Australian Government

Australian Institute of Health and Welfare

AIHW

Pregnancy and birth outcomes for Aboriginal and Torres Strait Islander women

2016–2018

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Australian Institute of Health and Welfare
Canberra
Cat. no. IHW 234

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ISBN 978-1-76054-856-8 (PDF)
ISBN 978-1-76054-855-1 (Print)

Suggested citation

Australian Institute of Health and Welfare 2021. Pregnancy and birth outcomes for Aboriginal and Torres Strait Islander women 2016–2018. Cat. no. IHW 234. Canberra: AIHW.

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Published by the Australian Institute of Health and Welfare

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Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

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Summary

The majority of babies born to Aboriginal and Torres Strait Islander mothers have a healthy birthweight. However, in the 3-year period 2016–2018, 1 in 7 (14%) babies born to Indigenous women were born preterm, while 1 in 8 (12%) were low birthweight.

Preterm birth and low birthweight are two important risk factors associated with perinatal death among babies born to Indigenous women.

Risk factors associated with perinatal death

Perinatal deaths are deaths occurring during the perinatal period; they comprise stillbirths (babies of at least 20 weeks gestation or weighing at least 400 grams who were born without any signs of life) and neonatal deaths (deaths of liveborn babies within 28 days of birth).

Among babies born to Indigenous women:

- the risk of perinatal death among low birthweight babies was about 11 times the risk of perinatal death among babies who were not low birthweight
- the risk of perinatal death among preterm babies was about 8 times the risk of perinatal death among non-preterm babies
- Some of the maternal factors associated with perinatal death included antepartum haemorrhage, having no antenatal care, and pre-existing diabetes.

Stillbirth

Among babies born to Indigenous women:

- low birthweight babies were about 9 times more likely to be stillborn than babies who were not low birthweight.
- preterm babies were about 7 times more likely to be stillborn than non-preterm babies.
- some of the maternal factors associated with stillbirth included antepartum haemorrhage, pre-existing diabetes, young maternal age, non-attendance or late attendance at first antenatal care and residence in a remote location.

Neonatal death

Among babies born to Indigenous women:

- the risk of neonatal death among low birthweight babies was about 14 times the risk of neonatal death among babies who were not low birthweight.
- the risk of neonatal death among preterm babies was about 13 times the risk of neonatal death among babies who were not preterm.
- some of the maternal risk factors for neonatal death included chronic hypertension and antepartum haemorrhage.

Risk factors associated with preterm birth and SGA

A number of key risk factors contributed to preterm birth and low birthweight, which in turn, contributed to perinatal death, stillbirth and neonatal death among Indigenous women. SGA is another measure of low birthweight, and takes gestational age into consideration. Babies are classified as SGA if their birthweight is below the 10th percentile for their gestational age and sex.

The major risk factors associated with preterm birth and SGA babies among Indigenous women included smoking during pregnancy, being underweight before the onset of pregnancy, pre-existing diabetes, and not receiving antenatal care (Table 1).

Understanding the risk factors contributing to preterm birth and low birthweight will enhance our understanding of the risk factors associated with perinatal mortality (stillbirth and neonatal mortality).

At the individual level, the risk of having a preterm or SGA baby was several times higher for women who smoked during pregnancy, did not receive antenatal care, initiated antenatal care later than the first trimester of their pregnancy, were underweight, and had pre-existing diabetes and/or chronic hypertension before the onset of pregnancy

Adjusted odds ratios for preterm and SGA birth among Indignous women: 2016–2018

	No. of times a baby born to a woman with a risk factor is likely to be preterm or SGA compared to a baby born to a woman who did not have the risk factor	
Risk factor	**Preterm birth**	**SGA**
Antepartum haemorrhage	7.2	..
Smoking during 1st 20 weeks of pregnancy	..	1.9
Smoking during 2nd 20 weeks of pregnancy	1.6	1.4
Not receving antenatal care	4.1	..
Started antenatal care after 1st trimester	..	1.2
Pre-existing diabetes	3.3	..
Chronic or pre-existing hypertension	2.5	..
Underweight at the onset of pregnancy	1.6	1.6
Pregnancy-induced hypertension	2.7	1.6

.. = not statistically significant at the p<0.05 level

Source: National Perinatal Data Collection

Comparison with non-Indigenous mothers

As with babies born to Indigenous women, pre-term birth and low birthweight were also strongly associated with perinatal death (stillbirth and neonatal death) among babies born to non-Indigenous women.

Reducing preterm birth and SGA birth at the population level

At the population level, 1 in 2 preterm births (50%) among Indigenous women could be prevented if smoking during pregnancy, pregnancy-induced hypertension, antepartum haemorrhage, and diabetes (pre-existing or acquired during pregnancy) were prevented.

Nearly one out of every two SGA births (47%) among Indigenous women could also be prevented if women did not smoke during pregnancy and if all women received antenatal care during the first trimester of their pregnancy.

Smoking alone accounted for 17% of preterm births and 41% of SGA births— this means that at the population level, more than 1 in 6 preterm births and 4 out of every 10 SGA births could be prevented if there was no smoking during pregnancy.

One out of every 6 preterm births could also be prevented if antepartum haemorrhage (APH) during pregnancy were prevented. Smoking during pregnancy is a contributory factor to APH. The absence of smoking during pregnancy could therefore contribute not only directly to the reduction in preterm and SGA births, but also to the reduction in APH during pregnancy.

A further 1 out of every 17 SGA births (6%) could also be prevented if all women accessed antenatal care during the first trimester of their pregnancy.

1 Pregnancy and birth outcomes

Introduction

Improving health outcomes of Australian children is a high priority for all levels of government. Some factors that affect a child's health, however, have their origins even before the baby is born. They include the mother's age, her pre-pregnancy health, the social and economic conditions in which she lived before and during her pregnancy, as well as any complications that she may have experienced during her pregnancy.

Despite the overall improvements in infant and child mortality over the last 2 decades for all Australian babies and for babies born to Aboriginal and Torres Strait Islander mothers, disparities remain in the proportion of low birthweight, preterm births, perinatal deaths as well as in infant and child mortality (AIHW 2018a).

Gestational age (the duration of pregnancy when the baby is born) and birthweight are the biggest predictors of perinatal (stillbirth and neonatal death) and infant death (AIHW 2018a, 2018b). Preterm birth and low birthweight also have significant effects on the long-term health and wellbeing of children (Behrman & Stith Butler 2007).

Aim of this report

Although most Aboriginal and Torres Strait Islander women have healthy pregnancies and positive pregnancy outcomes, a small proportion of women have adverse pregnancy and birth outcomes. The aim of this report is to identify the key factors associated with specific adverse pregnancy and birth outcomes among Indigenous women who experience these adverse outcomes. The pregnancy and birth outcomes investigated in this report cover the following:

- perinatal deaths (stillbirths or babies born without any signs of life, and neonatal deaths or deaths of newborn babies within 28 days of birth)
- preterm births (births before 37 weeks of gestation)
- low birthweight (birthweight less than 2,500 grams).

Box 1.1 Key pregnancy and birth outcomes

Perinatal death refers to a death occurring prior to or during labour and/or birth (stillbirth) or up to 28 days after birth (neonatal death) where babies are of 20 or more completed weeks gestation or have a birthweight of at least 400 grams.

Stillbirth, also known as a fetal death, is defined as a baby born without any signs of life with a birthweight of at least 400 grams or a gestational age of at least 20 weeks.

Neonatal death refers to the death of a live-born baby less than 28 completed days after birth.

Preterm birth refers to a birth before 37 completed weeks of gestation.

Low birthweight is the weight of a baby at birth that is less than 2,500 grams.

Small for gestational age (SGA) refers to birthweight that is below the 10th percentile for their gestational age and sex.

Factors associated with pregnancy and birth outcomes

There are a number of factors that can affect birth outcomes such as perinatal death.

These factors, which we refer to as 'risk factors', include the environment in which a woman was living prior to her pregnancy, during her pregnancy and after the birth of her baby, housing circumstances, demographic factors, socioeconomic and health characteristics, and any complications that she may experience during pregnancy.

Pregnancy complications can be viewed both as outcomes as well as risk factors. For example, a pregnancy complication such as antepartum haemorrhage (APH) during pregnancy can be an outcome of modifiable health risk factors such as smoking during pregnancy, previous multiple pregnancies, closely spaced pregnancies, low body mass index (BMI) and intra-uterine infection. On the other hand, APH during pregnancy can also be a risk factor for perinatal death, preterm birth and low birthweight.

For this report, these risk factors are classified as follows:

- contextual factors such as:
  - location, that is, whether a woman was usually resident in a major city, regional area or remote area during her pregnancy
  - housing
  - proximity to services
  - availability of transport
- demographic factors such as:
  - age of the mother at the end of the pregnancy
  - marital status
  - previous pregnancy and birth outcomes, such as:
    - previous stillbirths
    - parity (number of previous pregnancies resulting in a live birth)
- modifiable health risk factors such as:
  - timely access to antenatal care
  - pre-pregnancy BMI
  - smoking and alcohol consumption during pregnancy
  - pre-existing diabetes mellitus (PDM)
  - pre-existing or chronic hypertension (high blood pressure)
- pregnancy-related complications such as:
  - gestational diabetes (diabetes that occurs during pregnancy)
  - pregnancy-induced hypertension or blood pressure disorders that occur during pregnancy (e.g. gestational hypertension, pre-eclampsia and eclampsia)
  - antepartum haemorrhage (defined to include placenta praevia, placental abruption, threatened abortion)
- pregnancy outcomes such as:
  - duration of gestation (preterm or not-preterm birth)
  - birthweight.

Duration of gestation and birthweight are analysed as both risk factors in chapters 4, 5 and 6, and as outcomes, in Chapter 7 in this report.

Housing, proximity to services and availability of transport are not covered in this report.

Source of data

The analysis in this report is based on the National Perinatal Data Collection (NPDC) which is compiled by the AIHW from perinatal data collections (PDCs) received from each jurisdiction. Each jurisdictional PDC covers all pregnancies in each jurisdiction that result in a live birth or a stillbirth of at least 20 weeks' gestation or with a birthweight of at least 400 grams. Further details on the NPDC are provided at (AIHW 2018a).

Structure of this report

This report is divided into 7 chapters and 1 appendix.

Chapter 2 describes the characteristics of the mothers examined in this report, including a review of relevant literature on these characteristics and how they may relate to the outcomes examined in this report.

Chapter 3 discusses the statistical and methodological methods used in this report, such as logistic regression, odds ratios and population attributable fractions (PAFs).

Chapter 4 examines the levels and trends of perinatal death in Australia as well as the risk factors associated with perinatal death among Indigenous women.

Chapter 5 examines the levels and trends of stillbirth as a component of perinatal death. The main focus of this chapter, however, is an examination of the risk factors associated with stillbirth among Indigenous women.

Chapter 6 examines the levels and trends of neonatal death as the second component of perinatal death. The main focus of this chapter is an examination of the risk factors associated with neonatal death among Indigenous women.

Chapter 7 contains three sections. The first section presents an analysis of the risk factors associated with preterm birth among Indigenous women, while the second section focuses on analysis of the risk factors associated with low birthweight and small for gestational age (SGA) babies among Indigenous women. The third section examines the contributions of various risk factors to preterm and SGA births, and the reductions in preterm and SGA births that could be achieved if these risk factors were eliminated.

Appendix A contains the complete tables of all the risk factors associated with perinatal death, stillbirth, neonatal death, preterm birth and SGA birth that were examined in this report.

2 Characteristics of mothers

This chapter examines the relationship between demographic factors, pregnancy-related complications and modifiable risk factors, on the one hand, and pregnancy outcomes such as perinatal deaths (stillbirths and neonatal deaths) preterm births, and low birthweight, on the other.

Remote location

The relationship between remoteness and health is particularly important for Indigenous Australians, as they are more likely than non-Indigenous Australians to live outside metropolitan areas (AIHW 2014). Table 2.1 shows that only about one-third of Indigenous mothers were living in *Major cities* compared with nearly three-quarters of non-Indigenous mothers. In addition, about 1 in 5 Indigenous mothers (20%) were living in *Remote and very remote* areas compared with only 1.6% of non-Indigenous mothers.

Indigenous Australians living in remote areas have on average worse health outcomes than those living outside remote areas. Among other factors, this may be related to the higher rates of poor housing and overcrowding in remote areas (AIHW 2011), poorer access to health services, lack of transport and poorer access to healthy food—all of which may have a negative effect on the health of people living in remote areas (AIHW 2014).

Socioeconomic factors

Differences in health outcomes are related to the socioeconomic status of the areas where people live. Given that a higher proportion of residents in remote areas are disadvantaged compared with those who live in major cities or regional areas, their health may be worse because of socioeconomic disadvantage rather than just environmental or geographical factors related to remoteness (AIHW 2014).

Maternal age

Studies have demonstrated a potential for adverse pregnancy outcomes at both extremes of reproductive age. The maternal ages most commonly associated with the best pregnancy and birth outcomes have been stated as being between the late 20s and early 30s (Londero et al. 2019; Roustaei et al. 2018; Zhang & Savitz 1993). Compared with women aged 20–34 years, women giving birth at age 35 or older carried nearly a 1.5-fold increased risk for pregnancy complications and a 1.6–2.6-fold increased risk for adverse perinatal outcomes (Hsieh et al. 2010).

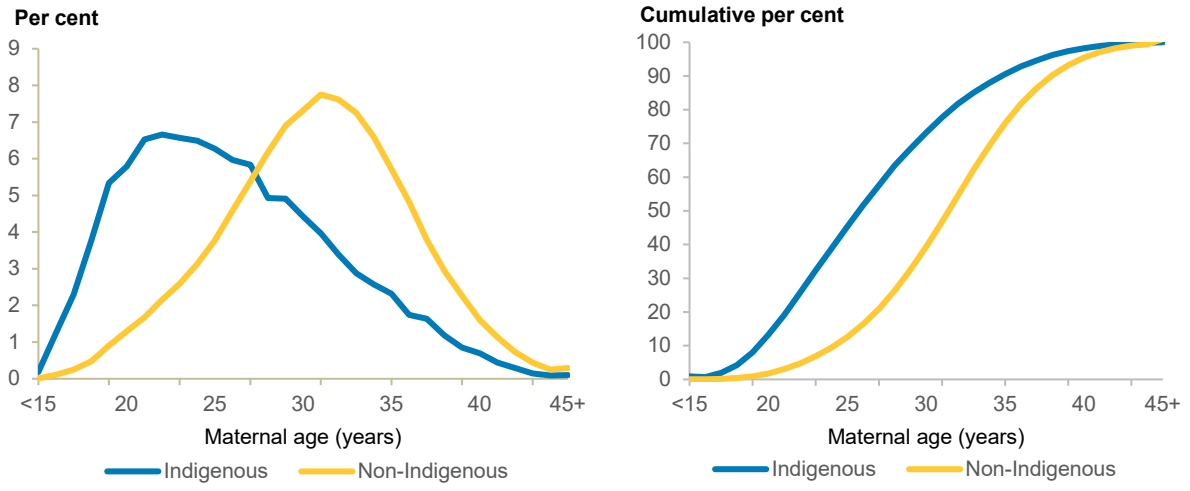
Young mothers are also more likely to have inadequate antenatal care, and to carry a greater risk of adverse pregnancy outcomes, mainly due to preterm births. Babies of teenage mothers have lower birthweights, higher rates of Neonatal Intensive Care Unit (NICU) admission, congenital anomalies, and carry a greater risk of at least 1 adverse outcome compared with mothers aged 20–39 years (Da Silva et al. 2003; Hediger et al. 1997; Kang et al. 2015; Marvin-Dowle et al. 2018; Shirim et al. 2011)

Some studies attribute the association between maternal age and adverse pregnancy outcomes to socioeconomic factors, thus indicating that social disadvantage rather than biological factors may be the explanation (Hediger et al. 1997). Other studies attribute this association to biological factors (e.g. low gynaecological age) (Da Silva et al. 2003).

Figure 2.1 shows that Indigenous women who gave birth during 2016–2018 were much younger than non-Indigenous women who gave birth during the same period. While a higher percentage of Indigenous (82.5%) than non-Indigenous (75.1%) mothers were aged 20–34 years, a higher percentage of Indigenous mothers (8%) were 18 years or younger compared with less than 1% of non-Indigenous mothers.

The cumulative percentages in Figure 2.1 show that while 13.3% and 19.1% of Indigenous women who had a baby in 2016–2018 did so by age 19 and 20 years, respectively, only 1.8% and 3.1% of non-Indigenous mothers who had a baby in 2016–2018 had done so by age 19 and 20 years, respectively. Similarly, while only 12.6% of non-Indigenous women who had a baby in 2016–2018 had done so by age 24, close to one-half or nearly 4 times as many Indigenous mothers (45.4%) who had a baby in 2016–2018 had done so by age 24.

Figure 2.1: Percentage and cumulative percentage distribution of women who had a baby by age, Australia, 2016–2018



Source: National Perinatal Data Collection.

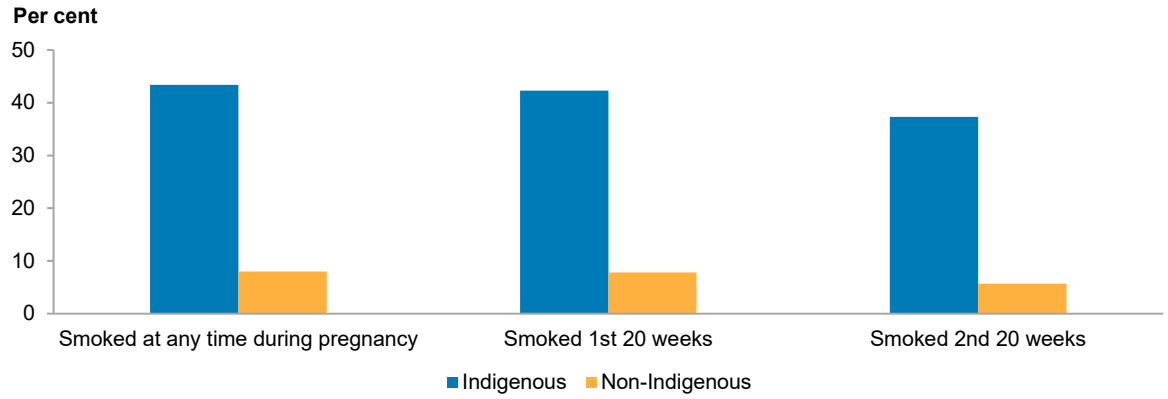
Smoking during pregnancy

Smoking during pregnancy is the most important preventable cause of a wide range of adverse pregnancy and birth outcomes. Smoking is associated with serious obstetric and fetal complications and serious harm extending into childhood and even adulthood (Mendelsohn et al. 2014).

Obstetric complications associated with smoking include spontaneous miscarriage, preterm birth, placenta praevia, placental abruption, ectopic pregnancy and stillbirth. Fetal complications include fetal growth restriction, low birthweight, birth defects and sudden infant death syndrome (Behrman & Stith Butler 2007; Mendelsohn et al. 2014; Mohsin & Bauman 2005).

In 2016–2018, over 43% of Indigenous mothers smoked at any time during their pregnancy (Table 2.1 and Figure 2.2). A similar proportion of Indigenous mothers (42.3%) smoked during the first 20 weeks of their pregnancy, compared with 7.8% of non-Indigenous mothers. The proportion that smoked after 20 weeks of pregnancy reduced for both groups of mothers to 37.3% and 5.7%, respectively.

Figure 2.2: Percentage of women who smoked during pregnancy, Australia, 2016–2018



Source: National Perinatal Data Collection.

Antenatal care

Timely antenatal care may mediate the effects of adverse pregnancy and birth risk factors by providing pregnant women with information that can help them to ensure that their health and their baby's growth is optimal. Antenatal care is particularly effective when started in the first trimester.

Timely antenatal care can also help in identifying medical risk factors, such as pre-existing diabetes and chronic hypertension, as well as risk factors that could contribute to labour complications. Steps can then be taken to ensure that deliveries take place at hospitals with appropriate resources for both mother and baby (AIHW 2018b; Department of Health 2018).

Nearly all women who had a baby in 2016–2018 attended antenatal care. About 2 in 3 (63%) Indigenous mothers and 71% of non-Indigenous mothers attended their first antenatal care during the first trimester of pregnancy, while a further 30% of Indigenous mothers and 26% of non-Indigenous mothers did so during the second trimester. About 7% of Indigenous mothers did not attend antenatal care at all, or they did so after the second trimester of pregnancy.

Initiating antenatal care during the first trimester of pregnancy provides sufficient time to have the recommended number of visits. The Australian Pregnancy Care guidelines (Department of Health 2018) recommend that the first antenatal visit occur within the first 10 weeks of pregnancy and that first-time mothers with an uncomplicated pregnancy attend 10 visits, with 7 visits recommended for subsequent uncomplicated pregnancies.

Maternal weight/pre-pregnancy BMI

Overweight and obese women are at increased risk of several adverse obstetric outcomes, including gestational diabetes, hypertensive disorders of pregnancy and caesarean delivery, while their babies are at increased risk of admission to NICU for a stay of 48 hours or more, and in-hospital newborn mortality. Overweight and obese women however, have a lower risk of having a low birthweight baby (McDonald et al. 2010; Schummers L et al. 2015).

Low maternal BMI is associated with increased risk of pregnancy complications, such as preterm delivery and low birthweight (Sebire et al. 2001).

Nearly 52% of Indigenous mothers who gave birth in 2016–2018 were overweight or obese compared with about 44% of non-Indigenous mothers. Higher levels of Indigenous mothers (6.5%) were also underweight compared with about 3.7% of non-Indigenous mothers.

Diabetes

Diabetes is a chronic condition marked by high levels of glucose in the blood. It is caused either by the inability of the body to produce insulin (type 1 diabetes) or by the body not being able to use insulin effectively (type 2 diabetes), or both.

Women labelled as having pre-existing diabetes mellitus (PDM) were diagnosed with diabetes before the onset of pregnancy. Gestational diabetes mellitus (GDM), on the other hand, develops or is first recognised during pregnancy, mostly in the second or third trimester (AIHW 2019a; Nankervis & Conn 2013; Royal Australian College of General Practitioners 2016).

PDM is relatively rare compared with GDM. Just over 2% of Indigenous mothers and less than 1% of non-Indigenous mothers who had a baby in 2016–2018 reported that they had PDM. On the other hand, about 12% of Indigenous mothers and nearly 13% of non-Indigenous mothers were recorded as having developed diabetes during pregnancy (GDM).

Pregnancies complicated by PDM and early GDM are associated with adverse outcomes for both mother and baby. For the mother, these adverse outcomes include pregnancy-induced hypertensive disorders (including pre-eclampsia and eclampsia), miscarriage, and hemolysis. For the baby, the adverse outcomes include a variety of congenital abnormalities, fetal growth acceleration, preterm delivery and perinatal mortality (Becerra et al. 1990; Negrato et al. 2012; Sweeting et al. 2016; Wahabi et al. 2012).

Hypertension

Hypertension is the most common medical condition encountered during pregnancy. It complicates 2-3% of pregnancies, and may be classified into the following 4 categories: (1) chronic hypertension (2) pre-eclampsia and eclampsia (3) pre-eclampsia superimposed on chronic hypertension, and (4) gestational hypertension (Government of Western Australia 2018; Lowe et al. 2014; Mammaro et al. 2009).

A woman has chronic hypertension if she was diagnosed with high blood pressure before she became pregnant or if she was diagnosed with high blood pressure in the first 20 weeks of pregnancy. Gestational hypertension is also known as transient hypertension, and is diagnosed retrospectively. A woman is said to have had gestational hypertension if she was diagnosed with high blood pressure after 20 weeks of pregnancy, and she previously had normal blood pressures, does not develop pre-eclampsia or eclampsia, and if blood pressure returns to normal by the 12th week after delivery (Mammaro et al. 2009).

Pre-eclampsia is a multi-system disorder characterised by hypertension and involvement of one or more other organ systems (renal, haematological, liver and neurological) and/or the fetus. Eclampsia is a condition in which one or more convulsions occur in a pregnant woman suffering from high blood pressure, often followed by coma. Pre-eclampsia and eclampsia pose serious threats to the health of both mother and baby.

Hypertensive disorders during pregnancy carry risks for the pregnant woman and the baby. These risks include preterm birth, perinatal death and caesarean delivery, and are much more serious for women with chronic hypertension than gestational hypertension, and also more serious among women diagnosed with gestational hypertension early in pregnancy. Gestational hypertension near term is associated with little increase in the risk of adverse pregnancy outcomes (Government of Western Australia 2018; Lowe et al. 2014).

About 6.6% and 5.5%, respectively, of Indigenous and non-Indigenous mothers who gave birth in 2016–2018 had pregnancy-induced hypertensive disorders, with the bulk of these women being diagnosed with gestational hypertension, pre-eclampsia and eclampsia.

Table 2.1: Selected characteristics of women who gave birth in Australia, 2016–2018

Risk factors	Indigenous women (%)	Non-Indigenous women (%)
Location		
Major cities	34.4	74.1
Inner and outer regional	45.3	23.1
Remote and very remote	19.6	1.6
Not stated	0.8	1.2
Maternal age		
18 years of under	7.7	0.8
19–34 years	82.7	74.8
35 years or over	9.6	24.4
Marital status[a]		
Never married	51.6	11.7
Currently married	44.7	84.0
Divorced/widowed/separated	3.7	4.4
Body mass index (BMI)		
Underweight	6.5	3.7
Normal weight	35.8	49.3
Overweight/obese	51.7	44.1
Not stated	6.0	2.9
Diabetes during pregnancy[b]		
None[c]	85.8	86.3
Pre-existing	2.3	0.9
Gestational	11.9	12.8
Chronic hypertension[b]		
No[c]	98.9	99.2
Yes	1.1	0.8
Pregnancy-induced hypertension[b, d]		
No[c]	94.4	95.2
Yes	5.6	4.8
Antepartum haemorrhage[d,e]		
No	96.0	96.6
Yes	3.8	3.3

(continued)

Table 2.1 (continued): Selected characteristics of women who gave birth in Australia, 2016–2018

Risk factors	Indigenous women (%)	Non-Indigenous women (%)
Parity		
0	32.3	43.0
1–3	55.0	53.9
4 or more	12.4	2.9
Not stated	0.2	0.2
Smoking during pregnancy		
Smoked	43.4	8.0
Did not smoke	54.9	90.3
Not stated	1.7	1.7
Smoking during first 20 weeks of pregnancy		
Smoked	42.3	7.8
Did not smoke	56.2	91.5
Not stated	1.5	0.7
Smoking during second 20 weeks of pregnancy		
Smoked	37.3	5.7
Did not smoke	59.5	92.3
Not stated	3.2	2.0
First attendance at antenatal care		
During first trimester	62.8	71.1
After first trimester	34.6	27.5
Did not attend antenatal care	0.8	0.1
Not stated	1.8	1.4
Total number of women	**41,488**	**881,701**

(a) Estimates exclude Western Australia.

(b) Estimates exclude Victoria.

(c) Combines 'No' and 'Not stated', as some jurisdictions did not distinguish between the two.

(d) Estimates exclude New South Wales and Western Australia.

(e) Includes placenta praevia, placental abruption, and antepartum haemorrhage unspecified.

Source: National Perinatal Data Collection.

3 Methods for modelling risk factors for pregnancy and birth outcomes

Logistic regression modelling

Chapters 4, 5 and 6 examine the risk factors that are associated with specified pregnancy and birth outcomes, such as perinatal death, stillbirth, neonatal death, preterm birth and low birthweight, using a statistical modelling method called 'logistic regression'.

Logistic regression modelling involves calculating the odds of a binary outcome or event occurring at varying levels of different characteristics in the study population. The odds are related to the probability of observing the event represented by the binary dependent variable (for instance, the probability of a baby with specific characteristics dying during the perinatal period). The odds of an event are represented as the probability of that event occurring divided by the probability of that same event not occurring (which is 1 minus the probability of the event occurring).

The characteristics of the study population are represented by the set of explanatory variables used in the regression model. These variables can be categorical or continuous. All the explanatory variables used in this report are, however, categorical.

For example, in the case of logistic regression modelling to examine the risk factors associated with perinatal death, the dependent variable is perinatal death, that is, whether or not a baby died during the perinatal period. The set of explanation variables may include characteristics of the baby, including whether or not the baby was a preterm baby, whether or not the baby was a low birthweight baby, and whether or not the baby's mother had pre-existing diabetes mellitus.

For each explanatory variable or risk exposure, a reference category is selected. The reference category represents the absence of exposure to that risk. For categorical variables such as 'smoking during pregnancy', one category is assigned as the reference category. Odds ratios are then estimated as the odds of being in any other particular category relative to the odds of being in the reference category.

For 'smoking during pregnancy' as an exposure or explanatory variable, baby's mother 'did not smoke during pregnancy' is selected as the reference category, while baby's mother 'smoked during pregnancy' becomes the comparison category.

The logistic regression model results are usually presented as estimated odds ratios attributed to each explanatory variable used in the model. The odds ratio is estimated as the odds of an outcome (e.g. perinatal death) in one population (e.g. comparison group: 'preterm birth') to the odds of that outcome in a different population (reference category: 'not a preterm birth').

However, for the sake of simplicity this report adopts the convention to loosely equate the changes in the odds to the changes in probability. This approach is acceptable where the outcome (e.g. perinatal death) is rare or less than 10% (Ranganathan et al. 2015). Hence, when the estimated odds ratio associated with a specific category of an explanatory variable is 1.5, we re-interpret that as the outcome also being 1.5 times as likely to occur (in probability) in that category than in the reference group category. Note that is not an exact statistical result.

The key statistics used in Chapters 4, 5, 6 and 7 to describe the results of the logistic regression modelling are shown in Box 3.1.

Box 3.1: Key statistical terms

Odds: Odds are a measure of the likelihood of a particular outcome (e.g. perinatal death) occurring. They are calculated as the ratio of the number of events (e.g. preterm births) that are associated with the outcome (perinatal deaths) to the number of events that are not associated with the event (no perinatal deaths).

Odds ratio: An odds ratio (OR) is the ratio of the odds of an outcome (e.g. perinatal death) in one population (e.g. comparison group: 'smoked during pregnancy') to the odds of that outcome in a different population (reference category: 'did not smoke during pregnancy').

The value of the odds ratio is interpreted as:

- an odds ratio close to or equal to 1 means that the exposure (e.g. preterm birth) has little or no effect on the odds of the outcome (perinatal death) occurring
- an odds ratio greater than 1 means that the exposure (preterm birth) increases the odds of the outcome (perinatal death) occurring
- an odds ratio less than 1 means that the exposure (preterm birth) decreases the odds of the outcome (perinatal death) occurring.

Adjusted odds ratio: An adjusted odds ratio (AOR) is an odds ratio that controls for other risk factors in a model. For example, instead of only modelling the relationship between a risk factor or predictor variable (e.g. preterm birth) and an outcome (e.g. perinatal death), AORs indicate the relationship between an outcome and a predictor variable or risk factor after taking into consideration the woman's other characteristics or risk factors that are included in the model.

Population attributable fractions (PAF)

Population attributable fractions (PAF) are used in Chapter 7 to illustrate the contribution of various risk factors to the reduction in adverse pregnancy and birth outcomes in Australia.

The population attributable fraction (PAF), is a measure of the proportional reduction in an outcome (e.g. perinatal death) that would occur if exposure to a risk factor were reduced to an alternative ideal exposure scenario (e.g. no smoking during pregnancy) (WHO 2020). It can be interpreted as the estimated fraction of an outcome (e.g. perinatal death) that would not have occurred if there had been no exposure to a particular risk factor (e.g. smoking during pregnancy) (Mansournia & Altman 2018).

Many diseases are caused by multiple risk factors, and individual risk factors may interact in their impact on overall risk of disease. As a result, PAFs for individual risk factors often overlap and add up to more than 100 percent (WHO 2020).

While the adjusted odds ratio is a measure of risk at the individual-woman level, the PAF is a population-level measure. It takes into account both the relative risk of exposure to a specified risk factor and the proportion of the population exposed to that risk.

4 Perinatal death

Perinatal deaths are deaths occurring during the perinatal period; they comprise stillbirths and neonatal deaths (see also Box 4.1). Perinatal deaths are widely recognised as an important indicator of population health. The death of a child, including stillbirth, is a traumatic event that can have long-term effects on the lives of parents, including depression and marital disruption, and serious health and behavioural consequences on surviving siblings (Cain et al. 1964).

While Australia is one of the safest places in the world to give birth, almost 1 in 100 pregnancies will end in a perinatal death (AIHW: Monk et al. 2016).

This chapter examines the risk factors associated with perinatal death among babies born to Indigenous women.

Box 4.1 Definition of perinatal deaths in Australia

The AIHW defines perinatal deaths as 'those occurring prior to or during labour and/or birth (stillbirth) or up to 28 days after birth (neonatal death) where babies are of 20 or more completed weeks gestation or have a birthweight of at least 400 grams' (AIHW 2019b) Perinatal deaths are defined for all births rather than for only live births, provided the criteria of 400 grams birthweight or 20 weeks gestational age are met.

The study of perinatal deaths is important for a variety of reasons, including:

- The same obstetric conditions responsible for a large proportion of pregnancy-related deaths are also responsible for a large proportion of perinatal deaths.
- Understanding the risk factors associated with perinatal deaths will contribute to the development of more effective policies, programs, services and practices to reduce stillbirths, neonatal deaths and maternal deaths.

How common are perinatal deaths?

During 2016–2018, there were about 8,100 perinatal deaths in Australia out of nearly 922,300 births. This was equivalent to a perinatal death rate of about 8.8 per 1,000 births (Table 4.1).

During 2016–2018, the perinatal death rate among babies born to Indigenous women was 14.8 per 1,000 births, or nearly 74% higher than the rate of 8.5 per 1,000 births among babies born to non-Indigenous women.

Table 4.1: Number of perinatal deaths, Australia, 2016–2018

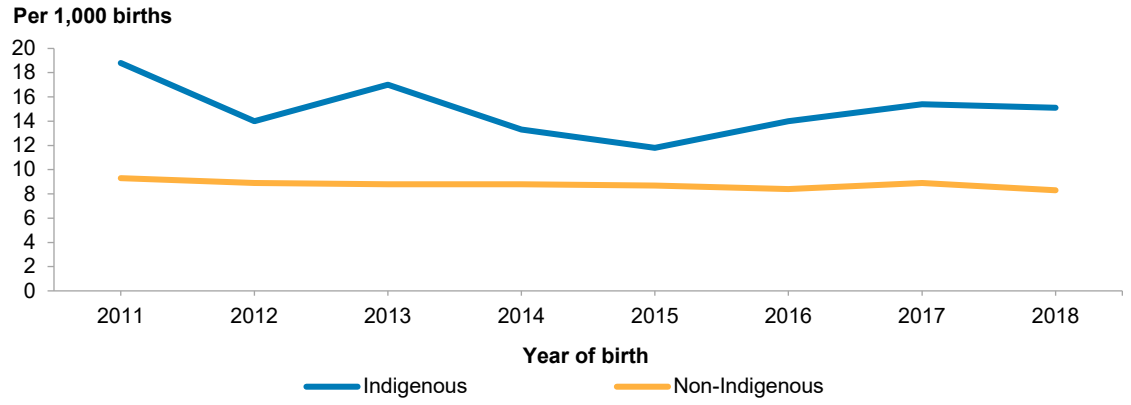
Indigenous status	Births	Perinatal deaths	Rate per 1,000 births
Indigenous	41,448	615	14.8
Non-Indigenous	880,822	7,504	8.5
Total	922,270	8,119	8.8

Source: National Perinatal Data Collection.

Between 2011 and 2018, the perinatal death rate among babies born to Indigenous women was variable. The rate, however, declined from about 18.8 per 1,000 births in 2011 to about 15.1 in 2018 (Figure 4.1).

The perinatal death rate was more stable for babies born to non-Indigenous women, but appeared to have also declined slightly, from about 9.3 to 8.3 deaths per 1,000 births between 2011 and 2018.

Figure 4.1: Number of perinatal deaths per 1,000 births, Australia



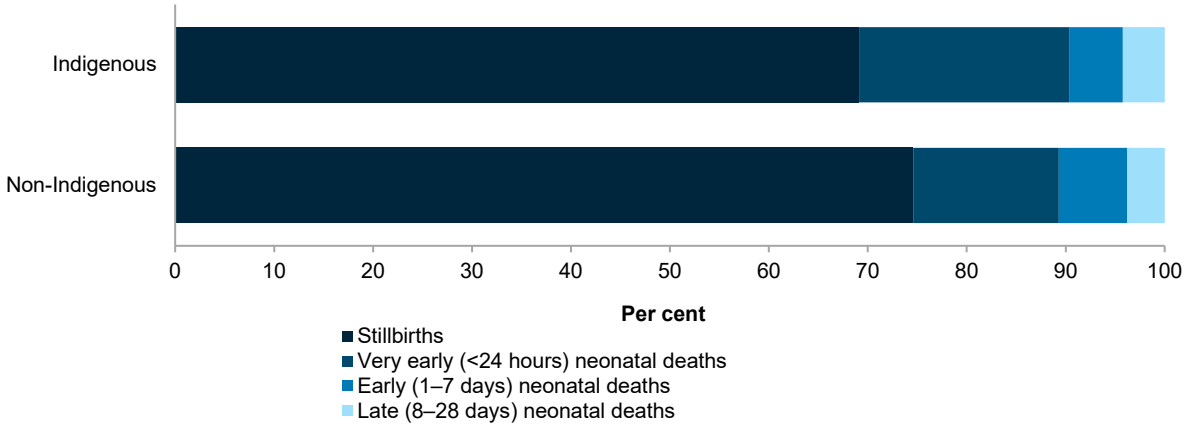
Source: National Perinatal Data Collection.

Components of perinatal deaths

Perinatal deaths can be divided into stillbirths and neonatal deaths, while neonatal deaths, in turn, can be divided into very early, early and late neonatal deaths, depending on how soon after birth the death occurs (see Chapter 6 Neonatal deaths).

During 2016–2018, stillbirths made up nearly 70% of Indigenous perinatal deaths compared with about three-quarters (75%) of non-Indigenous perinatal deaths, while very early neonatal deaths, or deaths within 24 hours after birth, made up about 21% of Indigenous perinatal deaths and about 15% of non-Indigenous perinatal deaths (Figure 4.2). Early and late neonatal deaths made up 5.2% and 4.1%, respectively, of Indigenous perinatal deaths, and 6.7% and 3.7%, respectively, of non-Indigenous perinatal deaths.

Figure 4.2: Timing of perinatal deaths, Australia, 2016–2018



Source: National Perinatal Data Collection.

Risk factors for perinatal death: Indigenous women

This section examines the risk factors associated with perinatal death among babies born to Indigenous women during 2016–2018.

Table 4.2 shows the adjusted odds ratios for the risk factors that were found to be associated with an elevated risk of perinatal death among babies born to Indigenous women. This risk is interpreted to mean the number of times a baby with a given characteristic was likely to experience perinatal death compared with a baby without the given characteristic. Estimates are based on only singleton births in order to avoid any possible confounding effects of multiple births on adverse pregnancy outcomes.

Appendix Tables A1 and A3 show the full results of all the risk factors associated with perinatal death among babies born to both Indigenous and non-Indigenous women.

Table 4.2: Key risk factors associated with perinatal death[a, b, c] among babies born to Indigenous women, Australia, 2016–2018

Adjusted odds ratios** or number of times a baby born to a woman with a given risk factor was likely to die during the perinatal period compared with a baby born to a woman without the given risk factor	
Risk factor / baby's characteristic	**Adjusted odds ratio**
Low birthweight baby (compared with a baby that was not low birthweight)	10.5
Preterm birth (compared with a non-preterm birth)	8.3
Antepartum haemorrhage (APH): mother developed APH during pregnancy (compared with a baby born to a woman who did not develop APH during pregnancy)	3.9
No antenatal care – mother did not receive antenatal care (compared with a baby born to a woman who attended her first antenatal care during the first trimester of her pregnancy)	3.6
Pre-existing diabetes mellitus – mother had pre-existing diabetes mellitus (compared with a baby born to a women without pre-existing diabetes mellitus)	1.9

(a) Estimates are based on all singleton babies.

(b) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(c) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

Low birthweight and preterm birth were the two most important risk factors associated with perinatal death among babies born to Indigenous women.

Among Indigenous women, the risk of perinatal death was higher among: low birthweight and preterm babies; babies born to women who experienced APH during their pregnancy; babies whose mothers did not receive antenatal care during their pregnancy; and babies born to women who had pre-existing diabetes mellitus before the onset of pregnancy.

Among Indigenous women, the risk of perinatal death among low birthweight babies was about 11 times the risk of perinatal death among babies that were not low birthweight. The risk of perinatal death among preterm babies born to Indigenous women was about 8 times the risk of perinatal death among non-preterm babies born to Indigenous women.

The risk of perinatal death among babies born to Indigenous women who developed APH during their pregnancy was nearly 4 times the risk of perinatal death among babies born to Indigenous women who did not develop APH during their pregnancy.

Most Indigenous women received antenatal care during their pregnancy, did so from the first trimester of their pregnancy, and also had positive pregnancy outcomes. The analysis revealed, however, that women who did not receive antenatal care experienced a statistically significant increase in the risk of having an adverse pregnancy outcome. The risk of perinatal death among babies born to Indigenous women who did not receive antenatal care during their pregnancy was 3.6 times the risk of perinatal death among babies born to Indigenous women who received antenatal care in the first trimester of their pregnancy.

The risk of perinatal death among babies born to Indigenous women who had pre-existing diabetes mellitus (PDM) before the onset of their pregnancy was nearly 2 times the risk of perinatal death among babies born to Indigenous women who did not have PDM.

Risk factors for perinatal death: non-Indigenous women

With few exceptions, the same risk factors were associated with perinatal death among babies born to both Indigenous and non-Indigenous women (Appendix Table A3).

Among both Indigenous and non-Indigenous women, the risk of perinatal death was higher among preterm babies, low birth weight babies, babies born to mothers who developed APH during pregnancy, and babies born to women who did not receive antenatal during their pregnancy, than among babies born to non-Indigenous women who did not have these characteristics.

Additionally, among non-Indigenous women, the risk of perinatal death was higher among babies born to women who were overweight or obese before the onset of their pregnancies than among babies born to women whose pre-pregnancy body mass index (BMI) was in the normal weight range.

5 Stillbirth

Stillbirths are a component of perinatal deaths. A stillbirth is often distinguished from a live birth (where a baby is born alive, even if it dies shortly thereafter), or a miscarriage (an early pregnancy loss, where a fetus dies before 20 weeks of gestation have elapsed) (Robinson 2014).

The definition of a stillbirth is, however, not universal across countries. The World Health Organization (WHO), for instance, defines a stillbirth as a baby born without any signs of life at greater than or equal to 28 completed weeks' gestation (WHO 2017). In the USA, there are 8 different definitions of stillbirth, based on combinations of gestational age and weight, and at least as many in Europe (Nguyen & Wilcox 2005).

In this report, stillbirth is defined as the death of a baby born without any signs of life with a birthweight of at least 400 grams or a gestational age of at least 20 weeks (Box 5.1).

This chapter examines the risk factors associated with stillbirth birth among babies born to Indigenous women in Australia during 2016–2018.

Box 5.1 Definition of stillbirths in Australia

In Australia, a stillbirth, also known as a fetal death, is defined as a baby born without any signs of life with a birthweight of at least 400 grams or a gestational age of at least 20 weeks (AIHW: Monk et al. 2016).

The study of stillbirths is important for several reasons, including:

- Stillbirths exert a heavy adverse toll on pregnancies of both Indigenous and non-Indigenous women. In 2016–2018, 70% of Indigenous perinatal deaths and 75% of non-Indigenous perinatal deaths were stillbirths.
- The risk factors for stillbirths are also associated with the same obstetric conditions responsible for a large proportion of pregnancy-related deaths (Goldenberg et al. 2011).
- Understanding the risk factors associated with stillbirths will lead to the development of policies and programs to prevent neonatal deaths (Stillbirth Collaborative Research Network Writing Group 2011).

How common are stillbirths?

There were about 922,300 births in Australia during the period 2016–2018, of which about 6,000 were stillbirths, resulting in a stillbirth rate of 6.5 per 1,000 births (Table 5.1).

The stillbirth rate among births to Indigenous mothers was 10.3 per 1,000 births—about 60% higher than the rate of 6.4 per 1,000 births among babies born to non-Indigenous women.

Table 5.1: Number of stillbirths, Australia, 2016–2018

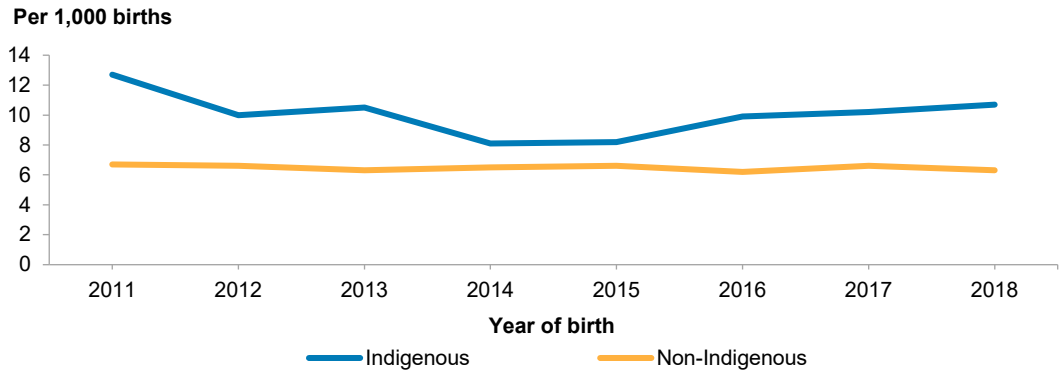
Indigenous status	Births	Stillbirths	Rate per 1,000 births
Indigenous	41,448	425	10.3
Non-Indigenous	880,822	5,596	6.4
Total	922,270	6,021	6.5

Source: National Perinatal Data Collection.

Although variable, the stillbirth rate among births to Indigenous women appears to have declined marginally between 2011 and 2018. In 2011, the stillbirth rate among births to Indigenous women was 12.7 per 1,000 births compared with 10.7 per 1,000 births in 2018 (Figure 5.1).

The stillbirth rate among births to non-Indigenous women, however, appears to have remained stable at between 6 and 7 per 1,000 births during the period 2011 to 2018.

Figure 5.1: Number of stillbirths per 1,000 births, Australia



Source: National Perinatal Data Collection.

Risk factors for stillbirths: Indigenous women

Table 5.2 shows the adjusted odds ratios for the risk factors that were found to be associated with an elevated risk of stillbirth among babies born to Indigenous women. This risk is interpreted to mean the number of times a baby born to a woman with a given characteristic was likely to be a stillborn baby compared with a baby born to a woman without the given characteristic.

Estimates are based on only singleton births in order to avoid the confounding effects of multiple births on adverse pregnancy and birth outcomes, such as perinatal death, preterm birth and low birthweight.

Appendix Tables A1 and A3 show the full results of all the risk factors associated with stillbirths among babies born to both Indigenous and non-Indigenous women.

Among Indigenous women, the risk of stillbirth was higher among:

- preterm babies
- low birthweight babies
- babies born to women who developed APH during pregnancy
- babies born to women who had pre-existing diabetes mellitus
- babies born to women who did not receive antenatal care
- babies born to women who were less than 19 years old at delivery

Low birthweight and preterm birth posed the biggest risks to the occurrence of stillbirths among Indigenous women.

Among Indigenous women, low birthweight babies were more than 9 times as likely to be stillborn as non-low birthweight babies, while the likelihood that a preterm baby will be stillborn was nearly 7 times the risk for a non-preterm baby.

Among Indigenous women who did not receive antenatal care during their pregnancy, the risk of having a stillbirth was about 6 times the risk of stillbirth among Indigenous women who attended their first antenatal care during the first trimester of their pregnancy.

Indigenous women who developed APH during their pregnancy were nearly 4 times as likely to have a stillbirth as Indigenous women who did not develop APH during their pregnancy.

The risk of having a stillborn baby among Indigenous women who had pre-existing diabetes mellitus was about 2.3 times the risk of having a stillborn baby among Indigenous women who did not have pre-existing diabetes mellitus, while Indigenous women who were 18 years of younger at delivery were about 1.9 times as likely to have a stillbirth as Indigenous women who were older than 18 years at delivery.

Table 5.2: Key risk factors associated with stillbirth[a, b, c] among babies born to Indigenous women, Australia, 2016–2018

Adjusted odds ratio** or number of times a woman with a given risk factor was likely to have a stillbirth compared with a woman without the given risk factor	
Risk factor/mother's characteristic	**Adjusted odds ratio**
Had a low birthweight baby (compared with a non-low birthweight baby)	9.2
Had a preterm baby (compared with a non-preterm birth)	6.8
Did not attend antenatal care at all (compared with a woman who attended her first antenatal care during the first trimester of her pregnancy)	6.1
Antepartum haemorrhage (APH): developed APH during pregnancy (compared with a woman who did not develop APH during pregnancy)	3.8
Had pre-existing diabetes mellitus (PDM) [b] (compared with a woman who did not have PDM)	2.3
Maternal age: 18 years or younger (compared with a woman aged 19–34 years at delivery)	1.9

(a) Estimates are based on all singleton babies.

(b) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(c) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

Risk factors for stillbirth: non-Indigenous women

Many of the risk factors that were associated with stillbirth among Indigenous women were also found to be associated with stillbirth among non-Indigenous women (Table A3). Among the risk factors relating to the baby were low birthweight and preterm birth while factors relating to the mother included developing APH during pregnancy, and having pre-existing diabetes mellitus before the onset of pregnancy.

Additionally, non-Indigenous women who were 35 years or older at delivery, and those who were overweight or obese before the onset of pregnancy, were more likely to have a stillborn baby compared with non-Indigenous women who were younger than 35 years or who were not overweight or obese.

6 Neonatal death

Neonatal deaths are both a component of perinatal deaths and a component of infant deaths. A neonatal death refers to the death of a live-born baby less than 28 completed days after birth.

This chapter examines the risk factors associated with neonatal death among babies born to Indigenous women.

How common are neonatal deaths?

There were about 916,200 live births in Australia during the period 2016–2018, of which about 2,100 died during the neonatal period, resulting in a neonatal death rate of 2.3 per 1,000 live births (Table 6.1).

During the period 2016–2018, the neonatal death rate among live births to Indigenous mothers was 4.6 neonatal deaths per 1,000 live births, which was about double the rate of 2.2 neonatal deaths per 1,000 live births among births to non-Indigenous women.

Table 6.1: Number of neonatal deaths, Australia, 2016–2018

Indigenous status	Live births	Neonatal deaths	Rate per 1,000 live births
Indigenous	41,021	190	4.6
Non-Indigenous	875,199	1,908	2.2
Total	916,220	2,098	2.3

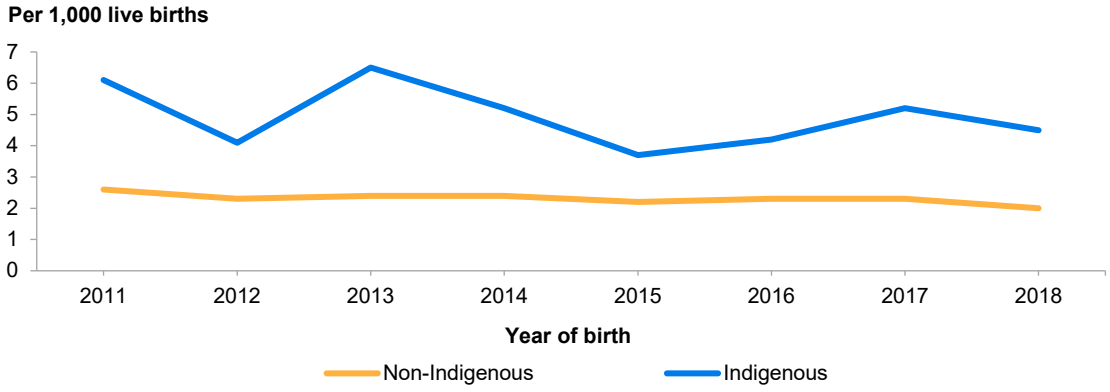
Source: National Perinatal Data Collection.

Despite a variable trend, the neonatal death rate among live births to Indigenous women appears to have declined marginally between 2011 and 2018 (Figure 6.1).

In 2011, the neonatal death rate among live births to Indigenous women was 6.1 per 1,000 live births compared with 4.5 per 1,000 live births in 2018.

The neonatal death rate among live births to non-Indigenous women also appears to have declined marginally from about 2.6 to 2.0 neonatal deaths per 1,000 live births between 2011 and 2018.

Figure 6.1: Number of neonatal deaths per 1,000 live births, Australia



Source: National Perinatal Data Collection.

Among live-born babies, the neonatal period is the most vulnerable time for survival, where babies face the highest risk of dying. Most neonatal deaths, especially early neonatal deaths, have obstetric origins similar to those for stillbirths (WHO 2006, 2017).

Around the world, more than one-third of all child deaths occur in the first month or during the neonatal period (WHO 2018; World Health Organization 2005).

In Australia during the period 2016–2018, neonatal deaths accounted for about one-third of all Indigenous perinatal deaths and about one-quarter of all non-Indigenous perinatal deaths. During the same period, neonatal deaths comprised just over one-half of Indigenous infant deaths and about two-thirds of non-Indigenous infant deaths in Australia.

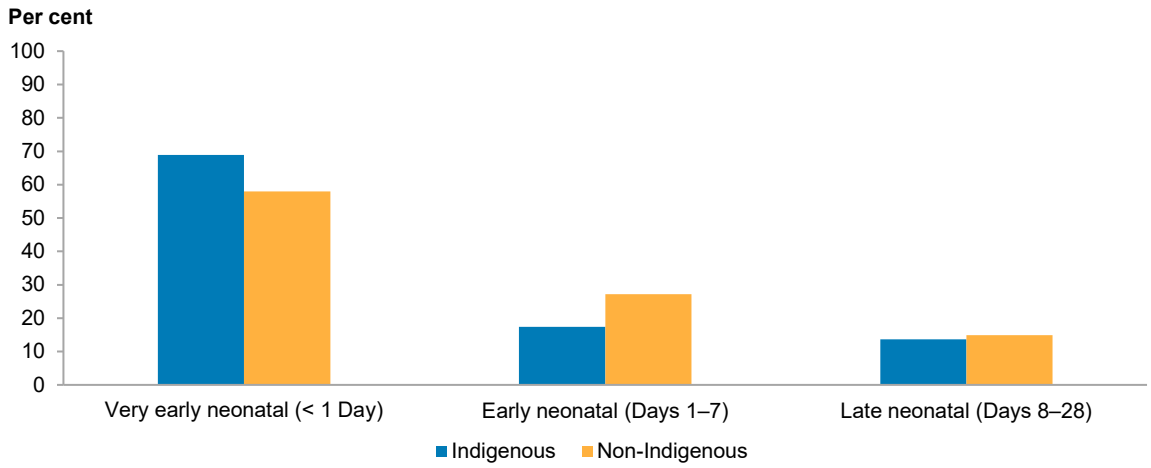
Timing of neonatal deaths

Neonatal deaths can be divided into very early, early and late neonatal deaths, depending on how soon after birth they occur. The time-of-death distribution differs substantially between these periods. By far, most neonatal deaths occur soon after birth, particularly within 24 hours after birth.

Figure 6.2 shows the timing of neonatal deaths that occurred in Australia between 2016 and 2018 among babies born to Indigenous and non-Indigenous mothers. The timing of neonatal deaths differs between Indigenous and non-Indigenous babies.

A larger proportion of Indigenous than non-Indigenous neonatal deaths occurred within 24 hours after birth (very early neonatal deaths), while a larger proportion of non-Indigenous than Indigenous neonatal deaths occurred more than 24 hours after birth.

Figure 6.2: Timing of neonatal deaths, Australia, 2016–2018



Source: National Perinatal Data Collection.

About 69% of Indigenous babies compared with 58% of non-Indigenous babies who died during the neonatal period did so ‘very early’ or within 24 hours after birth. Neonatal deaths have an aetiology similar to that for stillbirths, however, the cause of very early neonatal deaths may be the closest in aetiology to that contributing to the occurrence of stillbirths. The most common causes for these deaths are congenital anomalies and spontaneous preterm birth (AIHW 2019c).

About 17% and 14%, respectively, of Indigenous neonatal deaths occurred during the early and late neonatal periods, while 27% and 15%, respectively, of non-Indigenous neonatal deaths occurred during the early and late neonatal periods.

Risk factors for neonatal death: Indigenous women

Table 6.2 shows the adjusted odds ratios for the risk factors that are associated with an elevated risk of neonatal death among babies born to Indigenous women. This risk is interpreted to mean the number of times a baby with a given characteristic was likely to experience neonatal death compared with a baby without the given characteristic.

Estimates are based on only singleton births in order to avoid the confounding effects of multiple births on adverse pregnancy and birth outcomes such as perinatal death, preterm birth and low birthweight.

Appendix Tables A1 and A3 show all the risk factors that were found to be associated with neonatal death among babies born to both Indigenous and non-Indigenous women.

Four risk factors were found to be associated with an elevated risk of neonatal death among babies born to Indigenous women. These were low birthweight, preterm birth, APH and chronic hypertension.

Among Indigenous women, the risk of neonatal death among low birthweight babies was nearly 14 times the risk of neonatal death among babies that were not low birthweight, while the risk of neonatal death among preterm babies was nearly 13 times the risk of neonatal death among non-preterm babies.

Table 6.2: Key risk factors associated with neonatal death[a, b, c], Australia, 2016–2018

Adjusted odds ratios** or number of times a baby born to a woman with a given risk factor was likely to die during the neonatal period compared with a baby born to a woman without the given risk factor	
Risk factor / mother's characteristic	**Adjusted odds ratios**
Low birthweight baby (compared with a baby that was not low birthweight)	13.5 times
Preterm baby (compared with a non-preterm baby)	12.7 times
Antepartum haemorrhage (APH): mother developed APH during pregnancy (compared with a baby born to a woman who did not develop APH during pregnancy)	3.3 times
Chronic hypertension: mother had chronic hypertension (compared with a baby born to a woman who did not have chronic hypertension)	3.8 times

(a) Estimates are based on all singleton babies.

(b) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(c) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

Risk factors for neonatal death: non-Indigenous women

With few exceptions the same risk factors associated with neonatal death among Indigenous women were also found to be associated with neonatal death among non-Indigenous women. There were, however, 4 additional risk factors that were also found to be associated with neonatal death among non-Indigenous women. These additional risk factors consisted of antenatal care, parity of 4 babies and over, maternal pre-pregnancy BMI and marital status (Appendix Table A4).

7 Risk factors for preterm birth and low birthweight

In Chapters 4, 5 and 6, it was observed that among Indigenous women, the biggest risk factors associated with perinatal death, comprising stillbirths and neonatal death, were preterm birth and low birthweight.

Understanding the risk factors associated with preterm birth and low birthweight will enhance our understanding of the factors associated with perinatal mortality, stillbirth and neonatal mortality.

This chapter identifies risk factors for preterm birth and low birthweight, to help inform how the level of preterm birth and low birthweight babies among Indigenous women could be reduced.

Preterm births

A preterm birth is a birth before 37 completed weeks of gestation. Preterm birth is a leading cause of death, disabilty and disease among newborns (AIHW 2018c; U.S. Department of Health and Human Services 2010a, 2010b). In chapters 4, 5 and 6, preterm birth, along with low birthweight, was identified as the single most consistent and statistically significant risk factor associated with perinatal mortality (stillbirths and neonatal mortality).

This section examines the risk factors associated with preterm birth among babies born to Indigenous women.

How common are preterm births?

During 2016–2018, there were nearly 922,300 births in Australia, of which about 79,500 were preterm. This was equivalent to a preterm birth rate of about 8.6%.

During 2016–2018, the preterm birth rate among babies born to Indigenous women was 13.8%, or nearly 1.7 times the rate of 8.4% among babies born to non-Indigenous women (Table 7.1).

Table 7.1: Number of preterm births, Australia, 2016–2018

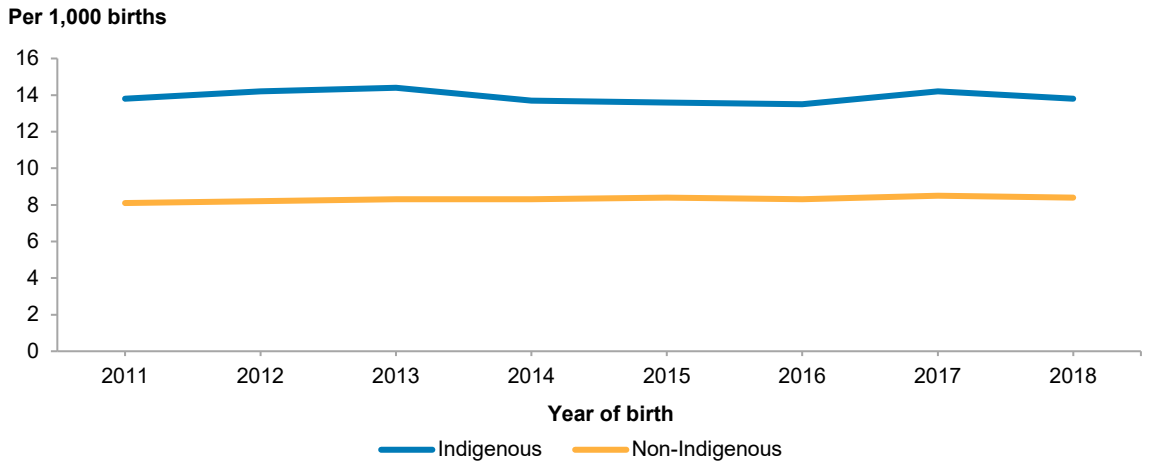
Indigenous status	All births	Preterm births	Per cent
Indigenous	41,448	5,725	13.8
Non-Indigenous	880,822	73,822	8.4
Total	922,270	79,547	8.6

Source: National Perinatal Data Collection.

The preterm birth rate among babies born to Indigenous women appeared to have remained relatively stable between 2011 and 2018 at about 13.8%, with only minor fluctuations observed (Figure 7.1).

The preterm birth rate among babies born to non-Indigenous women, however, appeared to have increased slightly, from about 8.1% in 2011 to 8.5% in 2018, but was consistently lower than the rate among babies born to Indigenous women.

Figure 7.1: Number of preterm births per 1,000 births, Australia



Source: National Perinatal Data Collection.

Risk factors for preterm birth: Indigenous women

Figure 7.2 shows the adjusted odds ratios for the risk factors that are associated with an elevated risk of pre-term birth among babies born to Indigenous women. This risk is interpreted to mean the number of times a baby with a given characteristic is likely to be a preterm baby compared with a baby without the given characteristic.

Preterm birth was associated with several pregnancy complications as well as with several maternal contextual, demographic, socioeconomic, and health risk factors. This suggests that preterm birth was acting as an overarching risk that encompassed several risk factors.

The most important risk factors associated with preterm birth among individual Indigenous women included:

- APH
- antenatal care
- pre-existing diabetes mellitus
- pregnancy-induced hypertension
- chronic hypertension
- being underweight
- smoking during pregnancy.

The full list of risk factors found to be associated with preterm birth among Indigenous women is shown in Appendix Table A2.

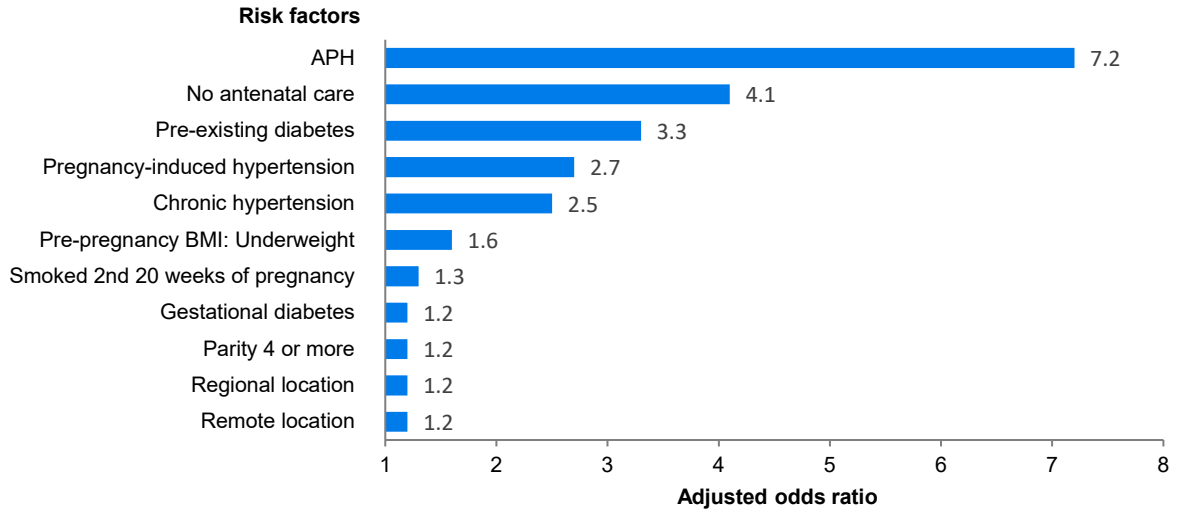
Indigenous women who developed APH during their pregnancy were about 7 times as likely to have a preterm baby as Indigenous women who did not develop APH during their pregnancy.

Pregnancy-induced hypertension (PIH) is defined in this report to include gestational hypertension, pre-eclampsia and eclampsia. Indigenous women who developed PIH were about 2.7 times as likely to have a preterm birth as Indigenous women who did not develop PIH.

Most Indigenous women in Australia attended antenatal care during their pregnancy, with nearly two out of three Indigenous women starting antenatal care during the recommended first trimester of their pregnancy. For women who did not receive antenatal care during their pregnancy, however, the risk of having a preterm baby was about 4 times the risk of having a preterm baby among Indigenous women who received antenatal care during the first trimester of their pregnancy.

Indigenous women who had pre-existing diabetes mellitus prior to the onset of pregnancy were about 3.3 times as likely to have a preterm birth as Indigenous women who did not have pre-existing diabetes mellitus before the onset of pregnancy.

Figure 7.2: Adjusted odds ratios ** or risk of preterm birth among Indigenous women, Australia, 2016–2018



1. Estimates are based on singleton live births
2. Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.
3. Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

Figure 7.2 also shows that Indigenous women who had chronic hypertension were about 2.5 times as likely to have a preterm birth as Indigenous women who did not have chronic hypertension before the onset of their pregnancy.

Smoking during pregnancy is categorised into ‘smoking during the first 20 weeks of pregnancy’ and ‘smoking during the second half of pregnancy’. The 2 types of smoking may have different effects on the growing fetus, due not only to the duration of smoking for those who continued to smoke during the second half of the pregnancy, but also to the effects smoking would have on different stages of fetal growth and development.

The risk of preterm birth among Indigenous women who smoked during the second half of their pregnancy was about 1.3 times the risk, or about 30% higher than the risk, of preterm birth among Indigenous women who did not smoke during the second half of their pregnancy.

Maternal pre-pregnancy BMI was also strongly associated with the risk of having a preterm baby. Indigenous women who were underweight before the onset of pregnancy were about 1.6 times as likely to have a preterm baby as Indigenous women whose pre-pregnancy BMI was in the normal weight range.

The likelihood of having a preterm birth was about 20% higher among Indigenous women who lived in regional or remote areas than among Indigenous women who lived in major cities. Residence in remote areas, and in some regional areas, is associated with poorer access to health, economic and social services, which may, in turn, lead to adverse health outcomes, including adverse pregnancy and birth outcomes.

Risk factors for preterm birth: non-Indigenous women

With very few exceptions, the risk factors associated with preterm birth among Indigenous women were similar to those associated with preterm birth among non-Indigenous women.These risk factors included the following:

- pregnancy complications such as antepartum haemorrhage, gestational diabetes and pregnancy-induced hypertension
- modifiable health risk factors, such as pre-pregnancy BMI, chronic hypertension, pre-existing diabetes, smoking during pregnancy and attendance at antenatal care
- contextual and demographic factors, such as marital status, maternal age and parity.

The full list of risk factors found to be associated with preterm birth among non-Indigenous women is shown in Appendix Table A4.

Low birthweight

This section examines low birthweight as the next most important risk factor found to be associated with perinatal death.

Low birthweight babies are babies that weigh less than 2,500 grams at birth, irrespective of gestational age. Birthweight is a useful indicator of the health of babies at birth. It is also a valuable indicator of the future health of the baby, as well as a critical risk factor for adverse pregnancy and birth outcomes, such as stillbirth and neonatal death.

How common are low birthweight babies?

During 2016–2018, there were nearly 916,200 live births in Australia, of which about 60,700 were low birthweight babies, that is, weighing less than 2,500 grams. This is equivalent to a low birthweight rate of 6.6%.

During 2016–2018, the low birthweight rate among live-born babies to Indigenous women was 11.9%, or nearly 1.9 times the rate of 6.4% among live-born babies to non-Indigenous women (Table 7.2).

Table 7.2: Number of low birthweight babies among all live births, Australia, 2016–2018

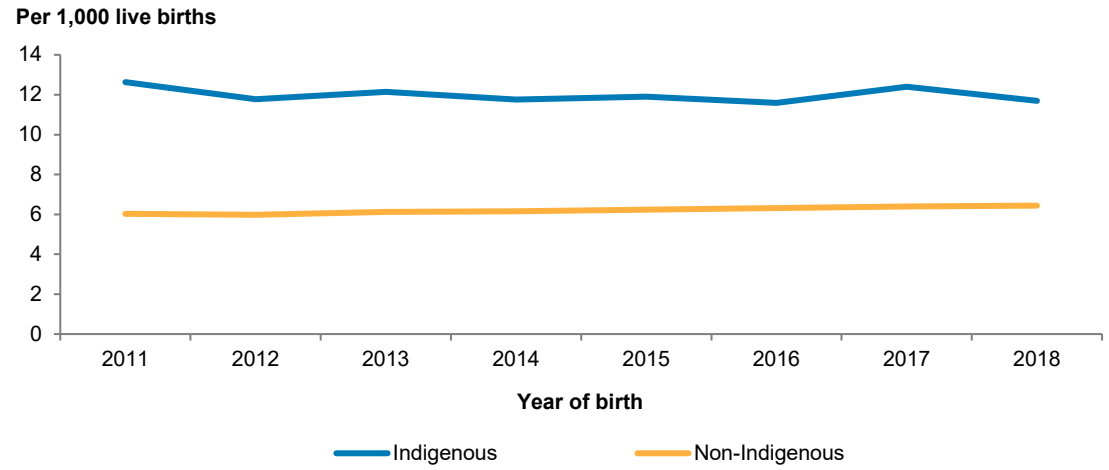
Indigenous status	Live births	Low birthweight	Per cent
Indigenous	41,021	4,885	11.9
Non-Indigenous	875,199	55,836	6.4
Total	916,220	60,721	6.6

Source: National Perinatal Data Collection.

The low birthweight rate among live-born babies to Indigenous women declined marginally from about 12.6% in 2011 to 11.7% in 2018 (Figure 7.3).

On the other hand, the low birthweight rate among live-born babies to non-Indigenous women remained relatively stable at between 6.0% in 2011 and about 6.4% in 2018.

Figure 7.3: Number of low birthweight babies per 1,000 live births, Australia



Source: National Perinatal Data Collection.

Risk factors for low birthweight: Indigenous women

Figure 7.4 shows that preterm birth was, by far, the single most important risk factor for low birthweight among babies born to Indigenous women. Preterm birth was not only the most important risk factor for low birthweight, but as was shown earlier in this report, preterm birth, along with low birthweight, were the two biggest risk factors associated with perinatal death (comprising stillbirths and neonatal deaths) among babies born to Indigenous women.

Among Indigenous women, preterm babies were more than 33 times as likely to be low birthweight compared to babies that were not preterm.

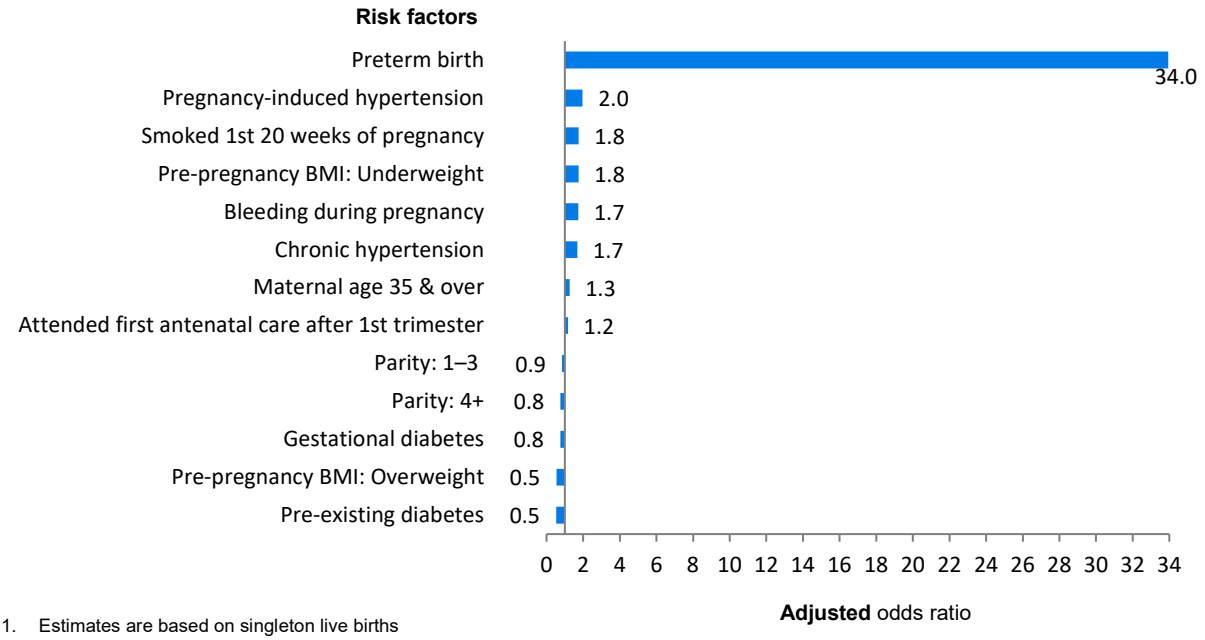
In addition to preterm birth, other risk factors associated with an increase in the risk of having a low birthweight baby include pregnancy-induced hypertension, smoking during pregnancy, being underweight before the onset of pregnancy, antepartum haemorrhage, or bleeding during pregnancy, being 35 years and over and not commencing antenatal care during the first trimester of pregnancy.

The risk of having a low birthweight baby among Indigenous women who developed pregnancy-induced hypertension or PIH during their pregnancy was nearly twice the risk of having a low birthweight baby among Indigenous women who did not develop PIH during their pregnancy

The risk of having a low birthweight baby among Indigenous women who smoked during the first 20 weeks of their pregnancy or who were underweight at the onset of their pregnancy was about 1.75 the risk (or about 75% higher than the risk) of having a low birthweight baby among Indigenous women who did not smoke during the first 20 weeks of their pregnancy or Indigenous women who were not underweight at the onset of their pregnancy.

Indigenous women who had chronic hypertension before their pregnancy had about 1.7 times the risk (or 70% higher risk) of having a low birthweight baby compared to Indigenous women who did not have chronic hypertension before their pregnancy, while Indigenous women who were 35 years of older at the time of the birth of their baby had about 1.26 times the risk of having a low birthweight baby compared to Indigenous women aged 19–34 years.

Figure 7.4: Adjusted odds ratios or risk of having a low birthweight baby among Indigenous women, Australia, 2016–2018**



1. Estimates are based on singleton live births
2. Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.
3. Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

BMI = body mass index

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

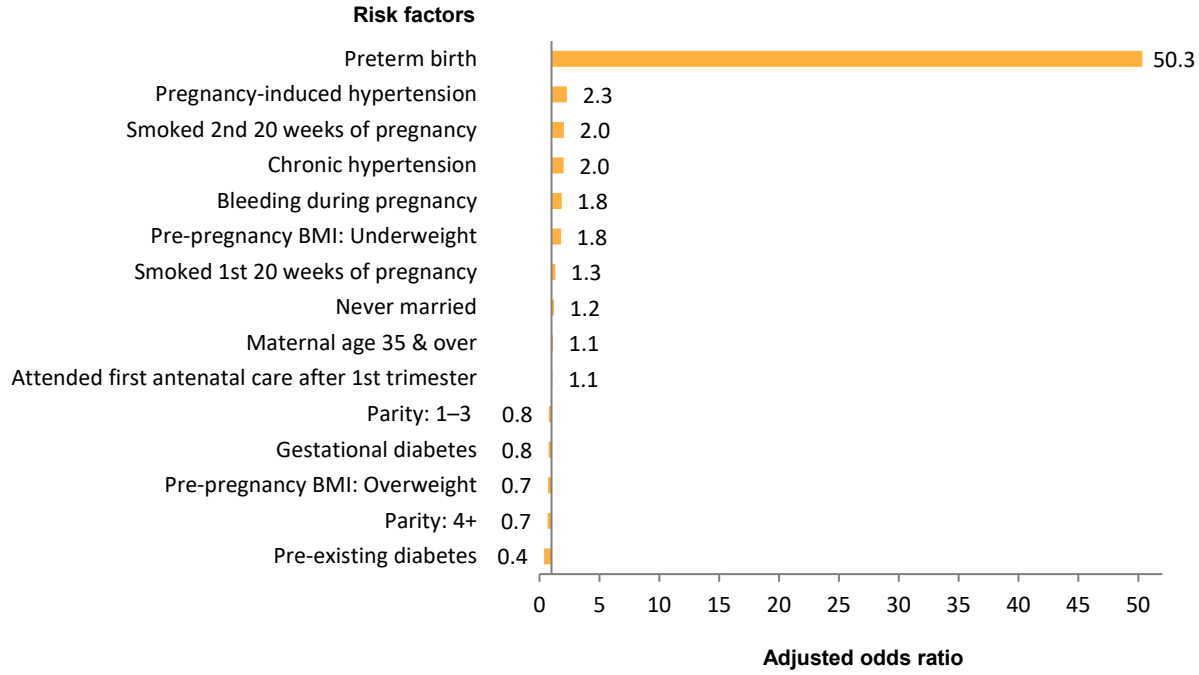
Most Indigenous women received antenatal care during their pregnancy, did so in a timely manner, from the first trimester of their pregnancy, and also had positive pregnancy and birth outcomes. Indigenous women who did not receive antenatal care during the first trimester of their pregnancy, however, experienced a statistically significant increase in the risk of having an adverse pregnancy or birth outcome. This study shows that the risk of having a low birthweight baby among Indigenous women who did not receive antenatal care during the first trimester of their pregnancy was about 1.17 the risk (or about 17% higher than the risk) of having a low birthweight baby among Indigenous women who commenced antenatal care during the first trimester of their pregnancy.

Other characteristics of women were however found to be associated with a lower risk of having a low birthweight baby. Women who were overweight before the onset of pregnancy, as well as women who had pre-existing diabetes or who developed diabetes during their pregnancy had a decreased risk of having a low birthweight baby. These characteristics (e.g. being overweight, having pre-existing diabetes or developing diabetes during rpegnancy) are however also associated with a higher risk of having a stillbirth (Table 5.2) and preterm birth (Figure 7.2), and are therefore not recommended as protection against low birthweight.

Risk factors for low birthweight: non-Indigenous women

The risk factors associated with low birthweight among babies born to non-Indigenous women were similar to those observed among Indigenous women. These included preterm birth, smoking during pregnancy, pregnancy-induced hypertension, chronic hypertension, antepartum haemorrhage or bleeding during pregnancy, and being underweight (Figure 7.5).

Figure 7.5: Adjusted odds ratios or risk of having a low birthweight baby among non-Indigenous women, Australia, 2016–2018**



1. Estimates are based on singleton live births
2. Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.
3. Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

BMI = body mass index

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

Small for gestational age (SGA)

This section explores another measure of birthweight, 'small for gestational age' or SGA. SGA babies are defined as being small for gestational age if their birthweight is below the 10th percentile for their gestational age and sex.

The main difference between low birthweight and SGA babies is that babies may be deemed to be low birthweight if their weight at birth is less than 2,500 grams, irrespective of gestational age, whereas SGA takes gestational age into account. Some babies may be of low birthweight because of a shorter gestational period. SGA babies may be born full term or preterm, yet their weight may be lower than that of other babies of the same gestational age.

As a measure of birthweight, SGA removes the confounding effect of differences in gestational age on birthweight by comparing birthweights at the same gestational ages. SGA as a measure of birthweight is based on only singleton live births compared with low birthweight which is applied to all births.

Risk factors for SGA birth: Indigenous women

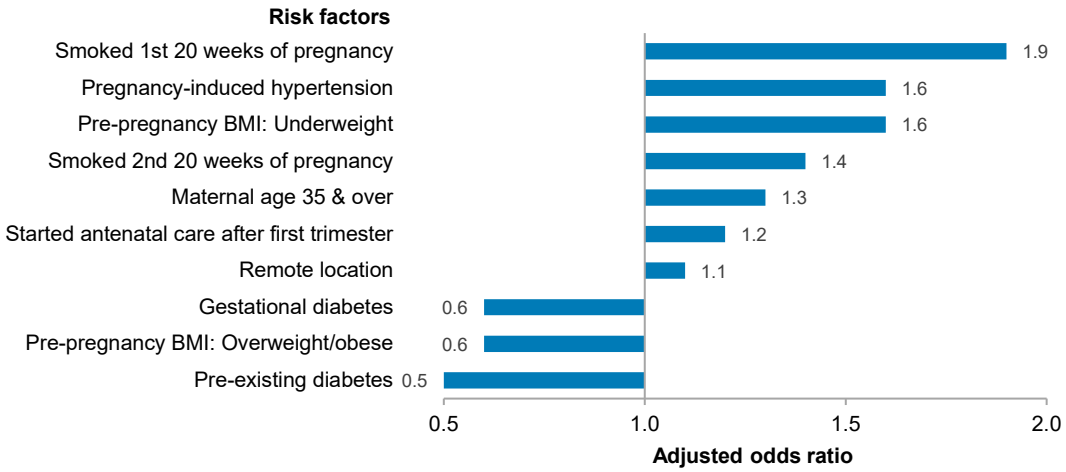
To illustrate the difference between SGA and low birthweight, this study examined 39,900 singleton live babies born to Indigenous women between 2016 and 2018. About 14% (5,594) of these were SGA, while 10.4% (4,142) were low birthweight.

This chapter examines the factors associated with SGA birth among Indigenous and non-Indigenous women. SGA estimates used in this report are modelled on singleton live births.

Figure 7.6 shows the adjusted odds ratios for the risk factors that are associated with an increase in the risk of SGA birth among Indigenous women. This risk is interpreted to mean the number of times an Indigenous woman with a given characteristic is likely to have an SGA baby compared with an Indigenous woman without the given characteristic. Appendix Table A4 shows the complete list of risk factors found to be associated with SGA birth.

Figure 7.6 shows that SGA birth was associated with several maternal health risk factors, pregnancy complications as well as with a number of contextual and demographic factors, an indication that SGA birth was acting as an overaching variable that encompassed several risk factors.

Figure 7.6: Adjusted odds ratios or risk of SGA birth among Indigenous women, Australia, 2016–2018**



1. Estimates are based on singleton live births
2. Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.
3. Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

BMI = body mass index

Adjusted odds ratio: Please see Glossary.

** = statistically significant at p <0.05

Source: National Perinatal Data Collection.

Modifiable health risk factors

In contrast to preterm birth, where pregnancy complications posed the greatest risk, the most important risk factors associated with SGA birth were mostly maternal modifiable health risk factors such as:

- smoking during pregnancy
- pre-pregnancy BMI
- attendance at antenatal care.

Among Indigenous women, smoking during the first 20 weeks and second 20 weeks of pregnancy were 2 of the most important risk factors associated with having an SGA baby. Indigenous women who smoked during the first 20 weeks of their pregnancy were about 1.9 times as likely to have an SGA baby as Indigenous women who did not smoke during the first 20 weeks of their pregnancy.

Indigenous women who smoked during the second half of their pregnancy had nearly a 40% higher risk of having an SGA baby compared with Indigenous women who did not smoke during the second half of their pregnancy.

Maternal pre-pregnancy BMI was also strongly associated with the risk of having an SGA baby. Indigenous women who were underweight prior to the onset of their pregnancy were about 1.6 times as likely to have an SGA baby as Indigenous women whose pre-pregnancy BMI was within the normal weight range.

On the other hand, there was an inverse relationship between being overweight or obese and having an SGA baby. Women who were overweight or obese at the onset of their pregnancies were less likely to have an SGA baby compared with women whose pre-pregnancy BMI was in the normal weight range.

An inverse relationship was observed between having diabetes and having an SGA baby. Women who had pre-existing diabetes mellitus or who developed gestational diabetes were less likely than women who did not have pre-existing diabetes to have an SGA baby. Other studies have however noted that pregnancies complicated by any type of diabetes (pre-pregnancy diabetes mellitus or gestational diabetes) are more likely to result in preterm births, large for gestational age babies and caesarean section compared with pregnancies not complicated by diabetes (dos Santos et al. 2005; Penney et al. 2003; Stogianni et al. 2019).

Indigenous women who did not receive antenatal care during the first trimester of their pregnancy, but did so after the first trimester, had about 20% higher risk of having an SGA baby compared with Indigenous women who attended their first antenatal care during the first trimester of their pregnancy. Of pregnancy-related complications, pregnancy-induced hypertension was strongly associated with the risk of having an SGA baby. Indigenous women who developed pregnancy-induced hypertension were more than 1.6 times as likely to have an SGA baby as Indigenous women who did not develop pregnancy-induced hypertension.

Two demographic factors, maternal age and living in remote areas, were observed to be associated with the risk of having SGA birth.

Risk factors for SGA birth: non-Indigenous women

The risk factors associated with SGA birth among non-Indigenous women were similar to those observed for Indigenous women. These included health risk factors, pregnancy complications and demographic and contextual factors.

Non-Indigenous women who smoked during pregnancy, were underweight, had chronic hypertension or initiated antenatal care after the first trimester of pregnancy were more likely to have an SGA baby than non-Indigenous women without these characteristics.

Non-Indigenous women who developed pregnancy complications such as pregnancy-induced hypertension and gestational diabetes also had a higher risk of having an SGA baby compared with non-Indigenous women who did not have these pregnancy complications.

The contextual and demographic factors associated with having SGA babies included maternal age, parity, marital status and residence in a regional area.

The full list of risk factors found to be associated with SGA birth among non-Indigenous women are shown in Appendix Table A4.

Reducing adverse pregnancy and birth outcomes

This section uses a new measure, the population attributable fraction (PAF), to examine the contribution of various risk factors (e.g. smoking during pregnancy) to specified adverse pregnancy and birth outcomes (e.g. perinatal mortality, stillbirths and neonatal mortality) at the population level, and how these adverse outcomes can be reduced (see Chapter 3).

The PAF can be interpreted as the proportion of an outcome (e.g. perinatal death) that could be prevented if there had been no exposure to a particular risk factor, such as diabetes or smoking during pregnancy (Mansournia & Altman 2018; Porter et al. 2011; WHO 2020).

While the previous chapters examined the association between a risk factor (e.g. smoking) and an adverse outcome (e.g. perinatal mortality) for individual women, the PAF looks at how an adverse outcome can be reduced across the whole population.

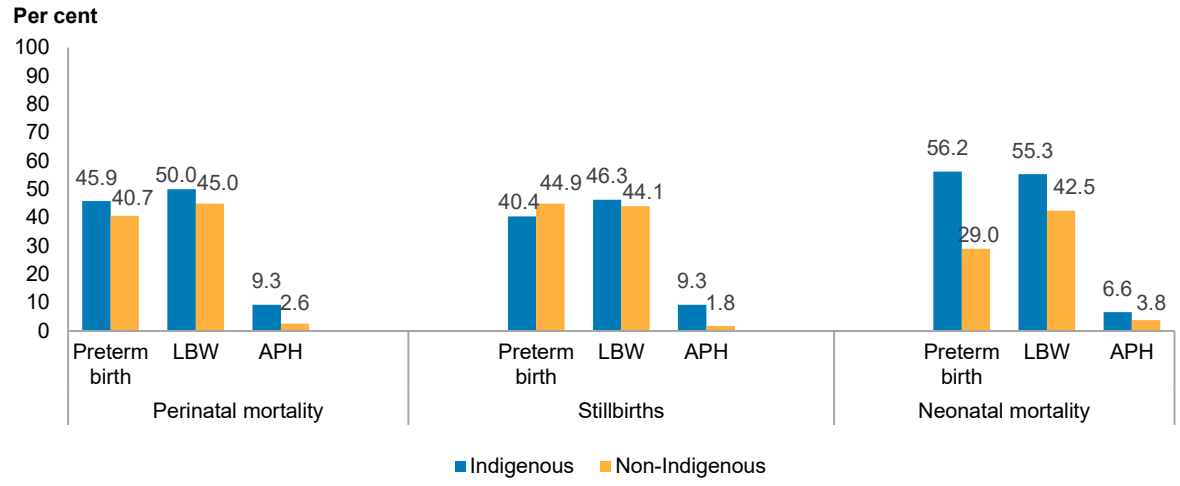
The PAFs take into account both the adjusted odds ratios for specified risk factors for individual women, but also the percentage of women who have the particular risk (e.g. smoked during pregnancy or had pre-existing diabetes). Thus, while the adjusted odds ratios show the risk of an adverse pregnancy or birth outcome for individual women based on their individual risk profile, the PAFs show the risk at the population level.

Figure 7.7 presents PAF estimates for 3 of the most consistent risk factors (preterm birth, SGA and APH) associated with perinatal death, stillbirths and neonatal mortality in Australia during 2016–2018. The PAFs show the percentage contribution of preterm birth, low birthweight and APH to perinatal mortality, stillbirths and neonatal mortality.

The PAFs show that among both Indigenous and non-Indigenous women, preterm birth and low birthweight alone accounted for nearly all cases of perinatal death, stillbirth and neonatal death in Australia.

The PAFs give an indication of what proportional reductions in perinatal mortality, stillbirths and neonatal mortality would have occurred if preterm births, low birthweight and antepartum haemorrhage during pregnancy were eliminated. The incidence of perinatal death could therefore be reduced if preterm birth and low birthweight could also be reduced.

Figure 7.7: PAFs (%) for perinatal deaths, stillbirths and neonatal deaths, Australia, 2016–2018



PAF = population attributable fraction
LBW = low birthweight
APH = antepartum haemorrhage
Source: National Perinatal Data Collection.

Because of the overarching role of preterm birth and low birthweight as risk factors for perinatal death, stillbirths and neonatal death, a further PAF analysis was carried out to determine the risk factors that were contributing the most to preterm birth and low birthweight, and what contributions they could make to reducing preterm birth and low birthweight among both Indigenous and non-Indigenous women. The results are shown in tables 7.3 and 7.4.

Reducing preterm birth among Indigenous women

Table 7.3 shows 4 main contributors to preterm birth among both Indigenous and non-Indigenous women in Australia during the period 2016–2018. These are smoking during pregnancy, pregnancy-induced hypertension, antepartum haemorrhage and diabetes (comprising both pre-existing diabetes and gestational diabetes).

The 4 key contributors to preterm birth together contributed about 51% or one out of every 2 cases of preterm birth among Indigenous women in Australia during the period 2016–2018.

Since preterm birth was a major contributor to perinatal mortality, stillbirths and neonatal mortality among both Indigenous and non-Indigenous women (Figure 7.5), reducing preterm births will also reduce the incidence of perinatal mortality, stillbirths and neonatal mortality among both Indigenous and non-Indigenous women.

About one-half (50%) of all preterm births among Indigenous women could therefore be prevented if smoking during pregnancy, pregnancy-induced hypertension, antepartum haemorrhage and both pre-existing diabetes and gestational diabetes were eliminated.

Table 7.3: Per cent contribution (PAF) of key risk factors to preterm birth among Indigenous women, Australia, 2016–2018

Risk factor	Population attributable fraction (PAF) %
Smoking during pregnancy[(d)]	16.7
Smoked 1st 20 weeks of pregnancy	(5.2)
Smoked 2nd 20 weeks of pregnancy	(11.5)
Pregnancy-induced hypertension	9.1
Antepartum haemorrhage	16.3
Diabetes [(e)]	7.9
Pre-existing diabetes	(5.4)
Gestational diabetes	(2.7)
Total contribution (%)	**50.0**

(a) Estimates are based on singleton live births.

(b) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(c) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

(d) While it is important to show the differential impact on pregnancy outcomes of smoking at different periods of pregnancy, the sum of the PAFs for 'Smoking during the 1st 20 weeks of pregnancy' and 'Smoking during the 2nd 20 weeks of pregnancy' should be treated with caution as they are not necessarily mutually exclusive. A woman can smoke in either the first 20 weeks or second 20 weeks of pregnancy or in both.

(e) Estimates for pre-existing diabetes and gestational diabetes may not add up to the total provided.

Source: National Perinatal Data Collection.

Specifically, smoking during pregnancy alone contributed about 17% or about 1 out of every 6 preterm births among Indigenous women. This means that 1 in 6 preterm births among Indigenous women could be prevented if smoking at any time during pregnancy were eliminated.

With respect to the other 3 main contributors, preterm births among Indigenous women could be reduced by about 9%, 16% and 8%, respectively, or by a total of 33% (or 1 out of every 3 preterm births) if pregnancy-induced hypertension, antepartum haemorrhage, and diabetes (comprising pre-existing diabetes and gestational diabetes) among Indigenous women were eliminated.

Pregnancy-induced hypertension, antepartum haemorrhage and pre-existing diabetes are health risk factors and pregnancy complications which are associated with other health risk factors, some of which are modifiable.

The health risk factors associated with pregnancy-induced hypertension and antepartum haemorrhage include smoking during pregnancy, overweight and obesity, chronic hypertension, diabetes, chronic kidney disease, hypertensive disease during a previous pregnancy and multiple pregnancy (Behrman & Stith Butler 2007; Government of Western Australia 2018; Lowe et al. 2014; Mendelsohn et al. 2014; Mohsin & Bauman 2005).

Reducing preterm birth among non-Indigenous women

The factors that could help to reduce preterm birth among Indigenous women are the same factors that could help to reduce preterm birth among non-Indigenous women. Appendix Table A5 shows estimates of PAFs for preterm and SGA birth among non-Indigenous women.

Nearly 1 in 3 preterm births among non-Indigenous women (37%) could be prevented if smoking during pregnancy, diabetes, pregnancy-induced hypertension and antepartum haemorrhage were eliminated.

About 3% of preterm births non-Indigenous women could be prevented if smoking during pregnancy were eliminated. The much lower PAF for smoking among non-Indigenous women compared with the PAF for Indigenous women is related to the much higher proportion of Indigenous women who smoked during pregnancy (43% compared with 8% of non-Indigenous women who smoked during pregnancy).

With respect to individual risk factors, the occurrence of preterm birth among non-Indigenous women could be reduced by about 11%, 15% and 5%, respectively, if pregnancy-induced hypertension, antepartum haemorrhage and diabetes (comprising pre-existing diabetes and gestational diabetes) were eliminated.

Reducing SGA births among Indigenous women

Table 7.4 shows the 3 key modifiable risk factors contributing to SGA births among Indigenous and non-Indigenous women in Australia during the period 2016–2018.

The 3 key contributors to SGA births among Indigenous women were smoking during pregnancy, late or non-attendance at antenatal care and being underweight.

More than one-half of all cases of SGA births (51.6%) that occurred to Indigenous women could be prevented if smoking during pregnancy were eliminated, if all Indigenous women received timely antenatal care during their pregnancy, and if all Indigenous women who were underweight at the onset of their pregnancies had their pre-pregnancy BMIs in the normal weight range.

Smoking during pregnancy was the single most important risk factor associated with the occurrence of SGA birth among Indigenous women. Smoking during pregnancy alone contributed about 41 of all SGA births among Indigenous women, with smoking during the first 20 weeks of pregnancy contributing about twice (28%) as much as smoking during the second 20 weeks of pregnancy (13%) to the incidence of SGA births among Indigenous women.

About 4 out of every 10 SGA births among Indigenous women could therefore be prevented if smoking during pregnancy were eliminated.

Table 7.4: Per cent contribution (PAF) of key risk factors to SGA births among Indigenous women, Australia, 2016–2018

Risk factor	Population attributable fraction (PAF) %
Smoking during pregnancy	40.8
Smoked 1st half of pregnancy	(27.9)
Smoked 2nd half of pregnancy	(12.9)
No antenatal care	6.3
Pre-pregnancy BMI: Underweight	4.5
Total contribution (%)	**51.6**

(a) Estimates are based on singleton live births.

(b) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(c) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes..

(d) While it is important to show the differential impact on pregnancy outcomes of smoking at different periods of pregnancy, the sum of the PAF estimates for 'Smoking during the 1st 20 weeks of pregnancy' and 'Smoking during the 2nd 20 weeks of pregnancy' should be treated with caution as they are not necessarily mutually exclusive

Source: National Perinatal Data Collection.

Reducing SGA births among non-Indigenous women

The 3 key contributors to SGA births among non-Indigenous women were smoking during pregnancy, non-attendance at antenatal care, and being underweight. While these were also important risk factors for SGA births among non-Indigenous women, they contributed much less to SGA births compared with their contribution to SGA births among Indigenous women.

SGA births among non-Indigenous women could be reduced by nearly 15% if smoking during pregnancy were eliminated, if all women received timely antenatal care, that is, from the first trimester of pregnancy, and if all pre-pregnancy BMIs were in the normal weight range.

Antepartum haemorrhage during pregnancy is associated with several maternal health risk factors, including advanced maternal age, smoking and drug misuse, low BMI, intrauterine infection, multiple pregnancy, closely spaced pregnancies, previous termination of pregnancy, and endometriosis (Royal College of Obstetricians & Gynaecologists 2011).

About 9% or 1 out of every 11 SGA births among non-Indigenous women could also be prevented if smoking during pregnancy were eliminated. The much lower PAF for SGA due to smoking among non-Indigenous women (9.4%) compared with the PAF for SGA due to smoking among Indigenous women (40.8%) is related to the higher proportions of Indigenous women (43%) who smoked during pregnancy compared with the much lower proportions of non-Indigenous women (8%) who smoked during pregnancy (see Table 2.1).

Appendix A: Tables

Table A1: Adjusted odds ratios[a, b] for perinatal death, stillbirth and neonatal death, Indigenous women, Australia, 2016–2018

Risk factor	Perinatal death[c]	Stillbirth[c]	Neonatal death[d]
Contextual factors			
Place of usual residence			
Major cities (Reference)	1.0	1.0	1.0
Inner and outer regional	1.24 [0.86–1.78]	1.14 [0.74–1.75]	1.39 [0.76–2.55]
Remote and very remote	1.30 [0.86–1.97]	1.36 [0.84–2.22]	1.16 [0.56–2.40]
Marital status			
Never married	1.15 [0.84–1.58]	1.08 [0.74–1.57]	1.31 [0.77–2.21]
Married (Reference)	1.0	1.0	1.0
Divorced/widowed/separated	0.45 [0.13–1.53]	0.48 [0.11–2.08]	0.49 [0.06–3.80]
Demographic factors			
Maternal age at end of pregnancy			
18 years & under	1.39 [0.85–2.28]	**1.88 [1.08–3.27]	0.65 [0.24–1.75]
19–34 years (Reference)	1.0	1.0	1.0
35 years & over	1.18 [0.71–1.95]	1.20 [0.67–2.16]	1.14 [0.48–2.72]
Parity			
0 (None:Reference)	1.0	1.0	1.0
1–3	0.88 [0.63–1.23]	0.85 [0.57–1.27]	0.94 [0.55–1.62]
4+	*0.58 [0.34–1.00]	0.73 [0.39–1.35]	*0.36 [0.13–1.01]
Health risk factors and complications of pregnancy			
Smoked 1st 20 weeks of pregnancy			
Did not smoke (Reference)	1.0	1.0	1.0
Smoked	0.98 [0.50–1.90]	1.22 [0.59–2.54]	0.50 [0.12–2.06]
Smoked 2nd 20 weeks of pregnancy			
Did not smoke (Reference)	1.0	1.0	1.0
Smoked	0.81 [0.42–1.59]	0.64 [0.31–1.35]	0.86 [0.38–6.44]
Gestational age at first antenatal care			
1st trimester (Reference)	1.0	1.0	1.0
After 1st trimester	0.99 [0.73–1.34]	1.14 [0.80–1.64]	0.79 [0.47–1.34]
No antenatal care	**3.62 [1.33–9.85]	**6.13 [2.24–16.77]	<0.001
Pre-pregnancy body mass index			
Underweight	0.70 [0.43–1.15]	0.64 [0.34–1.19]	0.86 [0.41–1.81]
Normal weight (Reference)	1.0	1.0	1.0
Overweight/obese	1.26 [0.92–1.73]	*1.39 [0.95–2.01]	1.08 [0.63–1.84]

(continued)

Table A1 (continued): Adjusted odds ratios[a,b] for perinatal death, stillbirth and neonatal death, Indigenous women, Australia, 2016–2018

Risk factor	Perinatal death[c]	Stillbirth[c]	Neonatal death[d]
Diabetes			
None (Reference)	1.0	1.0	1.0
Pre-existing diabetes	**1.90 [1.02–3.54]	**2.34 [1.18–4.64]	0.99 [0.29–3.45]
Gestational diabetes	**0.57 [0.33–0.98]	*0.57 [0.29–1.09]	0.59 [0.24–1.45]
Chronic hypertension			
No (Reference)	1.0	1.0	1.0
Yes	1.24 [0.47–3.30]	0.30 [0.03–2.24]	**3.79 [1.22–11.75]
Pregnancy-induced hypertension			
No (Reference)	1.0	1.0	1.0
Yes	0.72 [0.43–1.20]	0.93 [0.53–1.65]	*0.39 [0.13–1.12]
Antepartum haemorrhage			
No APH (Reference)	1.0	1.0	1.0
Yes	**3.87 [2.73–5.49]	**3.79 [2.51–5.72]	**3.27 [1.90–5.65]
Factors determined at the end of pregnancy			
Low birthweight			
No (Reference)	1.0	1.0	1.0
Yes	**10.48 [6.55–16.76]	**9.19 [5.29–15.95]	**13.48 [5.38–3.74]
Preterm birth			
No (Reference)	1.0	1.0	1.0
Yes	**8.29 [5.10–13.46]	**6.84 [3.88–12.05]	**12.70 [4.81–33.54]

(a) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(b) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

(c) Estimates are based on all singleton births.

(d) Estimates are based on all singleton live births

** = p <0.05

* = p <0.10

Source: National Perinatal Data Collection.

Table A2: Adjusted odds ratios[a, b] for preterm birth and SGA, Indigenous women, Australia, 2016–2018

Risk factor	Preterm birth[c]	SGA[c]
Contextual factors		
Place of usual residence		
Major cities (Reference)	1.0	1.0
Inner and outer regional	**1.16 [1.03–1.32]	1.01 [0.91–1.13]
Remote and very remote	**1.18 [1.02–1.36]	**1.36 [1.00–1.29]
Marital status		
Never married	0.97 [0.87–1.08]	*1.09 [0.99–1.20]
Married (Reference)	1.0	1.0
Divorced/widowed/separated	1.12 [0.82–1.53]	*1.31 [0.99–1.74]
Demographic factors		
Maternal age at end of pregnancy		
18 years & under	*1.20 [0.99–1.46]	0.89 [0.75–1.04]
19–34 years (Reference)	1.0	1.0
35 years & over	1.12 [0.94–1.33]	**1.31 [1.11–1.55]
Parity		
0 (None:Reference)	1.0	1.0
1–3	1.06 [0.94–1.19]	**0.63 [0.57–0.70]
4+	**1.24 [1.04–1.48]	**0.60 [0.51–0.70]
Health risk factors and complications of pregnancy		
Smoked 1st 20 weeks of pregnancy		
Did not smoke (Reference)	1.0	1.0
Smoked	1.13 [0.89–1.42]	**1.89 [1.55–2.30]
Smoked 2nd 20 weeks of pregnancy		
Did not smoke (Reference)	1.0	1.0
Smoked	**1.33 [1.05–1.69]	**1.38 [1.14–1.68]
Gestational age at first antenatal care		
1st trimester (Reference)	1.0	1.0
After 1st trimester	0.94 [0.85–1.05]	**1.18 [1.07–1.29]
No antenatal care	**4.12 [2.41–7.01]	1.22 [0.63–2.37]
Pre-pregnancy body mass index		
Underweight	**1.65 [1.40–1.95]	**1.60 [1.39–1.85]
Normal weight (Reference)	1.0	1.0
Overweight/obese	**0.71 [0.63–0.79]	**0.62 [0.56–0.68]

(continued)

Table A2 (continued): Adjusted odds ratios[a,b] for preterm birth and SGA, Indigenous women, Australia, 2016–2018

Risk factor	Preterm birth[c]	SGA[c]
Diabetes		
None (Reference)	1.0	1.0
Pre-existing diabetes	**3.34 [2.64–4.23]	**0.52 [0.36–0.76]
Gestational diabetes	**1.20 [1.04–1.39]	**0.62 [0.53–0.73]
Chronic hypertension		
No (Reference)	1.0	1.0
Yes	**2.48 [1.75–3.53]	1.34 [0.87–2.07]
Pregnancy-induced hypertension		
No (Reference)	1.0	1.0
Yes	**2.70 [2.29–3.20]	**1.60 [1.34–1.91]
Antepartum haemorrhage		
No (Reference)	1.0	1.0
Yes	**7.24 [6.03–8.71]	0.94 [0.72–1.23]
Factors determined at the end of pregnancy		
Small for gestational age		
No (Reference)	1.0	. .
Yes	**0.88 [0.77–1.03]	. .
Preterm birth		
No (Reference)	. .	1.0
Yes	. .	*0.88 [0.76–1.02]

(a) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(b) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

(c) Estimates are based on all singleton live births

** = p <0.05

* = p <0.10

. . = not applicable

Source: National Perinatal Data Collection.

Table A3: Adjusted odds ratios[a, b] for perinatal death, stillbirth and neonatal death, non-Indigenous women, Australia, 2016–2018

Risk factor	Perinatal death[c]	Stillbirth[c]	Neonatal death[d]
Contextual factors			
Place of usual residence			
Major cities (Reference)	1.0	1.0	1.0
Inner and outer regional	0.93 [0.84–1.03]	0.92 [0.81–1.04]	0.99 [0.81–1.20]
Remote and very remote	0.89 [0.64–1.25]	0.93 [0.64–1.37]	0.80 [0.42–1.53]
Marital status			
Never married	**1.16 [1.01–1.33]	1.03 [0.88–1.21]	**1.49 [1.18–1.88]
Married (Reference)	1.0	1.0	1.0
Divorced/widowed/separated	1.14 [0.82–1.59]	1.16 [0.80–1.68]	1.09 [0.59–2.02]
Demographic factors			
Maternal age at end of pregnancy			
18 years & under	0.97 [0.64–1.48]	1.02 [0.63–1.65]	0.89 [0.41–1.96]
19–34 years (Reference)	1.0	1.0	1.0
35 years & over	1.06 [0.94–1.20]	**1.19 [1.04–1.36]	*0.79 [0.63–1.00]
Parity			
0 (None:Reference)	1.0	1.0	1.0
1–3	*1.10 [0.99–1.22]	1.04 [0.92–1.17]	**1.26 [1.03–1.53]
4+	1.15 [0.91–1.46]	0.95 [0.72–1.25]	**1.75 [1.17–2.57]
Health risk factors and complications of pregnancy			
Smoked 1st 20 weeks of pregnancy			
Did not smoke (Reference)	1.0	1.0	1.0
Smoked	0.90 [0.65–1.25]	0.97 [0.67–1.40]	0.77 [0.42–1.41]
Smoked 2nd 20 weeks of pregnancy			
Did not smoke (Reference)	1.0	1.0	1.0
Smoked	**0.70 [0.49–1.00]	*0.69 [0.46–1.03]	0.78 [0.40–1.51]
Gestational age at first antenatal care			
1st trimester (Reference)	1.0	1.0	1.0
After 1st trimester	0.96 [0.84–1.09]	1.05 [0.91–1.21]	**0.76 [0.59–0.96]
No antenatal care	**2.66 [1.32–5.36]	1.93 [0.83–4.47]	**3.53 [1.31–9.55]
Pre-pregnancy body mass index			
Underweight	**0.51 [0.39–0.66]	**0.49 [0.36–0.67]	**0.59 [0.37–0.95]
Normal weight (Reference)	1.0	1.0	1.0
Overweight/obese	**1.33 [1.19–1.47]	**1.25 [1.11–1.41]	**1.49 [1.23–1.80]

(continued)

Table A3 (continued): Adjusted odds ratios[a, b] for perinatal death, stillbirth and neonatal death, non-Indigenous women, Australia, 2016–2018

Risk factor	Perinatal death[c]	Stillbirth[c]	Neonatal death[d]
Diabetes			
None (Reference)	1.0	1.0	1.0
Pre-existing diabetes	*1.33 [0.96–1.84]	**1.46 [1.02–2.10]	0.85 [0.56–1.29]
Gestational diabetes	**0.50 [0.42–0.60]	**0.48 [0.38–0.59]	**0.50 [0.39–0.63]
Chronic hypertension			
No (Reference)	1.0	1.0	1.0
Yes	**0.68 [0.46–0.99]	**0.49 [0.30–0.81]	1.25 [0.72–2.19]
Pregnancy-induced hypertension			
No (Reference)	1.0	1.0	1.0
Yes	**0.27 [0.21–0.34]	**0.26 [0.19–0.33]	**0.33 [0.22–0.5]
Antepartum haemorrhage			
No APH (Reference)	1.0	1.0	1.0
Yes	**1.89 [1.66–2.14]	**1.61 [1.39–19.59]	**2.39 [1.91–2.98]
Factors determined at the end of pregnancy			
Low birthweight			
No (Reference)	1.0	1.0	1.0
Yes	**16.51 [13.92–19.60]	**16.00 [13.07–4.65]	**16.22 [11.79–22.31]
Preterm birth			
No (Reference)	1.0	1.0	1.0
Yes	**10.92 [9.13–13.05]	**12.78 [10.30–15.84]	**7.27 [5.26–10.05]

(a) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(b) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

(c) Estimates are based on all singleton births.

(d) Estimates are based on all singleton live births

** = p <0.05

* = p <0.10

Source: National Perinatal Data Collection.

Table A4: Adjusted odds ratios[a, b] for preterm birth and SGA, non-Indigenous women, Australia, 2016–2018

Risk factor	Preterm birth[c]	SGA[c]
Contextual factors		
Place of usual residence		
Major cities (Reference)	1.0	1.0
Inner and outer regional	**1.10 [1.06–1.14]	**0.91 [0.89–0.94]
Remote and very remote	0.95 [0.86–1.06]	**0.89 [0.81–0.98]
Marital status		
Never married	**1.23 [1.17–1.28]	**1.06 [1.02–1.10]
Married (Reference)	1.0	1.0
Divorced/widowed/separated	**1.30 [1.16–1.46]	1.04 [0.93–1.16]
Demographic factors		
Maternal age at end of pregnancy		
18 years & under	1.09 [0.95–1.26]	**0.84 [075–95]
19–34 years (Reference)	1.0	1.0
35 years & over	**1.19 [1.15–1.24]	**1.15 [1.11–1.19]
Parity		
0 (None:Reference)	1.0	1.0
1–3	**0.90 [0.87–0.94]	**0.54 [0.53–0.56]
4+	**1.34 [1.24–1.46]	**0.55 [0.51–0.16]
Health risk factors and complications of pregnancy		
Smoked 1st 20 weeks of pregnancy		
Did not smoke (Reference)	1.0	1.0
Smoked	**1.15 [1.04–1.28]	**1.32 [1.20–1.44]
Smoked 2nd 20 weeks of pregnancy		
Did not smoke (Reference)	1.0	1.0
Smoked	**1.52 [1.35–1.71]	**1.99 [1.80–2.20]
Gestational age at first antenatal care		
1st trimester (Reference)	1.0	1.0
After 1st trimester	**0.92 [0.89–0.96]	**1.21 [1.08–1.16]
No antenatal care	**5.33 [3,81–7.45]	1.31 [0.84–2.04]
Pre-pregnancy body mass index		
Underweight	**1.53 [1.42–1.64]	**1.69 [1.60–1.79]
Normal weight (Reference)	1.0	1.0
Overweight/obese	**0.97 [0.93–1.00]	**0.66 [0.64–0.68]

(continued)

Table A4 (continued): Adjusted odds ratios[a,b] for preterm birth and SGA, non-Indigenous women, Australia, 2016–2018

Risk factor	Preterm birth[c]	SGA[c]
Diabetes		
None (Reference)	1.0	1.0
Pre-existing diabetes	**3.89 [3.52–4.29]	**0.59 [0.50–0.71]
Gestational diabetes	**1.25 [1.19–1.31]	**1.10 [1.05–1.15]
Chronic hypertension		
No (Reference)	1.0	1.0
Yes	**2.55 [2.46–3.09]	**1.42 [1.23–1.63]
Pregnancy-induced hypertension		
No (Reference)	1.0	1.0
Yes	**3.28 [3.125–3.45]	**1.55 [1.47–1.64]
Antepartum haemorrhage		
No (Reference)	1.0	1.0
Yes	**7.05 [6.67–7.44]	0.94 [0.86–1.032
Factors determined at the end of pregnancy		
Small for gestational age		
No (Reference)	1.0	. .
Yes	**1.07 [1.01–1.13]	. .
Preterm birth		
No (Reference)	. .	1.0
Yes	. .	*1.06 [1.00–1.12]

(a) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(b) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes..

(c) Estimates are based on all singleton live births

** = p <0.05

* = p <0.10

APH = antepartum haemorrhage.

. . = not applicable

Source: National Perinatal Data Collection.

Table A5: Per cent contribution (PAF) of key risk factors for preterm birth and SGA among non-Indigenous women, Australia, 2016–2018

Risk factor	Preterm birth	SGA
Smoking during pregnancy[(d)]	5.0	9.4
Smoked 1st 20 weeks of pregnancy	(1.4)	(2.8)
Smoked 2nd 20 weeks of pregnancy	3.6)	(6.6)
Pregnancy-induced hypertension	11.2	n.s.
Antepartum haemorrhage	14.8	2.6
Diabetes [(e)]	6.0	n.s.
Pre-existing diabetes	(2.9)	n.s.
Gestational diabetes	(3.3)	n.s.
No antenatal care	n.s.	2.6
Residence in a regional or remote area	3.0	n.s.
Pre-pregnancy BMI: Underweight	n.s.	2.9
Total contribution (%)	**40.0**	**14.9**

(a) Estimates are based on singleton live births.

(b) Estimates exclude New South Wales and Western Australia as these jurisdictions did not provide information on APH.

(c) Estimates exclude Victoria as Victoria did not provide any information on hypertension and diabetes.

(d) While it is important to show the differential impact on pregnancy outcomes of smoking at different periods of pregnancy, the sum of the PAF estimates for 'Smoking during the 1st 20 weeks of pregnancy' and 'Smoking during the 2nd 20 weeks of pregnancy' should be treated with caution as they are not necessarily mutually exclusive. A woman can smoke in either the first 20 weeks or second 20 weeks of pregnancy or in both.

(e) Estimates for pre-existing diabetes and gestational diabetes may not add up to the total provided got Diabetes.

n.s. = not statistically significant at either $p < 0.05$ or at $p < 0.10$.

Source: National Perinatal Data Collection.

Acknowledgments

This report was prepared by Tetteh Dugbaza.

Fadwa Al-Yaman, Jessica Cargill and David Whitelaw provided comments and advice on various drafts of the report.

The contribution of Byron Chen in preparing estimates of population attributable fractions (PAFs) is gratefully acknowledged.

Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
APH	Antepartum haemorrhage
ANC	Antenatal care
BMI	Body mass index
GDM	Gestational diabetes mellitus
LGA	Large for gestational age
NICU	Neonatal Intensive Care Unit
NPDC	National Perinatal Data Collection
PDM	Pre-existing diabetes mellitus
PIH	Pregnancy-induced hypertension
SGA	Small for gestational age
USA	United States of America
WHO	World Health Organization

Glossary

Aboriginal or Torres Strait Islander: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander.

antenatal: The period covering conception up to the time of birth. Synonymous with **prenatal**.

antenatal care: A planned visit between a pregnant woman and a midwife or doctor to assess and improve the wellbeing of the mother and baby throughout pregnancy. It does not include visits where the sole purpose is to confirm the pregnancy. Also known as an antenatal visit.

antepartum haemorrhage is defined as 'bleeding from or in to the genital tract, occurring from the 24th week of pregnancy and prior to the birth of the baby'. Antepartum haemorrhage is defined to include placenta praevia, placental abruption (abruptio placentae) and threatened abortion.

birth: A birth is counted when a fetus of at least 20 weeks' gestation or weighing 400 grams or more is born. The fetus can be live born or stillborn.

birthweight: The first weight of a baby (stillborn or live born) obtained after birth (usually measured to the nearest 5 grams and obtained within 1 hour).

blood pressure: The force exerted by the blood on the walls of the arteries as it is pumped around the body by the heart. It is written, for example, as 134/70 mmHg, where the upper number is the systolic pressure (the maximum force against the arteries as the heart muscle contracts to pump the blood out) and the lower number is the diastolic pressure (the minimum force against the arteries as the heart relaxes and fills again with blood). Levels of blood pressure can vary greatly from person to person and from moment to moment in the same person. See also **high blood pressure/hypertension**.

body mass index (BMI): The most commonly used method of assessing whether a person is normal weight, underweight, overweight or obese (see also **obesity**). It is calculated by dividing a person's weight (in kilograms) by their height (in metres) squared; that is, kg ÷ m^2. For both men and women, underweight is a BMI below 18.5, acceptable weight is a BMI from 18.5 to less than 25, overweight is a BMI from 25 to less than 30, and obese is a BMI of 30 and over. Sometimes overweight and obese are combined, and this is defined as a BMI of 25 and over.

chronic hypertension: A woman has chronic hypertension if she was diagnosed with high blood pressure before she became pregnant or if she was diagnosed with high blood pressure in the first 20 weeks of pregnancy.

death: This definition excludes all deaths prior to birth. For the purposes of the Australian Bureau of Statistics' Death Registration collection, a death refers to any death which occurs in or on the way to Australia and is registered with a state or territory Registry of Births, Deaths and Marriages.

determinant: Any factor that can increase the chances of ill health (risk factors) or good health (protective factors) in a population or individual. By convention, services or other programs that aim to improve health are usually not included in this definition.

diabetes (diabetes mellitus): A chronic condition in which the body cannot properly use its main energy source—the sugar glucose. This is due to a relative or absolute deficiency in insulin, a hormone that is produced by the pancreas and helps glucose enter the body's cells

from the bloodstream and then be processed by them. Diabetes is marked by an abnormal build-up of glucose in the blood: and it can have serious short- and long-term effects. For the 3 main types of diabetes see **type 1 diabetes**, **type 2 diabetes** and **gestational diabetes**.

eclampsia: A life-threatening complication of pregnancy. Eclampsia causes a pregnant woman, usually previously diagnosed with pre-eclampsia (high blood pressure and protein in the urine), to develop seizures or a coma.

fetal death (stillbirth): Death, before 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. Death is evidenced by the fact that, after such separation, the fetus does not breathe or show any other signs of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles.

fetal death rate: Number of fetal deaths per 1,000 total births (fetal deaths plus live births).

first trimester: The first 3 months of a pregnancy. Pregnancy is divided into 3 trimesters: first trimester (conception to 13 weeks), second trimester (13 to 26 weeks) and third trimester (26 to 40 weeks).

gestation: The process or period of carrying a baby in the womb from conception to delivery.

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

gestational diabetes: A form of diabetes that is first diagnosed during pregnancy (gestation). It may disappear after pregnancy but signals a high risk of diabetes occurring later on in life. See **diabetes (diabetes mellitus)**.

haemorrhage (bleeding): The escape of blood from a ruptured blood vessel, externally or internally.

high blood pressure/hypertension: Definitions can vary but a well-accepted one is from the World Health Organization: a systolic blood pressure of 140 mmHg or more or a diastolic blood pressure of 90 mmHg or more, or [the person is] receiving medication for high blood pressure. See also **blood pressure**.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Aboriginal or Torres Strait Islander**.

infant: A child who is aged less than 1.

infant mortality rate: The number of deaths among children aged under 1 in a given period, per 1,000 live births in the same period.

large for gestational age (LGA): Babies are defined as being large for gestational age if their birthweight is above the 90th percentile for their gestational age and sex, as determined by national percentiles.

live birth (live born): The complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life (such as the 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 birth is considered live born (World Health Organization definition).

low birthweight: Weight of a baby at birth that is less than 2,500 grams.

maternal age: Mother's age in completed years at the birth of her baby.

neonatal death: The death of an infant within 28 days of birth.

neonatal mortality rate: Number of neonatal deaths per 1,000 live births.

non-Indigenous: People who have declared they are not of Aboriginal or Torres Strait Islander descent. Compare with **other Australians**.

obesity: Marked degree of overweight, defined for population studies as a **body mass index (BMI)** of 30 or over. See also **overweight**.

odds ratio: A measure of the association between an exposure and an outcome. The odds ratio represents the odds that an outcome will occur, given a particular exposure, compared with the odds of the outcome's occurring in the absence of that exposure. The value of the odds ratio is interpreted as:

• an odds ratio close or equal to 1 means that the exposure has little or no effect on the odds of the outcome's occurring

• an odds ratio greater than 1 means that the exposure increases the odds of the outcome's occurring

• an odds ratio less than 1 means that the exposure decreases the odds of the outcome's occurring.

other Australians: People who have declared they are not of Aboriginal or Torres Strait Islander descent, and those for whom their Indigenous status is unknown. Compare with **non-Indigenous.**

overweight: Defined for the purpose of population studies as a **body mass index (BMI)** of 25 or over. See also **obesity**.

perinatal: Pertaining to, or occurring in, the period shortly before or after birth (usually up to 28 days after).

perinatal death: A fetal or neonatal death of at least 20 weeks gestation or at least 400 grams birthweight.

perinatal mortality rate: Number of perinatal deaths per 1,000 total births (fetal deaths plus live births).

population attributable fraction (PAF): The proportion (fraction) of a disease, illness, disability or death in a population that can be attributed to a particular **risk factor** or combination of risk factors. For example, the PAF for cigarette smoking in contributing to lung cancer deaths has been consistently put at about 80% or more in Australia, meaning that if nobody smoked in Australia there would be 80% fewer deaths from lung cancer. Also known as an aetiological (causal) fraction.

pre-eclampsia: A condition that complicates pregnancy and is characterised by high blood pressure, fluid retention and protein in the urine. The placental function may be compromised.

pregnancy-induced hypertension: A woman has pregnancy-induced hypertension (PIH), also known as 'gestational hypertension' if she was diagnosed with high blood pressure after 20 weeks of pregnancy. A woman has chronic hypertension if she was diagnosed with high blood pressure before she became pregnant or if she was diagnosed with high blood pressure in the first 20 weeks of pregnancy (see **chronic hypertension).**

preterm birth: Birth before 37 completed weeks of gestation.

remoteness classification: Each state and territory is divided into several regions based on their relative accessibility to goods and services (such as to general practitioners, hospitals and specialist care) as measured by road distance. These regions are based on the **Accessibility/Remoteness Index of Australia** and defined as Remoteness Areas by either the **Australian Standard Geographical Classification (ASGC)** (before 2011) or the **Australian Statistical Geographical Standard (ASGS)** (from 2011 onwards) in each Census year. The 5 Remoteness Areas are *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote*.

risk factor: Any factor that represents a greater risk of a health disorder or other unwanted condition or event. Some risk factors are regarded as causes of disease, others are not necessarily so. Along with their opposites, protective factors, risk factors are known as **determinants**.

small for gestational age (SGA): Babies are defined as being small for gestational age if their birthweight is below the 10th percentile for their gestational age and sex. See also **large for gestational age (LGA)**.

stillbirth: See **fetal death (stillbirth).**

type 1 diabetes: A form of diabetes mostly arising among children or younger adults and marked by a complete lack of insulin. Insulin replacement is needed for survival. See **diabetes (diabetes mellitus).**

type 2 diabetes: The most common form of diabetes, occurring mostly in people aged 40 or over, and marked by reduced or less effective insulin. See **diabetes (diabetes mellitus)**.

underweight: A category defined for population studies as a **body mass index (BMI)** less than 18.5.

usual residence: Refers to the place where a person has lived or intends to live for a total of 6 months or more.

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The majority of babies born to Aboriginal and Torres Strait Islander women are healthy. However, in the 3-years 2016–2018, 1.5% of babies born to Indigenous women died during the perinatal period—of which 1.0% were stillborn and 0.5% died within the first 28 days of birth. This report explores the risk factors associated with perinatal death, and ways to reduce perinatal death among babies born to Indigenous women.

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