Te mate o ngā whaea | Maternal mortality

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.[1]

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*.[2]

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. 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 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.

Findings

The number of maternal deaths has fluctuated substantially over the time period 2006–2017, with a range from 3.30 deaths per 100,000 to 24.40 deaths per 100,000 maternities. There is some evidence[3] of a reduction in the total number of maternal deaths over the time period (Figure 5.1 and Table 5.1).

[1] World Health Organization. (nd). Maternal mortality ratio (per 100 000 live births). URL: https://www.who.int/healthinfo/statistics/indmaternalmortality/en/ (accessed 16 August 2019).

[2] World Health Organization. 2012. *The WHO Application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-MM*. URL: https://apps.who.int/iris/bitstream/handle/10665/70929/9789241548458_eng.pdf;jsessionid=CC029155D5B4A0E7BB4AE0129A0A6CEB?sequence=1 (accessed 16 August 2019).

[3] Chi-squared test for trend in proportions p=0.044.

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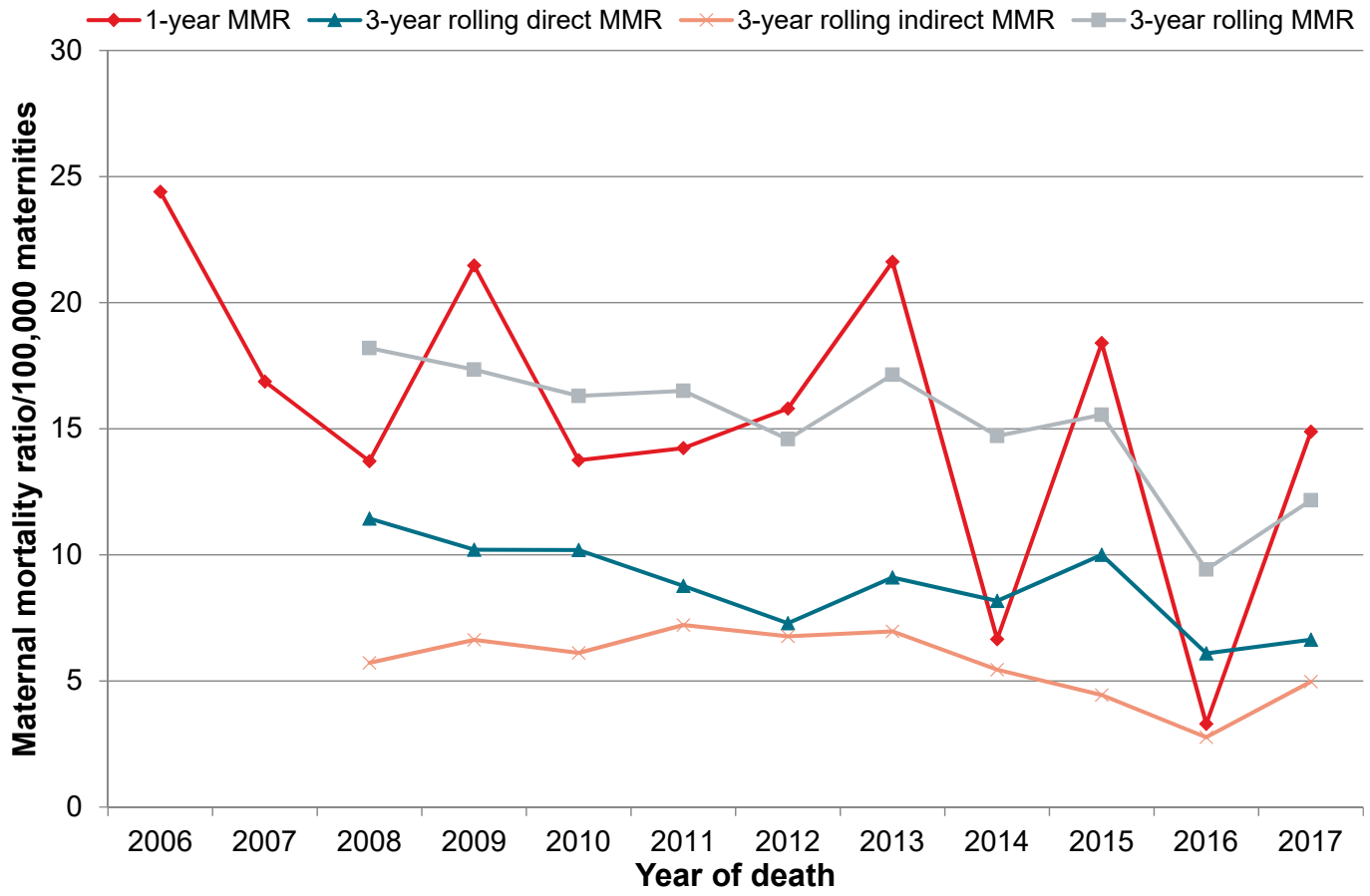
Figure 5.1: Maternal mortality ratios (per 100,000 maternities) (rolling one-year and three-year)* 2006–2017



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

MMR = maternal mortality ratio.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2017; Denominator: MAT data 2006–2017.

Table 5.1: Single-year and three-year rolling maternal mortality ratios (per 100,000 maternities) 2006–2017

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2006–2017			Chi-squared test for trend (p)
	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**	**116**	**100.0**	**15.46**	
Single-year MMR	24.40	16.87	13.71	21.47	13.75	14.23	15.80	21.62	6.66	18.40	s	14.89	-	-	-	0.044
Three-year rolling MMR	**-**	**-**	**06–08**	**07–09**	**08–10**	**09–11**	**10–12**	**11–13**	**12–14**	**13–15**	**14–16**	**15–17**	**-**	**-**	-	
	-	-	18.20	17.34	16.30	16.50	14.59	17.14	14.71	15.56	9.42	12.17	-	-	-	

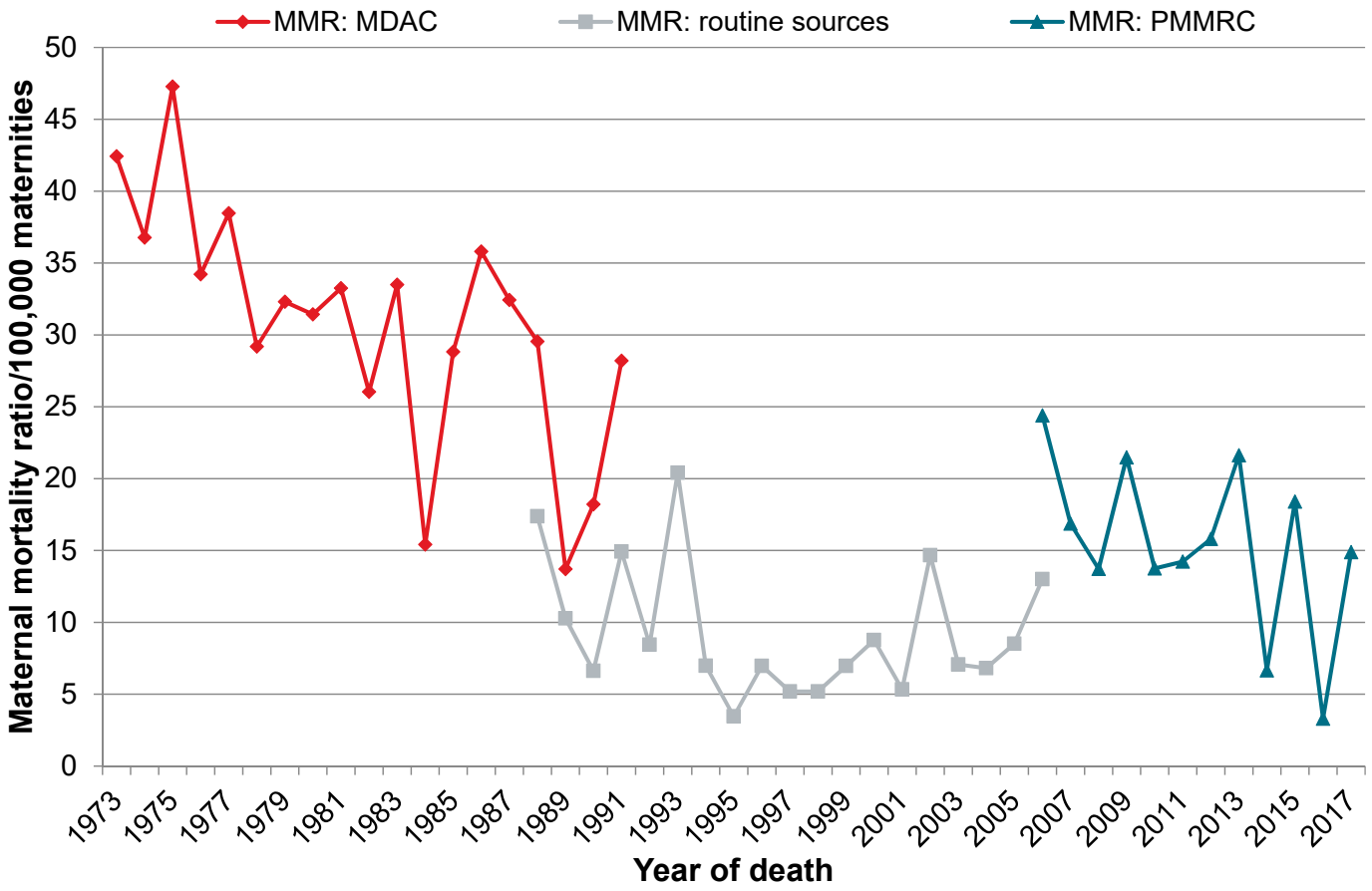
MMR = maternal mortality ratio.

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

Sources: Numerator: PMMRC’s maternal mortality data extract 2006–2017; Denominator: MAT data 2006–2017.

Substantial gains have been made in the rate of maternal death since the 1970s. Figure 5.2 shows the maternal mortality ratio over time, and by the different data sources that were available at various time periods. As well as an overall reduction in deaths over time, this figure shows that in the past, routine data sets are unlikely to have detected all maternal deaths, and there is now much better case ascertainment with active review of cases.

Figure 5.2: New Zealand maternal mortality ratio (per 100,000 maternities) by mortality data source 1973–2017



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 New Zealand data sets (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 2006–2017, including maternal deaths to six weeks postpartum; Denominator: MAT data 2006–2017.

The incidence of maternal death increased with age, with those aged 40 years and over having the highest rate (42.21 per 100,000 maternities). When examined by prioritised ethnic group, Māori and Pacific women had the highest rates, with 23.38 and 23.88 deaths per 100,000 maternities respectively. Women residing in the most deprived areas (NZDep2013 quintile 5) had the highest rate of mortality; there was some evidence of a statistically significant association between risk of death and increasing deprivation, as measured by NZDep2013 quintile (p=0.02).

Parity was unknown in 63,000 women over this time period, therefore it is not possible to comment on parity and the association with maternal death. This is largely due to a technical issue in the MAT data set. The Ministry of Health needs to urgently address this issue. It is recognised that high maternal BMI is associated with adverse outcomes for both the mother[4] and baby.[5] However, again, there were substantial

[4] 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.

[5] PMMRC. 2018. *Twelfth Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2016*. URL: https://www.hqsc.govt.nz/assets/PMMRC/Publications/12th-PMMRC-report-final.pdf (accessed 9 September 2019).

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amounts of missing data, with nearly 166,000 records (22%) with either height or weight incomplete. Given the significance of body size as a risk factor, it is of concern that information on height and weight is not consistently collected (Table 5.2).

Table 5.2: Demographic characteristics among maternal deaths 2006–2017

	Maternities		2006–2017					
	n=750,523		n=116		Maternal mortality ratio /100,000 maternities	95% CI	Rate ratio	95% CI
	n	%	n	%				
Maternal age (years)								
<20	46,684	6.2	6	5.2	12.85	4.72–27.97	1.04	0.43–2.51
20–24	132,895	17.7	16	13.8	12.04	6.88–19.55	0.97	0.52–1.80
25–29	192,288	25.6	31	26.7	16.12	10.95–22.88	1.30	0.78–2.18
30–34	217,643	29.0	27	23.3	12.41	8.18–18.05	1.00	-
35–39	129,941	17.3	23	19.8	17.70	11.22–26.56	1.43	0.82–2.49
≥40	30,798	4.1	13	11.2	42.21	22.48–72.18	3.40	1.76–6.59
Unknown	274	0.0	-	-	-	-	-	-
Prioritised ethnic group (mother)								
Māori	192,462	25.6	45	38.8	23.38	17.05–31.29	1.90	1.22–2.94
Pacific peoples	83,742	11.2	20	17.2	23.88	14.59–36.89	1.94	1.12–3.35
Asian	94,855	12.6	12	10.3	12.65	6.54–22.10		
Indian	29,841	4.0	4	3.4	13.40	3.65–34.32	1.09	0.39–3.05
Other Asian	65,014	8.7	8	6.9	12.31	5.31–24.25	1.00	0.46–2.15
MELAA	15,170	2.0	-	-	-	-	-	-
European	363,827	48.5	39	33.6	10.72	7.62–14.65		
NZ European	291,963	38.9	36	31.0	12.33	8.64–17.07	1.00	0.63–1.59
Other European	71,864	9.6	3	2.6	4.17	0.86–12.20	0.34	0.10–1.10
Other	-	-	-	-	-	-	-	-
Unknown	467	0.1	-	-	-	-	-	-
NZDep2013 quintile								
1 (least deprived)	105,602	14.1	11	9.5	10.42	5.20–18.64	1.00	-
2	114,379	15.2	11	9.5	9.62	4.80–17.21	0.92	0.40–2.13
3	136,046	18.1	23	19.8	16.91	10.72–25.37	1.62	0.79–3.33
4	172,442	23.0	31	26.7	17.98	12.21–25.52	1.73	0.87–3.43
5 (most deprived)	215,196	28.7	40	34.5	18.59	13.28–25.31	1.78	0.92–3.48
Unknown	6,858	0.9	-	-	-	-	-	-
Parity*								
0	272,435	36.3	31	26.7				
1–3	377,774	50.3	57	49.1				
4+	36,893	4.9	25	21.6				
Unknown	63,421	8.5	3	2.6				
Maternal BMI (kg/m^2)#								
<18.50	16,271	2.2	3	2.6				
18.50–24.99	284,596	37.9	39	33.6				
25.00–29.99	151,031	20.1	20	17.2				
30.00–34.99	77,165	10.3	23	19.8				
35.00–39.99	35,054	4.7	15	12.9				
≥40	20,414	2.7	12	10.3				
Missing data for height and or weight	165,992	22.1	4	3.4				

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

Mortality rates by BMI not calculated as denominator data unreliable.

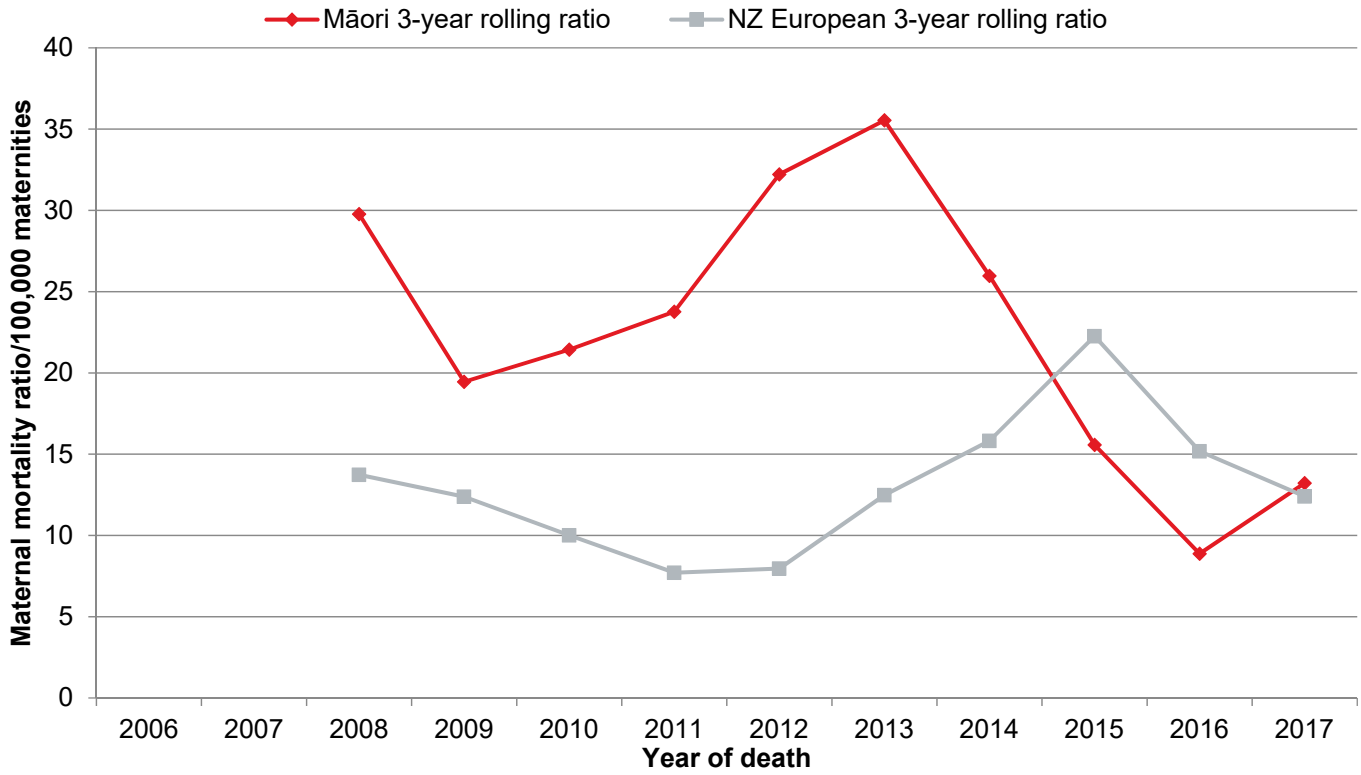
BMI = body mass index.

MELAA = Middle Eastern, Latin American, or African.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2017; Denominator: MAT data 2006–2017.

When examined by prioritised ethnicity, Māori women, until recently, had higher mortality rates than New Zealand European women. However, over the past four years their mortality rate has reduced and is currently similar to that for New Zealand European women. Over the time period 2006–2017 there is some evidence of a statistically significant reduction in deaths for wāhine Māori (p=0.04). There has been no change in the mortality rate for New Zealand European women over this time (Figure 5.3).

Figure 5.3: Maternal three-year rolling mortality ratios (per 100,000 maternities) by prioritised ethnic group (Māori and New Zealand European) and year 2006–2017



Sources: Numerator: PMMRC's maternal mortality data extract 2006–2017; Denominator: MAT data 2006–2017.

Table 5.3: Maternal mortality ratios (per 100,000 maternities) and cause of maternal death 2006–2017

	2006–2017		
	n=116		Cause-specific ratio
	n	%	/100,000 maternities
Maternities	**750,523**		
Direct maternal death	**66**	**56.9**	**8.79**
Suicide	30	25.9	4.00
Pregnancies with abortive outcome (ectopic and miscarriage)*	3	2.6	0.40
Hypertensive disorders	4	3.4	0.53
Obstetric haemorrhage	3	2.6	0.40
Pregnancy-related infection	6	5.2	0.80
Other obstetric complications	20	17.2	2.66
Amniotic fluid embolism	13	11.2	1.73
Venous thrombo-embolism	6	5.2	0.80
Other obstetric complications	<3	x	s
Indirect maternal death	**44**	**37.9**	**5.86**
Cardiac	11	9.5	1.47
Neurological	13	11.2	1.73
Infections not a direct result of pregnancy	8	6.9	1.07
Other non-obstetric complications	12	10.3	1.60
Unknown/undetermined	**6**	**5.2**	**0.80**

* This is the WHO category that includes first trimester pregnancy complications such as miscarriages and ectopic pregnancy.

Excludes 22 coincidental maternal deaths.

'x' indicates percentage suppressed due to small numbers.

's' indicates rate suppressed due to small numbers.

Sources: Numerator: PMMRC's maternal mortality data extract 2006–2017; Denominator: MAT data 2006–2017.

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There were 66 direct maternal and 44 indirect maternal deaths over the 12-year study period 2006–2017 inclusive. The single largest cause of maternal death in Aotearoa/New Zealand is suicide, with 30 deaths during this time (45%). The next leading causes were amniotic fluid embolism and neurological conditions, which caused 13 deaths (11.2%) each (Table 5.3). While there were only three deaths due to ectopic pregnancy, these are highly preventable deaths. Suicide deaths particularly affect wāhine Māori, with both the largest number of deaths and the highest rate, compared with other ethnic groups. Wāhine Māori were 3.41 times more likely to die by suicide than New Zealand European women (Table 5.4).

Table 5.4: Maternal suicide by prioritised ethnic group* 2006–2017

Ethnicity (prioritised)	N	n	Rate	Rate ratio	95% CI
Māori	192,462	18	9.35	3.41	1.48–7.85
NZ European	291,963	8	2.74	1.00	-

* Excludes four cases that were in Pacific 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 2006–2017; Denominator: MAT data 2006–2017.

Figure 5.4 shows that rates of maternal death in Aotearoa/New Zealand compared with the United Kingdom (UK) are generally higher, with a statistically significantly higher rate of direct deaths. For most individual causes there were no statistically significant differences between rates in Aotearoa/New Zealand with the UK, except for suicide, where the New Zealand rate was substantially higher.

Given that suicide is the leading cause of maternal death, it is imperative that comprehensive action is taken. There are currently screening guidelines during the antenatal and postnatal period; however, their use is variable. Difficulties arise when mild to moderate illness is diagnosed, as maternal mental health service provision is variable within Aotearoa/New Zealand, with particularly limited resources for women with mild to moderate illness.

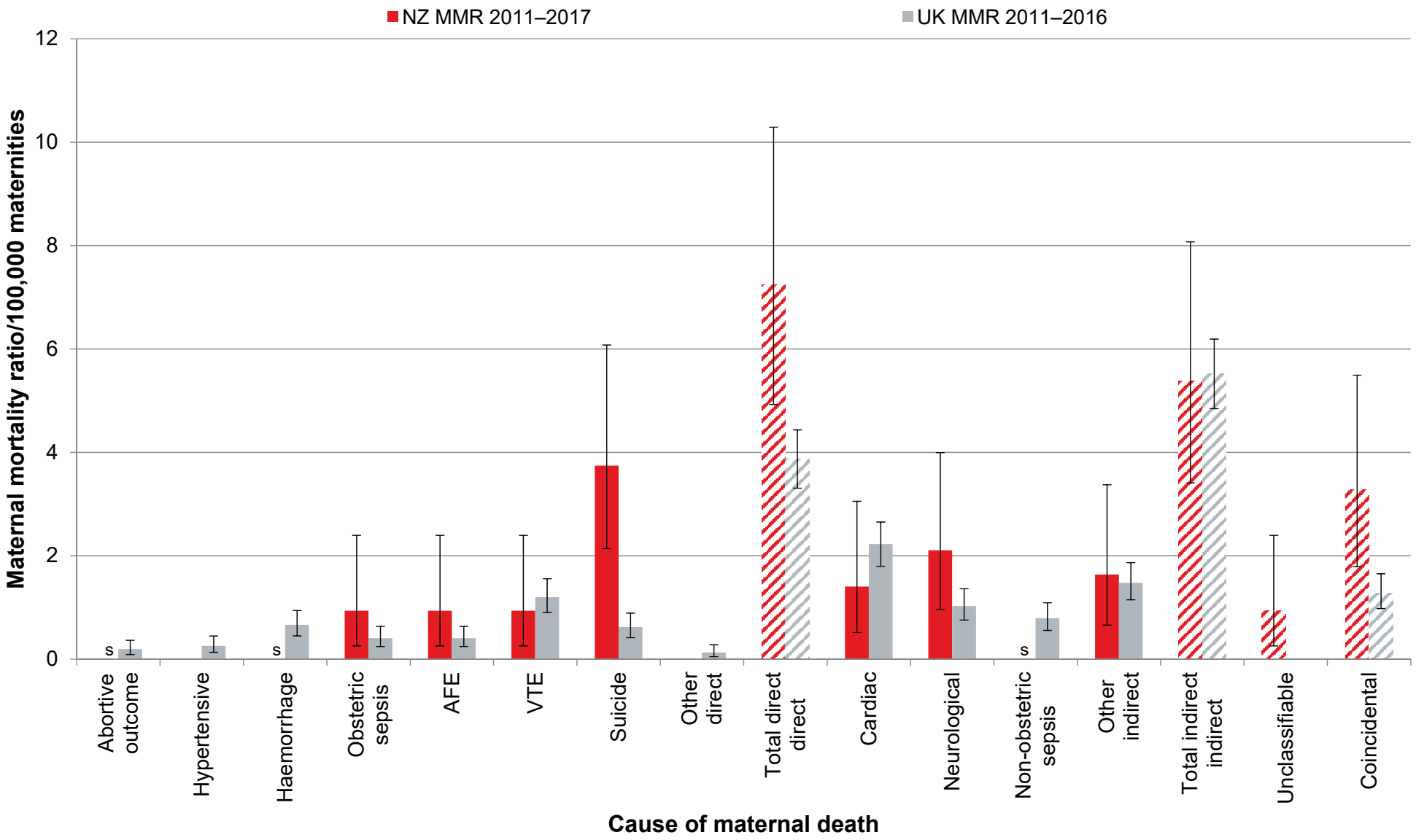
We have identified that wāhine Māori are a group at high risk, and warrant routine screening. The Edinburgh Postnatal Depression Scale has been used widely across many different cultures and found to have good validity across cultures.[6] However, this tool has never specifically been validated for Māori, and it has been shown that different cultural groups within Aotearoa/New Zealand may require different cut-offs to adequately detect women who require intervention.[7] While both suicide prevention and mental well-being are topical currently, there has not been any governmental budget provided specifically to reduce maternal suicide deaths. There has been only limited investment in maternal well-being – for example, there is inadequate provision of mother–baby units. Our findings show there is an urgent need for investment in this area, in the areas of prevention, developing appropriate screening tools and treatment for women and their babies. A previous review of maternal suicide in wāhine Māori made a number of recommendations around early recognition of risk factors, comprehensive assessment and active follow-up.[8] (See also 'Practice point: Psychosocial health and maternal suicide'.)

[6] Di Florio A, Putnam K, Altemus M, et al. 2017. The impact of education, country, race and ethnicity on the self-report of postpartum depression using the Edinburgh Postnatal Depression Scale. *Psychological Medicine* 47(5): 787–99.

[7] Ekeroma AJ, Ikenasio-Thorpe B, Weeks S, et al. 2012. Validation of the Edinburgh Postnatal Depression Scale (EPDS) as a screening tool for postnatal depression in Samoan and Tongan women living in New Zealand. *New Zealand Medical Journal* 125(1355): 41–50.

[8] PMMRC. 2017. *Eleventh Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting mortality 2015*. URL: https://www.hqsc.govt.nz/assets/PMMRC/Publications/2017_PMMRC_Eleventh_Annual_Report.pdf (accessed 12 August 2019).

Figure 5.4: Cause-specific maternal mortality ratios (per 100,000 maternities) in New Zealand 2011–2017 and the UK 2011–2016 (with 95% CIs)



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

AFE = amniotic fluid embolism.

MMR = maternal mortality ratio.

VTE = venous thromboembolism.

‘Other direct’ includes cardiomyopathy.

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

‘Coincidental’ includes motor vehicle accident, 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 2011–2017; Denominator: MAT data 2011–2017.
- UK MMR: Numerator: Maternal Deaths and Morbidity, includes surveillance data on women who died during or up to one year after pregnancy 2011–2016 in the UK.
- UK MMR: 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, the General Register Office for Scotland, Northern Ireland Statistics and Research Agency, and Hospital Episode Statistics 2011–2016.
- UK MMR: Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK). 2018. *Saving Lives, Improving Mothers Care: Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2014–16*. URL: https://www.npeu.ox.ac.uk/downloads/files/mbrrace-uk/reports/MBRRACE-UK%20Maternal%20Report%202018%20-%20Web%20Version.pdf (accessed 16 August 2019).

Practice point: Psychosocial health and maternal suicide

Pregnancy and the postpartum period are **not** protective against mental illness, and can be a trigger for onset and for deterioration of mental illness.

Suicide is a leading cause of maternal mortality, with Māori women and young women (<20 years old) over-represented among maternal suicides.

Psychosocial health screening

Early during a woman's contact with health services, including request for termination of pregnancy, a comprehensive assessment of her psychosocial health and risk factors should be undertaken. This will involve identifying:

her current social situation, including relationship with partner/ex-partner, whānau supports, and social stressors such as financial issues, housing, whether their other children are in care of other people, and phone and transport availability
any previous and current experience of family violence, sexual abuse and assault
a history of termination of pregnancy or miscarriage in the previous 12 months
any past or present mental illness, including self-harm and previous suicide attempts, use of alcohol and other drugs
any past or present treatment by a specialist mental health service, including inpatient care
a family history of severe mental illness, including perinatal mental illness or suicide in a close relative.

Pregnant and postpartum women who use substances often have complex social and mental health needs, and face additional barriers in accessing services.

Communication

All clinicians involved in a woman's care need relevant mental health history and current knowledge of a woman's pregnancy to support them to provide the best care. Routine sharing of relevant information across general practice, LMC, maternity and mental health service interfaces will enable better-informed care, and any concerns regarding risk need to be clearly communicated to all clinicians involved.

Care provision

Women who have a history of severe mental illness (eg, severe depression/bipolar disorder/psychosis) should be referred to a secondary mental health service even if currently well, as their risk of relapse in the postpartum period may be high. They need an appropriate mental health birth plan and monitoring for the peripartum period, with advice around avoiding sleep deprivation.

Mental health medications should not be stopped without review by a doctor and risk–benefit analysis. Consultation with a perinatal psychiatrist should be considered.

Women should have continuity of, and culturally appropriate, mental health care. During pregnancy and the postpartum period there may be more than one mental health team involved – in such cases there should be one identified individual who coordinates care.

Doctors who refer women for termination of pregnancy should actively follow-up these women to ensure they have their free post-termination of pregnancy check, which should specifically include assessment of mental health status.

Acute mental health episodes

Any of the following identified at any time suggests a serious mental illness and requires urgent (same day) assessment by mental health services, including early consultant psychiatrist review and consultation with perinatal mental health services:

suicidal ideation (new or increasing thoughts) and/or thoughts to harm baby or others
suicide attempts
psychotic symptoms
recent significant change in mental state including fluctuating or emergence of new symptoms
pervasive guilt or hopelessness
ongoing beliefs of inadequacy as a mother
a sense of estrangement or disconnection from the infant.

Following recovery

It is the responsibility of the treating team to ensure that all women experiencing postpartum psychosis or other severe postpartum mental illness receive a clear explanation of:

future risk
the availability of risk minimisation strategies including pre-pregnancy consultations prior to subsequent pregnancies
the need for re-referral during subsequent pregnancies.

The GP should also be notified of risk, risk minimisation strategies and of any subsequent pregnancies.

Partners, family, whānau and other support people require explanation and education regarding maternal mental illness and its accompanying risks.

Extracted from the full report at: www.hqsc.govt.nz/our-programmes/mrc/pmmrc/publications-and-resources/publication/3832

13. 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. a stocktake of current mental health services available across New Zealand for pregnant and recently pregnant women to identify both the strengths of services and gaps or inequity in current services and skills in the workforce a national pathway for accessing maternal mental health services, including: i. cultural appropriateness to ensure service access and provision appropriate screening care for women with a history of mental illness communication and coordination.	**The Ministry of Health** is currently planning the implementation of the Government's response to He Ara Oranga and the Wellbeing Budget 2019, of which mental health and addiction is a priority area. While there is no specific recommendation for maternal and infant mental health services, the underlying message of the report is one of expanding access and choice, investing in workforce development and placing people at the centre. In order to achieve this vision, significant stakeholder engagement and sector co-design is required, and the Ministry of Health welcomes the PMMRC's participation in this work. Some of the mental wellbeing initiatives the Ministry of Health will be implementing include: funding to co-design approaches to meet the needs of local communities funding to extend the pregnancy and parenting service the development of an enhanced support pilot for parents and whānau with mental wellbeing needs during pregnancy for the first years of a child's life or following a stillbirth $30 million over four years for primary maternity services to increase the fees paid to LMCs $4.3 million paid over four years to increase the Pacific nursing and midwifery workforce and to offer wrap-around support for Pacific nursing and midwifery students $67 million over four years for primary health care to cover increasing costs and demands for initiatives that aim to increase access.