



Guide to interpreting the Perinatal and Infant Mortality reports

1. Introduction

The Perinatal & Infant Mortality Committee (PIMC) was established with the purpose of investigating cases of perinatal and infant deaths occurring in Western Australia.

The PIMC publishes a series of reports for stillbirths, neonatal or infant deaths in infants born in Western Australia. Previous reports are available from:

<https://ww2.health.wa.gov.au/Reports-and-publications/Perinatal-infant-and-mortality-committee>

There are three PIMC dashboard views for the:

- **16th PIMC report cohort:** a detailed look at risk factors for stillbirth and infant mortality for the 5-year birth cohort born 2014 to 2018.
- **Last three years:** the number of stillbirths, neonatal deaths and post-neonatal deaths in the past 3 years
- **Year explorer:** a summary of trends in rates for stillbirth, neonatal, and infant mortality since 2000 to latest PIMC report cohort.

Within WA, the term Aboriginal is used in preference to Aboriginal and Torres Strait Islander, in recognition that Aboriginal people are the original inhabitants of Western Australia. No disrespect is intended to our Torres Strait Islander colleagues and community.

A glossary of terms is included in Section 5.

2. About rates and odds ratios

Rates of stillbirths are calculated as the number of stillbirths for every 1,000 births. Rates of neonatal and post-neonatal deaths are calculated as the number of deaths per 1,000 live births.

Many of the risk factors for stillbirths and infant deaths are assessed using odds ratios (OR) from logistic regression.

OR = 1

No increased or decreased risk of an outcome from an exposure/factor of interest.

OR > 1, Lower limit CI > 1, and CI small, and number of events > 9

Reliable indicator of higher risk of an outcome for the category of exposure relative to the reference category.

OR > 1, CI large, or Lower limit CI < 1, or number of events < 10

Unreliable indicator of higher risk of an outcome for the category of exposure. There may be no true increased risk of the outcome with this exposure.

OR < 1, Upper limit CI < 1, and CI small, and number of events > 9

Reliable indicator of lower risk of an outcome for the category of exposure relative to the reference category.

White font on a black background indicates a reliable OR of higher risk as the 95% CI does not cross 1. However, check the number of events is ≥ 10 to be sure OR is reliable.

Black font on a grey background indicates the reference category

The odds ratios (OR) and 95% confidence intervals (CI) in this report are based on single predictor logistic regressions calculated while preparing aggregated data in Python using the stats models package [1].

An OR is the likelihood of an event (e.g. stillbirth) occurring in the case of a certain exposure (maternal ethnicity) as a proportion of the likelihood that the event will not occur.

An OR greater than one (1) implies that an outcome is more likely for the category of exposure than for the reference category. The 95% CI estimates the precision of the OR. The lower and upper limits of the 95% CI are given in brackets “(lower limit, upper limit)”.

A large difference between the upper and lower bounds of the CI (a wide CI) means low precision in the OR. A wide CI may be caused by a small sample size. If there are fewer than 10 cases of the outcome (e.g. less than 10 stillbirths for a category) then the OR calculated using logistic regression may not be reliable.

3. Data sources

The birth data summarised in the dashboards are sourced from the Western Australian (WA) Midwives Notification System (MNS). Perinatal and infant mortality data are from the Perinatal and Infant Mortality Committee (PIMC) dataset.

The MNS contains information on births notified by registered midwives to the Chief Health Officer (CHO) and the PIMC dataset consists of deaths notified to the CHO. Both notifications are required by the *Health (Miscellaneous Provisions) Act 1911*. For more information on these notification processes go to the [Midwives Notification System](#) and [notification of perinatal and infant deaths](#) websites.

Information displayed in the dashboards is from summarised and aggregated data. This removes the possibility of re-identification of infants or their mothers.

The data sources are updated every calendar month. It is unlikely that this will change the data displayed in two of these reports but will more regularly affect the totals provided in the **Last three years** view.

The total births, stillbirths and deaths shown in the data tables may differ due to record exclusion for some variables.

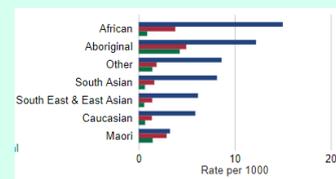
Example from report

Consider the maternal characteristic maternal ethnicity. The table indicates that a stillbirth is more likely for infants of African women than for the reference group, infants of Caucasian women (OR 2.6 95% CI (1.9, 3.4)). The OR of 2.6 indicates that given the *exposure* (African maternal ethnicity), the *outcome* (stillbirth) is more likely to occur than for the *reference* (Caucasian maternal ethnicity). The CI of (1.9, 3.4) indicates that there is a 95% chance that the true OR is between the lower limit of 1.9 and the upper limit of 3.4. The width of the CI is $3.4 - 1.9 = 1.5$.

Maternal ethnicity

Association of category and Stillbirth

Maternal ethnicity	Odds Ratio	95% CI	Count
African	2.6	(1.9, 3.4)	52
Aboriginal	2.1	(1.7, 2.6)	110
Other	1.5	(1.2, 1.8)	97
South Asian	1.4	(1.1, 1.8)	76
South East & East Asian	1.0	(0.9, 1.3)	119
Maori	0.6	(0.3, 1.1)	9
Caucasian	Ref		701
Total			1164



4. Reports

The following sections list and describe data presented in these three dashboard views.

4.1. Past three years

Presents a count of stillbirths and infant deaths.

This dashboard view provides:

- a count of stillbirths, neonatal deaths and post-neonatal deaths
- a treemap graph displaying proportion (percentage) of all infants that died in the last three years and had an Aboriginal status of Aboriginal, Other or Unknown.
- a clustered vertical bar graph displaying the number of infants by age period at death for each 3-month period in the last three years.
- the treemap graph can be used to filter the total counts and the bar graph on this page. Select a colour in the treemap e.g. “Aboriginal” to change the count of infants to only include those that were Aboriginal.
- “Data extracted” card showing the date the data was extracted from the PIMC database. Data may not be accurate up to this date, since there is sometimes a delay between a notification of death or stillbirth being received and the date it is added to the database
- “Dashboard refreshed” card showing the date and time the dashboard was last refreshed. This does not reflect how recently the data was updated.

Membership of this infant cohort was determined by infant **date of death**.

The cohort is all infants who died within the last three calendar years.

This view uses data from the PIMC dataset only.

4.2. 16th PIMC Report

This dashboard view provides the following.

Home page

- a count of infants in the cohort that were stillborn or died in the neonatal or post-neonatal period.
- links to views for data examined by the following exposure categories:
 - maternal characteristics
 - plurality of birth and parity of pregnancy;
 - place of birth;
 - region of residence and social disadvantage;
 - smoking in pregnancy;
 - birth characteristics & antenatal care;
 - cause of death; and
 - medical preventability.

This view uses data matched for each infant from both MNS (about the pregnancy and birth) and the PIMC dataset (about the death and classification by PIMC).

Membership of the infant cohort was determined by infant **date of birth**.

The cohort was all infants born in WA within the five-year period of 2014 to 2018.

Previous PIMC reports examined three-year birth cohorts. This, the 16th PIMC report examines a five-year birth cohort. As there was a change in the classification systems for describing cause of death for stillbirths and neonatal deaths that occurred at the beginning of 2019. It is planned that the 17th PIMC report will examine the three-year birth cohort from 2019 using the descriptions from the new classification systems.

Maternal characteristics

- a filter for infant death type enables filtering of the values displayed in the OR and 95% CI tables on this page.

Maternal age:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for each maternal age group compared with the 30-34 year group. The OR and CI can be filtered to infant death type by selecting one of the options in the main filter on this page.
- clustered column graph displaying rate of stillbirths per 1,000 births, and neonatal and post-neonatal deaths per 1,000 live births, for different maternal age groups.
- count of total births used in this analysis. This number can be filtered by selecting a category in the maternal age graph.

White font on a black background for OR in the table indicate a reliable OR of higher risk as the 95% CI does not straddle 1. However, check if number of events is ≥ 10 to be sure OR is reliable.

Maternal Body Mass Index (BMI):

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for each maternal BMI group compared with the 18.50-24.99 maternal BMI group. The OR and CI can be filtered to infant death type by selecting one of the options in the main filter on this page.
- clustered column graph displaying rate of stillbirths per 1,000 births, and neonatal and post-neonatal deaths per 1,000 live births, for different maternal BMI groups.
- count of total births used in this analysis. This number can be filtered by selecting a category in the maternal BMI graph.

Maternal ethnicity:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for each maternal ethnicity group compared with Caucasian group. The OR and CI can be filtered to infant death type by selecting one of the options in the filter main filter on this page.
- clustered horizontal bar graph displaying rate per rate of stillbirths per 1,000 births, and neonatal and post-neonatal deaths per 1,000 live births for each maternal ethnic group.
- count of total births used in this analysis. This number can be filtered by selecting a category in the maternal ethnicity graph.

Plurality and Parity

- a filter for infant death type enables filtering of the values displayed in the OR and 95% CI tables on this page.

Plurality:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for multiple pregnancies compared with singleton pregnancies. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.

White font on a black background for OR in the table indicate a reliable OR of higher risk as the 95% CI does not straddle 1. However, check if number of events is ≥ 10 to be sure OR is reliable.

- clustered horizontal bar graph displaying rate of stillbirths per 1,000 births, and neonatal and post-neonatal deaths per 1,000 live births for singleton and multiple pregnancies.
- count of total births used in this analysis. This number can be filtered by selecting a category in the plurality graph.

Parity:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for multiparous women compared with primiparous women. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered horizontal bar graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for primiparous and multiparous women.
- count of total births used in this analysis. This number can be filtered by selecting a category in the parity graph.

Place of birth

- a filter for infant death type enables filtering of the values displayed in the OR and 95% CI tables on this page.

Intended place of birth:

(The following figures and tables exclude preterm births before 37 weeks gestation)

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for infant intended place of birth of Home or Other compared with birth in hospital. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered vertical bar graph displaying rate of stillbirths per 1,000 births, and neonatal and post-neonatal deaths per 1,000 live births for intended place of birth of in hospital or at home.
- count of total births used in this analysis. This number can be filtered by selecting a category in the intended place of birth graph.

Born before arrival:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for infants born before arrival (BBA) compared with infants born at the planned place (not BBA). The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered vertical bar graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for infants that were born before arrival (BBA) or born at planned place (not BBA).
- count of total births used in this analysis. This number can be filtered by selecting a category in the born before arrival graph.

Region of Residence

- a filter for infant death type enables filtering of the values displayed in the OR and 95% CI tables on this page.

White font on a black background for OR in the table indicate a reliable OR of higher risk as the 95% CI does not straddle 1. However, check if number of events is ≥ 10 to be sure OR is reliable.

SEIFA IRSD:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for each quintile of the Index of Relative Social Disadvantage (IRSD) compared with Quintile 5 (least disadvantaged). The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered column graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for SEIFA IRSD quintiles.
- count of total births used in this analysis. This number can be filtered by selecting a category in the SEIFA IRSD graph.

Health region:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for health region of maternal residence compared to the North Metropolitan region. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered horizontal bar graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for the cohort for health region of maternal residence.
- count of total births used in this analysis. This number can be filtered by selecting a category in the health region graph.

Metropolitan or regional:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for rural or non-WA location of maternal residence compared with metropolitan location. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- count of total births used in this analysis. This number can be filtered by selecting a category in the metro or regional graph.

Smoking tobacco during pregnancy

- a filter for infant death type enables filtering of the values displayed in the OR and 95% CI table on this page.

Smoking During Pregnancy:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for mothers who smoked during pregnancy compared with non-smokers. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered column graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for smoking and non-smoking during pregnancy.
- count of total births used in this analysis. This number can be filtered by selecting a category in the smoking graph.

Birth Characteristics & Antenatal Care

- a filter for infant death type enables filtering of the values displayed in the OR and 95% CI table on this page.

Gestation at first antenatal care visit:

- a table of OR and 95% CI for stillbirth, neonatal death, or post-neonatal death for when in the pregnancy the first antenatal care appointment was attended relative to before the 14th week. The OR and CI can be filtered to infant death type by selecting one of the options in the filter.
- clustered column graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for when the first antenatal care appointment was attended.
- count of total births used in this analysis. This number can be filtered by selecting a category in the antenatal care graph.

Gestational Age:

- clustered column graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for births at different gestational ages.
- counts of births, stillbirths, neonatal deaths and post-neonatal deaths used in this analysis. These numbers can be filtered by selecting a category in gestational age graph.

Birthweight:

- clustered column graph displaying rate of stillbirths per 1000 births, and neonatal and post-neonatal deaths per 1000 live births for different birthweight categories.
- counts of births, stillbirths, neonatal deaths and post-neonatal deaths used in this analysis. These numbers can be filtered by selecting a category in the birthweight graph.

Cause of Death

- Filter for Aboriginal status of infant to alter the cohort shown in all graphs on this page.
- PSANZ-PDC figures show the number of neonatal, post-neonatal deaths and stillbirths with each PSANZ-Perinatal Death Classification. Clicking on bars or headings of these figures will filter the corresponding PSANZ-NDC figure.
- PSANZ-NDC figures show the number of neonatal and post-neonatal deaths with each PSANZ-Neonatal Death Classification. Clicking on bars or headings of these figures will filter the corresponding PSANZ-PDC figure.
- “Go to Crossover Matrix” button navigates to the crossover matrices between Perinatal Death and Neonatal Death Classifications for neonatal and post-neonatal deaths.

Medical Preventability

- Bookmark buttons allow navigation between medical preventability figures for stillbirths, neonatal deaths and post-neonatal deaths.
- Stacked horizontal bar graph shows numbers of investigated deaths with no evidence of preventability, evidence of low preventability and evidence of high preventability for different PSANZ-PDC (stillbirths, neonatal deaths) or PSANZ-NDC (post-neonatal deaths) categories.
- Pie chart shows the proportion (percentage) of deaths with no, low and high evidence of preventability.

4.3. Year explorer

This dashboard view includes five pages: a homepage showing rates of perinatal and infant deaths over time, and four pages showing how the rates differ between risk factors. All five pages contain:

- A filter for start and end years of birth to create own cohort periods. The filter can be set by typing in years or by moving start and end points of range bar. This filter is synchronised across all pages of this section.
- A count of infants born, stillbirths, neonatal deaths and post-neonatal deaths in the period.
- Buttons to select which summary figures to show, either:
 - Maternal characteristics
 - Birth characteristics
 - Place of residence or
 - Place of birth.

Membership of the infant cohort was determined by infant **date of birth**.

The cohort was all infants born each year in WA between 2000 and 2019.

Home page

- A filter for Aboriginal status of the infant that enables filtering of the rates over time graph.
- A line graph showing the rates of stillbirths per 1000 births, and the rates of neonatal and post-neonatal deaths per 1000 live births each year since 2000. Selecting a single point on the graph will change the counts of total births, stillbirths, neonatal deaths, and post-neonatal deaths to focus on the selected year.

Maternal characteristics

- Bookmark buttons to toggle figures between displaying rates and counts.
- A clustered bar graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by maternal ethnicity.
- A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by maternal age group.
A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by maternal body mass index (BMI). Maternal BMI is calculated using the last measured weight before pregnancy, or the weight at the first medical appointment during pregnancy.

Birth characteristics

- A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by infant's sex.
- A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by birthweight category. This graph can be zoomed using the slider on the x-axis.
- A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by gestational age at birth. This graph can be zoomed using the slider on the y-axis.

Place of residence

- A clustered bar graph showing the number or rate of stillbirths, neonatal deaths and post-neonatal deaths by maternal region of residence. This graph can be filtered using to show only metro or only regional health regions.
- A clustered column graph displaying the number or rate of stillbirths, neonatal deaths and post-neonatal deaths by metropolitan or regional region of residence. Clicking the columns of this graph filters .
- A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by quintile of the Index of Relative Social Disadvantage (IRSD).

Place of birth

- A clustered column graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by Born Before Arrival (BBA) category.
- A clustered horizontal bar graph displaying number or rate of stillbirths, neonatal deaths and post-neonatal deaths by intended place of birth. The birth may not actually have taken place at this location. Note that figures and tables exploring intended place of birth contain only full-term births (≥ 37 weeks gestation).

5. Glossary

Item	Meaning
BBA or Born Before Arrival	A birth occurring in an uncontrolled environment like prior to arrival of the mother at the health service reporting the birth. It usually indicates a planned hospital or birth centre birth occurring unexpectedly before arrival at service. A planned homebirth is reported as BBA if the birth occurs before the midwife arrives at the home.
Birth location type	The establishment code and ward name was used to allocate each infant to four categories of Public, Private, Home and NA. Public includes all births at WA Health maternity services, Private includes all births at private hospitals, Home includes all homebirths contracted to a publicly funded midwife or privately practising midwife, and NA includes births at non-maternity services, clinics or births at home without a homebirth planned with a contracted midwife.
BMI or Body Mass Index	A calculation using height and first measured weight of the pregnant woman to determine the woman's body mass index. The BMI is used to classify weight into low, normal and high ranges. The calculation is maternal weight in kilograms divided by maternity height in metres squared (kg/m^2).
Ethnic origin	Self-reported ethnic origin of the woman who gave birth. A woman who identifies herself as more than one of the listed descriptions can be reported as Other.
Infant death	The death within a year of birth of a live born infant. This includes neonatal (1 to 27 days) and post-neonatal deaths (28 days to 1 year)
Intended place of birth	At the time of onset of labour, the type of maternity service planned (arranged, booked) for birth, regardless of where the birth took place.
IRSD quintile	Index of Relative Social Disadvantage in five categories. Using data from the latest Australian census, Australian residential areas (not

Item	Meaning
	individuals) are ranked by social disadvantage. The IRSD quintiles used in this report were calculated from SA2 assigned to the maternal address. Quintile ranks are from 1 “most disadvantaged” to 5 “least disadvantaged”.
Live birth	The complete expulsion or extraction from its mother of an infant irrespective of duration of pregnancy, which after birth shows signs of life.
Multipara	A woman who gave birth from 20 weeks gestation who had given birth at least once before.
Neonatal death	The death of a live born infant before 28 days of age.
Parity	The total number of pregnancies that reached at least 20 weeks gestation that a woman has had prior to the index pregnancy.
Perinatal death	A stillbirth (fetal death) or neonatal death.
Plurality	The number of infants resulting from one pregnancy of 20 weeks gestation or more. On this basis a birth may be classified as single or multiple.
Post-neonatal death	The death of a live born infant from 28 to 364 days after birth.
Primigravida	A woman pregnant for the first time.
Primipara	A woman who has had one pregnancy of at least 20 weeks gestation resulting in birth
PSANZ-NDC	Perinatal Society of Australia and New Zealand Neonatal Death Classification used to classify the cause of a neonatal or post-neonatal death. The classification was used to describe the 16 th PIMC Report cohort.
PSANZ-PDC	Perinatal Society of Australia and New Zealand Perinatal Death Classification used to classify the cause of stillbirth, neonatal or post-neonatal death. The classification was used to describe the 16 th PIMC Report cohort.
Region of residence	For each infant, the maternal address was allocated to three categories, Perth metropolitan region, WA country region, and NA (not applicable). The latter describes infants with maternal residence in other Australian jurisdictions, other countries, or with no fixed abode.
SA2	Statistical Areas Level 2 (SA2s) are medium-sized general purpose areas built up from whole SA1s. Their purpose is to represent a community that interacts together socially and economically. SA2s generally have a population between 3,000 and 25,000 with an average of about 10,000 people. They are developed from census data by the Australian Bureau of Statistics (ABS).
SEIFA	Socio-Economic Indexes for Areas including the IRSD developed by the Australian Bureau of Statistics (ABS).
Stillbirth	The complete expulsion or extraction from its mother of an infant of at least 20 weeks gestation or 400 grams weight who shows no signs of life from the time of birth.

6. Notes on data presented

Midwives report births of infants born in WA from pregnancies of at least 20 weeks gestation.

Data presented include the most recent complete time period.

Recent data are incomplete and subject to change.

6.1. Data extraction and reporting

Data for this report are extracted from data collections each month.

The graphs and tables present data up to the most recent complete period.

6.2. Inclusion criteria

Data include all women whose birth in WA was notified to the Chief Health Officer by a registered midwife. They also include all infants born to these women. A pregnancy must be at least 20 weeks gestation for a birth to be notified.

6.3. Timeliness, accuracy and completeness

Data presented will accurately reflect MNS data as it was on the date of export. The number of births and the data presented are subject to correction and change for at least one year after the birth period reported.

6.4. Data interpretation

Caution should be exercised in interpreting trends in these data due to changes over time in data definitions and notification requirements. The most recent time periods will contain incomplete data.

Contact the MNS Data Custodian at birthdata@health.wa.gov.au should assistance in interpretation of these data be required.

6.5. Citation for data presented in these dashboards

Acknowledgement of source of data as the WA Midwives Notification System and the Perinatal and Infant Mortality Committee Data Collection should accompany any use of these data.

Suggested citation: Department of Health Western Australia. WA Midwives Notification System and Perinatal and Infant Mortality Committee Data Collection, available at <https://ww2.health.wa.gov.au/Reports-and-publications/Perinatal-infant-and-mortality-committee-dashboards-dashboards> accessed [date].

6.6. References

- [1] S. Seabold and J. Perktold, *statsmodels: Exonometric and statistical modelling with Python*, 2010.

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