoid Haemorrhage
- 5.24 Subdural Haemorrhage
- 5.28 Other Intracranial Haemorrhage

5.3 Post haemorrhagic hydrocephalus

5.4 Periventricular leukomalacia

5.8 Other

6 Gastrointestinal

6.1 Necrotising enterocolitis (NEC)

6.2 Short gut syndrome

6.3 Gastric or intestinal perforation (excluding NEC)

6.4 Gastrointestinal haemorrhage

6.8 Other

7 Other

7.1 Sudden unexpected death in infancy (SUDI)

- 7.11 Sudden Infant Death Syndrome (SIDS)
  - 7.112 SIDS Category IA: Classic features of SIDS present and completely documented.
  - 7.113 SIDS Category IB: Classic features of SIDS present but incompletely documented.
  - 7.114 SIDS Category II: Infant deaths that meet category I except for one or more features.
- 7.12 Unknown/Undetermined
- 7.13 Unclassified Sudden Infant Death in the neonatal period
  - 7.131 Bed sharing/unsafe sleep
  - 7.132 Not bed sharing

7.2 Multisystem failure

- 7.21 Secondary to intrauterine growth restriction
- 7.28 Other specified
- 7.29 Unspecified/undetermined primary cause or trigger event

7.3 Trauma

- 7.31 Accidental
- 7.32 Non accidental
- 7.39 Unspecified

7.4 Treatment complications

- 7.41 Surgical
- 7.42 Medical

7.5 Unsuccessful resuscitation in infants of 28 weeks gestation or more without an obvious sentinel event

7.8 Other specified

Table A3.13: New Zealand perinatal related mortality rates (per 1000 births) using the international definition (≥1000 g or ≥28 weeks if birthweight unknown) 2007–2019

	n												
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total births	64,659	65,082	64,631	64,892	62,698	62,732	59,608	59,517	59,330	60,099	59,961	58,762	60,047
Fetal deaths (terminations of pregnancy and stillbirths)†	211	207	231	199	191	166	155	162	164	171	158	151	155
Terminations of pregnancy	6	14	9	17	24	13	12	13	7	15	16	7	19
Stillbirths	205	193	222	182	167	153	143	149	157	156	142	144	136
Early neonatal deaths <7 days	58	67	59	68	65	54	45	59	57	53	46	40	54
Late neonatal deaths 7–27 days	28	35	30	31	18	24	24	23	28	23	22	20	23
Neonatal deaths <28 days#	86	102	89	99	83	78	69	82	85	76	68	60	77
Perinatal mortalities+	269	274	290	267	256	220	200	221	221	224	204	191	209
Perinatal related mortalities^	297	309	320	298	274	244	224	244	249	247	226	211	232
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	224	215	237	202	179	166	156	167	174	167	156	149	152
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	238	235	253	219	188	176	167	177	185	180	169	157	164
	Rate												
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total births													
Fetal deaths (terminations of pregnancy and stillbirths)†	3.26	3.18	3.57	3.07	3.05	2.65	2.60	2.72	2.76	2.85	2.64	2.57	2.58
Terminations of pregnancy	0.09	0.22	0.14	0.26	0.38	0.21	0.20	0.22	0.12	0.25	0.27	0.12	0.32
Stillbirths	3.17	2.97	3.43	2.80	2.66	2.44	2.40	2.50	2.65	2.60	2.37	2.45	2.26
Early neonatal deaths <7 days													
Late neonatal deaths 7–27 days													
Neonatal deaths <28 days#	1.33	1.57	1.38	1.53	1.33	1.25	1.16	1.38	1.44	1.27	1.14	1.02	1.29
Perinatal mortalities+	4.16	4.21	4.49	4.11	4.08	3.51	3.36	3.71	3.72	3.73	3.40	3.25	3.48
Perinatal related mortalities^	4.59	4.75	4.95	4.59	4.37	3.89	3.76	4.10	4.20	4.11	3.77	3.59	3.86
Perinatal mortalities excluding lethal and terminated fetal abnormalities•	3.46	3.30	3.67	3.11	2.85	2.65	2.62	2.81	2.93	2.78	2.60	2.54	2.53
Perinatal related mortalities excluding lethal and terminated fetal abnormalities•	3.68	3.61	3.91	3.37	3.00	2.81	2.80	2.97	3.12	3.00	2.82	2.67	2.73

† Fetal death rate per 1000 babies born (includes terminations and stillbirths).

Neonatal death rate per 1000 live born babies.

+ Fetal deaths and early neonatal deaths per 1000 babies born.

^ Fetal deaths and early and late neonatal deaths per 1000 babies born.

• Lethal and terminated fetal abnormalities are all perinatal related deaths with PSANZ-PDC of congenital anomaly, and neonatal deaths with PSANZ-NDC of congenital anomaly.

Sources: Numerator: PMMRC's perinatal data extract using the international definition (≥1000 g or ≥28 weeks if birthweight unknown) 2007–2019; Denominator: MAT births using the international definition (≥1000 g or ≥28 weeks if birthweight unknown) 2007–2019.

Table A3.14: Perinatal death classification (PSANZ-PDC) specific perinatal related mortality rates (per 1000 births) using New Zealand definition by year 2010–2019

Perinatal death classification (PSANZ-PDC)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	N=65,453		N=63,248		N=63,294		N=60,141		N=60,083		N=59,791		N=60,611		N=60,490		N=59,315		N=60,604	
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
Congenital anomaly	214	3.27	206	3.26	206	3.25	164	2.73	191	3.18	163	2.73	177	2.92	163	2.69	162	2.73	183	3.02
Perinatal infection	28	0.43	21	0.33	19	0.30	20	0.33	24	0.40	22	0.37	26	0.43	28	0.46	21	0.35	17	0.28
Hypertension	27	0.41	21	0.33	19	0.30	13	0.22	13	0.22	21	0.35	9	0.15	13	0.21	19	0.32	18	0.30
Antepartum haemorrhage	78	1.19	78	1.23	60	0.95	75	1.25	69	1.15	79	1.32	72	1.19	78	1.29	59	0.99	49	0.81
Maternal conditions	32	0.49	26	0.41	36	0.57	34	0.57	39	0.65	29	0.49	37	0.61	29	0.48	42	0.71	34	0.56
Complications of multiple pregnancy	22	0.34	23	0.36	25	0.39	26	0.43	25	0.42	10	0.17	21	0.35	21	0.35	31	0.52	30	0.50
Specific perinatal conditions	37	0.57	38	0.60	27	0.43	25	0.42	27	0.45	33	0.55	32	0.53	31	0.51	28	0.47	27	0.45
Hypoxic peripartum death	20	0.31	20	0.32	21	0.33	11	0.18	17	0.28	17	0.28	13	0.21	13	0.21	6	0.10	7	0.12
Placental dysfunction or causative placental pathology	50	0.76	56	0.89	57	0.90	57	0.95	45	0.75	43	0.72	53	0.87	54	0.89	56	0.94	50	0.83
Spontaneous preterm labour or rupture of membranes (<37 weeks gestation)	120	1.83	94	1.49	115	1.82	88	1.46	122	2.03	77	1.29	87	1.44	85	1.41	101	1.70	107	1.77
Unexplained antepartum fetal death	70	1.07	80	1.26	76	1.20	81	1.35	80	1.33	77	1.29	79	1.30	71	1.17	77	1.30	100	1.65
Neonatal death without obstetric antecedent	10	0.15	4	0.06	9	0.14	6	0.10	7	0.12	7	0.12	6	0.10	8	0.13	<3	s	17	0.28

‘s’ indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract 2010–2019; Denominator: MAT births 2010–2019.

Table A3.15: Neonatal death classification (PSANZ-NDC) specific neonatal death rates (per 1000 live births) by year 2010–2019

Neonatal death classification (PSANZ-NDC)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
Gestation <28 weeks	**N=289**		**N=244**		**N=255**		**N=257**		**N=274**		**N=255**		**N=251**		**N=283**		**N=259**		**N=276**	
Congenital anomaly	-	-	<3	s	<3	s	<3	s	<3	s	3	11.76	<3	s	4	14.13	<3	s	<3	s
Extreme prematurity	84	290.66	54	221.31	67	262.75	63	245.14	69	251.82	51	200.00	55	219.12	70	247.35	63	243.24	68	246.38
Cardio-respiratory disorders	16	55.36	7	28.69	10	39.22	5	19.46	12	43.80	10	39.22	6	23.90	9	31.80	10	38.61	13	47.10
Infection	7	24.22	7	28.69	10	39.22	5	19.46	7	25.55	<3	s	4	15.94	8	28.27	7	27.03	8	28.99
Neurological	<3	s	8	32.79	6	23.53	8	31.13	12	43.80	11	43.14	8	31.87	9	31.80	3	11.58	8	28.99
Gastrointestinal	4	13.84	<3	s	<3	s	<3	s	<3	s	<3	s	3	11.95	4	14.13	6	23.17	3	10.87
Other	-	-	-	-	<3	s	<3	s	<3	s	4	15.69	<3	s	<3	s	-	-	3	10.87
Gestation ≥28 weeks	**N=64,113**		**N=61,995**		**N=61,627**		**N=59,108**		**N=58,949**		**N=58,768**		**N=59,538**		**N=59,376**		**N=58,173**		**N=59,321**	
Congenital anomaly	46	0.72	48	0.77	36	0.58	31	0.52	43	0.73	42	0.71	33	0.55	28	0.47	34	0.58	33	0.56
Extreme prematurity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<3	s
Cardio-respiratory disorders	<3	s	4	0.06	4	0.06	<3	s	4	0.07	6	0.10	5	0.08	7	0.12	4	0.07	4	0.07
Infection	12	0.19	8	0.13	7	0.11	7	0.12	8	0.14	5	0.09	10	0.17	7	0.12	5	0.09	<3	s
Neurological	26	0.41	15	0.24	19	0.31	17	0.29	12	0.20	20	0.34	16	0.27	14	0.24	13	0.22	15	0.25
Gastrointestinal	<3	s	-	-	<3	s	-	-	<3	s	<3	s	<3	s	-	-	3	0.05	<3	s
Other	10	0.16	9	0.15	13	0.21	13	0.22	9	0.15	10	0.17	8	0.13	12	0.20	4	0.07	18	0.30

's' indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract, neonatal deaths only, 2010–2019; Denominator: MAT births excluding fetal deaths 2010–2019.

Table A3.16: Perinatal related mortality rates (per 1000 births) by maternal prioritised ethnic group 2015–2019

Prioritised ethnic group (mother)	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,811†		n=700			n=1502†			n=824			n=3026†		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Māori	75,919	25.2	125	17.9	1.65	396	26.4	5.22	281	34.1	3.73	802	26.5	10.56
Pacific peoples	30,648	10.2	50	7.1	1.63	200	13.3	6.53	125	15.2	4.11	375	12.4	12.24
Asian	53,038	17.6	145	20.7	2.73	280	18.6	5.28	125	15.2	2.38	550	18.2	10.37
Indian	19,339	6.4	63	9.0	3.26	145	9.7	7.50	61	7.4	3.19	269	8.9	13.91
Other Asian	33,699	11.2	82	11.7	2.43	135	9.0	4.01	64	7.8	1.91	281	9.3	8.34
MELAA	7254	2.4	18	2.6	2.48	31	2.1	4.27	15	1.8	2.08	64	2.1	8.82
European	133,806	44.5	362	51.7	2.71	594	39.5	4.44	279	33.8	2.10	1235	40.8	9.23
NZ European	104,521	34.7	301	43.0	2.88	503	33.5	4.81	251	30.4	2.42	1055	34.9	10.09
Other European	29,285	9.7	61	8.7	2.08	91	6.1	3.11	28	3.4	0.96	180	5.9	6.15

† Includes 146 unknown maternal ethnicity among total births and 1 unknown maternal ethnicity perinatal related death (total).

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Table A3.17: Perinatal related mortality rates (per 1000 births) by baby prioritised ethnic group 2015–2019

Prioritised ethnic group (baby)	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,811†		n=700†			n=1502†			n=825†			n=3027†		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Māori	84,390	28.1	161	23.0	1.91	443	29.5	5.25	324	39.3	3.87	928	30.7	11.00
Pacific peoples	30,125	10.0	53	7.6	1.76	209	13.9	6.94	133	16.1	4.45	395	13.0	13.11
Asian	53,757	17.9	142	20.3	2.64	287	19.1	5.34	123	14.9	2.31	552	18.2	10.27
Indian	20,426	6.8	65	9.3	3.18	154	10.3	7.54	65	7.9	3.22	284	9.4	13.90
Other Asian	33,331	11.1	77	11.0	2.31	133	8.9	3.99	58	7.0	1.75	268	8.9	8.04
MELAA	7078	2.4	19	2.7	2.68	31	2.1	4.38	19	2.3	2.70	69	2.3	9.75
European	122,380	40.7	324	46.3	2.65	531	35.4	4.34	225	27.3	1.85	1080	35.7	8.82
NZ European	97,088	32.3	293	41.9	3.02	474	31.6	4.88	206	25.0	2.14	973	32.1	10.02
Other European	25,292	8.4	31	4.4	1.23	57	3.8	2.25	19	2.3	0.75	107	3.5	4.23

† Includes 3081 unknown baby's ethnicity total births and 3 unknown baby's ethnicity perinatal related deaths (total).

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Table A3.18: Perinatal related mortality rates (per 1000 births) by maternal prioritised ethnic group† and year 2010–2019

Maternal prioritised ethnic group	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N
Māori	193	17,143	176	16,541	163	16,421	156	15,253	166	14,884	143	15,133	182	15,376	154	15,267	166	14,958	157	15,185
Pacific peoples	107	7652	79	7265	94	7087	84	6544	83	6309	71	6188	73	5977	82	6098	72	6096	77	6289
Asian	90	7025	86	7252	100	8585	83	8229	95	9352	96	9331	107	10,670	121	10,705	95	10,727	131	11,605
Indian	36	2074	35	2158	38	2369	37	2449	45	2763	43	3121	53	3505	58	3862	46	4216	69	4635
Other Asian	54	4951	51	5094	62	6216	46	5780	50	6589	53	6210	54	7165	63	6843	49	6511	62	6970
MELAA	5	1326	13	1313	16	1273	10	1323	15	1314	15	1357	8	1402	17	1561	10	1442	14	1492
European	312	32,261	313	30,812	296	29,882	267	28,752	299	28,180	253	27,751	241	27,160	220	26,829	261	26,062	260	26,004
NZ European	271	26,071	263	24,794	250	24,007	230	22,881	262	22,292	224	21,876	207	21,366	183	20,901	217	20,173	224	20,205
Other European	41	6190	50	6018	46	5875	37	5871	37	5888	29	5875	34	5794	37	5928	44	5889	36	5799

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate
Māori	11.26	10.64	9.93	10.23	11.15	9.45	11.84	10.09	11.10	10.34
Pacific peoples	13.98	10.87	13.26	12.84	13.16	11.47	12.21	13.45	11.81	12.24
Asian	12.81	11.86	11.65	10.09	10.16	10.29	10.03	11.30	8.86	11.29
Indian	17.36	16.22	16.04	15.11	16.29	13.78	15.12	15.02	10.91	14.89
Other Asian	10.91	10.01	9.97	7.96	7.59	8.53	7.54	9.21	7.53	8.90
MELAA	3.77	9.90	12.57	7.56	11.42	11.05	5.71	10.89	6.93	9.38
European	9.67	10.16	9.91	9.29	10.61	9.12	8.87	8.20	10.01	10.00
NZ European	10.39	10.61	10.41	10.05	11.75	10.24	9.69	8.76	10.76	11.09
Other European	6.62	8.31	7.83	6.30	6.28	4.94	5.87	6.24	7.47	6.21

† Excludes 430 unknown maternal ethnicity total births and 2 unknown maternal ethnicity perinatal related deaths (total).

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's perinatal data extract 2010–2019; Denominator: MAT births 2010–2019.

Table A3.19: Perinatal related mortality rates (per 1000 births) by maternal age 2015–2019

Maternal age (years)	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,811		n=700			n=1502			n=825			n=3027		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
<20	11,946	4.0	35	5.0	2.93	93	6.2	7.79	69	8.4	5.84	197	6.5	16.49
20–24	46,972	15.6	77	11.0	1.64	276	18.4	5.88	183	22.2	3.93	536	17.7	11.41
25–29	83,111	27.6	186	26.6	2.24	375	25.0	4.51	206	25.0	2.50	767	25.3	9.23
30–34	95,123	31.6	220	31.4	2.31	412	27.4	4.33	218	26.5	2.31	850	28.1	8.94
35–39	51,171	17.0	141	20.1	2.76	259	17.2	5.06	114	13.8	2.25	514	17.0	10.04
≥40	12,408	4.1	41	5.9	3.30	86	5.7	6.93	35	4.2	2.85	162	5.4	13.06
Unknown	80	0.0	-	-	-	<3	x	-	-	-	-	<3	x	-

'x' indicates percentage suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Table A3.20: Perinatal related mortality rates (per 1000 births) by maternal age and year 2010–2019

Maternal age (years)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N
<20	57	4625	65	4128	63	3966	65	3382	51	3047	45	2828	54	2491	32	2331	38	2164	28	2132
20–24	164	12,259	116	11,939	126	11,696	115	11,010	116	10,477	86	10,139	125	9781	104	9497	108	8844	113	8711
25–29	162	16,306	147	15,865	149	16,268	139	15,598	165	16,015	150	15,994	143	16,892	154	16,947	159	16,568	161	16,710
30–34	149	18,108	160	17,609	163	17,858	147	17,130	175	17,985	158	18,294	169	18,746	174	19,038	156	19,127	193	19,918
35–39	136	11,395	145	11,028	119	10,678	89	10,319	111	9941	107	9980	90	10,203	100	10,103	108	10,249	109	10,636
≥40	40	2732	34	2652	50	2807	45	2680	40	2597	32	2534	30	2482	30	2553	35	2350	35	2489
Unknown	-	28	-	27	-	21	-	22	<3	21	-	22	<3	16	-	21	-	13	-	8

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate
<20	12.32	15.75	15.89	19.22	16.74	15.91	21.68	13.73	17.56	13.13
20–24	13.38	9.72	10.77	10.45	11.07	8.48	12.78	10.95	12.21	12.97
25–29	9.93	9.27	9.16	8.91	10.30	9.38	8.47	9.09	9.60	9.63
30–34	8.23	9.09	9.13	8.58	9.73	8.64	9.02	9.14	8.16	9.69
35–39	11.94	13.15	11.14	8.62	11.17	10.72	8.82	9.90	10.54	10.25
≥40	14.64	12.82	17.81	16.79	15.40	12.63	12.09	11.75	14.89	14.06
Unknown	-	-	-	-	-	-	-	-	-	-

Sources: Numerator: PMMRC's perinatal data extract 2010–2019; Denominator: MAT births 2010–2019.

Table A3.21: Perinatal related mortality rates (per 1000 births) by parity† 2015–2019

Parity	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=277,592		n=571			n=1214			n=648			n=2433		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
0	113,782	41.0	237	41.5	2.08	587	48.4	5.16	304	46.9	2.69	1128	46.4	9.91
1	93,395	33.6	202	35.4	2.16	314	25.9	3.36	182	28.1	1.96	698	28.7	7.47
2	41,010	14.8	99	17.3	2.41	159	13.1	3.88	95	14.7	2.33	353	14.5	8.61
3	16,239	5.8	18	3.2	1.11	71	5.8	4.37	43	6.6	2.66	132	5.4	8.13
4	6910	2.5	9	1.6	1.30	48	4.0	6.95	13	2.0	1.90	70	2.9	10.13
≥5	6131	2.2	6	1.1	0.98	35	2.9	5.71	11	1.7	1.81	52	2.1	8.48
Unknown	125	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Data not supplied to MAT				<3			8			-6			4	

† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Parity '0' indicates women having their first baby/babies of 20 weeks or greater gestation.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, 2015–2019; Denominator: MAT births 2015-2019

Table A3.22: Perinatal related mortality rates (per 1000 births) by DHB of maternal residence 2015–2019

Maternal DHB of residence	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=300,811		n=700			n=1502			n=825			n=3027		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Northland	11,281	3.8	34	4.9	3.01	67	4.5	5.94	36	4.4	3.22	137	4.5	12.14
Waitematā	38,943	12.9	111	15.9	2.85	163	10.9	4.19	67	8.1	1.73	341	11.3	8.76
Auckland	28,793	9.6	76	10.9	2.64	125	8.3	4.34	55	6.7	1.92	256	8.5	8.89
Counties Manukau	41,850	13.9	113	16.1	2.70	261	17.4	6.24	195	23.6	4.70	569	18.8	13.60
Waikato	27,151	9.0	65	9.3	2.39	145	9.7	5.34	80	9.7	2.97	290	9.6	10.68
Bay of Plenty	15,114	5.0	25	3.6	1.65	80	5.3	5.29	50	6.1	3.33	155	5.1	10.26
Lakes	7782	2.6	12	1.7	1.54	44	2.9	5.65	18	2.2	2.33	74	2.4	9.51
Hauora Tairāwhiti	3661	1.2	5	0.7	1.37	23	1.5	6.28	12	1.5	3.30	40	1.3	10.93
Taranaki	7537	2.5	15	2.1	1.99	27	1.8	3.58	26	3.2	3.47	68	2.2	9.02
Hawke's Bay	10,454	3.5	19	2.7	1.82	50	3.3	4.78	21	2.5	2.02	90	3.0	8.61
Whanganui	4189	1.4	7	1.0	1.67	28	1.9	6.68	12	1.5	2.89	47	1.6	11.22
MidCentral	10,801	3.6	24	3.4	2.22	42	2.8	3.89	38	4.6	3.54	104	3.4	9.63
Wairarapa	2493	0.8	3	0.4	1.20	20	1.3	8.02	7	0.8	2.83	30	1.0	12.03
Capital & Coast	17,105	5.7	26	3.7	1.52	85	5.7	4.97	41	5.0	2.41	152	5.0	8.89
Hutt Valley	9917	3.3	9	1.3	0.91	46	3.1	4.64	28	3.4	2.84	83	2.7	8.37
Nelson Marlborough	7420	2.5	18	2.6	2.43	23	1.5	3.10	16	1.9	2.17	57	1.9	7.68
West Coast	1726	0.6	3	0.4	1.74	18	1.2	10.43	4	0.5	2.35	25	0.8	14.48
Canterbury	32,024	10.6	74	10.6	2.31	155	10.3	4.84	76	9.2	2.39	305	10.1	9.52
South Canterbury	3215	1.1	5	0.7	1.56	12	0.8	3.73	10	1.2	3.13	27	0.9	8.40
Southern	17,094	5.7	55	7.9	3.22	86	5.7	5.03	25	3.0	1.47	166	5.5	9.71
Other†	2261	0.8	<3	x	s	<3	x	s	8	1.0	s	11	0.4	s
Total	**300,811**	**100.0**	**700**	**100.0**	**2.33**	**1502**	**100.0**	**4.99**	**825**	**100.0**	**2.76**	**3027**	**100.0**	**10.06**

† Other includes Overseas, Unknown and Other.

'x' indicates percentage suppressed due to small numbers.

's' indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2015–2019; Denominator: MAT births 2015–2019.

Table A3.23: Perinatal related mortality rates (per 1000 births) by gestation and birthweight 2019

	Total births		Fetal deaths						Neonatal deaths			Perinatal related deaths (total)		
			Termination of pregnancy			Stillbirths								
	N=60,604		n=177			n=284			n=178			n=639		
	N	%	n	%	Rate	n	%	Rate	n	%	Rate	n	%	Rate
Gestation at birth (weeks)														
20–22	216	0.4	93	52.5	†	84	29.6	†	55	30.9	†	232	36.3	†
23–24	133	0.2	41	23.2	308.27	32	11.3	240.60	26	14.6	433.33	99	15.5	744.36
25–27	226	0.4	21	11.9	92.92	28	9.9	123.89	23	12.9	129.94	72	11.3	318.58
28–31	481	0.8	9	5.1	18.71	19	6.7	39.50	8	4.5	17.66	36	5.6	74.84
32–36	3830	6.3	8	4.5	2.09	48	16.9	12.53	17	9.6	4.50	73	11.4	19.06
37–40	46,985	77.5	4	2.3	0.09	60	21.1	1.28	42	23.6	0.90	106	16.6	2.26
≥41	8183	13.5	-	-	-	10	3.5	1.22	7	3.9	0.86	17	2.7	2.08
Unknown	550	0.9	<3	x	-	3	1.1	-	-	-	-	4	0.6	-
Birthweight (g)														
<500	237	0.4	90	50.8	†	100	35.2	†	50	28.1	†	240	37.6	†
500–999	309	0.5	64	36.2	207.12	47	16.5	152.10	51	28.7	257.58	162	25.4	524.27
1000–1499	368	0.6	9	5.1	24.46	17	6.0	46.20	7	3.9	20.47	33	5.2	89.67
1500–1999	691	1.1	3	1.7	4.34	23	8.1	33.29	14	7.9	21.05	40	6.3	57.89
2000–2499	2333	3.8	4	2.3	1.71	25	8.8	10.72	10	5.6	4.34	39	6.1	16.72
2500–2999	8426	13.9	<3	x	s	23	8.1	2.73	16	9.0	1.90	40	6.3	4.75
3000–3499	19,242	31.8	-	-	-	28	9.9	1.46	14	7.9	0.73	42	6.6	2.18
3500–3999	17,833	29.4	-	-	-	16	5.6	0.90	8	4.5	0.45	24	3.8	1.35
4000–4499	6385	10.5	-	-	-	3	1.1	0.47	7	3.9	1.10	10	1.6	1.57
≥4500	1289	2.1	-	-	-	<3	x	s	<3	x	s	<3	x	s
Unknown	3491	5.8	6	3.4	-	<3	X	-	-	-	-	7	1.1	-

† Denominator data unreliable where † is present, and therefore rates have not been calculated.

'x' indicates percentage suppressed due to small numbers.

's' indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC's perinatal data extract 2019; Denominator: MAT births 2019.

Table A3.24: Stillbirth risk (per 1000 ongoing pregnancies) 2010–2019

Gestation at birth (weeks)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n
Stillbirths																				
20–22	231	94	230	90	231	85	215	88	245	110	169	73	206	83	211	72	230	100	216	84
23–24	122	31	129	37	119	28	123	29	137	28	117	32	126	29	110	27	125	29	133	32
25–27	225	32	187	24	218	36	192	25	187	25	206	31	189	26	213	30	185	23	226	28
28–31	562	32	509	34	505	30	471	32	462	31	458	29	483	22	481	31	485	27	481	19
32–36	4004	66	3907	55	3933	54	3724	63	3729	58	3653	48	3827	60	3759	48	3691	56	3830	48
37–40	48,206	78	47,051	83	47,043	78	45,607	60	45,847	72	45,756	72	46,628	76	46,828	68	45,862	69	46,985	60
≥41	11,550	14	10,729	9	10,325	9	9480	9	9093	3	9076	20	8788	14	8478	12	8304	11	8183	10
Unknown	553	-	506	-	920	-	329	-	383	-	356	-	364	-	410	-	433	-	550	3

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk
Stillbirths										
20–22	1.45	1.43	1.36	1.47	1.84	1.23	1.38	1.20	1.70	1.40
23–24	0.48	0.59	0.45	0.49	0.47	0.54	0.48	0.45	0.49	0.53
25–27	0.50	0.38	0.58	0.42	0.42	0.52	0.43	0.50	0.39	0.47
28–31	0.50	0.55	0.49	0.54	0.52	0.49	0.37	0.52	0.46	0.32
32–36	1.04	0.89	0.88	1.07	0.99	0.82	1.01	0.81	0.97	0.81
37–40	1.31	1.44	1.36	1.09	1.31	1.31	1.37	1.23	1.27	1.09
≥41	1.21	0.84	0.87	0.95	0.33	2.20	1.59	1.42	1.32	1.22
Unknown	-	-	-	-	-	-	-	-	-	-

Sources: Numerator: PMMRC's perinatal data extract, stillbirths only, 2010–2019; Denominator: MAT births 2010–2019.

Table A3.25: Neonatal death risk (per 1000 ongoing pregnancies) 2010–2019

Gestation at birth (weeks)	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n	Total births	n
20–22	45	62	33	38	28	44	44	46	44	52	30	36	36	46	58	57	43	51	39	55
23–24	71	30	63	29	59	34	62	24	78	39	58	33	65	23	58	30	70	34	60	26
25–27	173	21	148	13	168	20	151	14	152	14	167	13	150	11	167	18	146	6	177	23
28–31	524	14	464	13	470	15	434	12	424	8	426	9	447	12	445	13	456	14	453	8
32–36	3929	26	3844	24	3876	16	3657	24	3666	22	3602	27	3765	17	3706	23	3632	15	3774	17
37–40	48,124	45	46,967	39	46,965	38	45,546	28	45,769	38	45,684	39	46,552	39	46,759	27	45,792	31	46,921	42
≥41	11,536	12	10,720	8	10,316	11	9471	5	9090	9	9056	9	8774	6	8466	5	8293	3	8173	7
Unknown	553	-	506	-	920	-	329	-	383	-	356	-	364	-	410	-	433	-	546	-

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk	Risk
20–22	0.96	0.61	0.71	0.77	0.88	0.61	0.77	0.96	0.87	0.92
23–24	0.47	0.47	0.55	0.40	0.66	0.56	0.38	0.50	0.58	0.44
25–27	0.33	0.21	0.32	0.24	0.24	0.22	0.18	0.30	0.10	0.39
28–31	0.22	0.21	0.24	0.20	0.14	0.15	0.20	0.22	0.24	0.13
32–36	0.41	0.39	0.26	0.41	0.38	0.46	0.29	0.39	0.26	0.29
37–40	0.75	0.68	0.66	0.51	0.69	0.71	0.70	0.49	0.57	0.76
≥41	1.04	0.75	1.07	0.53	0.99	0.99	0.68	0.59	0.36	0.86
Unknown	-	-	-	-	-	-	-	-	-	-

Sources: Numerator: PMMRC's perinatal data extract specific neonatal deaths 2010–2019; Denominator: MAT births excluding fetal deaths 2010–2019.

Table A3.26: Perinatal related mortality rates by customised birthweight centile group among singleton births† from 26 weeks gestation without congenital anomalies 2010–2019

Year of death	Small for gestational age			Appropriate for gestational age			Large for gestational age			Unknown/missing data			Total		
	N=49,832	N=429		N=388,867	N=890		N=64,852	N=163		N=24,553	N=105		N=528,104	N=1587	
	N	n	Rate	N	n	Rate	N	n	Rate	N	n	Rate	N	n	Rate
2010	5096	52	10.20	38,167	96	2.52	6305	22	3.49	2680	7	2.61	52,248	177	3.39
2011	5115	44	8.60	37,972	80	2.11	6138	21	3.42	2747	13	4.73	51,972	158	3.04
2012	5053	44	8.71	39,200	95	2.42	6540	11	1.68	2246	6	2.67	53,039	156	2.94
2013	4900	42	8.57	37,978	86	2.26	6207	21	3.38	2365	7	2.96	51,450	156	3.03
2014	4986	44	8.82	38,664	93	2.41	6395	15	2.35	2268	5	2.20	52,313	157	3.00
2015	4880	43	8.81	39,220	102	2.60	6383	18	2.82	2480	6	2.42	52,963	169	3.19
2016	4980	36	7.23	39,620	97	2.45	6669	17	2.55	2399	16	6.67	53,668	166	3.09
2017	4792	43	8.97	39,839	92	2.31	6717	12	1.79	2274	10	4.40	53,622	157	2.93
2018	4982	43	8.63	38,747	72	1.86	6641	15	2.26	2448	10	4.08	52,818	140	2.65
2019	5048	38	7.53	39,460	77	1.95	6857	11	1.60	2646	25	9.45	54,011	151	2.80
Data not supplied to MAT		83			-39			-56			-3			-15	

† MAT data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's perinatal data extract where matched to MAT data, among singleton births from 26 weeks gestation without congenital anomalies 2010–2019; Denominator: MAT births among singleton births from 26 weeks gestation 2010–2019.

Table A3.27: Perinatal related mortality rates among babies born in multiple pregnancies 2010–2019

Year of death	Total multiple births	Fetal deaths				Neonatal deaths		Perinatal related deaths (total)	
		Termination of pregnancy		Stillbirths					
		n	Rate	n	Rate	n	Rate	n	Rate
2010	1906	9	4.72	35	18.36	35	18.80	79	41.45
2011	1825	18	9.86	48	26.30	27	15.35	93	50.96
2012	1806	14	7.75	34	18.83	32	18.20	80	44.30
2013	1741	8	4.60	40	22.98	16	9.45	64	36.76
2014	1727	10	5.79	34	19.69	40	23.77	84	48.64
2015	1665	<3	s	29	17.42	20	12.24	51	30.63
2016	1631	3	1.84	33	20.23	11	6.90	47	28.82
2017	1552	4	2.58	29	18.69	22	14.48	55	35.44
2018	1491	9	6.04	37	24.82	32	22.15	78	52.31
2019	1545	14	9.06	17	11.00	33	21.80	64	41.42
2010–2019 Regression for trend (95%CI)		-0.160 (-0.946, 0.625)		-0.532 (-1.601, 0.536)		0.223 (-1.284, 1.730)		-0.466 (-2.634, 1.703)	

‘s’ indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC’s perinatal data extract among babies born in multiple pregnancies 2010–2019; Denominator: MAT births among babies born in multiple pregnancies 2010–2019.

A4 Neonatal Encephalopathy | Te Māuiui Roro i ngā Pēpi Whānau Hou

Definitions

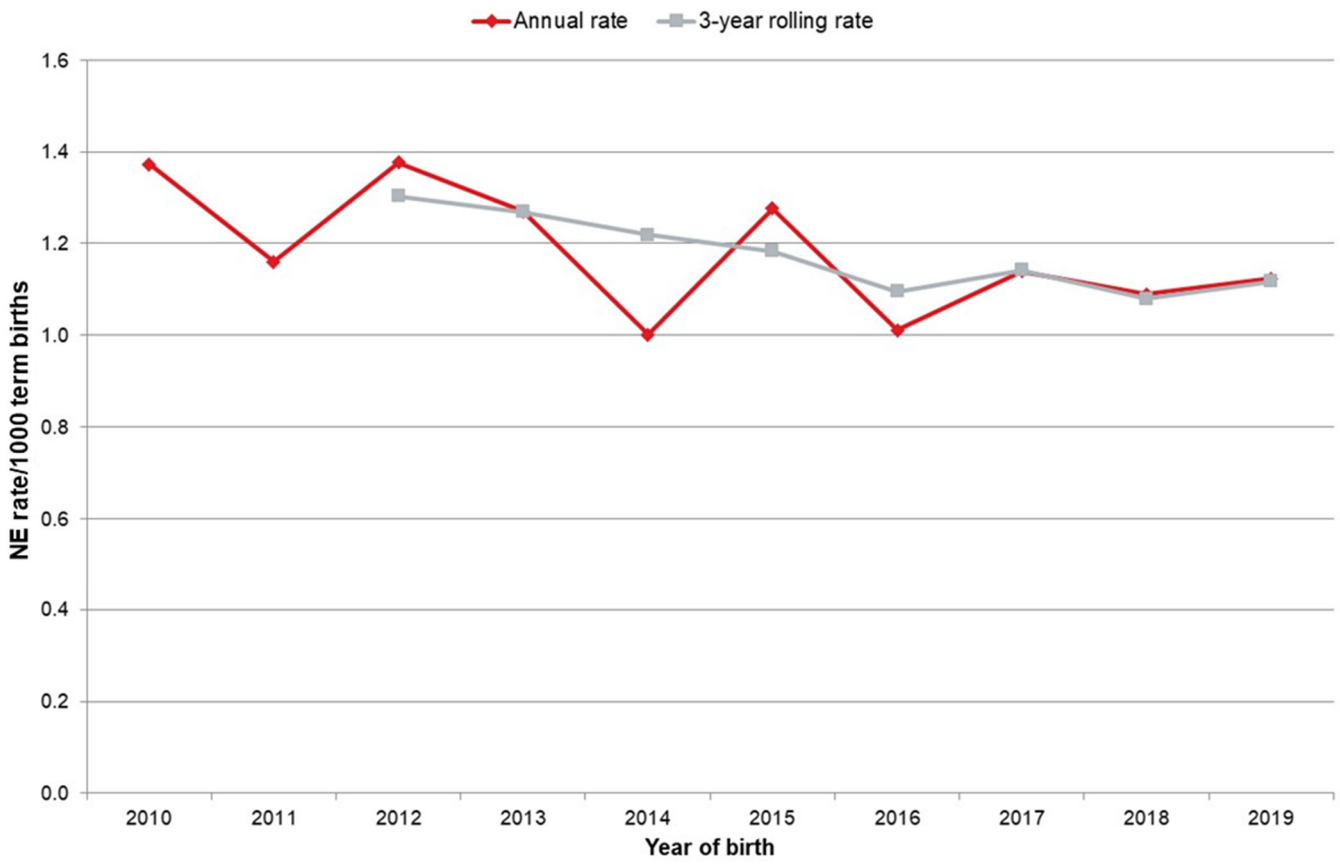
Neonatal encephalopathy (NE) is a clinically defined syndrome of disturbed neurological function within the first week after birth in an infant born from 35 weeks gestation, manifested by difficulty in initiating and maintaining respiration, depression of tone and reflexes, subnormal level of consciousness and often seizures. The severity of the encephalopathy is measured by the Sarnat stages 1, 2 or 3 as mild, moderate or severe.[67]

Methods

The PMMRC collects data on babies who present with moderate or severe NE in the first seven days after birth. Data have been collected on babies with NE from 37 weeks gestation onwards since 2010. In 2016, the PMMRC started collecting data on babies from 35 weeks gestation. Due to the small number of cases in 35–36 weekers, this report only includes data on babies born at 37 weeks gestation onwards.

Findings

Figure A4.1: NE annual and three-year rolling rates† (per 1000 term births) 2010–2019



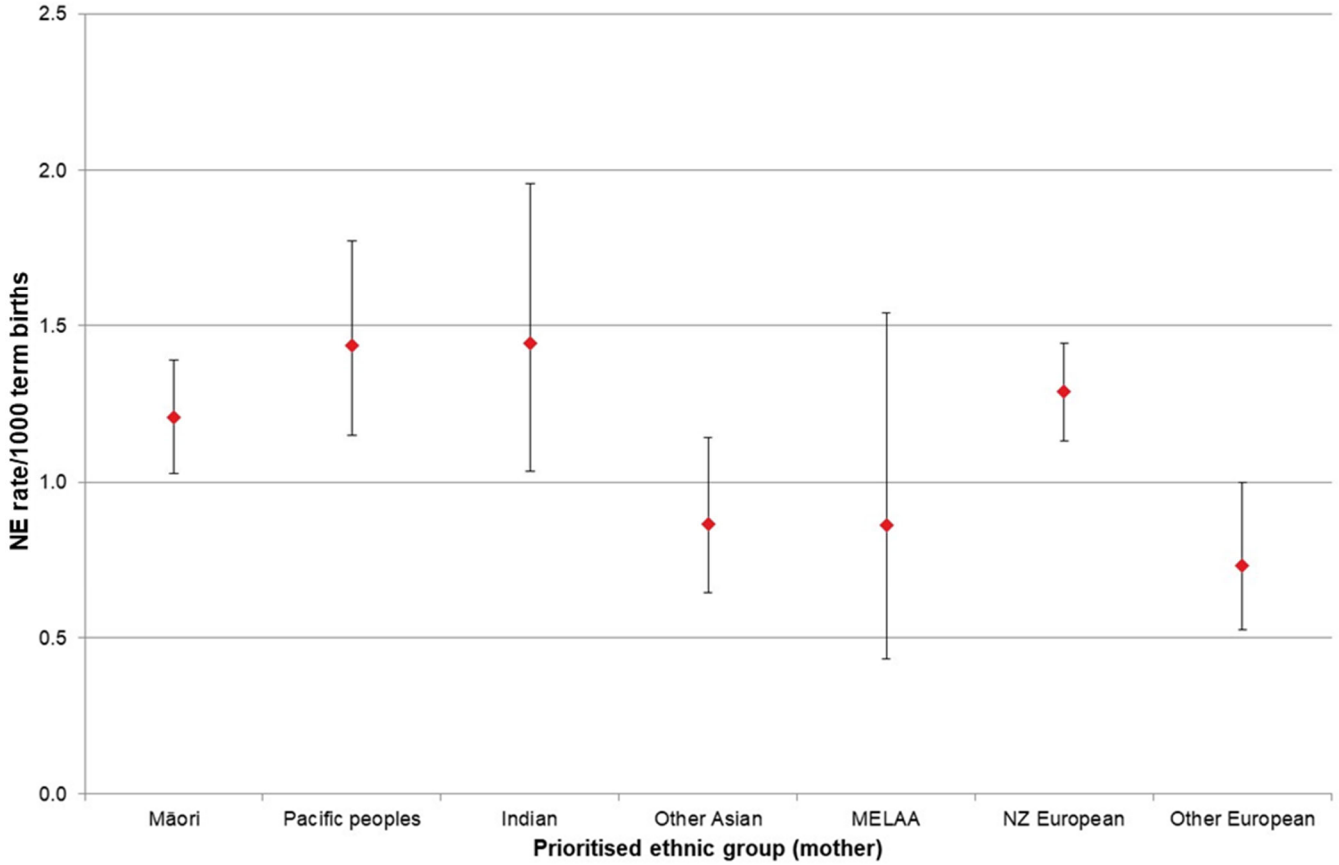
Regression for trend -0.027, 95% CI -0.056, 0.003

† Rolling three-year maternal mortality ratio represented at final year of triennium

Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

[67] Nelson KB, Leviton A. 1991. How much of neonatal encephalopathy is due to birth asphyxia? *American Journal of Diseases of Children* 145(11): 1325–31.

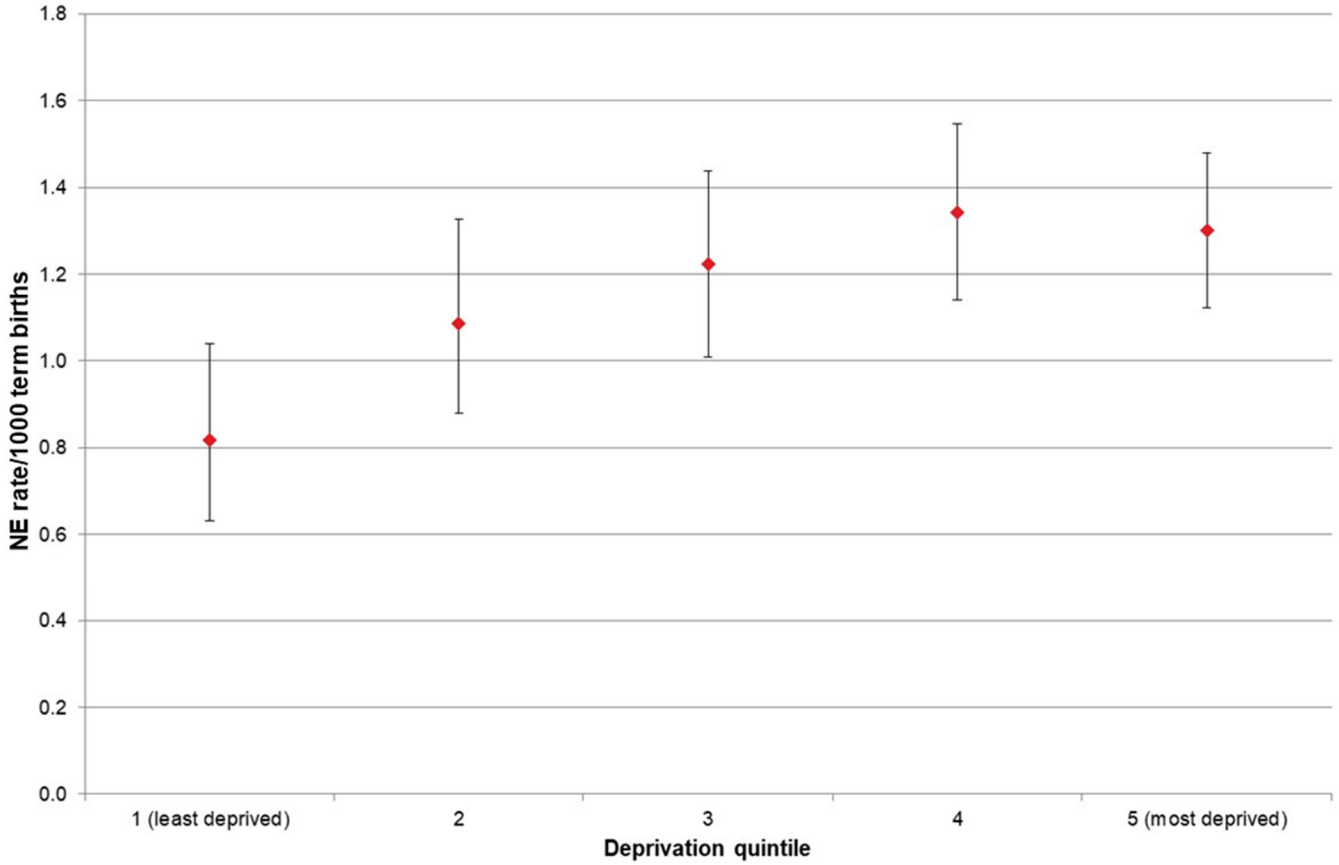
Figure A4.2: NE rates (per 1000 term births, with 95% CIs) by maternal prioritised ethnic group 2010–2019



MELAA = Middle Eastern, Latin American, or African.

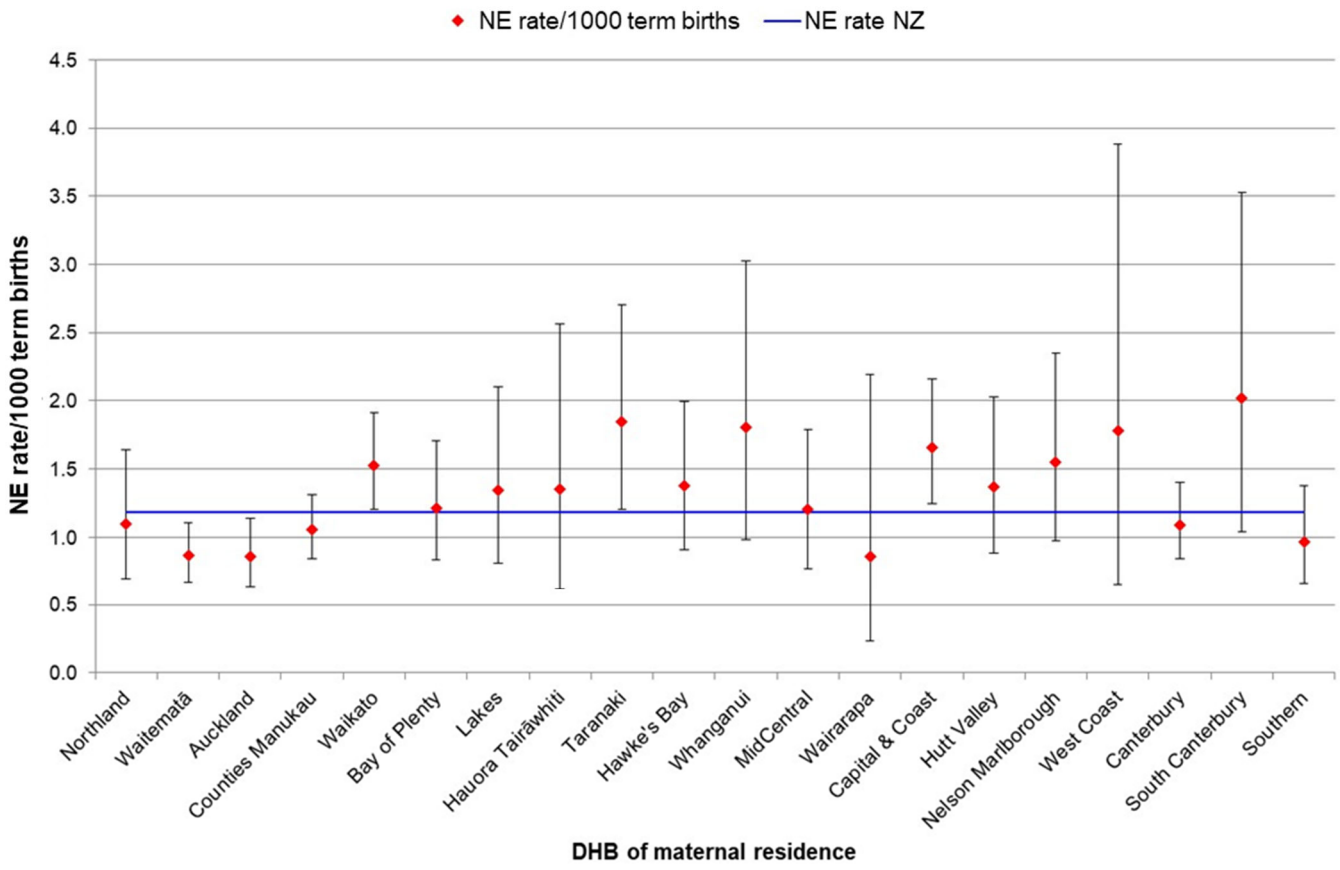
Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019.

Figure A4.3: NE rates (per 1000 term births, with 95% CIs) by NZDeprivation quintile 2010–2019



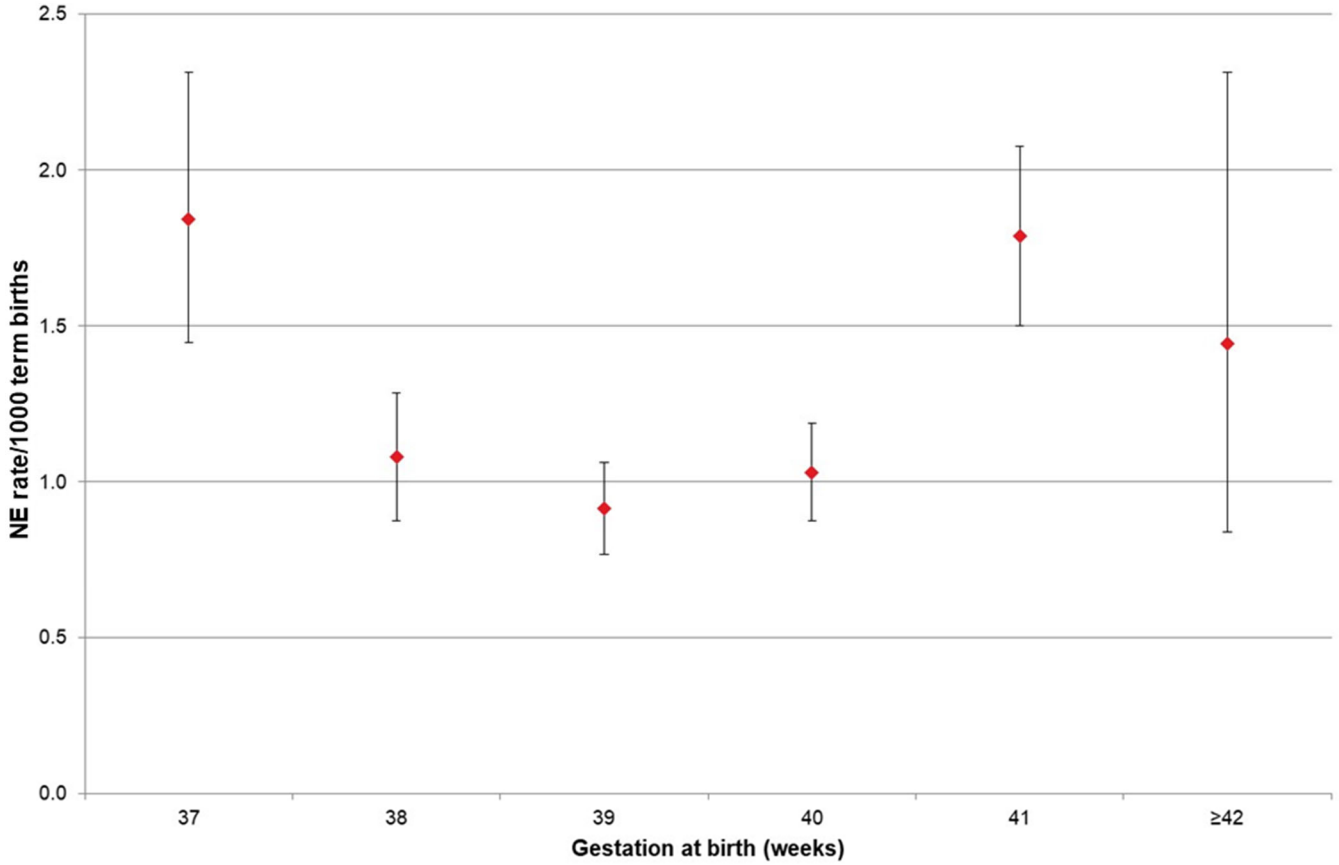
Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019.

Figure A4.4: NE rates (per 1000 term births, with 95% CIs) by DHB of maternal residence (compared with New Zealand NE rate) 2010–2019



Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Figure A4.5: NE rates (per 1000 term births) by gestation at birth (≥37 weeks) 2010–2019



Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Table A4.1: NE rates (per 1000 term births) by gestation, sex, birthweight, customised birthweight centiles and plurality 2010–2019

	MAT births 2010–2019 ≥37 weeks		NE babies		Rate (/1000 term births)	
	N=599,819		n=663			
	N	%	n	%	/1000	95% CI
Gestation at birth (weeks)						
37	40,172	7.2	74	11.2	1.84	1.45–2.31
38	99,926	17.8	108	16.3	1.08	0.88–1.28*
39	162,843	29.1	149	22.5	0.91	0.77–1.06*
40	162,872	29.1	168	25.3	1.03	0.88–1.19*
41	82,227	14.7	147	22.2	1.79	1.50–2.08
≥42	11,779	2.1	17	2.6	1.44	0.84–2.31
Sex						
Male	286,092	51.1	360	54.3	1.26	1.13–1.39
Female	273,710	48.9	303	45.7	1.11	0.98–1.23
Undetermined/unknown	17	0.0	-	-	-	-
Birthweight (g)						
<2500	10,525	1.9	27	4.1	2.57	1.69–3.73*
2500–3999	441,261	78.8	548	82.7	1.24	1.14–1.35
4000–4499	68,594	12.3	63	9.5	0.92	0.71–1.18*
≥4500	13,874	2.5	25	3.8	1.80	1.17–2.66
Unknown	25,565	4.6	-	-	-	-
Customised birthweight centiles						
SGA	46,103	8.2	131	19.8	2.84	2.35–3.33*
AGA	374,171	66.8	472	71.2	1.26	1.15–1.38
LGA	60,071	10.7	60	9.0	1.00	0.76–1.29
Unknown	79,474	14.2	-	-	-	-
Plurality						
Singleton	550,778	98.4	651	98.2	1.18	1.09–1.27
Multiple	6524	1.2	12	1.8	1.84	0.95–3.21
Unknown	2517	0.4	-	-	-	-

* indicates rate statistically significantly different at the 0.05 level

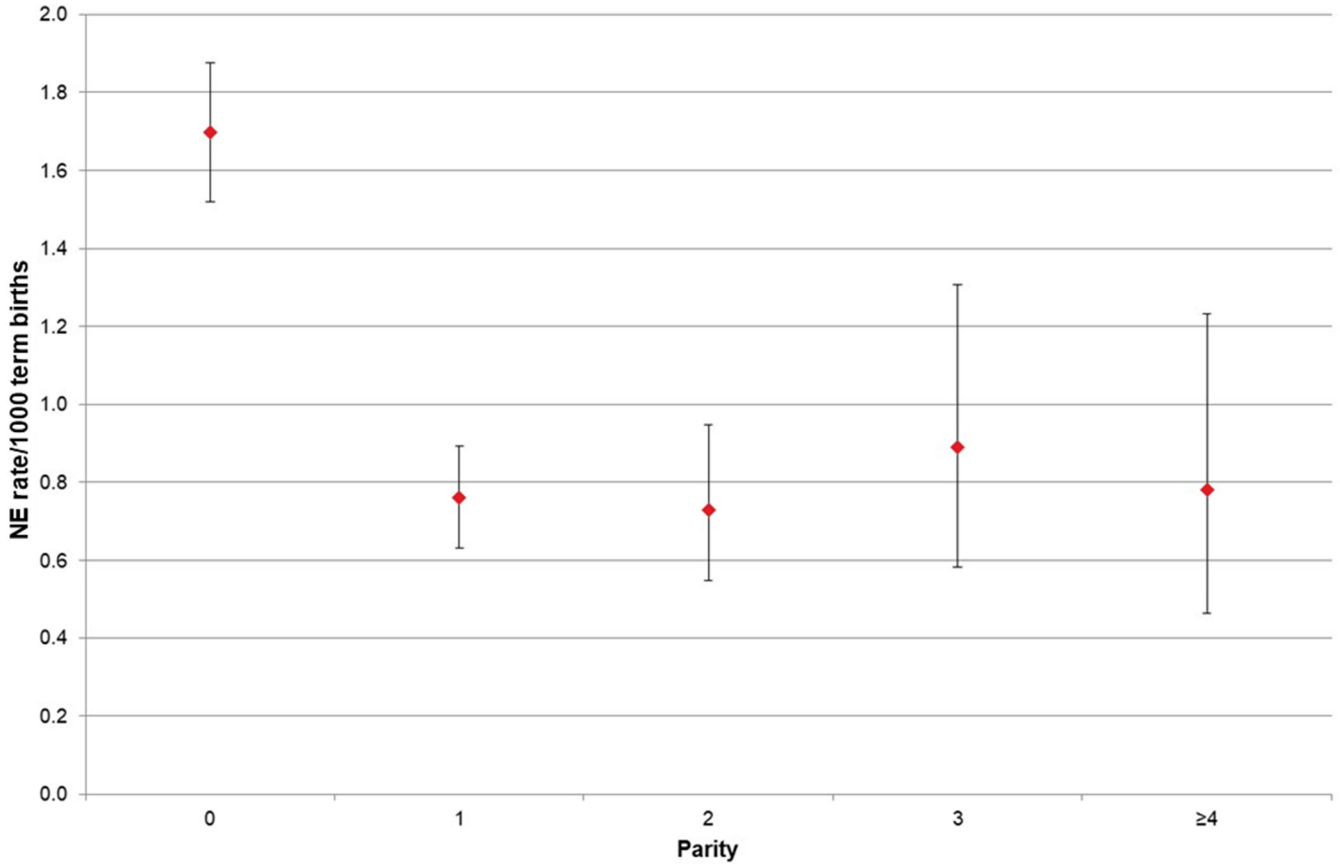
SGA = small for gestational age

AGA = appropriate for gestational age

LGA = large for gestational age

Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Figure A4.6: NE rates (per 1000 term births, at ≥37 weeks gestation, with 95% CIs) by parity prior to index birth† 2010–2019

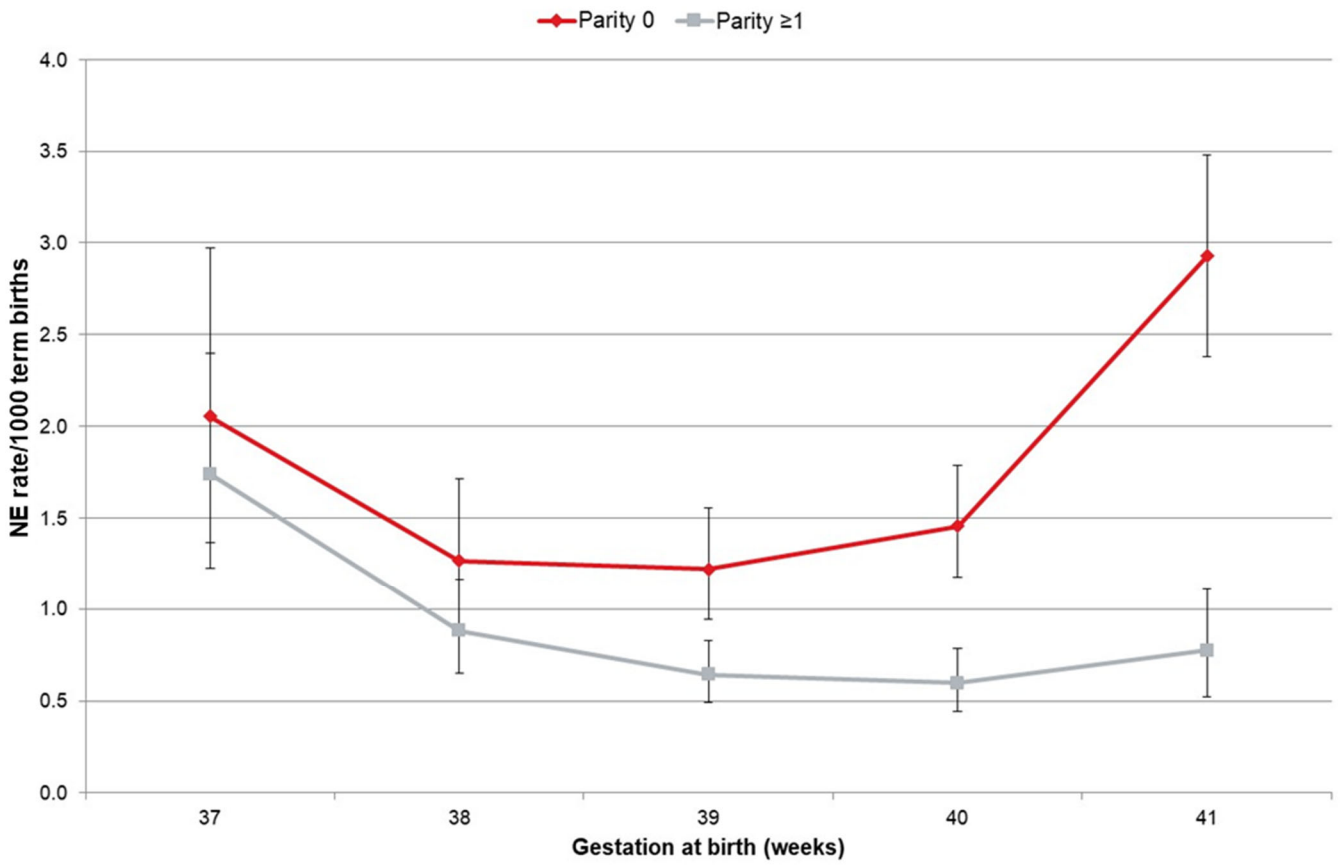


† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice

Parity '0' indicates women having their first baby/babies of 20 weeks or greater gestation

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Figure A4.7: NE rates (per 1000 term births, at ≥37 weeks gestation, with 95% CIs) by parity and gestation† 2010–2019



† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice

Parity '0' indicates women having their first baby/babies of 20 weeks or greater gestation

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Table A4.2: Maternal smoking, body mass index (BMI), gestation at first antenatal visit, and parity among NE babies† 2010–2019

	MAT births ≥37 weeks		NE cases		Rate (/1000 term births)	
	N=505,940		n=580			
	N	%	n	%	/1000	95% CI
Currently smoking						
Yes	69,544	13.7	83	14.3	1.19	0.95–1.48
No	436,378	86.3	497	85.7	1.14	1.04–1.24
Unknown	18	0.0	-	-	-	-
Maternal BMI (kg/m^2)						
<18.50	13,845	2.7	9	1.6	0.65	0.30–1.23
18.50–24.99	243,992	48.2	233	40.2	0.95	0.83–1.08
25.00–29.99	131,092	25.9	165	28.4	1.26	1.07–1.45*
30.00–34.99	67,596	13.4	90	15.5	1.33	1.07–1.64*
35.00–39.99	30,784	6.1	49	8.4	1.59	1.18–2.10*
≥40	17,874	3.5	34	5.9	1.90	1.32–2.66*
Missing data for height and or weight	757	0.1	-	-	-	-
Gestation first antenatal visit (weeks)						
≤14	344,861	68.2	382	65.9	1.11	1.00–1.22
15–27	136,524	27.0	170	29.3	1.25	1.06–1.43
≥28	21,184	4.2	26	4.5	1.23	0.80–1.80
Postnatal registration	3362	0.7	<3	x	s	-
Unknown	9	0.0	-	-	-	-
Parity						
0	206,207	40.8	350	60.3	1.70	1.52–1.88*
1	171,984	34.0	131	22.6	0.76	0.63–0.89
2	75,464	14.9	55	9.5	0.73	0.55–0.95
3	29,170	5.8	26	4.5	0.89	0.58–1.31
≥4	23,094	4.6	18	3.1	0.78	0.46–1.23
Unknown	21	0.0	-	-	-	-

† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice

BMI = body mass index

'x' indicates percentage suppressed due to small numbers.

's' indicates rate suppressed due to small numbers.

* indicates rate statistically significantly different at the 0.05 level

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Table A4.3: Antenatal complications, obstetric interventions, and maternal outcome among NE cases by parity and Sarnat stage 2010–2019[†]

	NE cases		Primiparous[§]		Multiparous[#]		Sarnat stage			
							Moderate		Severe	
	n=663		n=388		n=272		n=458		n=205	
	n	%	n	%	n	%	n	%	n	%
Antenatal complications										
APH (≥20 weeks vaginal bleeding)	63	9.5	35	9.0	28	10.3	40	8.7	23	11.2
Hypertension	80	12.1	58	14.9	22	8.1	59	12.9	21	10.2
Maternal trauma (antenatal)[‡]	12	1.8	5	1.3	7	2.6	6	1.3	6	2.9
Induction/augmentation of labour										
Induction of labour	164	24.7	106	27.3	57	21.0	122	26.6	42	20.5
Induced or augmented labour (any method)	301	45.4	205	52.8	95	34.9	226	49.3	75	36.6
Oxytocin for induction or augmentation	151	22.8	110	28.4	40	14.7	116	25.3	35	17.1
Epidural anaesthesia	163	24.6	122	31.4	40	14.7	130	28.4	33	16.1
Maternal outcome										
Deceased or alive with serious morbidity	24	3.6	10	2.6	14	5.1	14	3.1	10	4.9
Alive and well	639	96.4	378	97.4	258	94.9	444	96.9	195	95.1

[†] 3 cases with unknown parity not included in 'Primiparous' and 'Multiparous' columns

[‡] Vehicular, violent personal injury, other

[§] Primiparous: parity = 0 defined prior to current birth

[#] Multiparous: parity ≥1 defined prior to current birth

APH = antepartum haemorrhage

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

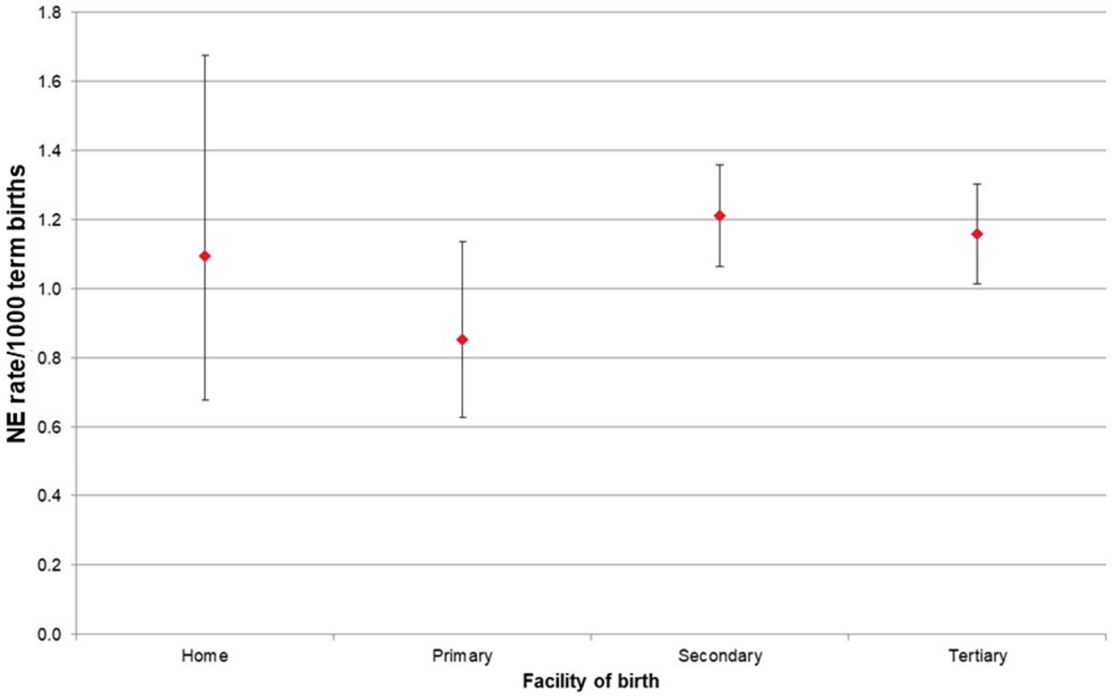
Table A4.4: Peripartum complications and mode of birth among NE cases 2010–2019

	Total NE cases n=663	
	n	%
Acute peripartum events	**174**	**26.2**
Cord prolapse	25	3.8
Abruption	57	8.6
Uterine rupture	14	2.1
Shoulder dystocia	50	7.5
Breech complication	15	2.3
Other complication	23	3.5
Liquor		
Blood stained	61	9.2
Thick meconium	147	22.2
Thin meconium	85	12.8
Purulent	<3	x
Clear	305	46.0
Unknown	64	9.7
Mode of birth		
Normal vaginal birth	**263**	**39.7**
Operative vaginal birth	**102**	**15.4**
Forceps	43	6.5
Ventouse	57	8.6
Unknown	<3	x
Vaginal breech birth	**12**	**1.8**
Caesarean section birth	**286**	**43.1**
Elective	**11**	**1.7**
Prelabour emergency	**73**	**11.0**
Antepartum haemorrhage/Abruption	13	2.0
Suspected fetal distress	53	8.0
Other	7	1.1
Unknown	-	-
In labour emergency	**201**	**30.3**
Antepartum haemorrhage/Abruption	15	2.3
Suspected fetal distress	141	21.3
Failure to progress/Cephalopelvic disproportion	18	2.7
Other	27	4.1
Attempt at operative vaginal birth before caesarean	**17**	**2.6**

'x' indicates percentage suppressed due to small numbers.

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

Figure A4.8: NE rates (per 1000 term births with 95% CIs) by place of birth† 2016–2020



† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019.

Table A4.5: NE rates (per 1000 term births) by place of birth† 2016–2020

Facility of birth	MAT births ≥37 weeks		NE cases		Rate (/1000 term births)	
	N=505,940		n=580			
	n	%	n	%	Rate	95% CI
Home	19,184	3.8	1	3.6	1.09	0.68–1.67
Primary	55,046	10.9	47	8.1	0.85	0.63–1.14
Secondary	216,380	42.8	262	45.2	1.21	1.06–1.36
Tertiary	210,785	41.7	244	42.1	1.16	1.01–1.30
Unknown	4545	0.9	6	1.0	1.32	-

† All data limited to mothers who were registered for care with an LMC (either a midwife, obstetrician or GP) claiming from the Section 88 Primary Maternity Services Notice.

Sources: Numerator: PMMRC's NE data extract where matched to MAT data, ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019.

Table A4.6: Immediate newborn wellbeing among NE babies 2010–2019

	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		Total	
	n=82		n=67		n=79		n=70		n=55		n=70		n=56		n=63		n=59		n=62		n=663	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Apgar scores																						
Apgar score <3 at 1 minute	48	58.5	41	61.2	47	59.5	40	57.1	37	67.3	39	55.7	37	66.1	36	57.1	39	66.1	43	69.4	407	61.4
Apgar score <7 at 1 minute	73	89.0	61	91.0	70	88.6	65	92.9	53	96.4	59	84.3	51	91.1	56	88.9	55	93.2	57	91.9	600	90.5
Apgar score <7 at 5 minutes	61	74.4	54	80.6	62	78.5	57	81.4	43	78.2	50	71.4	46	82.1	42	66.7	45	76.3	52	83.9	512	77.2
Apgar score <7 at 10 minutes	39	47.6	38	56.7	49	62.0	32	45.7	29	52.7	35	50.0	33	58.9	29	46.0	34	57.6	34	54.8	352	53.1
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	6	10.7	10	15.9	9	15.3	12	19.4	102	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	42	75.0	39	61.9	42	71.2	36	58.1	437	65.9
No gases reported	23	28.0	12	17.9	13	16.5	9	12.9	8	14.5	15	21.4	8	14.3	14	22.2	8	13.6	14	22.6	124	18.7
No gases and Apgar <7 at 1 minute	14	17.1	8	11.9	8	10.1	6	8.6	8	14.5	6	8.6	6	10.7	10	15.9	7	11.9	11	17.7	84	12.7
No gases and Apgar ≥7 at 1 minute	8	9.8	4	6.0	5	6.3	3	4.3	-	-	9	12.9	<3	x	3	4.8	<3	x	3	4.8	38	5.7
No gases and unknown Apgar	<3	x	-	-	-	-	-	-	-	-	-	-	-	-	<3	x	-	-	-	-	<3	x

BE = base excess

'x' indicates percentage suppressed due to small numbers.

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

Table A4.7: Induced cooling therapy among NE babies 2010–2019

Cooling	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		Total	
	n=82		n=67		n=79		n=70		n=55		n=70		n=56		n=63		n=59		n=62		n=663	
	n	%	n	%	n	%	n	%	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	44	78.6	43	68.3	45	76.3	50	80.6	510	76.9
No	26	31.7	16	23.9	17	21.5	12	17.1	10	18.2	14	20.0	12	21.4	20	31.7	14	23.7	12	19.4	153	23.1
Unknown																						
Age at cooling	**n=56**		**n=51**		**n=62**		**n=58**		**n=45**		**n=56**		**n=44**		**n=43**		**n=45**		**n=50**		**n=510**	
≤6 hours	46	82.1	39	76.5	53	85.5	47	81.0	39	86.7	44	78.6	34	77.3	36	83.7	32	71.1	34	68.0	404	79.2
>6 hours	10	17.9	8	15.7	9	14.5	11	19.0	6	13.3	11	19.6	10	22.7	7	16.3	12	26.7	14	28.0	98	19.2
Unknown time	-	-	4	7.8	-	-	-	-	-	-	<3	x	-	-	-	-	<3	x	<3	x	8	1.6

'x' indicates percentage suppressed due to small numbers.

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

Table A4.8: Neonatal resuscitation and early neonatal management by Sarnat stage among NE babies 2010–2019

	NE babies		Sarnat stage			
			Moderate		Severe	
	n=663		n=458		n=205	
	n	%	n	%	n	%
Resuscitation at birth						
Yes	614	92.6	423	92.4	191	93.2
No	49	7.4	35	7.6	14	6.8
Type of resuscitation at birth†						
Oxygen only	10	1.5	9	2.0	<3	x
IPPV with mask	445	67.1	316	69.0	129	62.9
IPPV with ETT	334	50.4	193	42.1	141	68.8
Cardiac massage	262	39.5	141	30.8	121	59.0
Adrenaline	104	15.7	36	7.9	68	33.2
Respiratory and ventilation management						
Mechanical ventilation	512	77.2	331	72.3	182	88.8
Nitric oxide	153	23.1	98	21.4	55	26.8
Infection						
Positive blood culture	25	3.8	19	4.1	6	2.9
Antibiotics	600	90.5	428	93.4	173	84.4
Anticonvulsant therapy	473	71.3	318	69.4	156	76.1
Phenobarbitone	424	64.0	279	60.9	146	71.2
Phenytoin	144	21.7	74	16.2	70	34.1
Benzodiazepines	170	25.6	102	22.3	68	33.2
Other	112	16.9	78	17.0	34	16.6

† Categories not mutually exclusive

IPPV = intermittent positive pressure ventilation

ETT = endotracheal tube

'x' indicates percentage suppressed due to small numbers.

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

Table A4.9: Use of cooling and outcomes of encephalopathy by Sarnat stage among NE babies 2010–2019

	NE babies		Sarnat stage			
			Moderate		Severe	
	n=663		n=458		n=205	
	n	%	n	%	n	%
Induced cooling						
Yes	510	76.9	367	80.1	143	69.8
No	153	23.1	91	19.9	62	30.2
Unknown						
Deceased						
Yes	134	20.2	12	2.6	122	59.5
No	529	79.8	446	97.4	83	40.5
Unknown						

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

Table A4.10: Investigations and neonatal outcome by Sarnat stage of NE survivors 2010–2019

Investigations	Total NE survivors		Sarnat stage			
			Moderate		Severe	
	n=529		n=446		n=83	
	n	%	n	%	n	%
Examination on discharge/transfer						
Normal	234	44.2	221	49.6	13	15.7
Mild or moderate abnormality	186	35.2	153	34.3	33	39.8
Severe abnormality	40	7.6	11	2.5	29	34.9
Not examined	26	4.9	23	5.2	3	3.6
Examined but finding unknown	21	4.0	17	3.8	4	4.8
Missing data	22	4.2	21	4.7	<3	x
MRI† (investigation done)	420	79.4	339	76.0	81	97.6
No MRI or unknown	109	20.6	107	24.0	<3	x
Results of MRI						
Moderately/severely abnormal	163	30.8	109	24.4	54	65.1
Normal or only mildly abnormal	249	47.1	223	50.0	26	31.3
Unknown result	117	22.1	114	25.6	3	3.6

† MRI = magnetic resonance imaging (of the brain)

'x' indicates percentage suppressed due to small numbers.

Source: PMMRC's NE data extract ≥37 weeks 2010–2019

Neonatal Encephalopathy Appended Tables

Table A4.11: NE rates (per 1000 term births) by maternal prioritised ethnic group, maternal age and NZDep2013 quintile 2010–2019

	MAT births ≥37 weeks		NE cases		Rate (/1000 term births)	
	N=564,623†		n=663			
	n	%	n	%	/1000	95% CI
Maternal prioritised ethnic group						
Māori	140,655	25.1	170	25.6	1.21	1.03–1.39
Pacific peoples	59,869	10.7	86	13.0	1.44	1.15–1.77
Asian	86,147	15.4	91	13.7	1.06	0.85–1.30
Indian	28,403	5.1	41	6.2	1.44	1.04–1.96
Other Asian	57,744	10.3	50	7.5	0.87	0.64–1.14*
MELAA	12,768	2.3	11	1.7	0.86	0.43–1.54
European	260,348	46.5	305	46.0	1.17	1.04–1.30
NZ European	205,772	36.8	265	40.0	1.29	1.13–1.44
Other European	54,576	9.7	40	6.0	0.73	0.52–1.00*
Other	-	-	-	-	-	-
Maternal age (years)						
<20	27,927	5.0	38	5.7	1.36	0.96–1.87
20–34	414,257	74.0	500	75.4	1.21	1.10–1.31
35–39	95,058	17.0	99	14.9	1.04	0.85–1.27
≥40	22,545	4.0	26	3.9	1.15	0.75–1.69
Unknown	32	0.0	-	-	-	-
Deprivation quintile						
1 (least deprived)	80,732	14.4	66	10.0	0.82	0.63–1.04
2	88,315	15.8	96	14.5	1.09	0.88–1.33
3	102,188	18.3	125	18.9	1.22	1.01–1.44*
4	126,589	22.6	170	25.6	1.34	1.14–1.54*
5 (most deprived)	158,355	28.3	206	31.1	1.30	1.12–1.48*
Unknown	3640	0.7	-	-	-	-

† Includes 32 unknown maternal ethnicity among MAT births

* indicates rate statistically significantly different at the 0.05 level

MELAA = Middle Eastern, Latin American, or African

Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

Table A4.12: NE rates (per 1000 term births) by DHB of maternal residence 2010–2019

DHB of residence	MAT births ≥37 weeks	Total NE cases	Rate (/1000 term births)	
	N=564,623	n=663		
	n	n	/1000	95% CI
Northland	20,975	23	1.10	0.70–1.65
Waitematā	72,679	63	0.87	0.67–1.11
Auckland	57,010	49	0.86	0.64–1.14
Counties Manukau	77,626	82	1.06	0.84–1.31
Waikato	49,741	76	1.53	1.20–1.91
Bay of Plenty	27,171	33	1.21	0.84–1.71
Lakes	14,114	19	1.35	0.81–2.10
Hauora Tairāwhiti	6654	9	1.35	0.62–2.57
Taranaki	14,083	26	1.85	1.21–2.71
Hawke's Bay	19,646	27	1.37	0.91–2.00
Whanganui	7763	14	1.80	0.99–3.03
MidCentral	19,910	24	1.21	0.77–1.79
Wairarapa	4669	4	0.86	0.23–2.19
Capital & Coast	33,136	55	1.66	1.25–2.16
Hutt Valley	18,221	25	1.37	0.89–2.03
Nelson Marlborough	14,154	22	1.55	0.97–2.35
West Coast	3367	6	1.78	0.65–3.88
Canterbury	57,605	63	1.09	0.84–1.40
South Canterbury	5938	12	2.02	1.04–3.53
Southern	31,986	31	0.97	0.66–1.38
Other†	3371	-	-	-

† Other includes Overseas, Unknown and Other

Sources: Numerator: PMMRC's NE data extract ≥37 weeks 2010–2019; Denominator: MAT births ≥37 weeks 2010–2019

A5 Maternal Mortality | Te Mate o ngā Whaea

Definitions

Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy (miscarriage, termination or birth), irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.[68] Over the period 2006–2019, the PMMRC has collected information on a total of 164 maternal deaths during pregnancy or within 42 days postpartum, including 28 coincidental deaths. Unless stated otherwise, this analysis excludes data relating to coincidental maternal deaths.

The cause of maternal death is sub-classified into the following categories based on The WHO Application of ICD-10 to *Deaths during Pregnancy, Childbirth and Puerperium: ICD-MM*. [69]

- **Direct maternal deaths**: those resulting from obstetric complications of the pregnant state (pregnancy, labour or puerperium) from interventions, omissions, incorrect treatment or from a chain of events resulting from the above. In 2018, the PMMRC adopted the World Health Organization (WHO) revision to include deaths by suicide with direct maternal deaths. We then applied it retrospectively to data from previous years.
- **Indirect maternal deaths**: those resulting from previous existing disease or disease that developed during pregnancy and was not due to direct obstetric causes but that was aggravated by the physiologic effects of pregnancy.
- **Unknown/Undetermined (or Unclassifiable) maternal death** is a death during pregnancy, childbirth and the puerperium where the underlying cause is unknown or was not determined.
- **Coincidental maternal deaths**: deaths from unrelated causes that happen to occur in pregnancy or the puerperium.

[68] World Health Organization. nd. Number of maternal deaths. URL: https://www.who.int/data/gho/data/indicators/indicator-details/GHO/number-of-maternal-deaths (accessed 31 January 2022).

[69] https://apps.who.int/iris/handle/10665/70929

Findings

Figure A5.1: Maternal mortality ratios (per 100,000 maternities) (rolling one-year and three-year) 2006–2019†

Note: The number of deaths in 2016 was too small to calculate a reliable 1-year MMR.

† Rolling three-year maternal mortality ratio represented at final year of triennium.

MMR = maternal mortality ratio.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Table A5.1: Single-year and three-year rolling maternal mortality ratios (per 100,000 maternities) 2006–2019[70]

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Total maternal deaths	15	11	9	14	9	9	10	13	4	11	**<3**	9	10	8
Single-year MMR	24.39	16.87	13.71	21.47	13.75	14.23	15.80	21.62	6.66	18.40	s	14.88	16.86	13.20
Three-year rolling MMR	**–**	**–**	**06–08**	**07–09**	**08–10**	**09–11**	**10–12**	**11–13**	**12–14**	**13–15**	**14-16**	**15–17**	**16–18**	**17–19**
			18.20	17.34	16.30	16.50	14.58	17.14	14.71	15.55	9.42	12.16	11.64	14.97

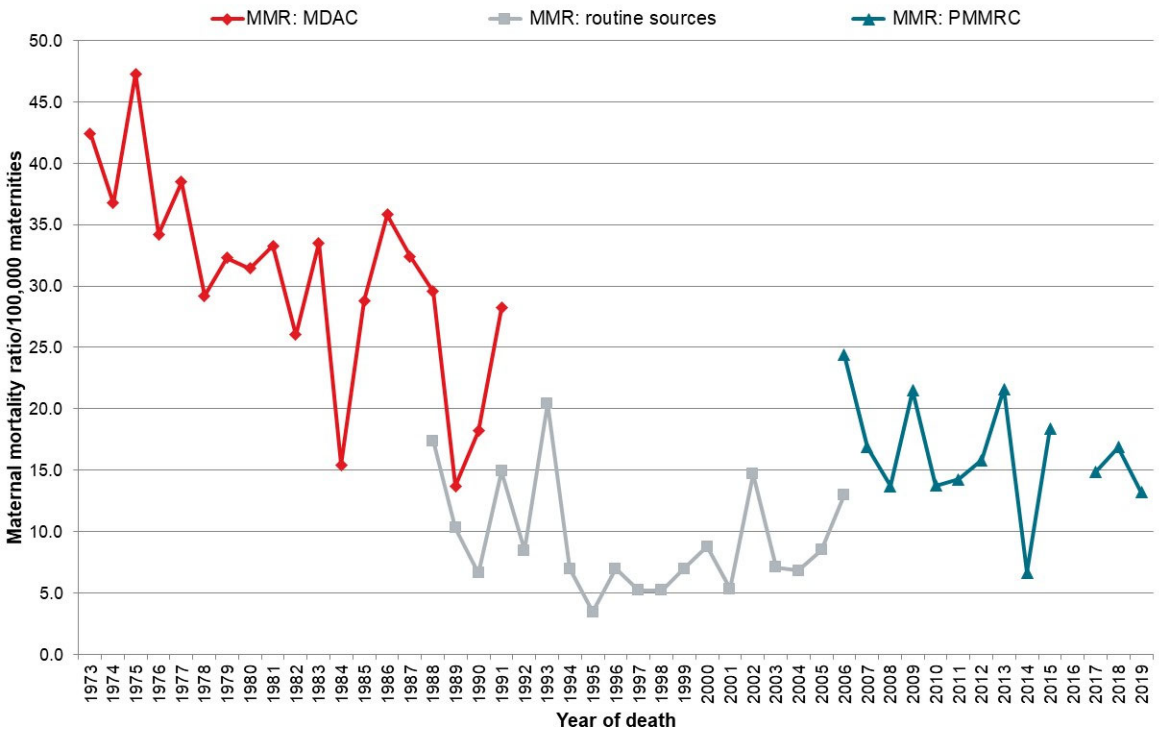
's' indicates rate not calculated due to small numbers.

MMR = maternal mortality ratio.

Source: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

[70] Cause specific ratio for the period 2006–2019 was 15.39/100,000 maternities. There was no statistically significant change in the MMR over this time: regression test for trend -0.56 (95% CI -1.32, 0.20).

Figure A5.2: New Zealand maternal mortality ratio (per 100,000 maternities) by mortality data source 1973–2019



Note: the numbers of deaths in 2016 was too small to calculate a reliable rate for this year.

MMR = maternal mortality ratio.

MDAC = Maternal Deaths Assessment Committee.

MMR: MDAC: Data from the MDAC, including maternal deaths to three months postpartum.

MMR: routine sources: Data from routine New Zealand datasets (i.e., Births, Deaths and Marriages (BDM), Mortality Collection and the National Minimum Dataset), including maternal deaths to six weeks postpartum.

MMR: PMMRC: Data from the PMMRC, including maternal deaths to six weeks postpartum.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Table A5.2: Demographic characteristics among maternal deaths 2006–2019

	Maternities		Maternal mortality 2006–2019						Chi-squared test (p)
	N=870,563		n=134		Maternal mortality ratio	95% CI	RR	95% CI	
	N	%	n	%	/100,000 maternities				
Maternal age (years)									
<20	50,988	5.9	6	4.5	11.77	4.32–25.61	0.94	0.39–2.26	
20–24	150,465	17.3	18	13.4	11.96	7.09–18.91	0.96	0.54–1.71	
25–29	225,575	25.9	38	28.4	16.85	11.92–23.12	1.35	0.84–2.16	0.014
30–34	256,703	29.5	32	23.9	12.47	8.53–17.60	1.00	-	
35–39	150,847	17.3	27	20.1	17.90	11.80–26.04	1.44	0.86–2.40	
≥40	35,678	4.1	13	9.7	36.44	19.40–62.31	2.92	1.53–5.57	
Unknown	307	0.0	-	-	-	-	-	-	
Prioritised ethnic group (mother)									
Māori	224,272	25.8	54	40.3	24.08	18.09–31.42	1.85	1.24–2.76	
Pacific peoples	96,238	11.1	21	15.7	21.82	13.51–33.36	1.68	1.00–2.83	
Asian	117,123	13.5	13	9.7	11.10	5.91–18.98	0.85	0.46–1.59	
Indian	38,577	4.4	5	3.7	12.96	4.21–30.25	1.00	0.39–2.52	
Other Asian	78,546	9.0	8	6.0	10.19	4.40–20.07	0.78	0.37–1.67	<0.001
MELAA	18,160	2.1	-	-	-	-	-	-	
European	414,170	47.6	46	34.3	11.11	8.13–14.81	0.85	0.56–1.29	
NZ European	330,755	38.0	43	32.1	13.00	9.41–17.51	1.00	-	
Other European	83,415	9.6	3	2.2	3.60	0.74–10.51	0.28	0.09–0.89	
Other	-	-	-	-	-	-	-	-	
Unknown	600	0.1	-	-	-	-	-	-	
Deprivation quintile									
1 (least deprived)	123,366	14.2	12	9.0	9.73	5.03–16.99	1.00	-	
2	133,672	15.4	12	9.0	8.98	4.64–15.68	0.92	0.41–2.05	
3	157,544	18.1	23	17.2	14.60	9.25–21.91	1.50	0.75–3.02	0.028
4	198,757	22.8	38	28.4	19.12	13.53–26.24	1.97	1.03–3.76	
5 (most deprived)	249,099	28.6	49	36.6	19.67	14.55–26.01	2.02	1.08–3.80	
Unknown	8125	0.9	-	-	0.00	-	0.00	-	

MELAA = Middle Eastern, Latin American, or African

Source: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Table A5.3: Characteristics among maternal deaths, by parity and body mass index (BMI) 2006–2019

	Maternities		Maternal mortality	
	N=870,563		n=134	
	N	%	n	%
Parity†				
0	319,414	36.7	36	26.9
1–3	439,600	50.5	67	50.0
4+	42,392	4.9	28	20.9
Unknown	69,157	7.9	3	2.2
Maternal BMI (kg/m²)‡				
<18.50	19,067	2.2	3	2.2
18.50–24.99	336,092	38.6	41	30.6
25.00–29.99	180,877	20.8	23	17.2
30.00–34.99	93,865	10.8	25	18.7
35.00–39.99	43,095	5.0	18	13.4
≥40	25,554	2.9	19	14.2
Missing data for height and or weight	172,013	19.8	5	3.7

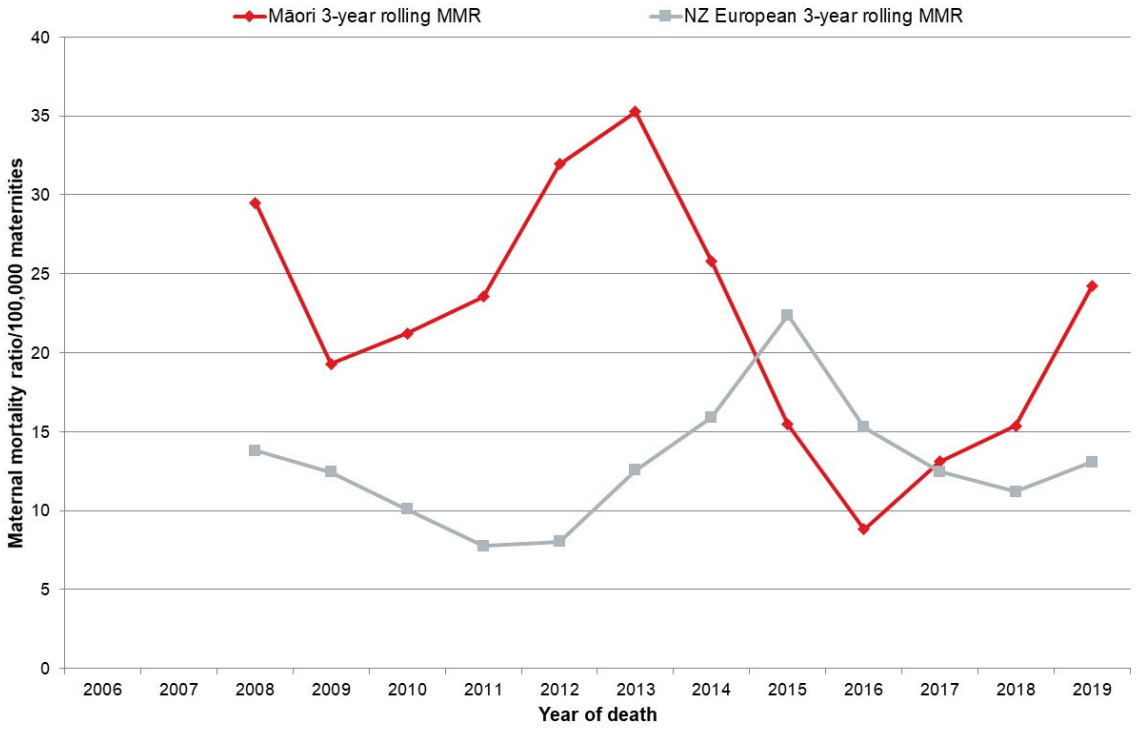
† Mortality rates by parity not calculated as denominator data unreliable.

‡ Mortality rates by BMI not calculated as denominator data unreliable.

BMI = body mass index.

Source: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Figure A5.3: Maternal three-year rolling mortality ratios (per 100,000 maternities) by prioritised ethnic group (Māori and New Zealand European) and year 2006–2019



MMR = maternal mortality ratio.

There was no statistically significant change in the MMR over this time: regression test for trend for wāhine Māori 0.95, 95% CI -3.13, 1.23; for non-Māori women 0.21, 95% CI -0.99, 1.41.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Table A5.4: Maternal mortality ratios (per 100,000 maternities) and cause of maternal death† 2006–2019

	2006–2019		2006–2019
	n=134		Cause specific ratio
	n	%	/100,000 maternities
Maternities	870,563		
Direct maternal death	71	53.0	8.16
Suicide	30	22.4	3.45
Pregnancies with abortive outcome (ectopic and miscarriage)‡	3	2.2	0.34
Hypertensive disorders	4	3.0	0.46
Obstetric haemorrhage	4	3.0	0.46
Pregnancy-related infection	7	5.2	0.80
Other obstetric complications	23	17.2	2.64
Amniotic fluid embolism	14	10.4	1.61
Venous thrombo-embolism	6	4.5	0.69
Other	3	2.2	0.34
Indirect maternal death	56	41.8	6.43
Cardiac	15	11.2	1.72
Neurological	15	11.2	1.72
Infections not a direct result of pregnancy	10	7.5	1.15
Other non-obstetric complications	13	9.7	1.49
Psychiatric causes - Drugs/alcohol/other	<3	x	s
Unknown	<3	x	s
Unknown/undetermined	7	5.2	-

† Other causes with small numbers have been suppressed.

‡ This is the WHO category that includes first trimester pregnancy complications such as miscarriages and ectopic pregnancy.

'x' indicates percentage suppressed due to small numbers.

's' indicates rate suppressed due to small numbers.

Source: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Maternal suicide

Table A5.5: Maternal suicide by prioritised ethnic group† 2006–2019

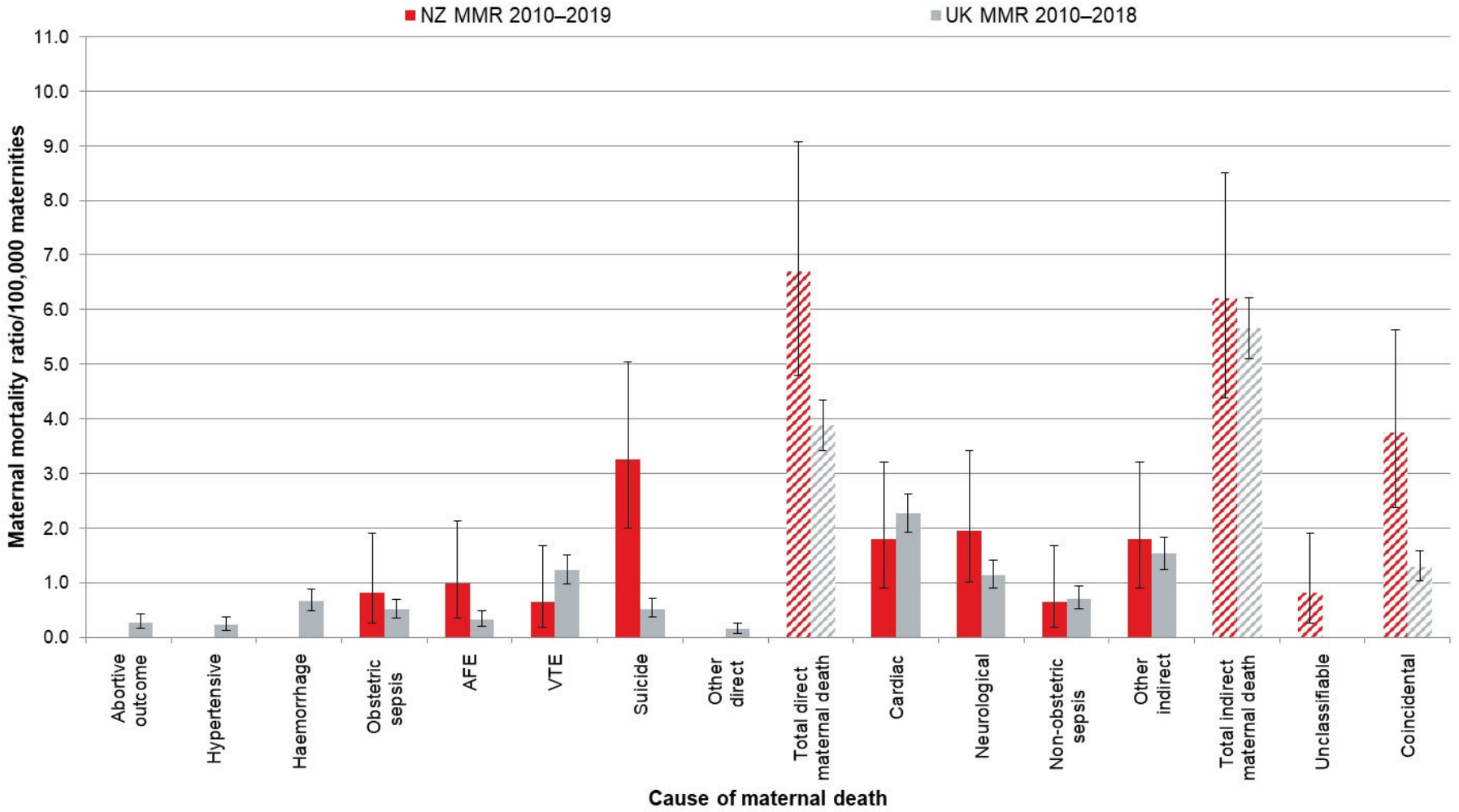
Maternal prioritised ethnic group	N	n	Rate	RR	95% CI
Māori	224,272	18	8.03	3.32	1.44–7.63
NZ European	330,755	8	2.42	1.00	-

† Excludes four cases that were in Pacific and 'Other Asian' ethnic groups.

There were no deaths due to suicide in Indian, MELAA, Other European or other ethnic groups.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2019; Denominator: MAT data 2006–2019.

Figure A5.4: Cause specific maternal mortality ratios† (per 100,000 maternities, with 95% CIs) in New Zealand 2010–2019 and the UK 2010–2018



† Includes coincidental deaths.

Note: The maternal mortality ratios of Abortive outcome, Hypertensive, Haemorrhage and Other direct for NZ MMR 2011–2020 suppressed due to small numbers.

The shaded bars represent total of direct, indirect, unclassifiable and coincidental deaths.

AFE = amniotic fluid embolism.

MMR = maternal mortality ratio.

VTE = venous thromboembolism.

‘Other direct’ includes cardiomyopathy.

‘Other indirect’ includes endocrine and respiratory conditions, neoplasms, other pre-existing medical conditions.

Coincidental includes motor vehicle accident, external causes of accidental injury, assault, malignancy not related to pregnancy.

Sources: NZ MMR: Numerator: PMMRC's maternal mortality data extract 2010–2019; Denominator: MAT data 2010–2019. UK MMR: Numerator: Maternal Deaths and Morbidity, includes surveillance data on women who died during or up to one year after pregnancy 2010–2018 in the UK;

Denominator: The number of pregnancies that result in a live birth at any gestation or stillbirths occurring at or after 24 completed weeks of gestation, supplied by organisations such as ONS, the Scotland General Registrar Office (GRO), Northern Ireland Statistical Research Agency (NISRA) and Hospital Episode Statistics (HES) 2010–2018.

UK MMR: Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK) November 2019, "Saving Lives, Improving Mothers Care: Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2016–18", Maternal, Newborn and Infant Clinical Outcome Review Programme.

Perinatal and Maternal Mortality Review Committee

He matenga ohorere, he wairua uiui, wairua mutungakore

Health Quality & Safety Commission New Zealand
Kupu Taurangi Hauora o Aotearoa

Appendix B: Perinatal and Maternal Mortality Review Committee Recommendations yet to be Fully Implemented | Āpitihanga B: Ngā tohutohu a te Komiti Arotake mō Te Mate Pēpi, Mate Whaea Kāore anō kia Tino Whakaritea

December 2022 | Hakihea 2022

Appendix B contents | Āpitihanga B: Ngā Ihirangi

Introduction | He Kupu Whakataki

This document includes sets of recommendations that have been made by the Perinatal and Maternal Mortality Review Committee (the PMMRC) since its first report in 2007 but that are not yet fully implemented. Although significant work has been undertaken towards implementing these recommendations, preventable deaths continue, and further priority must be given to the recommendations in this document. Each set of recommendations is aimed at a different area of maternity services and governing bodies. Importantly, we must all continue to support the work of our colleagues and organisations in owning these responsibilities. Together, we can make the greatest and most valuable impact towards changing outcomes for women and their babies, families and whānau. The report in which each recommendation first appeared is given in italics.

Government Departments and Agencies | Ngā Tari me ngā Pokapū Kāwanatanga

The recommendations in this section are aimed at government departments and agencies, and they should be viewed alongside the other tables. It is important that government ensures adequate funding and infrastructure to enable regions, districts and clinicians to implement the PMMRC recommendations.

Perinatal Mortality

Antenatal care/screening

1. All women should commence maternity care before 10 weeks, for the following reasons:
    - opportunity to offer screening for congenital abnormalities, sexually transmitted infections, family violence and maternal mental health and to refer as appropriate
    - education around nutrition (including appropriate weight gain), smoking, alcohol and drug use and other at-risk behaviours
    - recognition of underlying medical conditions with referral for secondary care as appropriate
    - identification of vunerable women at increased risk of perinatal related mortality. *(Fifth Annual Report, 2011)*
2. As smoking is a significant modifiable risk factor for both stillbirth and neonatal death, every effort must be made to encourage women to engage in effective smoking cessation programmes prior to, during and after pregnancy. *(Eighth Annual Report, 2014*)
3. Strategies to improve awareness of antenatal care services and increase access among women who are isolated for social, economic, cultural or language reasons should be developed. (*Third Annual Report, 2009*)

Guidelines

4. The PMMRC recommends a review of epilepsy in the Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines). (*Ninth Annual Report, 2015*)

Data Collection

5. The Ministry of Health should continue to support and fund [district health boards (DHBs); now health districts] and lead maternity carers (LMCs) in their collection of complete perinatal mortality statistics. (*Third Annual Report, 2009*)

6. As a matter of urgency, the Ministry of Health update the National Maternity Collection (MAT), including the ethnicity data as identified by the parents in the birth registration process. (*Eleventh Annual Report, 2017; Ninth Annual Report, 2015*)
7. The national MAT, linked to birth registration ethnicity data, be available for use by the mortality review committees. Access to these data would allow PMMRC to report the independent associations between ethnicity, maternal age, socioeconomic status and perinatal related death, adjusting for smoking and maternal body mass index. (*Seventh Annual Report, 2013*)
8. The PMMRC recommends the Ministry of Health:
    - urgently require DHBs to provide complete and accurate registration data to the MAT dataset (as required of LMCs providing services to pregnant women in order to receive funding for those services). Specifically, this should include women who present for birthing at DHB facilities without previous antenatal LMC registration and women who are provided primary maternity care by DHB maternity services
    - require that the MAT dataset include complete registration and antenatal data on live and stillborn babies from 20 weeks gestation (including terminations of pregnancy). *(Eleventh Annual Report, 2011)*

Mothers less than 20 years

9. Maternity and primary care providers need to be aware of the increasing risk of perinatal mortality for mothers under 20 years of age in New Zealand. Inequity in perinatal mortality for babies born to mothers under 20 years of age needs to be actively addressed. The PMMRC recommends the Ministry of Health and DHBs:
    - develop, in consultation with young mothers, acceptable and safe methods for mothers under 20 years of age to access and engage with care in order to achieve equitable health outcomes
    - identify and adequately resource evidence-based solutions to address risks for mothers under 20 years of age, paying attention to smoking cessation, screening and treatment for infections, screening for fetal growth restriction, and providing adequate information about the causes and symptoms of preterm labour
    - consider how they can support LMCs caring for mothers aged under 20 years. *(Twelfth Annual Report, 2018)*

Preterm birth

10. The PMMRC recommends the Ministry of Health establish a multidisciplinary working group to review current evidence for implementation of a preterm birth prevention programme such as that implemented in Western Australia, taking care to:
    - identify and adequately resource evidence-based solutions
    - ensure equitable access to screening and/or treatment for priority populations
    - ensure that priority populations have a voice in the development of health policy, process and practice in order to achieve equitable health outcomes
    - ensure that the outcomes of any implemented programme, including equity of access, are evaluated. *(Twelfth Annual Report, 2018)*
11. Birth in a tertiary centre is associated with improved outcomes for preterm babies at the lower limits of viability (prior to 25 weeks gestation). The PMMRC recommends the Ministry of Health leads the

development of a national consensus pathway for the care of women in preterm labour or requiring delivery prior to 25 weeks gestation. The PMMRC recommends this pathway includes:

- ensuring that all groups of women (irrespective of ethnicity, age, socioeconomic status or place of residence) are offered and provided the same level of care
- strategies for secondary units for management of women in threatened or early preterm labour, or who require delivery, prior to 25 weeks gestation. Including:
  - administration of corticosteroids and magnesium sulphate
  - timely transfer from primary and secondary units to tertiary units
  - management of babies inadvertently born in their units at the lower limits of viability
- ensuring that priority populations have a voice in the development of health policy, process and practice in order to achieve equitable health outcomes
- guidance on monitoring that care provision is equitable by ethnicity, age, socioeconomic status and place of residence. *(Twelfth Annual Report, 2018)*

12. **Priority recommendation:** There is a need to recognise the independent impact of socioeconomic deprivation on perinatal death, specifically on preterm birth, which after congenital abnormality is the leading cause of perinatal death. Addressing the impact of poverty requires wider societal commitment as has been highlighted in the recent health select committee report on improving child health outcomes. The PMMRC supports the implementation of the recommendations. The report can be found at https://www.parliament.nz/en/pb/sc/reports/document/50DBSCH_SCR6007_1/inquiry-into-improving-child-health-outcomes-and-preventing. *(Eighth Annual Report, 2014)*

Sudden unexpected death in infancy (SUDI) prevention

13. The PMMRC recommends that the Ministry of Health and DHBs have a responsibility to ensure that midwifery staffing ratios and staffing acuity tools:
    - enable active observation of mothers and babies who are undertaking skin-to-skin contact in the postnatal inpatient period
    - allow for the identification of, and additional needs of, mothers who have increased risk factors for SUDI. *(Twelfth Annual Report, 2018)*

Neonatal Encephalopathy (NE)

1. The Neonatal Encephalopathy Working Group (NEWG) and PMMRC support the development of a guideline for the investigation and management of NE. *(Eighth Annual Report, 2014)*

Maternal Mortality

Maternal mental health

1. The PMMRC recommends that a maternal and infant mental health network is funded by the Ministry of Health and that the network then determine an achievable work stream by the end of 2018 detailing work to be completed by the end of 2020, to include as potential areas of priority:
    - a national pathway for accessing maternal mental health services, including:
      - cultural appropriateness to ensure equity of service access and provision
      - appropriate screening
      - care for women with a history of mental illness
      - communication and coordination. *(Twelfth Annual Report, 2018)*

2. That a perinatal and infant mental health network be established to provide an interdisciplinary and national forum to discuss perinatal mental health issues. (*Tenth Annual Report, 2016*)

3. A comprehensive perinatal and infant mental health service should include:
    - screening and assessment
    - timely interventions including case management, transition planning and referrals
    - access to respite care and specialist inpatient care for mothers and babies
    - consultation and liaison services within the health system and with other agencies, for example, primary care and termination of pregnancy (TOP) services. *(Sixth Annual Report, 2012)*

Mortality review committees Māori caucus relating to maternal mental health

4. Improve awareness and responsiveness to the increased risk for Māori women. (*Eleventh Annual Report, 2017*)

Support for Parents, Families and Whānau

1. **Priority recommendation:** The Ministry of Health should resource, support and facilitate the development of a national perinatal bereavement pathway with key stakeholders, including governmental and non-governmental organisations, to ensure high-quality, appropriate and equitable care for all. (*Thirteenth Annual Report, 2019*)

2. Develop and improve the provision of perinatal pathology services with regards to accessibility, training and appropriateness and ensure quality and equitable services are available across the country. *(First Annual Report, 2007; Second Annual Report, 2008)*

Te Whatu Ora – Health New Zealand Districts | Te Whatu Ora – Ngā Rohe

The recommendations in this section are aimed at Te Whatu Ora – Health New Zealand districts. It is important that Te Whatu Ora districts view these recommendations alongside recommendations for health practitioners. This is to ensure that districts, through good systems and processes, can effectively support clinicians to implement PMMRC recommendations.

1. DHBs should demonstate that they have co-developed and implemented models of care that meet the needs of mothers of Indian ethnicity. *(Thirteenth Annual Report, 2019)*
2. **Priority recommendation:** That all maternity care providers identify women with modifiable risk factors for perinatal related death and work individually and collectively to address these strategies to address modifiable risk factors, including:
    - pre-pregnancy care for known medical disease such as diabetes
    - access to antenatal care
    - accurate height and weight measurement in pregnancy with advice on ideal weight gain
    - prevention and appropriate management of multiple pregnancy
    - smoking cessation
    - antenatal recognition and management of threatened preterm labour
    - following evidence-based recommendations for indications for induction of labour
    - advice to women and appropriate management of decreased fetal movements.
3. All DHBs should report the availability and uptake of relevant services in their annual clinical report to ensure that these strategies are embedded and to identify areas for improvements. *(Ninth Annual Report, 2015)*
4. **Priority recommendation:** There is a need to recognise the independent impact of socioeconomic deprivation on perinatal death, specifically on preterm birth, which after congenital abnormality is the leading cause of perinatal death. Addressing the impact of poverty requires wider societal commitment as has been highlighted in the recent health select committee report on improving child health outcomes. The PMMRC supports the implementation of the recommendations. The report can be found at https://www.parliament.nz/en/pb/sc/reports/document/50DBSCH_SCR6007_1/inquiry-into-improving-child-health-outcomes-and-preventing. *(Eighth Annual Report, 2014)*
5. For the management of suspected ectopic pregnancies, the PMMRC recommends DHB gynaecology services have:
    - clear pathways/processes for primary care regarding early pregnancy management.
6. Clear hospital guidelines for assessment of the collapsed woman of reproductive age that include the differential diagnosis of ectopic pregnancy. Collapse due to ectopic pregnancy requires rapid assessment and surgical management. *(Thirteenth Annual Report, 2019)*
7. Strategies to improve awareness of antenatal care services and increase access among women who are isolated for social, economic, cultural or language reasons should be developed. *(Third Annual Report, 2009)*

Communication and coordination

8. Pregnant women who are admitted to hospital for medical conditions not related to pregnancy need to have specific referral pathways for perinatal care. *(Fifth Annual Report, 2011)*

Education

9. **Priority recommendation:** The PMMRC recommends that regulatory bodies require cultural competency training of all individuals working across all areas of the maternity and neonatal workforce. Training should address awareness of, and strategies to reduce and minimise the impact of, implicit bias and racism. *(Twelfth Annual Report, 2018)*

10. The PMMRC recommends that DHBs provide free interdisciplinary fetal surveillance education for all clinicians involved in intrapartum care on a triennial basis. This is to be provided free for staff and at no cost to LMCs. The PMMRC encourages the Midwifery Council, the New Zealand College of Midwives (NZCOM) and Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) to work with DHBs in the implementation of this recommendation.
    - This education includes risk assessment for babies throughout pregnancy as well as intrapartum observations.
    - The aims include strengthening of supervision and support to promote professional judgement, interdisciplinary conversations and reflective practice. *(Thirteenth Annual Report, 2019; Ninth Annual Report, 2015)*

11. Offer education to all clinicians so they are proficient at screening women and are aware of local services and pathways to care for the following:
    - family violence
    - smoking
    - alcohol and other substance use. *(Ninth Annual Report, 2015)*

12. All clinicians involved in the care of pregnant women should undertake regular multidisciplinary training in management of obstetric emergencies. *(Tenth Annual Report, 2016; Fifth Annual Report, 2011)*

Mothers less than 20 years

13. **Priority recommendation:** Maternity and primary care providers need to be aware of the increasing risk of perinatal mortality for mothers under 20 years of age in New Zealand. Inequity in perinatal mortality for babies born to mothers under 20 years of age needs to be actively addressed. The PMMRC recommends the Ministry of Health and DHBs:
    - develop, in consultation with young mothers, acceptable and safe methods for mothers under 20 years of age to access and engage with care in order to achieve equitable health outcomes
    - identify and adequately resource evidence-based solutions to address risks for mothers under 20 years of age, paying attention to smoking cessation, screening and treatment for infections, screening for fetal growth restriction, and providing adequate information about the causes and symptoms of preterm labour
    - consider how they can support LMCs caring for mothers aged under 20 years. *(Twelfth Annual Report, 2018)*

14. **Priority recommendation:** Maternity services for teenage mothers need to address this increased risk by the provision of services that specifically meet their needs, paying attention to:
    - commencing maternity care before 10 weeks
    - smoking cessation, prevention of preterm birth (including smoking cessation, sexually transmitted infection screening and treatment, urinary tract infection screening and treatment) and screening for fetal growth restriction using regular fundal height measurement on customised growth charts
    - providing appropriate antenatal education. *(Fifth Annual Report, 2011)*

Preterm birth

15. DHBs make available appropriate information, including appropriate counselling for parents, families and whānau, about birth outcomes prior to 25 weeks gestation to enable shared decision making and planning of active care or palliative care options. *(Twelfth Annual Report, 2018)*
16. DHB maternity services audit the rates of antenatal corticosteroid administration, including repeat doses when indicated, to mothers of neonates live born at less than 34 weeks gestation, including auditing whether administration is equitable by ethnicity, DHB of residence and maternal age. *(Twelfth Annual Report, 2018)*

SUDI prevention

17. The PMMRC recommends that LMCs and DHBs ensure that every baby will have access to a safe sleep place on discharge from the hospital or birth unit, or at home, that is their own place of sleep, on their back and with no pillow. If they do not have access to a safe sleep place, then a wahakura or Pēpi-Pod must be made available for the baby's use prior to discharge from hospital. *(Twelfth Annual Report, 2018)*
18. The PMMRC recommends that DHBs have a responsibility to ensure that midwifery staffing ratios and staffing acuity tools:
    - enable active observation of mothers and babies who are undertaking skin-to-skin contact in the postnatal inpatient period
    - allow for the identification of, and additional needs of, mothers who have increased risk factors for SUDI. *(Twelfth Annual Report, 2018)*

Data collection

19. Clinicans and LMCs should be encouraged to collect accurate ethnicity details at the time of booking. *(Fourth Annual Report, 2010)*

Post-mortem

20. It is recommended that mothers who experience intrapartum stillbirth or intrapartum deaths of babies at term without obvious congenital abnormality are encouraged to have a full investigation, including a post-mortem examination. *(Third Annual Report, 2009)*

NE

1. All NE cases need to be considered for a severity assessment code (SAC) rating. Neonatal hypoxic brain injury resulting in permanent brain damage (or permanent and severe loss of function) should be rated as SAC1. Those who received cooling with as yet undetermined outcome should be rated as SAC3. *(Thirteenth Annual Report, 2019)*
2. All babies with NE, regardless of severity, should have a multidisciplinary discussion about whether to refer to the Accident Compensation Corporation (ACC) for consideration for cover as a treatment injury, using ACC's *Treatment Injury Claim Lodgement Guide*. Parents should be advised that not all treatment claims are accepted. All clinicians involved in the care of pregnant women should undertake regular multidisciplinary training in management of obstetric emergencies. *(Tenth Annual Report 2016; Fifth Annual Report, 2011)*
3. DHBs with rates of NE significantly higher than the national rate review or continue to review the higher rate of NE in their area and identify areas for improvement. *(Twelfth Annual Report, 2018; Eleventh Annual Report, 2017; Tenth Annual Report, 2016)*

4. Widespread multidiscipinary education is required on the recognition of NE with a particular emphasis on babies with evidence of neonatal asphyxia (eg, babies who required resuscitation) for all providers of care for babies in the immediate postpartum period. This should include:
    - recognition of babies at increased risk by their history
    - signs suggestive of encephalopathy
    - knowledge of clinical pathways to induce cooling if required. *(Ninth Annual Report, 2015)*
5. All DHBs should undertake local review of cases of NE to identify areas for improvement in care, including adequacy of resuscitation and cooling. *(Eighth Annual Report, 2014)*

Maternal Mortality

Antenatal care/screening

1. Women with pre-existing medical conditions (such as epilepsy, hypertension or mental health) should have individualised pre-conceptual counselling about their condition and the medication they are taking. Health professionals providing care to these women need to communicate the importance of continuing their medication in pregnancy, if appropriate, and to advise women to seek early medical review. *(Seventh Annual Report, 2013)*
2. Women with complex medical conditions require a multidisciplinary approach to care, often across more than one DHB. Each woman requiring such care should be assigned a key clinician to facilitate her care. *(Third Annual Report, 2009)*

Communication and coordination

3. Women who are unstable or clinically unwell should be cared for in the most appropriate place within each unit in order for close observation to occur. When observations are abnormal, clear documentation, early review by a senior clinican and development of a detailed management plan are required. *(Eighth Annual Report, 2014)*
4. Pregnant women who are admitted to hospital for medical conditions that are not related to pregnancy need to have specific referral pathways for perinatal care. *(Fifth Annual Report, 2011)*
5. Women with serious pre-existing medical conditions require a multidisciplinary management plan for the pregnancy, birth and postpartum period. This plan must be communicated to all relevant caregivers. *(Eighth Annual Report, 2014)*

Maternal mental health

6. A comprehensive perinatal and infant mental health service includes:
    - screening and assessment
    - timely interventions, including case management, transition planning and referrals
    - access to respite care and specialist inpatient care for mothers and babies
    - consultation and liaison services within the health system and with other agencies, for example, primary care and TOP services. *(Sixth Annual Report, 2012)*
7. TOP services should undertake holistic screening for maternal mental health and family violence and provide appropriate support and referral. *(Sixth Annual Report, 2012)*

8. At first contact with services, women should be asked:
    - are you currently receiving, or have you ever received treatment for a serious mental illness such as severe depression, bipolar disorder, schizophrenia or psychosis?
    - have you ever had treatment from a psychiatrist or specialist mental health team in the past?
    - do you have a family history of mental illness, including perinatal mental illness?

    Women with a previous history of serious affective disorder or other psychoses should be referred in pregnancy for psychiatric assessment and management, even if they are well. Regular monitoring and support is recommended for at least three months following delivery. *(Fifth Annual Report, 2011)*

Mortality review committees Māori caucus relating to maternal mental health

9. Improve awareness and responsiveness to the increased risk for Māori women. *(Eleventh Annual Report, 2017)*
10. All providers of maternity, obstetric, mental health and maternal mental health services should improve their systems, guidelines and professional development to ensure that they are responsive to the identified increased risk for Māori women. *(Eleventh Annual Report, 2017)*
11. Māori women who have a history of serious mental illness and are currently well should be referred to specialist mental health services for a mental health birth plan, and monitored closely by their maternity care provider +/- mental health services. Where such a woman has a miscarriage, the general practitioner (GP) should be notified immediately and an explicit process for early follow-up that includes a review of mental health status agreed with the GP. *(Eleventh Annual Report, 2017)*
12. Where Māori women exhibit symptoms suggesting serious mental illness or distress, an urgent mental health assessment, including consultant psychiatrist review and consultation with perinatal mental health services, on the same day these symptoms are first noted should be undertaken. *(Eleventh Annual Report, 2017)*
13. Primary care (GPs, family planning association [FPA]), LMCs, TOP services, alcohol and drug services and secondary and tertiary providers of maternity, obstetric, mental health and maternal mental health services should improve their systems, guidelines and professional development to ensure that they are responsive to the identified increased risk for Māori women. *(Eleventh Annual Report, 2017)*
14. Communication and coordination between primary care (GPs, FPA), LMCs, TOP services, alcohol and drug services and secondary providers of maternity, obstetric, mental health and maternal mental health services should be improved and enhanced using a variety of means, including but not limited to case management, integrated notes systems and electronic transfer of information. *(Eleventh Annual Report, 2017)*

Auditing

1. The PMMRC recommends that DHBs with rates of perinatal related mortality and NE significantly higher than the national rate review, or continue to review, the higher rates of mortality in their area and identify areas for improvement. *(Twelfth Annual Report, 2018; Eleventh Annual Report, 2017; Tenth Annual Report, 2016)*
2. DHBs should monitor key maternity indicators by ethnic group to identify variations in outcomes. They should then improve areas where there are differences in outcome. *(Thirteenth Annual Report, 2019)*
3. Further research is warranted to understand the higher rate of perinatal related mortality in the Counties Manukau region. *(Third Annual Report, 2009)*

Health Organisations, Colleges and Regulatory Bodies | Ngā Rōpū Hauora, Kāreti me ngā Rōpū Ture

The recommendations in this section are aimed at health organisations, colleges and regulatory bodies. It is important that health organisations view these recommendations alongside Appendix E recommendations for health practitioners. This is to ensure that health organisations, through good systems and education, can effectively support clinicians to implement PMMRC recommendations.

Perinatal Mortality

Antenatal care/screening

1. The PMMRC recommends that DHBs provide free interdisciplinary fetal surveillance education for all clinicians involved in intrapartum care on a triennial basis. This is to be provided free for staff and at no cost to LMCs. The PMMRC encourages the Midwifery Council, the NZCOM and RANZCOG to work with DHBs in the implementation of this recommendation.
    - This education includes risk assessment for babies throughout pregnancy as well as intrapartum observations.
    - The aims include strengthening of supervision and support to promote professional judgement, interdisciplinary conversations and reflective practice. *(Thirteenth Annual Report, 2019; Ninth Annual Report, 2015)*
2. The PMMRC endorses all recommendations of the audit of congenital abnormalities. Key recomendations from the audit include:
    - all primary care providers (if first contact of a pregnant woman with the health service) should offer first trimester screening and facilitate expeditious registration
    - the National Screening Unit review the cost benefit of the current algorithms in the first and second trimester screening programme, so they are calibrated for maximal sensitivity for all chromosomal abnormalities
    - the National Screening Unit review false-negative screening tests
    - the New Zealand National Maternal Fetal Medicine Network regularly audit time from referral to review to ensure that the majority of women are seen within seven days as recommended. *(Seventh Annual Report, 2013)*

Education

3. **Priority recommendation:** The PMMRC recommends that regulatory bodies require cultural competency training of all individuals working across all areas of the maternity and neonatal workforce. Training should address awareness of, and strategies to reduce and minimise the impact of, implicit bias and racism. *(Twelfth Annual Report, 2018)*

NE

1. Widespread multidiscipinary education is required on the recognition of NE, with a particular emphasis on babies with evidence of neonatal asphyxia (eg, babies who required resuscitation) for all providers of care for babies in the immediate postpartum period. This should include:
    - recognition of babies at increased risk by their history
    - signs suggestive of encephalopathy
    - knowledge of clinical pathways to induce cooling if required. *(Ninth Annual Report, 2015)*

2. The NEWG and PMMRC support the development of a guideline for the investigation and management of NE. *(Eighth Annual Report, 2014)*

Maternal Mortality

Mortality review committees Māori caucus relating to maternal mental health

1. Improved awareness and responsiveness to the increased risk for Māori women. *(Eleventh Annual Report, 2017)*
2. Primary care (GPs, FPA), LMCs, TOP services, alcohol and drug services and secondary and tertiary providers of maternity, obstetric, mental health and maternal mental health services should improve their systems, guidelines and professional development to ensure that they are responsive to the identified increased risk for Māori women. *(Eleventh Annual Report, 2017)*

Health Practitioners | Ngā Mātanga Hauora

The recommendations in this section are aimed at health practitioners involved in the care of pregnant women. It is important that government departments, agencies and Te Whatu Ora regions and their districts fund, develop and maintain effective systems and processes to enable health practitioners to implement these recommendations.

Perinatal Mortality

Antenatal care/screening

1. **Priority recommendation:** That all maternity care providers identify women with modifiable risk factors for perinatal related death and work individually and collectively to address these.

   Strategies to address modifiable risk factors include:

   - pre-pregnancy care for known medical disease such as diabetes
   - access to antenatal care
   - accurate height and weight measurement in pregnancy with advice on ideal weight gain
   - prevention and appropriate management of multiple pregnancy
   - smoking cessation
   - antenatal recognition and management of threatened preterm labour
   - following evidence-based recommendations for indications for induction of labour
   - advice to women and appropriate management of decreased fetal movements.

   All DHBs should report the availability and uptake of relevant services in their annual clinical report to ensure that these strategies are embedded and to identify areas for improvements. *(Ninth Annual Report, 2015)*

2. All women should commence maternity care before 10 weeks, for the following reasons:

   - opportunity to offer screening for congenital abnormalities, sexualy transmitted infections, family violence and maternal mental health and to refer as appropriate
   - education around nutrition (including appropriate weight gain), smoking, alcohol and drug use and other at risk behaviours
   - recognition of underlying medical conditions with referral for secondary care as appropriate
   - identification of vunerable women at increased risk of perinatal related mortality. *(Fifth Annual Report, 2011)*

3. If small for gestational age is confirmed by ultrasound at term, timely delivery is recommended. *(Sixth Annual Report, 2012)*

4. Pregnant women should consult their midwife, GP or specialist services as soon as symptoms of influenza-like illness develop or if other family members are unwell to allow:

   - referral to hospital for assessment if there are symptoms of respiratory compromise due to influenza, that is, worsening shortness of breath, especially at rest, productive cough, pleuritic chest pain, haemoptysis
   - prescription of antiviral medication. *(Fifth Annual Report, 2011)*

Communication and coordination

5. Pregnant women who are admitted to hospital for medical conditions not related to pregnancy need to have specific referral pathways for perinatal care. *(Fifth Annual Report, 2011)*

Data collection

6. Clinicans and LMCs should be encouraged to collect accurate ethnicity details at the time of booking. *(Fourth Annual Report, 2010)*

Education

7. All clinicians involved in the care of pregnant women should undertake regular multidisciplinary training in management of obstetric emergencies and resuscitation. *(Tenth Annual Report, 2016; Fifth Annual Report, 2011)*
8. **Priority recommendation:** Maternity services for teenage mothers need to address this increased risk by the provision of services that specifically meet their needs, paying attention to:
    - commencing maternity care before 10 weeks
    - smoking cessation, prevention of preterm birth (including smoking cessation, sexually transmitted infection screening and treatment, urinary tract infection screening and treatment) and screening for fetal growth restriction using regular fundal height measurement on customised growth charts
    - providing appropriate antenatal education. *(Fifth Annual Report, 2011)*

SUDI prevention

9. The PMMRC recommends that LMCs and DHBs ensure that every baby will have access to a safe sleep place on discharge from the hospital or birth unit, or at home, that is their own place of sleep, on their back and with no pillow. If they do not have access to a safe sleep place, then a wahakura or Pēpi-Pod must be made available for the baby's use prior to discharge from hospital. *(Twelfth Annual Report, 2018)*

NE

1. All NE cases need to be considered for a SAC rating. Neonatal hypoxic brain injury resulting in permanent brain damage (or permanent and severe loss of function should be rated as SAC1. Those who received cooling with as yet undermined outcome should be rated as SAC3. *(Thirteenth Annual Report, 2019)*
2. For all babies diagnosed with NE, a multidisciplinary discussion about whether to refer to the ACC for consideration for cover as a treatment injury, using ACC's *Treatment Injury Claim Lodgement Guide*, should be arranged. Parents should be advised that not all treatment claims are accepted. *(Thirteenth Annual Report, 2019)*
3. If NE 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. *(Sixth Annual Report, 2012)*
4. Cord gases should be performed on all babies born with an Apgar 7 at one minute. *(Sixth Annual Report, 2012)*

Maternal Mortality | Te Mate Whaea

Antenatal care/screening

1. Women with serious pre-existing medical conditions require a multidisciplinary management plan for the pregnancy, birth and postpartum period. This plan must be communicated to all relevant caregivers. *(Eighth Annual Report, 2014)*
2. Women who are unstable or clinically unwell should be cared for in the most appropriate place within each unit in order for close observation to occur. When observations are abnormal, clear documentation, early review by a senior clinican and development of a detailed management plan are required. *(Eighth Annual Report, 2014)*
3. Women with pre-existing medical conditions (such as epilepsy, hypertension or mental health) should have individualised pre-conceptual counselling about their condition and the medication they are taking. Health professionals providing care to these women need to communicate the importance of continuing their medication in pregnancy, if appropriate, and to advise women to seek early medical review. *(Seventh Annual Report, 2013)*
4. Pregnant women who are admitted to hospital for medical conditions not related to pregnancy need to have specific referral pathways for perinatal care. *(Fifth Annual Report, 2011)*

Communication and coordination

5. Women with complex medical conditions require a multidisciplinary approach to care, often across more than one DHB. Each woman requiring such care should be assigned a key clinician to facilitate her care. *(Third Annual Report, 2009)*

Maternal mental health

6. A comprehensive perinatal and infant mental health service should include:
    - screening and assessment
    - timely interventions, including case management, transition planning and referrals
    - access to respite care and specialist inpatient care for mothers and babies.
    - consultation and liaison services within the health system and with other agencies for example, primary care and TOP services. *(Sixth Annual Report, 2012)*
7. TOP services should undertake holistic screening for maternal mental health and family violence and provide appropriate support and referral. *(Sixth Annual Report, 2012)*
8. At first contact with services, women should be asked:
    - are you currently receiving, or have you ever received treatment for a serious mental illness such as severe depression, bipolar disorder, schizophrenia or psychosis
    - have you ever had treatment from a psychiatrist or specialist mental health team in the the past?
    - do you have a family history of mental illness, including perinatal mental illness?

    Women with a previous history of serious affective disorder or other psychoses should be referred in pregnancy for psychiatric assessment and management even if they are well. Regular monitoring and support is recommended for at least three months following delivery. *(Fifth Annual Report, 2011)*

Mortality review committees Māori caucus relating to maternal mental health

9. Improved awareness and responsiveness to the increased risk for Māori women. *(Eleventh Annual Report, 2017)*
10. Communication and coordination between primary care (GPs, FPA), LMCs, TOP services, alcohol and drug services, and secondary providers of maternity, obstetric, mental health and maternal mental health services should be improved and enhanced using a variety of means, including but not limited to case management, integrated notes systems and electronic transfer to information. *(Eleventh Annual Report, 2017)*
11. Primary care (GPs, PA) LMCs, TOP services, alcohol and drug services and secondary and tertiary providers of maternity, obstetric, mental health and maternal mental health services should improve their systems, guidelines and professional development to ensure that they are responsive to the identified increased risk for Māori women. *(Eleventh Annual Report, 2017)*
12. Where Māori women exhibit symptoms suggesting serious mental illness or distress, an urgent mental health assessment, including consultant psychiatrist review and consultation with perinatal mental health services, on the same day these symptoms are first noted should be undertaken. *(Eleventh Annual Report, 2017)*
13. Comprehensive assessment of risk factors for all Māori women, including those seeking a TOP, should be undertaken at diagnosis of pregnancy and/or on first presentation for antenatal care. *(Eleventh Annual Report, 2017)*
14. Māori women who have a history of serious mental illness and are currently well should be referred to specialist mental health services for a mental health birth plan and monitored closely by their maternity care provider +/- mental health services. Where such a woman has a miscarriage, the GP should be notified immediately and an explicit process for early follow-up that includes a review of mental health status agreed with GP. *(Eleventh Annual Report, 2017)*
15. The referring doctor of women who undergo a TOP is expected to provide a free post-TOP follow-up consultation 10–14 days after the procedure. The referring doctor should actively follow-up Māori women referred for TOP to ensure this consultation is completed and review mental health status during this consultation. *(Eleventh Annual Report, 2017)*
16. Clinicans are reminded that mental illness can deteriorate very rapidly in pregnancy and the postnatal period and that suicide is the most common cause of maternal death in New Zealand at this time. *(Fifth Annual Report, 2011)*

Researchers | Ngā Kairangahau

The recommendations in this section are aimed at researchers. It is worthwhile viewing the below recommendations alongside other recommendations contained within this document.

Recommendations Relating to Research

1. Collectively, we need to increase our understanding of the reasons for adverse outcomes in certain groups. For example, within Aotearoa New Zealand and internationally, we have an incomplete understanding of what puts women and babies of Indian ethnicity at increased risk. *(Thirteenth Annual Report, 2019)*
2. Research on the best model of care for teenage pregnant mothers in New Zealand should be undertaken with a view to reducing stillbirth and neonatal death. *(Fifth Annual Report, 2011)*
3. Key stakeholders in the provision of health and social services to women at risk should work together to identify existing research on:
    - reasons for barriers to engagement with maternity care
    - interventions to address barriers to engagement with maternity care. *(Fifth Annual Report, 2011)*
4. Possible causes for the increase in perinatal-related death of babies born to Pacific women, Māori women, women under the age of 20 and over the age of 40, and women who live in areas of high socioeconomic deprivation should be researched. This information is necessary in order to develop appropriate strategies to reduce these possibly preventable deaths. *(Fourth Annual Report, 2010)*
5. Strategies to improve awareness of antenatal care services and increase access among women who are isolated for social, economic, cultural or language reasons should be developed. *(Third Annual Report, 2009)*