

Maternal deaths in Australia 2003–2005

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The AIHW National Perinatal Statistics Unit (NPSU) is a collaborating unit of the AIHW established in 1979. The NPSU aims to improve the health of Australian mothers and babies through the collection, analysis and reporting of information on reproductive, perinatal and maternal health. The NPSU maintains national data collections on perinatal health, maternal deaths, congenital anomalies and assisted reproduction technology. NPSU is located at Sydney's Children Hospital. NPSU is situated within the School of Women's and Children's Health, Faculty of Medicine, The University of New South Wales.

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Maternal deaths in Australia 2003–2005

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Beverley Hall

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Foreword

The regular reporting of maternal deaths provides accountability to the Australian community about a key indicator of the quality of our health services.

In relation to international experience, the number of maternal deaths in Australia appears to be low, at about 25 per year. However, there is evidence to suggest that this number is conservative. There is room to improve the rate of maternal death, particularly among Aboriginal and Torres Strait Islander women, as their death rates are more than twice as high as other women's. Regular reporting is critical to reducing the numbers of maternal deaths and the funding of this year's report by the Australian Commission on Safety and Quality in Health Care is gratefully acknowledged. However, the Commission is not able to provide ongoing funding and it is concerning that no resources have been identified to sustain and improve this reporting in the future. Continuity of funding is needed to ensure that clinically relevant, high quality and up-to-date reporting can be pursued.

Another key to improving Australia's performance in relation to maternal deaths is the proposed introduction of a national agreed system of review with cross-disciplinary expertise and a standardised audit process. I look forward to further developments in this regard.

Penny Allbon
Director
Australian Institute of Health and Welfare

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Abbreviations

ABS	Australian Bureau of Statistics
ACSQHC	Australian Commission on Safety and Quality in Health Care
ACT	Australian Capital Territory
AFE	amniotic fluid embolism
AIHW	Australian Institute of Health and Welfare
APH	ante partum haemorrhage
CEMACH	Confidential Enquiries into Maternal and Child Health
HELLP	haemolysis, elevated liver enzymes and low platelets
ICD-10	International Statistical Classification of Diseases and Related Health Problems, tenth revision
MMR	maternal mortality ratio
NACMM	AIHW National Advisory Committee on Maternal Mortality
NHMD	AIHW National Hospital Morbidity Database
NPSU	AIHW National Perinatal Statistics Unit
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
RANZCP	Royal Australian and New Zealand College of Psychiatrists
RCOG	Royal College of Obstetricians and Gynaecologists
SA	South Australia
SLE	systemic lupus erythematosus
STMMC	State and territory Maternal Mortality Committees
Tas	Tasmania
TTP	thrombotic thrombocytopenic purpura
UNSW	University of New South Wales
Vic	Victoria
WA	Western Australia
WHO	World Health Organization

Summary

The Australian community expects high quality clinical care during pregnancy and childbirth leading to a safe birth for the mother and her baby. Maternal mortality is one important measure of this care. Using this measure, Australia continues to be one of the safest countries in which women give birth.

This fourteenth triennial report presents an epidemiological overview of maternal deaths in Australia for the period 2003–2005. It has been prepared by the Australian Institute of Health and Welfare (AIHW) under the auspices of the Institute's National Advisory Committee on Maternal Mortality (NACMM) – see Appendix 1 for membership.

Australia's low maternal mortality rate

Over the three years, 65 deaths were classified as directly or indirectly relating to the pregnancy or its management, with all deaths occurring while the women were pregnant, or within 42 days of termination of pregnancy.

During the triennium, one woman died for every 11,896 women giving birth, giving a maternal death ratio of 8.4 per 100,000 of women giving birth. This compares favourably with the reported Maternal Mortality Rates (MMR) in other developed countries (WHO 2007).

Indigenous results are the great exception

Maternal mortality rates for Aboriginal or Torres Strait Islander women were more than two and a half times as high as for other women. There were 21.5 deaths per 100,000 women giving birth, versus 7.9 per 100,000 for non-Indigenous women.

This high rate is consistent with previous reports. The lack of improvement indicates that further measures are needed to improve the pregnancy outcomes for Aboriginal and Torres Strait Islander women.

Leading causes of maternal deaths

The leading causes of direct maternal deaths were: amniotic fluid embolism, thromboembolism and hypertension. Cardiac disease, psychiatric related causes and non-obstetric haemorrhage were the main indirect causes of maternal deaths.

The need for more information

An important finding from this report is that the current system for reporting maternal deaths needs to be enhanced to reflect changes in safety and quality initiatives. The current data system lacks the quality and sufficiency of information on risk factors, clinical pathways and management to allow adequate analysis of the deaths in order to inform recommendations on policy and practice change.

Section A: Introduction

Background to the report

In 1964, Australia instigated the practice of reporting and publishing data on maternal mortality every three years. This report is the 14th triennial report of maternal deaths in Australia, representing a summary of maternal deaths in Australia for the period 2003–2005.

Reports prior to the 1997–1999 trienniums were undertaken under the auspices of the National Health and Medical Research Council (NHMRC).

This report is the third in the series prepared by the Australian Institute of Health and Welfare (AIHW). It is prepared under the auspices of the AIHW National Advisory Committee on Maternal Mortality (NACMM). This report has been funded by the Australian Commission on Safety and Quality in Health Care (ACSQHC).

AIHW National Advisory Committee on Maternal Mortality (NACMM)

The role of the AIHW National Advisory Committee on Maternal Mortality (NACMM) is to oversee the compilation of all reported maternal deaths into a national report. The current NACMM members and their professional affiliations are listed in Appendix 1.

This committee has previously convened for the preparation of the 1997–1999 and 2000–2002 reports. The term of the previous Committee members expired in December 2006 and a new committee established in 2007.

The terms of reference for the current Committee are listed in Appendix 2.

Aims of the report

The aims of this report are to:

- collate maternal mortality data for the period 1 January 2003 to 31 December 2005 from the state Mortality Committees
- employ observational epidemiological techniques to provide an overview of maternal deaths in Australia.

Methodology and structure of the report

The data presented in this report form an observational study of maternal deaths in Australia for the period 2003–2005. Only descriptive statistics are presented.

The methodology of this report differs from that of previous reports. It takes the form of an epidemiological monograph, presenting data on direct and indirect maternal deaths for the period 2003–2005. In contrast to previous reports, there are no illustrative vignettes

presented, no clinical commentary and no clinical recommendations. This change in the scope and content of the report reflects the advice of the Australian Commission on Safety and Quality in Health Care and their concerns about timeliness of the report and the scope and quality of the maternal death data collection across states and territories.

Compilation of the National Maternal Deaths database

The current Australian system for notification of maternal deaths involves several tiers of reporting and review. Reporting of maternal deaths is not mandatory at a national level. Maternal deaths are notified to the relevant state and territory Maternal Mortality Committees (current members of which are listed in Appendix 3), by clinicians, midwives, hospitals, health departments, coronial and post-mortem investigations, perinatal and hospital morbidity collections and from the Registrar of Births, Deaths and Marriages. The AIHW National Perinatal Statistics Unit then requests maternal death data from the states and territories.

Data were supplied for maternal deaths occurring during the period 1st January 2003 to 31st December 2005 per the national maternal death case report form (Appendix 4). Data were supplied in hard copy for all states except NSW which supplied data electronically. The extent of completion of the form varied among the states and territories. Data elements such as Indigenous status and indication for caesarean section were not collected consistently across Australia. Gestation at time of death was difficult to establish due to wording on the reporting form, which requested gestation at the time of the woman's death if she died antepartum, but not the gestation at death specifically.

These data were reviewed by a Maternal Mortality Classification Subcommittee of the NACMM to ensure national consistency with classifications to be consistent with best practice using CEMACH (Confidential Enquiries into Maternal and Child Health) as the gold standard, and to be inclusive rather than exclusive in categorising deaths (Lewis et al. 2004). In some cases the classification of death assigned by the Subcommittee differed from that reported to the NACMM on the maternal death form. Several jurisdictions did not have state and territory Maternal Mortality Committees during the period of preparation of the report, and these maternal deaths were classified by the Maternal Mortality Classification Subcommittee of the NACMM using the supplied data. In 14 of the 79 reported cases for 2003–2005, the classification of death was changed by the Subcommittee for the purpose of this report. The changes in classification included: five deaths reported as incidental by state committees which were reassigned as indirect deaths, one unascertained death reassigned as an incidental death, two indirect deaths reassigned as direct deaths and six direct deaths reassigned as indirect deaths. Data were compiled to constitute the National Maternal Deaths Database.

Section B: Epidemiology of maternal mortality

Australian definitions and classifications of maternal deaths

Maternal death is defined in the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) (WHO,1992) as:

The death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

This definition includes deaths of women from pregnancy, terminations of pregnancy, miscarriage and ectopic pregnancy, but currently excludes deaths associated with assisted reproduction technologies where pregnancy has not occurred.

Three maternal death categories are used in Australia and are based on ICD-10 definitions. They are presented below in Box 1.

Box 1: WHO classification of maternal deaths

Direct deaths:

those resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment or from a chain of events resulting from any of the above e.g. eclampsia, amniotic fluid embolism, rupture of the uterus, postpartum haemorrhage

Indirect deaths:

result from pre-existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by the physiological effects of pregnancy e.g. heart disease, diabetes, renal disease

Incidental deaths:

result from conditions occurring during pregnancy, where the pregnancy is unlikely to have contributed significantly to the death, although it is sometimes possible to postulate a distant association e.g. road accidents, some malignancies

Scope of report

The scope of the reports includes all direct and indirect maternal deaths that occurred in Australia during the period 1st January 2003 to 31st December 2005. Late deaths have not been included in this report per the terms of reference specified by the ACSQHC.

Number of maternal deaths

Sixty-five maternal deaths occurred in Australia during the period 1st January 2003 to 31st December 2005 that satisfied the inclusion criteria of the report. This report presents data on these deaths (Table 1).

In addition, 13 women died as a result of car accidents, carcinomas or infections during pregnancy or the puerperium. The Committee classified these 13 deaths as incidental and therefore they are outside the scope of this report. A foreign national, transferred to Australia for treatment following childbirth, who subsequently died, is also outside the scope of the report. The deaths of these 14 women were excluded from the following analysis.

Table 1: Maternal deaths by type of death, Australia, 2003–2005

Type of death	2003–2005
Direct cause	29
Indirect cause	36
Total	65

Over the three-year period, the number of maternal deaths fluctuated annually from 18 to 25 (Table 2).

Table 2: Annual maternal deaths, direct and indirect, Australia, 2003–2005

Type of death	2003	2004	2005	Total
Direct	8	13	8	29
Indirect	10	12	14	36
Total	18	25	22	65

Measuring maternal mortality

Maternal mortality is an internationally accepted index by which we measure maternal health. There are three measures of maternal mortality in widespread use: the maternal mortality ratio, the maternal mortality rate and the lifetime risk of maternal death. All measures need to be defined to enable meaningful comparison between countries. The following measures have been described by United Nations Agencies (WHO, UNICEF and UNFPA, 2004 p.5).

*The most commonly used measure is the **maternal mortality ratio (MMR)**, that is, the number of [direct and indirect] maternal deaths during a given period per 100,000 live births during the same period. This is a measure of the risk of death once a woman has become pregnant.*

*The **maternal mortality rate** is the number of [direct and indirect] maternal deaths in a given period per 100,000 women of reproductive age during the same period, reflects the frequency with which women are exposed to risk of death through fertility.*

*The **lifetime risk of maternal death** takes into account both the probability of becoming pregnant and the probability of dying as a result of that pregnancy cumulated across a woman's reproductive years. In theory, the lifetime risk is a cohort measure but it is usually calculated with period measures for practical reasons. It can be approximated by multiplying the maternal mortality rate by the length of the reproductive period (around 35 years).*

Determining the maternal mortality ratio

The formula for calculating the MMR in Australia is: **MMR = Numerator/Denominator**

Numerator: The number of direct and indirect maternal deaths x 100,000 (in three years).

The numerator used in this report is the total number of direct and indirect maternal deaths that occurred in the triennium (65), noting that the Australian definition of indirect maternal deaths is more inclusive than the definition used in some countries. The figures presented in this report may not be comparable to previous years, due to changes in ascertainment and in the known aetiology of some conditions, their relationship to pregnancy and changes in classification practice with assigning deaths as direct or indirect maternal deaths.

Denominator: The total number of women who gave birth (in three years). The World Health Organization definition of the denominator specifies that the number of live births or the number of total births (live births plus fetal deaths) can be used (WHO 1992). The denominator used for calculating maternal mortality measures differs across the world depending on the data available. The most appropriate denominator for estimating maternal mortality rates is the number of women at risk, that is, the number of pregnant or recently pregnant women. However, this figure is not known, the unknown component being the number of pregnancies ending before 20 weeks gestation. Where both denominators are available the WHO report suggests that both calculations be made.

The denominator data used in this report are shown in Table 3 and obtained from the National Perinatal Data Collection. It is the number of women who gave birth to either a live or stillborn baby of 20 or more completed weeks gestation, or weighing at least 400 grams at birth.

Table 3: Number of women who gave birth by maternal age, Australia, 2003–2005

Age group (years)	2003	2004	2005	Total	Per cent
<20	11,617	11,541	11,799	34,957	4.5
20–24	37,501	36,874	39,131	113,506	14.7
25–29	70,223	68,599	71,615	210,437	27.2
30–34	85,757	86,404	90,515	262,676	34.0
35–39	39,454	41,093	45,764	126,311	16.3
≥40	8,000	8,318	8,948	25,266	3.3
Not stated	32	42	21	95	—
Total	252,584	252,871	267,793	773,248	100.0

Maternal Mortality Ratio

Using the denominator data from the previous table, the MMR for the period 2003–2005 was calculated to be 8.4 per 100,000 women giving birth (Table 4).

Table 4: Maternal mortality ratio, Australia, 2003–2005

Type of death	Number of deaths	Maternal mortality ratio ^(a)
Direct and Indirect	65	8.4

(a) The MMR is calculated as the number of [direct and indirect] maternal deaths during the 3-year period per 100,000 women giving birth.

Table 5 shows trends in direct and indirect maternal deaths between 1973 and 2005. The maternal mortality rate has decreased from 12.7 in 1973–1975 to 8.4 in 2003–2005, mainly as a result of a decrease in direct deaths.

In 2000–2002 the number of indirect deaths increased from the preceding triennia by 74%, for 2003–2005 the number has decreased to 36 which is similar to the number reported over most triennia. The 52 indirect deaths reported for 2000–2002 was in part attributable to changes in classification, although an increase in the actual incidence for that period could not be ruled out.

Deaths due to psychiatric causes were classified as indirect rather than incidental from 1997 onwards. Deaths due to some cancers and tumours were classified as indirect rather than incidental, from 2000 onwards.

Table 5: Maternal mortality ratios, classified as direct or indirect, Australia, 1973–1975 to 2003–2005

Triennium	Direct deaths	Indirect deaths	Number of women who gave birth	Maternal mortality ratio ^(a)
1973–1975	60	32	726,690	12.7
1976–1978	52	35	678,098	12.8
1979–1981	54	34	682,880	12.9
1982–1984	42	25	713,985	9.4
1985–1987	32	30	726,642	8.5
1988–1990	37	33	754,468	9.3
1991–1993	27	22	769,253	6.2
1994–1996	46	20	767,448	9.1
1997–1999	34	^(b) 30	758,030	8.4
2000–2002	32	52	753,901	11.1
2003–2005	29	36	773,248	8.4

(a) Per 100,000 women who gave birth.

(b) Data updated to include two indirect deaths in the 1997–1999 triennium that were notified or amended after the 1997–1999 report was published.

Maternal mortality rate

Tables 6, 7 and 8 present age-specific and age-standardised mortality rates for direct deaths, indirect deaths and combined direct and indirect deaths, calculated to present a more detailed measure of maternal mortality.

Age-specific and age-standardised maternal mortality rates

Age-specific mortality rates were calculated by dividing the average number of maternal deaths occurring in each specified age group, between 2003–2005, by the corresponding population at risk in the same age group in the specified time period (e.g. the average of the Australian female population at 30 June for the years 2003–2005, for each age group), expressed as a rate per 100,000 women. These rates are used to compare differences in maternal mortality between age groups.

In this report, direct standardisation was used in which the standard population was the Australian female population aged between 15–44 years (Australian Bureau of Statistics at the 30th June 2001). The standardised rate was calculated by summing the product of the age specific rates in the study population and the number of women in each age group in the standard population and then dividing the total sum by the number of women in the standard population.

As maternal deaths are rare in Australia, the data presented in Tables 6 to 8 must be interpreted with the understanding that fluctuations in the rates may be due to the small numbers.

The age-standardised rate for maternal deaths in 2003–2005 was 0.50 deaths per 100,000 female population (Table 6). The rate has declined from a high of 1.09 in 1972–1975 and has fluctuated between 0.39 and 0.66 since the 1982–1984 triennium.

Table 6: Age-specific and age-standardised maternal mortality rates: direct and indirect maternal deaths, Australia, 1973–1975 to 2003–2005

Triennium	Direct & indirect deaths	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	Age-standardised rate ^(a)
1973–1975	96	0.30	1.52	1.71	0.74	1.11	1.17	1.09
1976–1978	87	0.33	1.22	1.23	1.07	0.65	1.20	0.95
1979–1981	88	0.33	1.19	1.25	1.10	0.69	0.63	0.86
1982–1984	67	0.23	1.03	0.97	0.53	0.77	0.08	0.59
1985–1987	62	0.51	0.46	1.15	0.68	0.38	—	0.52
1988–1990	70	0.10	0.56	1.04	1.13	0.52	0.11	0.58
1991–1993	48	0.15	0.19	0.68	0.60	0.49	0.21	0.39
1994–1996	66	0.11	0.43	0.67	1.23	0.56	0.10	0.53
1997–1999	^(b) 62	0.16	0.25	0.68	0.75	0.84	0.19	0.49
2000–2002	84	0.20	0.26	1.13	1.35	0.62	^(c) 0.31	0.66
2003–2005	65	0.25	0.39	0.68	0.69	0.72	0.26	0.50

(a) Age-standardised to the 2001 Australian female population aged 15 to 44 years.

(b) Data do not include two indirect deaths in the 1997–1999 triennium that were notified or amended after the 1997–1999 report was published.

(c) Includes one woman aged over 44 years.

Note: Rates expressed per 100,000 female population.

The age-standardised rate for direct maternal deaths for 2003–2005 was 0.34 deaths per 100,000 female population (Table 7). The mortality rates generally increase with increasing maternal age. However, there has been a marked decrease in the age-specific mortality rate for women aged 20–24 years and 40–44 years for the period of 1973–2005 as shown in Table 7.

Table 7: Age-specific and age-standardised maternal mortality rates: direct maternal deaths, Australia, 1973–1975 to 2003–2005

Triennium	Direct deaths	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	Age-standardised rate ^(a)
1973–1975	66	0.25	1.10	1.14	0.42	0.57	1.00	0.74
1976–1978	52	0.22	0.58	0.70	0.80	0.41	0.73	0.58
1979–1981	54	0.17	0.80	0.60	0.74	0.39	0.54	0.54
1982–1984	42	0.11	0.75	0.62	0.23	0.45	0.08	0.37
1985–1987	32	0.20	0.25	0.40	0.52	0.27	0.00	0.28
1988–1990	37	0.05	0.35	0.52	0.59	0.26	0.06	0.31
1991–1993	27	—	0.09	0.44	0.28	0.34	0.16	0.22
1994–1996	46	0.11	0.33	0.48	0.69	0.47	0.10	0.37
1997–1999	34	—	0.20	0.27	0.37	0.58	0.14	0.27
2000–2002	32	0.10	0.05	0.38	0.45	0.36	^(b) 0.13	0.25
2003–2005	29	0.10	0.15	1.00	0.22	0.40	0.13	0.34

(a) Age-standardised to the 2001 Australian female population aged 15 to 44 years.

(b) Includes 1 woman aged over 44 years.

Note: Rates expressed per 100,000 female population.

The age-standardised rate for indirect maternal deaths for 2003–2005 was 0.28 deaths per 100,000 females (Table 8).

Table 8: Age-specific and age-standardised maternal mortality rates: indirect maternal deaths, Australia, 1973–1975 to 2003–2005

Triennium	Indirect deaths	15–19 years	20–24 years	25–29 years	30–34 years	35–39 years	40–44 years	Age-standardised rate ^(a)
1973–1975	30	0.06	0.42	0.57	0.31	0.53	0.19	0.35
1976–1978	35	0.11	0.64	0.53	0.27	0.25	0.46	0.37
1979–1981	34	0.17	0.39	0.65	0.36	0.30	0.09	0.33
1982–1984	25	0.11	0.27	0.34	0.29	0.32	—	0.22
1985–1987	30	0.30	0.20	0.75	0.16	0.11	—	0.25
1988–1990	33	0.05	0.20	0.52	0.54	0.26	0.06	0.27
1991–1993	21	0.15	0.09	0.24	0.32	0.15	0.05	0.17
1994–1996	20	—	0.10	0.19	0.55	0.09	—	0.16
1997–1999	^(b) 28	0.16	0.05	0.41	0.37	0.27	0.05	0.22
2000–2002	52	0.15	0.26	0.75	0.90	0.22	0.13	0.41
2003–2005	36	0.15	0.24	0.34	0.48	0.31	0.13	0.28

(a) Age-standardised to the 2001 Australian female population aged 15 to 44 years.

(b) Data do not include two indirect deaths in the 1997–1999 triennium that were notified or amended after the 1997–1999 report was published.

Note: Rates expressed per 100,000 female population.

Maternal deaths by state and territory of death

Tables 9 and 10 present the number and rate of deaths by state and territory. The methods of data collection and process of review vary across the states and territories. It is important to note that variations in case ascertainment across states and territories will impact on comparability of state and territory data. Data should be interpreted with qualification to the small number of deaths and the variability in ascertainment.

Table 9: Maternal deaths by state and territory, 2003–2005

State and territory	Number of women who gave birth	Direct and indirect deaths ^(a)
NSW and ACT	273,039	16
Vic	190,376	22
Qld	153,898	18
WA	75,919	5
SA	52,641	2
Tas ^(b)	16,669	1
NT	10,706	1
Total	773,248	65

(a) Numbers may differ from those published in state and territory reports due to possible differences in the classification of maternal deaths by the NACMM compared to the state and territory maternal mortality committees (STMMC).

(b) Data already published.

Due to the small number of deaths, data were compiled into six-year periods for calculation of the MMRs for jurisdictions (Table 10). Queensland reported the highest MMR at 13.2 for the period 1997–2002 and 13.7 for the period 2000–2005.

Table 10: Maternal deaths by state and territory, 1997–2005

State and territory	Years	Number of women who gave birth	Direct and indirect deaths ^(a)	MMR ^(b)
NSW and ACT	1997–2002	541,132	52	9.6
	2000–2005	542,271	41	7.6
Vic	1997–2002	368,671	29	7.9
	2000–2005	375,078	39	10.4
Qld ^(c)	1997–2002	288,524	38	13.2
	2000–2005	299,645	41	13.7
WA	1997–2002	149,233	9	6.0
	2000–2005	149,627	10	6.7

continued

Table 10 (continued): Maternal deaths by state and territory, 1997–2005

State and territory	Years	Number of women who gave birth	Direct and indirect deaths ^(a)	MMR ^(b)
SA ^(d)	1997–2002	107,473	12	11.2
	2000–2005	105,067	10	9.5
Tas	1997–2002	35,281	4	11.3
	2000–2005	33,704	3	8.9
NT	1997–2002	21,592	2	9.3
	2000–2005	21,738	2	9.2
Total	1997–2005	2,319,744	211	9.1

(a) Numbers may differ from those published in state and territory reports due to possible differences in the classification of maternal deaths by the NACMM compared to the STMMC.

(b) Per 100,000 women who gave birth.

(c) Includes one death where the birth occurred in NSW and the woman was transferred and died in Qld.

(d) The South Australian Maternal, Perinatal and Infant Mortality Committee, Maternal Subcommittee enquiries into maternal deaths during the period 1997–2002 did not find recurring causes or system deficiencies in its review of deaths.

Maternal deaths referred to the Coroner

Coronial notifications are mandated for: all violent deaths, all unnatural deaths, all deaths within 24 hours of having an anaesthetic and all deaths where the medical practitioner cannot give a cause of death. The complete autopsy is the preferred standard for the investigation of maternal deaths and the Royal College of Pathologists Australasia recommends that all maternal deaths should receive a post-mortem examination.

For the 2003–2005 triennium, 39 of the 65 deaths were investigated by a state or territory coroner (Table 11). Of the 29 direct maternal deaths, 24 had post-mortem examinations and 19 were referred to the coroner. Of the 36 indirect maternal deaths, 23 had a post-mortem examination and 20 were referred to the coroner. For seven deaths, the post-mortem or coronial findings were unavailable to the state and national committees for review at the time of submission of data to the NPSU.

Table 11: Maternal deaths examined post-mortem and/or referred to the coroner, 2003–2005

State and territory	Maternal deaths	Post-mortem examination	Coronial referral
NSW and ACT	16	15	15
Vic	22	17	18
Qld	18	9	5
WA	5	2	—
SA	2	2	1
Tas	1	1	—
NT	1	1	—
Total	65	47	39

Direct maternal deaths

Direct maternal deaths have declined from 202 in the 1964–1966 triennium to 30 in 2003–2005, with a marked decline from 150 in 1970–1972 to 60 in 1973–1975 (Table 12).

Table 12: Direct maternal deaths by triennium, Australia, 1973–1975 to 2003–2005

Triennium	Direct deaths	Maternal mortality ratio ^(a)
1973–1975	60	8.3
1976–1978	52	7.7
1979–1981	54	7.9
1982–1984	42	5.9
1985–1987	32	4.4
1988–1990	37	4.9
1991–1993	27	3.5
1994–1996	46	6.0
1997–1999	34	4.5
2000–2002	32	4.2
2003–2005	29	3.8

(a) Per 100,000 women who gave birth.

Cause of direct maternal deaths

Table 13: Cause of direct maternal deaths, Australia, 2003–2005

Cause of death	Number
Amniotic fluid embolism	8
Hypertensive disorders of pregnancy	5
Thrombosis and thromboembolism	5
Obstetric haemorrhage	4
Cardiac conditions	3
Infection	1
Deaths associated with anaesthesia	1
Non-genital tract haemorrhage	1
Thrombotic thrombocytopenic purpura	1
Total	29

The leading causes of direct deaths are shown in Table 13. Amniotic fluid embolism was the main cause of direct maternal death for eight women in 2003–2005. In the previous triennium 10 deaths were reported as due to amniotic fluid embolism. Hypertensive

disorders (n=5), thrombosis and thromboembolism (n=5) and obstetric haemorrhage (n=4) accounted for almost half of the direct maternal deaths.

Additional information regarding the type of labour and method of birth of the eight women who died from an amniotic fluid embolism is outlined in Table 14.

Table 14: Onset of labour and method of deaths due to amniotic fluid embolism in Australia, 2003–2005

Type of labour	Type of birth
No labour	Emergency caesarean section
Spontaneous	Vacuum extraction
Induced	Emergency caesarean section
Induced	Spontaneous vaginal
Induced	Vacuum extraction
Induced and augmented	Emergency caesarean section
Induced and augmented	Caesarean section for fetal retrieval
Induced and augmented	Vacuum extraction

Five women died as a direct result of hypertensive disease (Table 15).

Table 15: Direct deaths due to hypertensive disease, Australia, 2003–2005

Comment and contributing conditions	Type of labour	Type of birth
Severe pre-eclampsia, intracranial haemorrhage and pulmonary thromboembolism	Not in labour	Emergency caesarean section
Systemic lupus erythematosus and intracranial haemorrhage	Not in labour	Emergency caesarean section
HELLP eclampsia and massive intracranial haemorrhage, presented with abdominal pain	Not in labour	Emergency caesarean section
Pregnancy induced hypertension: limited information provided	Not in labour	Not delivered
Subarachnoid haemorrhage: previous pregnancy treated for severe pre-eclampsia, no evidence of pre-eclampsia this pregnancy	Not in labour	Not delivered

Maternal age and parity

Twelve of the 29 direct deaths were in women aged less than 30 years (Table 16). Over half the deaths were in nulliparous or primiparous women. During their first ongoing pregnancy, 11 women died at or beyond 20 weeks gestation. Two women who died had a parity of five or more.

Table 16: Direct maternal deaths by parity and age group, Australia, 2003–2005

Age group (years)	Parity (number)				Total
	0	1	≥ 2	Not stated	
15–19	1	1	—	—	2
20–24	1	2	—	—	3
25–29	—	4	3	—	7
30–34	1	2	2	—	5
35–39	1	2	6	—	9
40–44	—	—	2	1	3
Total	4	11	13	1	29

Indirect maternal deaths

There were 36 indirect deaths during 2003–2005, compared with 52 in the 2000–2002 triennium (Table 17). The increase in the number of indirect deaths for the 2000–2002 triennium was attributed to changes in classification occurring during the triennium and statistical fluctuation, however, an increase in the actual incidence for that period could not be ruled out.

Table 17: Indirect maternal deaths by triennium, Australia, 1973–1975 to 2003–2005

Triennium	Indirect deaths	Maternal mortality ratio ^(a)
1973–1975	32	4.4
1976–1978	35	5.2
1979–1981	34	5.0
1982–1984	25	3.5
1985–1987	30	4.1
1988–1990	33	4.4
1991–1993	22	2.9
1994–1996	20	2.6
1997–1999	^(b) 30	4.0
2000–2002	52	6.9
2003–2005	36	4.7

(a) Per 100,000 women who gave birth.

(b) Data updated to include two indirect deaths in the 1997–1999 triennium that were notified or amended after the 1997–1999 report was published.

Causes of indirect maternal deaths

The leading causes of death for indirect deaths are presented in Table 18. Ten of the indirect maternal deaths for 2003–2005 were attributed to cardiac conditions. Psychiatric conditions (n=6), non-obstetric haemorrhage (n=5) and infection (n=4) accounted for 15 deaths, with hypertension indirectly responsible for one maternal death.

Table 18: Causes of indirect maternal deaths, Australia, 2003–2005

Cause of death	Number
Cardiac conditions	10
Psychiatric causes	6
Non-obstetric haemorrhage	5
Infection	4
Hypertension	1
Other indirect causes	10
Total	36

Table 19 presents further information about the medical condition of the women who died as a result of underlying cardiac disease.

Table 19: Indirect deaths due to cardiac disease, Australia, 2003–2005

Comment and contributing conditions	Type of labour	Type of birth
Previous correction of major congenital heart defects, pulmonary hypertension	No labour	Emergency caesarean section
Pneumonia in a woman with a history of coarctation repair, sub-aortic stenosis and mitral stenosis repair	Spontaneous	Spontaneous vaginal
Intrathoracic haemorrhage due to aortic dissection in a woman with previous evidence of aortic cardiac surgical repair	Not in labour	C/S for fetal retrieval
Congenital mitral valve disease, pulmonary hypertension and arrhythmia	Not in labour	C/S for fetal retrieval
Marfan Syndrome; dissecting thoracic aneurysm	Not in labour	Emergency caesarean section
Thrombocytopenia and pre-eclampsia developed during labour, primary pulmonary hypertension diagnosed at post-mortem examination	Augmented	Emergency caesarean section
Primary pulmonary hypertension, congestive cardiac failure, cardiomyopathy	Not stated	Not stated
Peripartum cardiomyopathy, arrhythmia	Augmented	Forceps
Marfan Syndrome, Type B aortic dissection, peripartum cardiomyopathy	Not in labour	Not delivered
Cardiac cause of death not determined	Spontaneous	Spontaneous vaginal

Psychiatric conditions, with or without associated illicit drug use, were the cause of death for six women either in the antenatal or early postpartum period during 2003–2005 (Table 20).

Table 20: Indirect deaths, classified as psychiatric related, Australia, 2003–2005

Comment or contributing conditions	Type of labour	Type of birth
Previous depression, no medication, suicide	Not in labour	Not delivered
Suicide	Not in labour	Not delivered
Suicide	Not stated	Not stated
Suicide	Induced	Vacuum extraction
Major depression, unspecified pre-eclampsia, methadone toxicity	Not stated	Not stated
Heroin toxicity	Spontaneous	Spontaneous vaginal

Three of the 36 women who died from indirect causes died as a result of violence. Table 21 gives details of the causes of death for the 10 women who died from other indirect causes.

Table 21: Cause of death, categorised as Other Indirect, by NACMM, Australia, 2003–2005

Cause of death	Gestational age at death	Birth outcome
Homicide	24	Not delivered
Homicide	13	Not delivered
Homicide	36	Not delivered
Air embolism	23	Not delivered
Epilepsy	Not stated	Not delivered
Ehlers Danlos Syndrome	Not stated	Stillbirth
Cancer of the stomach	Not stated	Live birth—survived at least 28 days
Systemic lupus erythromatosus	Not stated	Stillbirth
Idiopathic pulmonary haemosiderosis	Not stated	Live birth—neonatal death (within 28 days)
Cause of death undetermined, but considered related to the pregnancy	Not stated	Live birth—survived at least 28 days

Information about gestation and parity was not well documented in women who were categorised as dying from indirect causes, compared to those dying from direct causes. Fifteen of the maternal deaths occurred in women with a parity of two or more. Whilst it is not shown in the table the data showed that six of these 15 maternal deaths occurred in women with a parity of four or more (Table 22).

Table 22: Indirect maternal deaths by parity and age group, Australia, 2003–2005

Age group (years)	Parity				Total
	0	1	≥ 2	Not stated	
15–19	—	1	—	2	3
20–24	2	2	—	1	5
25–29	—	1	4	2	7
30–34	3	3	5	—	11
35–39	1	—	5	1	7
40–44	—	1	1	1	3
Total	6	8	15	7	36

Maternal age

The rate of death varies by maternal age. An estimated one maternal death (direct and indirect) per 4,211 women aged 40–44 years occurred between 2003 and 2005, compared with one in every 16,417 women aged 30–34 years (Table 23).

Table 23: Maternal deaths by age group, Australia, 2003–2005

Age group (years)	Number of deaths ^(a)	Per cent	Number of women who gave birth	Per cent of total number of women who gave birth	MMR ^(b)
15–19	5	7.7	34,957	4.5	14.3
20–24	8	12.3	113,506	14.7	7.0
25–29	14	21.5	210,437	27.2	6.7
30–34	16	24.6	262,676	34.0	6.1
35–39	16	24.6	126,311	16.3	12.7
40–50	6	9.2	25,266	3.3	23.7
Not stated	—	—	95	—	—
Total	65	100.0	773,248	100.0	8.4

(a) Direct and indirect maternal deaths.

(b) Per 100,000 women who gave birth.

Place of death

Area of usual residence

Fifty-six per cent of deaths were women whose usual residence were in major cities, where 69% of the population live. Compared to, 8% of deaths occurred to women whose usual residence were in remote or very remote locations, where 3% of the population live (Table 24). Direct deaths were proportionately over-represented in outer regional areas.

Table 24: Maternal deaths by Remoteness Area and type of death, Australia, 2003–2005 (per cent)

Remoteness Area ^(a)	Direct	Indirect	Total
Major cities	53	58	56
Inner regional	17	19	18
Outer regional	20	8	14
Remote / Very Remote	7	8	8
Not stated	3	6	5
Total	100	100	100

(a) Geographical location derived from the woman's postcode of usual residence.

Location of death

The setting of death varied by type of classification with 90% of direct deaths occurring in a hospital setting while 31% of indirect deaths occurred at home (Table 25).

Table 25: Maternal deaths by setting and type of death, Australia, 2003–2005 (per cent)

Setting of death	Direct	Indirect	Total
Home	7	31	19
Hospital	90	69	79
Birth centre	—	—	—
Other	—	—	—
Not stated	3	—	2
Total	100	100	100

Table 26: Maternal deaths in the hospital setting and type of death, Australia, 2003–2005(per cent)

Hospital	Direct	Indirect	Total
Hospital in which woman was booked to deliver	22	20	41
Un-booked admission	4	2	6
Emergency transfer	22	18	39
Other	—	4	4
Not stated	4	6	10
Total	51	49	100

Of the 51 deaths that occurred within a hospital, 21 women died in their hospital of booking and another 20 women were transferred (Table 26).

Time of death

Of the 65 who died, 25 (38%) women died within 24 hours of giving birth (Table 27). The 10 women who died undelivered were not counted in other routine data collections, such as the state and territory perinatal data collections. Their pregnancy remained unrecorded, as these women had not given birth.

Table 27: Maternal deaths by timing of death, Australia, 2003–2005

Timing of death	Total
Died undelivered	10
Within 24 hours of birth or termination of pregnancy	25
2–6 days postpartum	11
7–42 days postpartum	14
Not stated	5
Total	65

Early pregnancy deaths

There were two direct deaths in early pregnancy defined as less than 20 weeks. One was due to an ectopic pregnancy, the second was due to thrombotic thrombocytopenic purpura (TTP) which is usually considered to be an indirect cause of maternal death. The latter death was classified by NACMM as the direct cause of death for this woman. Of the five indirect deaths in early pregnancy, two were violent deaths due to psychiatric causes (Table 28).

Table 28: Maternal deaths, early pregnancy, Australia, 2003–2005

	Principal cause of death	Gestation (weeks)
Direct	Thrombotic thrombocytopenic purpura	17
	Ectopic pregnancy	8
Indirect	Psychiatric	4
	Psychiatric	6
	Cardiac	5
	Epilepsy	12
	Cardiac	3

Maternal deaths of Aboriginal and Torres Strait Islander women

In 60 of the 65 maternal deaths information was reported on Indigenous status in 2003–2005 (Table 29).

Table 29: Proportion of maternal deaths where Indigenous status was reported, Australia, 1970–2005 (per cent)

Triennium	Per cent
1976–1978 ^(a)	50
1979–1981	48
1982–1984	51
1985–1987	84
1988–1990	91
1991–1993 ^(b)	92
1994–1996	83
1997–1999	83
2000–2002	89
2003–2005	92

(a) Reporting of Indigenous status for direct maternal deaths commenced in 1970.

(b) Reporting of Indigenous status for indirect and incidental maternal deaths commenced in 1991.

Six of the women who died during the 2003–2005 period were identified as Aboriginal or Torres Strait Islanders. The MMR for Aboriginal and Torres Strait Islander women for the 2003–2005 triennium was 21.5 per 100,000 women who gave birth. This was two-and-half times higher than non-Indigenous women for the same period (Table 30).

The MMR for Aboriginal and Torres Strait Islander women was also calculated for overlapping six-year periods to improve the stability of the estimate (Table 30). The rate ratio for the most recent period 2000–2005 was 3.6 compared to a rate ratio of <3 for the periods 1991–1996 and 1994–1999. These findings need to be interpreted with caution owing to the very small number of deaths and the inconsistencies and lack of completeness of Indigenous identification in mortality data.

Table 30: Maternal direct and indirect deaths by Indigenous status, Australia, 1991–2005

Triennium	Number of Indigenous maternal deaths		Number of Indigenous women who gave birth	Maternal mortality ratio ^(a)		
	Direct	Indirect		Indigenous	Non-Indigenous ^(b)	Rate ratio ^(c)
2003–2005	2	4	27,901	21.5	7.9	2.7
Double triennia						
1991–1996	4	5	44,535	20.2	7.1	2.8
1994–1999	4	6	48,526	20.6	8.0	2.6
1997–2002	5	13	51,658	34.8	7.7	4.5
2000–2005	7	10	53,968	31.5	8.8	3.6

(a) Ratio per 100,000 women who gave birth calculated using direct and indirect deaths only.

(b) For 1991 to 1996, includes deaths where Indigenous status was not reported. For 1997 to 2005, does not include deaths where Indigenous status was not reported.

(c) Indigenous maternal mortality rate divided by non-Indigenous maternal mortality rate.

Of the six deaths of Aboriginal and Torres Strait islander women in 2003–2005, two were classified as direct and four as indirect (Table 30). Two of deaths occurred in primiparous women aged less than 20 years old.

Table 31 presents additional information about the causes of death of Aboriginal and Torres Strait islander women.

Table 31: Causes of maternal death among Aboriginal and Torres Strait Islander women, Australia, 2003–2005

Age group (years)	Principal cause of death	Contributing cause of death, comments
Direct	Intracranial haemorrhage	HELLP Syndrome, severe eclampsia
	Subdural haemorrhage	Subdural haematoma, presumably secondary to undetected pre-eclampsia
Indirect	Suicide	No information
	Peritonitis	Perforated carcinoma of the stomach diagnosed at autopsy
	Primary pulmonary hypertension	Cardiomyopathy, congestive cardiac failure
	Undetermined cause of death	Small bowel resection, previous history of asthma

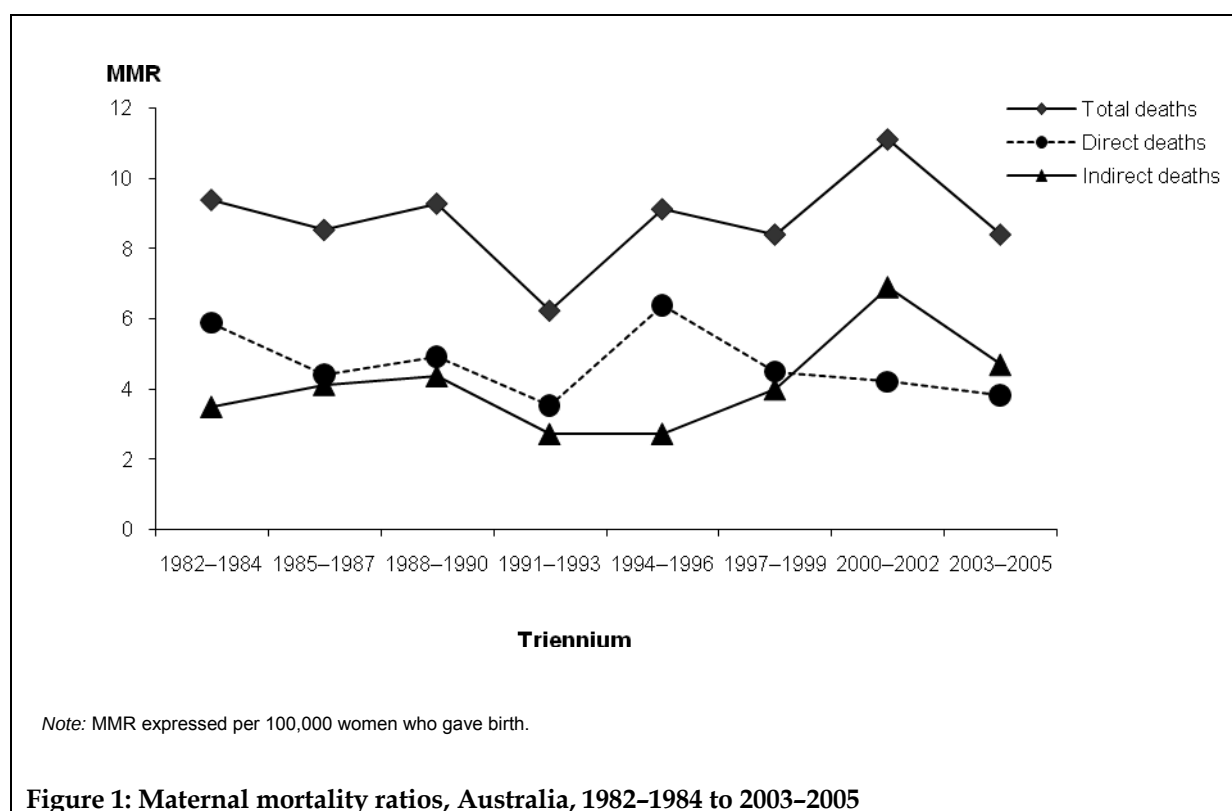
Section C: Trends in maternal mortality in Australia

Introduction

Maternal deaths in Australia have been reported triennially since 1964. Data were not available from the first four reports for inclusion in this section. All presented data should be interpreted with caution due to the small numbers and variability in ascertainment over time.

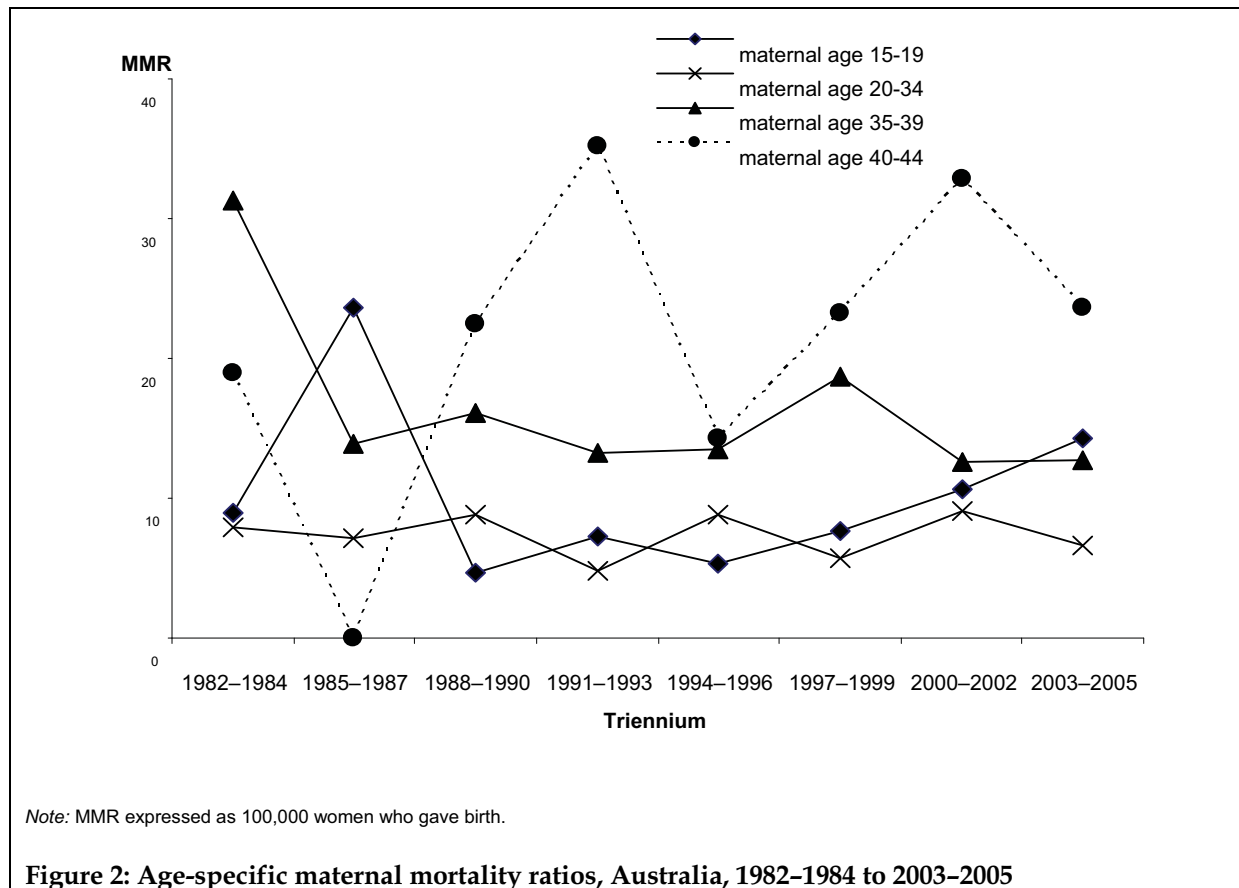
Maternal mortality ratios 1982–2005

For the period 1982–2005, 529 deaths were classified as being causally related to pregnancy, including 283 (57.7%) direct deaths and 246 (42.3%) indirect deaths. The highest reported MMR was for the period 2000–2002 (Figure 1). This however may reflect changes in classification practice at national level. Deaths due to psychiatric causes were mainly classified as indirect rather than incidental from 1997 onwards; and some deaths due to cancers and tumours were also classified as indirect rather than incidental, from 2000 onwards. This rise may be potentially explained by enhanced surveillance identifying more deaths than in previous triennia.



Age-specific maternal mortality ratios 1982–2005

For the period 1982–2005, the age-specific mortality ratios were highest for women aged 40–44 years followed by women aged 35–39 years (Figure 2).



Maternal deaths of Aboriginal and Torres Strait Islander women

The MMR differed significantly by Indigenous status with the rate ratio of maternal deaths of Indigenous women to other women ranging from 2.1 for the triennium 1994–96 to 5.3 for 2000–02 (Figure 3).

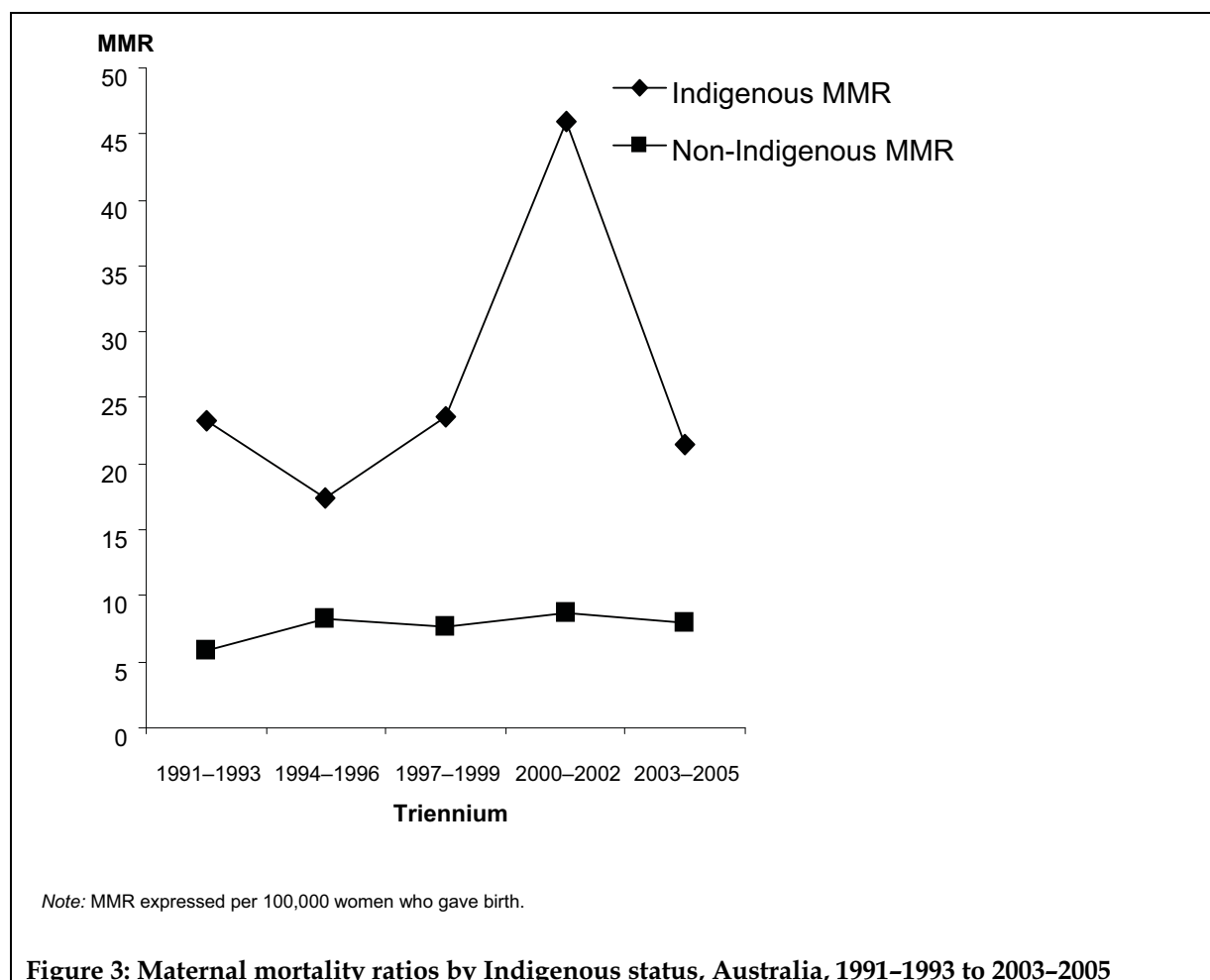


Figure 3: Maternal mortality ratios by Indigenous status, Australia, 1991-1993 to 2003-2005

Leading causes of maternal deaths 1997-2005

From 1997-2005, there was a total of 211 maternal deaths classified as directly or indirectly relating to pregnancy. Deaths due to cardiac disease were the leading category of maternal death for this period with a total of 32 deaths attributed to cardiac disease and accounting for 15% of all maternal deaths over the three triennia. Amniotic fluid embolism was the next leading cause of death (n=25), responsible for 12% of all deaths, followed closely by psychiatric illness (n=23) which accounted for 11% of all deaths. Genital tract haemorrhage (n=22) comprised 10% of all deaths. Together, these four categories accounted for 48% of all maternal deaths in the last nine years. Ten per cent of direct and indirect maternal deaths were due to an infectious process, including viral pneumonia, active hepatitis B and C, and septic shock due to E coli and streptococcus.

Direct deaths 1997–2005

The leading principal causes of direct deaths for this period are listed in Table 32. Amniotic fluid embolism and genital tract haemorrhage together accounted for nearly half of all direct maternal deaths. Maternal death associated with hypertensive disease accounted directly for 15 maternal deaths, with thrombosis and thromboembolism causing 14 deaths.

Table 32: Direct causes of death, Australia, 1997–2005

Causes of death	1997–1999	2000–2002	2003–2005	Total
Amniotic fluid embolism	7	10	8	25
Genital tract haemorrhage	9	9	4	22
Hypertension	6	4	5	15
Thrombosis and thromboembolism	7	2	5	14
Infection	—	5	1	6
Anaesthetic associated	3	1	1	5
Cardiac condition	1	—	3	4
Early pregnancy (ectopic)	1	1	—	2
Thrombotic thrombocytopenic purpura	—	—	1	1
Non-genital tract haemorrhage	—	—	1	1
Total	34	32	29	95

Indirect deaths 1997–2005

Of the 116 deaths that were classified as indirect during the last nine years, cardiac conditions accounted for 28 deaths, which was 13% of all maternal deaths. Psychiatric illness accounted for 23 of the 116 deaths, or 11% of all maternal deaths. Other causes of indirect death accounted for 37 deaths, which were difficult to group into categories (Table 33). Examples include epilepsy, asthma and cancer of the stomach or cause of death undetermined, but considered related to the pregnancy.

Table 33: Indirect causes of death, Australia, 1997–2005

Causes of death	1997–1999	2000–2002	2003–2005	Total
Cardiac disorders	7	11	10	28
Psychiatric disorders	8	9	6	23
Infection	—	10	4	14
Non-genital tract haemorrhage	—	8	5	13
Hypertension	—	—	1	1
Other indirect	13	14	10	37
Total	28	52	36	116

Section D: Data development

The current national maternal death case report form collects limited information on maternal deaths (Appendix 4). It lacks detail on risk factors, clinical pathways and managements to enable recommendations to be made on policy and practice change. The form reflects the lack of national consistency in auditing deaths at a state and territory level. For the current report several jurisdictions did not undertake a clinical review of the deaths prior to submission to the NPSU for compilation into the National Maternal Deaths Database. The current report also has not benefited from the introduction of root cause analyses with the majority of deaths in this triennium not reviewed using this process. The introduction of a nationally agreed system of review with relevant cross-disciplinary expertise and a standardised audit process would support the standardisation of data processes and the development of a national epidemiological collection of maternal deaths. It would also assist in the development of a high quality and sustainable system, for the estimated 25 deaths per year which occur nationally.

A major concern in the national compilation and reporting of maternal mortality has been the time taken for the triennial maternal mortality report to be produced. The delay in publication has led to questions regarding the clinical relevance of data as maternal health care continues to evolve. In the past, the publication time for the report has been five years after the deaths occurred, with the 1997–1999 report published in 2004 and the 2000–2002 report published in 2006. For this 2003–2005 report, published in early 2008, some data were not received until late 2007, and even then, data were not available for all deaths. These delays in data collection and publication reflect the complexity of many maternal deaths which require an investigation by a coroner as well as a clinical review. In addition, the timeline for preparation of the report had been adversely impacted by delays in transfer of data and variability in existing state and territory-based reporting systems.

A program of national data development is required to improve the quality and utility of the maternal deaths data collection. This would include development of a nationally-agreed process of review of maternal deaths. Historically, the review of maternal deaths in Australia has been driven by obstetricians and midwives and the need for professional self-evaluation. Unlike the United Kingdom (UK) and New Zealand (NZ), there is no government requirement stipulating that all maternal deaths should be subject to a confidential inquiry. Integral to a nationally agreed system of review would be the development of a nationally-agreed set of data elements for use in future reporting of maternal deaths.

Finally, the lack of continuity of funding at both state and national level, impacts on the ability to undertake clinically relevant, contemporaneous maternal death reporting. Continuity of funding is required to sustain a program of national data development that will improve the quality and utility of the data collection for use in the development of policy, clinical guidelines and education resources for healthcare professionals and consumers.

Appendixes

Appendix 1: National Advisory Committee on Maternal Mortality (NACMM) and Committee Member Affiliations (2003–2005)

Committee member	Position/Organisation
A/Professor James King	Chair NACMM
Professor Michael Peek	Deputy Chair, NACMM/Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)
Professor David Ellwood	State Mortality Committee ACT
Mr Peter Mansfield (Acting)	TAS Health
Professor Jeffrey Robinson	State Mortality Committee SA
Dr Martha Finn	State Mortality Committee NT
Ms Suzanne Cornes (Acting)	QLD Health
Professor John Newnham	State Mortality Committee WA
Professor Michael Bennett	State Mortality Committee NSW
Professor Jeremy Oats	State Mortality Committee VIC
A/Professor Marie-Paule Austin	Royal Australian and NZ College of Psychiatrists
Professor Michael Paech	Australian and NZ College of Anaesthetists
Professor Yee Khong	Royal College of Pathologists of Australasia
Professor Caroline Homer	Australian College of Midwives
Dr Ines Rio	RACGP
Dr Angela Bascomb	ACRRM
Professor Gus Dekker	SOMANZ
Professor Barry Walters	Obstetric medicine physician
A/Professor Elizabeth Sullivan	AIHW NPSU
Dr Fadwa Al-Yaman	AIHW
Dr Christine Jorm	ACSQH
Ms Ros Madden	ACSQH (resigned November 2007)
Dr Rob Buist	Women's Hospitals Australasia
A/Professor Lisa Jackson Pulver	Epidemiologist, Head of Muru Marri Indigenous Health Unit UNSW
A/Professor Katie Panaretto	Public health physician

Ms Alyssa Anstey	Consumer representative
Mr David Dumbrell	Dept of Health and Ageing (resigned November 2007)
Ms Annie Dullow	Dept of Health and Ageing (commenced December 2007)
Professor Cindy Farquhar	Chair, New Zealand Perinatal and Maternal Mortality Review Committee (observer capacity)
Dr Greg Ash	National Health and Medical Research Council
Ms Wendy Pollock	Critical care midwifery consultant
Dr Susan Killion	AIHW
Dr Claire McLintock	Representative, New Zealand Perinatal and Maternal Mortality Review Committee (observer capacity)

NACMM Maternal Mortality Classification Subcommittee

A/Professor James King (Chair)
A/Professor Elizabeth Sullivan
Professor David Ellwood
Professor Michael Peek
Professor Michael Paech

NACMM Education and Training Subcommittee

Professor Caroline Homer (Chair)
Dr Nolan McDonnell
A/Professor Elizabeth Sullivan
Professor David Ellwood
Professor Michael Peek
A/Professor Lisa Jackson Pulver
Professor Barry Walters

Appendix 2: NACMM terms of reference

With the establishment of a new National Advisory Committee on Maternal Mortality in 2007, three national workshops were held to look at future developments for monitoring of maternal mortality and morbidity in Australia. These workshops comprised representatives of STMMCs, professional colleges, coroners, Australian Bureau of Statistics, AIHW, the National Centre for Classification in Health, the Australian Commission on Safety and Quality in Health Care, the Australian Government Department of Health and Ageing and Indigenous and consumer representation.

Key objectives of the workshops were to examine the processes used to report deaths at the state, territory and national level and to investigate the development of a mechanism to enable nationally consistent examination of maternal death and morbidity.

Terms of reference for the AIHW National Advisory Committee on Maternal Mortality are:

Advise the National Perinatal Statistics Unit on the development and preparation of the Maternal Deaths in Australia report 2003–2005, including:

1. Advising and assisting on the collation of maternal mortality data for deaths in the period 1 January 2003 to 31 December 2005 from State and Territory maternal mortality committees.
2. Providing clinical, epidemiological and statistical expertise in the assessment of causes of and trends in maternal deaths in Australia.
3. Providing a subcommittee to work closely with NPSU in the categorisation of the data received from State Committees.
4. Participating, prior to publication, in the development of a brief commentary on the statistical findings of the draft report. If possible, to advise on the implications of the findings to maternity care.
5. Reviewing the draft Maternal Deaths in Australia report before publication by the Australian Institute of Health and Welfare.
6. Providing clinical expertise in relation to enquiries regarding the report.

Appendix 3: Membership of the state and territory Maternal Mortality Committees 2003–2005

The composition and titles of the state and territory Maternal Mortality Committees for the period 2003–2005 were as follows:

New South Wales

Professor William Walters (Chair), Obstetrician, Newcastle University

Dr John Smoleniec, Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) (feto-maternal medicine)

Ms Hannah Dahlen, Australian College of Midwives Inc (NSW Branch)

Professor Pat Brodie, Australian College of Midwives Inc (NSW Branch)

Professor Michael Bennett, Obstetrician, University of New South Wales

Professor Brian Trudinger, Obstetrician, University of Sydney

Dr John Hobbs, Royal College of Pathologists of Australasia (maternal pathology)

Dr Susan Arbuckle, Royal College of Pathologists of Australasia (perinatal pathology)

Vacant: Representative of Royal Australian College of General Practitioners involved in the practice of obstetrics in a rural setting

Professor David Henderson-Smart, NSW Pregnancy and Newborn Services Network

Ms Melinda Bell, Aboriginal Health Resource Cooperative

Vacant: The Royal Australian and New Zealand College of Obstetricians and Gynaecologists involved in the practice of obstetrics in a rural setting

Dr Andrew Berry, Royal Australasian College of Physicians (RACP), Paediatric & Child Health Division

Dr Paul Bloomfield, Royal Australasian College of Physicians (RACP), Paediatric & Child Health Division

A/Professor Kathy Baker, Chief Nursing and Midwifery Officer, NSW Health

Professor Jonathan Morris, Obstetric representative of the Greater Metropolitan Clinical Group (Temporary appointment 6 months)

Dr Andrew Child, NSW Department of Health nominee (clinical quality management)

Ms Jennifer Dawson, Neonatal Nurses Association

Dr Louise Newman, Royal Australian and New Zealand College of Psychiatrists

Dr Ross Wilson, The Australian College of Rural and Remote Medicine

Ms Claire Bell, Consumer representative

Ms Megan Smith, Consumer representative

Dr Elisabeth Murphy, Primary Health and Community Care, NSW Department of Health

Ms Ann Kinnear, NSW Health Maternity Services Advisor

Dr Lee Taylor, Epidemiologist, NSW Department of Health

Victoria

A/Professor James King (Chair, retired 2007)

Dr Christine Bessell
Dr Virginia Bilson
Dr Matthew Lynch
Professor Jeremy Oats (Chair)
Ms Wendy Pollock
Professor Michael Permezel
Dr Andrew Ross
Dr Craig Walker
Professor Euan Wallace

Queensland

The Queensland Maternal Mortality and Morbidity Subcommittee did not complete reviews of deaths in the 2003–2005 triennium. Twenty-four maternal deaths were reported by the Health Information Centre, Queensland Health.

Tasmania

Dr Shelby Jarrell (Chair) 2003–2004
Dr Melwyn D'Mello
Ms Ruth Forrest

Western Australia

Maternal Mortality Committee of Western Australia (2002–2005)
Professor John Newnham, Chair (Obstetrician)
Professor Barry Walters (Obstetric physician)
A/Professor Jan Dickinson (Obstetrician)
Dr Louise Farrell (Obstetrician)
Dr Timothy Jeffery (Obstetrician)
Dr Peter Hugo (Obstetrician)
Dr Christopher Nichols (Obstetrician)
Professor Michael Paech (Obstetric anaesthetist)
Dr Virginia McLaughlin (until 2003)
Dr Everett Magann (Obstetric investigator) (until 2003)
Dr Erica Shellabear (Obstetric investigator) (2005)
Dr Julia Barton (Obstetric investigator) (from 2005)
Mr Terry Jongen (Nurse/Midwife) (until 2003)
Ms Janice Butt (Nurse/Midwife) (from 2003)

South Australia

Maternal, Perinatal and Infant Mortality Committee

The Maternal subcommittee members for 2005 were:

Professor Jeffrey Robinson, Obstetrician (Chair)

Dr William Hague (Obstetric physician)

Dr James Harvey (Obstetrician)

Dr Scott Simmons (Obstetric anaesthetist 2003–2004)

Dr Jonathan Hopkinson (Obstetric anaesthetist 2005)

Professor T. Yee Khong (Pathologist)

Dr George Kokar (General practitioner)

Mrs Elizabeth Wood (Midwife)

Dr Annabelle Chan (Public health physician, medical secretary)

ACT

The data for the Australian Capital Territory maternal deaths 2000–02 were collected and provided to the NPSU by the ACT Maternal Perinatal Information Network. The Committee was formed in 1998 and meets three or four times per year.

The members of the ACT Maternal and Perinatal Information Network collecting data for maternal deaths from 2000–02 comprised of:

Professor David Ellwood, Associate Dean, Clinical School, The Canberra Hospital (TCH) (Chair)

Mrs Maureen Bourne, Data Manager, Population Health Research Centre, ACT Health (Coordinator)

Ms Louise Freebairn, Population Health Research Centre, ACT Health

Ms Sue Minter, Associate Director of Nursing, Maternity, Medical & Mental Health, Calvary Public and Private Hospitals

Ms Stephanie Ham, Clinical Nurse Consultant, Delivery Suite, John James Memorial Hospital

Northern Territory

The Northern Territory did not have a maternal mortality committee during the years 2003–2005. The Northern Territory representative for the NACMM is Dr Martha Finn.

Appendix 4: National Maternal Deaths Reporting Form

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NATIONAL MATERNAL DEATH REPORTING FORM

1. This standardized reporting form is for the use of State and Territory Maternal Mortality Committees and hospitals (where indicated) in the review of all deaths in women while either pregnant or within 42 days of a pregnancy being delivered or terminated, irrespective of the duration and the site of the pregnancy, including abortions and ectopic pregnancies. Cases where the pregnancy was unlikely to contribute significantly to the death are also included.

2. All data will be treated confidentially and is covered under the protection of the AIHW Act.

3. This form was developed in conjunction with the National and State and Territory Maternal Mortality Committees. Some components have been developed from the Guidelines for completing the maternal death notification form (Second edition, 1999), Department of Health, South Africa.

4. Please return forms and direct enquiries to Dr Elizabeth Sullivan, Director, AIHW National Perinatal Statistics Unit, Level 2, McNevin Dixon Building, Randwick Hospital Campus, Avoca St, Randwick NSW 2031. Please telephone Elizabeth Sullivan on (02) 9382 1014 with any queries.



For office use only: AIHW NPSU case number

Details of deceased	
State/Country (of usual residence) Postcode (of usual residence)	State in which death occurred
Date of death	State case number
Maternal date of birth	Maternal country of birth
Torres Strait Islander or Aboriginal status ☐ Torres Strait Islander ☐ Aboriginal ☐ Both ☐ Non Indigenous ☐ Not specified	
Maternal age at death	Maternal weight at time of death
Date of delivery/ abortion (if applicable)	If death occurred antepartum; gestational age at death
Plurality ☐ Single ☐ Multiple If multiple, no.	If death occurred postpartum; number of days postpartum at death
Parity (including current pregnancy if delivered at or beyond 20 weeks gestation):	Did the mother smoke at all during pregnancy? ☐ Yes ☐ No ☐ Unknown
Was this pregnancy the result of assisted reproductive technology? ☐ Yes ☐ No ☐ Unknown If yes, please specify	
Place of death	
Setting of death : ☐ Home ☐ Hospital ☐ Birth Centre ☐ Other (please specify)	If hospital, was it: ☐ The hospital in which she was booked to delivery ☐ Un-booked admission ☐ An emergency transfer from elsewhere ☐ Other (please specify) Hospital level
Date of last hospital admission (if applicable):	Date of last hospital discharge (if applicable):

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NATIONAL MATERNAL DEATH REPORTING FORM

Delivery and neonatal information					
Type of labour: ☐ Spontaneous ☐ Augmented ☐ Induced ☐ No labour ☐ No specified					
Type of delivery: ☐ Spontaneous vaginal ☐ Elective Caesarean section ☐ Forceps ☐ Vaginal breech ☐ Vacuum extraction ☐ Emergency Caesarean section ☐ Caesarean section for fetal retrieval in a recently dead or moribund mother ☐ Caesarean section (unspecified) ☐ Unspecified ☐ Other (please specify)					
Number of previous Caesarean section deliveries: Was the previous birth by Caesarean section? ☐ Yes ☐ No ☐ Unknown					
Baby outcome (if applicable) ☐ Livebirth ☐ Stillbirth ☐ Neonatal death Birth weight: (gms)					
Maternal medical conditions					
Pre-existing conditions ☐ Diabetes mellitus ☐ Essential hypertension ☐ Cardiac disease ☐ Epilepsy ☐ Mental illness ☐ Other Comments on pre-existing conditions:					
Pregnancy related conditions ☐ Gestational diabetes ☐ Hypertensive disorder of pregnancy ☐ Ectopic pregnancy ☐ Other					
Comments on pregnancy related conditions:					
Interventions (tick appropriate boxes)					
Early pregnancy	Antenatal	Intrapartum	Postpartum	Other	
Evacuation	Transfusion	Instrument Del.	Evacuation	Gen. Anaes.	
Laparotomy	Version	Symphysiotomy	Laparotomy	Epidural	
Hysterectomy		Caesarean	Hysterectomy	Spinal Anaes.	
Transfusion		Hysterectomy	Transfusion	Local Anaes.	
		Transfusion	Manual removal	ICU/CCU	
			Return to OT	Ventilation	
Other interventions: Comments on interventions:					
Anaesthesia: (related to terminal event) ☐ No ☐ Yes(please specify)					

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NATIONAL MATERNAL DEATH REPORTING FORM

Birth attendant: <table style="width: 100%;"><tr><td>☐ Obstetrician</td><td>☐ Registrar/RMO</td><td>☐ Other Doctor</td><td>☐ Anaesthetist</td></tr><tr><td>☐ Midwife</td><td>☐ GP</td><td colspan="2">☐ Other birth attendant</td></tr></table>		☐ Obstetrician	☐ Registrar/RMO	☐ Other Doctor	☐ Anaesthetist	☐ Midwife	☐ GP	☐ Other birth attendant	
☐ Obstetrician	☐ Registrar/RMO	☐ Other Doctor	☐ Anaesthetist						
☐ Midwife	☐ GP	☐ Other birth attendant							
Cause of death – as specified by State or Territory Maternal Mortality Committee									
Primary (underlying) cause of death: 									
Contributing (antecedent) causes of death: 									
Terminal event (description): 									
Classification of death <table style="width: 100%;"><tr><td>☐ Direct</td><td>☐ Indirect</td><td>☐ Incidental</td></tr></table>		☐ Direct	☐ Indirect	☐ Incidental					
☐ Direct	☐ Indirect	☐ Incidental							
Classification of death (into ICD-10 categories*) <table style="width: 100%;"><tr><td>☐ Pregnancy-related death – 0 to 42 days (any cause; O95 or other pregnancy, childbirth, puerperium code)</td></tr><tr><td>☐ Late maternal death – 42 to 365 days (direct or indirect; O96))</td></tr><tr><td>☐ Death from sequelae of direct causes – post 365 days (direct; O97)</td></tr><tr><td>☐ Other – incidental death occurring 42-365 days post-pregnancy or termination</td></tr></table>		☐ Pregnancy-related death – 0 to 42 days (any cause; O95 or other pregnancy, childbirth, puerperium code)	☐ Late maternal death – 42 to 365 days (direct or indirect; O96))	☐ Death from sequelae of direct causes – post 365 days (direct; O97)	☐ Other – incidental death occurring 42-365 days post-pregnancy or termination				
☐ Pregnancy-related death – 0 to 42 days (any cause; O95 or other pregnancy, childbirth, puerperium code)									
☐ Late maternal death – 42 to 365 days (direct or indirect; O96))									
☐ Death from sequelae of direct causes – post 365 days (direct; O97)									
☐ Other – incidental death occurring 42-365 days post-pregnancy or termination									
Cause of Death – as specified on Medical Death Certificate									
Direct cause of death (disease or condition directly leading to death)									
Antecedent causes of death: Morbidity conditions, if any, giving rise to the above cause, stating the underlying condition last (1) (2) (3)									
Post-mortem information									
Post-mortem conducted: <table style="width: 100%;"><tr><td>☐ Yes</td><td>☐ No</td></tr></table>	☐ Yes	☐ No	Coronial inquest: <table style="width: 100%;"><tr><td>☐ Yes</td><td>☐ No</td></tr></table>	☐ Yes	☐ No				
☐ Yes	☐ No								
☐ Yes	☐ No								
Macroscopic/ microscopic findings: (please attach relevant documentation) 									
Toxicology findings: (please attach relevant documentation) 									

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NATIONAL MATERNAL DEATH REPORTING FORM

Avoidable factors as determined by State/Territory Maternal Mortality Committee

Avoidable factors ☐ Yes, avoidable factors present ☐ No, death was inevitable

System	Examples	✓
Personal/family	Delay in woman seeking help	
	Refusal of treatment or admission	
	Insufficient antenatal care	
Logistical systems	Lack of transport from home to health care facility	
	Lack of transport between health care facilities	
	Communication breakdown between health services	
Facilities	Lack of facilities, equipment or consumables	
	Lack/ delay in access to health services due to rural location	
Health personnel	Lack of human resources (e.g. lack of available staff)	
	Lack of antenatal care providers	
	Lack of expertise, training or education	
	Lack of access to interpreter services	
Model of care	Inappropriate early discharge	

Comments on avoidable factors:

Case summary:

(or please attach discharge summary, autopsy report and other relevant information)

Reported in State report: ☐ Yes ☐ No

If yes, which State or Territory:

.....

Name of person completing form:

.....

Signature:

Phone No.

Date:

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Please return forms to Dr Elizabeth Sullivan, Director, AIHW National Perinatal Statistics Unit, Level 2, McNevin Dixon Building, Randwick Hospital Campus, Avoca St, Randwick NSW 2031.

Glossary

Caesarean section (C/S): operative birth through an abdominal incision.

Epidural: injection of anaesthetic agent into the epidural space of the spinal cord.

Fetal death (stillbirth): death prior to the complete expulsion or extraction from its mother of a product of conception of 20 or more completed weeks of gestation or of 400 grams or more birthweight. The death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles.

Gestational age: the duration of pregnancy in completed weeks calculated from the date of the first day of a woman's last menstrual period and her baby's date of birth, or via ultrasound, or derived from clinical assessment during pregnancy or from examination of the baby after birth.

Induction of labour: intervention to stimulate the onset of labour.

Live birth: the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered liveborn (WHO definition).

Maternal age: mother's age at death.

Neonatal death: death of a liveborn baby within 28 days of birth.

Not delivered: a woman who has died while still pregnant.

Parity: the number of previous pregnancies resulting in live births or stillbirths (of 20 weeks gestation or 400 g birthweight), including current pregnancy if delivered at or beyond 20 weeks gestation.

Spontaneous vaginal birth: birth without medical or surgical intervention.

Stillbirth: see *Fetal death*.

Term: between 37–41 completed weeks of gestation.

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