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# Smoking and pregnancy

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# Abbreviations

| | |
|---|---|
| ACT | Australian Capital Territory |
| AIHW | Australian Institute of Health and Welfare |
| ASGC | Australian Standard Geographical Classification |
| CI | Confidence interval |
| g | gram |
| METeOR | Metadata online registry |
| NDSHS | National Drug Strategy Household Survey |
| NHDD | National Health Data Dictionary |
| NHIA | National Health Information Agreement |
| NICU | Neonatal intensive care unit |
| NMDS | National Minimum Data Set |
| NPDC | National Perinatal Data Collection |
| NPDDC | National Perinatal Data Development Committee |
| NPSU | AIHW National Perinatal Statistics Unit |
| NSW | New South Wales |
| NT | Northern Territory |
| OR | Odds ratio |
| Qld | Queensland |
| RR | Relative risk |
| SA | South Australia |
| SACC | Standard Australian Classification of Countries |
| SCN | Special care nursery |
| SGA | Small for gestational age |
| SIDS | Sudden infant death syndrome |
| Tas | Tasmania |
| UNSW | University of New South Wales |
| US | United States of America |
| Vic | Victoria |
| WA | Western Australia |
| WAACHS | Western Australian Aboriginal Child Health Survey |
| WHO | World Health Organization |
| | |
| n.a. | Not available |

# Executive summary

Smoking during pregnancy is associated with poorer birth outcomes.

This report is one of a series of initiatives commissioned by the National Advisory Group on Smoking and Pregnancy as part of an overall strategy to reduce smoking in pregnancy in Australia.

It presents data on pregnancy and births according to the mother's smoking status during pregnancy for the period 2001 to 2003, using the National Perinatal Data Collection (NPDC). Data from the NPDC were available for this report from five states and territories: New South Wales, Western Australia, South Australia, the Australian Capital Territory and the Northern Territory, representing 53.5% of women who gave birth in Australia in 2003. Tasmania and Queensland began collecting smoking data in 2005, so data from these jurisdictions will be available for reporting in the future.

## Prevalence

The proportion of women who gave birth in 2003 and reported smoking while pregnant was 17.3% in the five states and territories.

## Maternal characteristics

Smoking during pregnancy was most prevalent in teenage mothers (42.1%) and decreased with older age to 10.9% of mothers aged 35 years and older.

Of Aboriginal and Torres Strait Islander mothers in these jurisdictions 52.2% reported smoking during pregnancy, compared with 15.8% of non-Indigenous mothers.

The proportion of mothers who smoked was lowest for mothers usually resident in major cities (14.0%) and increased with remoteness to 38.3% for mothers usually resident in very remote areas.

## Baby outcomes

Mothers who smoked during pregnancy had higher proportions of babies with poorer perinatal outcomes than mothers who did not smoke.

In 2003, the proportion of liveborn low birthweight babies (less than 2,500 grams) of mothers who smoked was 10.6%, twice that of babies of mothers who did not smoke (5.1%).

The odds of preterm birth at less than 37 weeks gestation, was 60% higher in babies of mothers who smoked than in babies of mothers who did not smoke.

## Data development

Data development for monitoring of smoking in pregnancy is being undertaken by the National Perinatal Data Development Committee (NPDDC) in collaboration with other stakeholders and with support from the National Advisory Group on Smoking and Pregnancy. The NPDDC is working towards the development of one or more standard national data elements on smoking status during pregnancy to be routinely collected.

# 1 Introduction

This report was commissioned by the National Advisory Group on Smoking and Pregnancy (the Advisory Group) as part of an overall strategy to reduce smoking in pregnancy in Australia. It is one in a series of initiatives from the Advisory Group.

The aim of this report is to provide baseline data on the characteristics of mothers who smoke in pregnancy and describe the perinatal outcomes of their babies. Data presented are principally from the National Perinatal Data Collection held by the Australian Institute of Health and Welfare's (AIHW) National Perinatal Statistics Unit (NPSU) at the University of New South Wales (UNSW).

## National Advisory Group on Smoking and Pregnancy

As part of the 2005–06 Budget the Department of Health and Ageing has been funded to lead a national program aimed at helping women—particularly Aboriginal and Torres Strait Islander women—to stop smoking during and after pregnancy. The program will encourage doctors, midwives and Indigenous health workers to give advice to pregnant women about the damage caused by smoking. Pregnant women who smoke may be more motivated to quit when the benefits of not smoking are highlighted in a clinical setting by their general practitioner or midwife. The general practitioner or midwife can then offer support to the women to quit smoking and may have an opportunity to educate a partner or family member on their role in supporting a pregnant woman who wants to stop smoking. A total of $4.3 million over three years has been provided for this program from July 2005.

The National Advisory Group on Smoking and Pregnancy has been formed to provide expert advice and direction relating to carrying out this smoking and pregnancy initiative, announced in the 2005–06 Budget. This may include:

- evidence-based advice on specific projects that could be undertaken as part of the smoking and pregnancy initiative;
- selecting interventions which are achievable and will have maximum impact on the household during pregnancy and in the early childhood years;
- evaluating community acceptance of any recommended interventions;
- providing recommendations to the Minister for Health and Ageing regarding the expenditure of the funding announced in the 2005–06 Budget;
- considering of the cost effectiveness of all suggested projects in terms of value for money for the Australian Government; and
- advising on the evaluation of existing strategies.

Organisations represented on this Advisory Group include: the Royal Australian and New Zealand College of Obstetricians and Gynaecologists, the Australian College of Midwives, Women's Hospitals Australasia and Children's Hospitals Australasia, Centre for Excellence in Indigenous Tobacco Control, and the Institute of Health Research.

# Structure of this report

**Chapter 1: Introduction**

This chapter provides information on the National Advisory Group on Smoking and Pregnancy, a review of the literature on the factors and outcomes associated with smoking and pregnancy and a description of the data sources.

**Chapter 2: Australian survey data**

This chapter presents data on smoking and pregnancy from surveys conducted in Australia.

**Chapter 3: National Perinatal Data Collection data**

Data from the National Perinatal Data Collection on the prevalence, and factors and outcomes associated with smoking and pregnancy are presented in this chapter.

**Chapter 4: Data development for monitoring of smoking in pregnancy**

This chapter presents information on future data development of smoking in pregnancy.

**Appendix 1: Tables**

The underlying data for the figures in the report are presented in this appendix.

**Appendix 2: Technical notes**

Notes on the statistics used in the report are presented.

# Factors and outcomes associated with smoking in pregnancy

Smoking is associated with poorer perinatal outcomes and is a risk factor for pregnancy complications. The term perinatal includes pregnancy and childbirth and is defined as the period from 20 weeks gestation in the pregnancy to 28 completed days after the baby's birth. This section presents a review of some recent studies conducted in Australia and other countries on smoking during pregnancy.

This report focuses on the health outcomes of babies born to mothers who smoked during pregnancy. The report does not examine interventions aimed at smoking cessation. However, a recent review of smoking cessation programs concluded that these programs need to be run in all maternity care settings, and that discussion of smoking behaviour should be a routine part of antenatal care (Lumley et al. 2004).

## Maternal factors

### Prevalence of smoking in pregnancy

Smoking in pregnancy is common, with Australian and international studies showing that around 20–30% of women who gave birth reported smoking during pregnancy (e.g. Dodds 1995, Cnattingius & Haglund 1997, Horta et al. 1997, Wong & Bauman 1997, Bai et al. 2000, Kallen 2001, Mohsin et al. 2003, Chiolero et al. 2005).

In Australia, 20% of women surveyed in the 2004 National Drug Strategy Household Survey reported smoking while they were pregnant and/or breastfeeding (AIHW 2005). More detailed data from this survey are presented in Chapter 2.

## Determinants of smoking in pregnancy

Many maternal factors have been found to be associated with smoking during pregnancy. Factors that have been examined and reported in the literature include maternal age, marital status, ethnicity, socioeconomic status, parity and gravidity (number of previous pregnancies).

Rates of smoking in pregnancy have been found to be higher in younger women, with 30–50% of women aged less than 20 years reporting smoking during pregnancy, compared with 10–30% of women aged 30 or 35 years or more (Dodds 1995, Walsh et al. 1997, Wong & Bauman 1997, Bai et al. 2000, Kahn et al. 2002, Ventura et al. 2003).

Educational level is also a factor in smoking during pregnancy, with women with a low level of educational attainment having higher rates compared to women with higher levels of educational attainment (Walsh et al. 1997, Kahn et al. 2002, Ventura et al. 2003). For example, Ventura and colleagues (2003), in a study using birth certificates of babies born in the United States of America (US) in 2000, found that 25.5% of women who attended but did not complete high school smoked during pregnancy, and that this proportion decreased with increasing years of education to 2.0% of women with a college education.

Rates of smoking in pregnancy are associated with marital status, with markedly higher rates among unmarried women (Dodds 1995, Walsh et al. 1997, Bai et al. 2000, Kahn et al. 2002, Ventura et al. 2003). Bai and colleagues (2000) used hospital data to examine the smoking status of women who gave birth over a two-year period and found that the proportion of married women who smoked during pregnancy was 9.9%, compared with 42.0% of single (excluding de facto, divorced and separated) women (Bai et al. 2000). In a study in the US, the rates for smoking were 8.0% for married women and 20.6% for unmarried women (Ventura et al. 2003).

Higher rates of smoking during pregnancy have also been found in women who: live or work with smokers; have a history of higher alcohol consumption before pregnancy (Kahn et al. 2002); are not covered by private health insurance; are unemployed (Bai et al. 2000); are from English-speaking backgrounds (Walsh et al. 1997, Bai et al. 2000); are white/Caucasian (Bai et al. 2000, Kahn et al. 2002, Ventura et al. 2003, Ananth et al. 2005); and are multigravidas (Walsh et al. 1997, Ananth et al. 2005).

The association between smoking during pregnancy and parity has been examined, but the results have been inconclusive (Dodds 1995, Walsh et al. 2001, Kahn et al. 2002).

### Indigenous mothers

Rates of smoking in pregnancy have consistently been found to be higher in Indigenous than non-Indigenous women.

In a study of singleton births from the South Australian Perinatal Statistics Collection for the years 1998 and 1999, the rate of smoking at the first antenatal visit among Aboriginal and Torres Strait Islander women was found to be markedly higher than the rate among non-Indigenous women (57.8% and 24.0% respectively) (Chan et al. 2001). The rate of smoking was over 50% in all age groups for Aboriginal and Torres Strait Islander women, but decreased with older age for non-Indigenous women. The proportion of Aboriginal and Torres Strait Islander women who smoked in the second half of pregnancy (51.5%) was over two times that of non-Indigenous women (21.3%).

Similar rates of smoking in pregnancy were found in a study using data from the New South Wales (NSW) Midwives Data Collection for women who gave birth in the years 1990–1997. The proportion of Aboriginal and Torres Strait Islander women who smoked

during pregnancy was 60.6%, compared with 20.0% for non-Indigenous women (Roberts & Algert 2000). A high rate of smoking among women who identified themselves as Aboriginal was also found in a study in Western Australia (66.9%) (Gilchrist et al. 2004).

As in the total population, smoking rates in Indigenous mothers have been shown to be higher in teenagers. In a study using data on teenagers from the South Australian Perinatal Statistics Collection, the proportion of Aboriginal and Torres Strait Islander teenagers who reported smoking at the first antenatal visit was 60.2% compared with 45.6% of non-Indigenous teenagers (Westenberg et al. 2002).

Markedly higher rates of smoking in pregnancy among Indigenous women have also been found in Canada and the US. In a study in Manitoba, 61.2% of Indigenous women reported smoking during pregnancy compared with 26.2% of non-Indigenous women (Heaman & Chalmers 2005). In a study in Edmonton, 41% of Indigenous women and 13% of non-Indigenous women smoked during pregnancy (Wenman et al. 2004). A US study showed the highest rates of smoking during pregnancy in 2000 were among American Indian women (20.5%) (Ventura et al. 2003).

## Maternal outcomes

Smoking during pregnancy is associated with pregnancy complications. Women who smoke during pregnancy have been found to have higher rates of placental abruption (Wong & Bauman 1997, Castles et al. 1999, Bai et al. 2000), placenta praevia (Wong & Bauman 1997, Castles et al. 1999), threatened premature labour and premature labour (Bai et al. 2000), premature rupture of membranes (Wong & Bauman 1997) and preterm premature rupture of membranes (Castles et al. 1999) when compared with non-smokers. However, the rates of some pregnancy complications have been found to be lower in women who smoked during pregnancy than those who did not smoke, for example, pregnancy-induced hypertension (Wong & Bauman 1997, Bai et al. 2000) and pre-eclampsia (Castles et al. 1999).

## Perinatal outcomes

Maternal smoking during pregnancy has been shown to be strongly associated with poor perinatal outcomes such as low birthweight (Horta et al. 1997, Wong & Bauman 1997, Chan et al. 2001, Kallen 2001, Mohsin et al. 2003, Ventura et al. 2003, Chiolero et al. 2005), preterm birth (Wong & Bauman 1997, Chan et al. 2001, Kallen 2001, Mohsin et al. 2003, Chiolero et al. 2005), small for gestational age babies (Cnattingius & Haglund 1997, Horta et al. 1997, Chan et al. 2001, Kallen 2001, Chiolero et al. 2005) and perinatal death (Wong & Bauman 1997, Tuthill et al. 1999, Kallen 2001, Winbo et al. 2001).

### Low birthweight

Low birthweight is generally defined as a birthweight of less than 2,500 grams (WHO 1992). Low birthweight babies have poorer health outcomes compared with heavier babies.

The relationship between smoking and pregnancy and low birthweight has been well documented, with the proportion of low birthweight babies being higher among women who smoked during pregnancy compared with women who did not smoke. This has been found in studies in Australia (Wong & Bauman 1997, Bai et al. 2000, Mohsin et al. 2003) and overseas (Fox et al. 1994, Kallen 2001, Chiolero et al. 2005).

Birthweight is generally lower among multiple births and among stillbirths. For example, in 2003, the average birthweight of stillborn babies was 1,331 grams compared with 3,372 grams for liveborn babies, and 75.2% of stillborn babies were low birthweight (Laws & Sullivan 2005). Some of the studies referenced here included only singleton babies and others included only liveborn babies. Birthweight may also be associated with other factors including sex, gestational age, maternal age, marital status, Indigenous status and parity (Mohsin et al. 2003).

In a hospital-based study in New South Wales, the proportion of low birthweight singleton babies (live births and stillbirths) was found to be 13.8% among women who smoked during pregnancy and 7.7% among women who did not smoke (Bai et al. 2000). A study using data from the NSW Midwives Data Collection for the years 1994–1996 found that overall, the proportion of liveborn babies of low birthweight was higher among women who smoked during pregnancy (8.4%) than among women who did not smoke (4.6%). This was also the case for liveborn singletons, although the proportions were lower than when multiple births were included (7.3% and 3.5% respectively) (Mohsin et al. 2003).

Another study using data from the NSW Midwives Data Collection for 1994 found that the proportion of low birthweight babies (defined as 1,500–2,499 grams) (live births and stillbirths) was 7.3% among women who smoked during pregnancy and 3.8% among women who did not smoke (Wong & Bauman 1997). The odds ratio (adjusted for potential confounders, including gestational age) for low birthweight babies of mothers who smoked was 2.12 (95% CI = 1.93, 2.32), indicating that mothers who smoked had over twice the odds of having a baby that was low birthweight than mothers who did not smoke. In this study, a dose-response was evident with babies of mothers who smoked more than 10 cigarettes per day being of lower average birthweight than babies of mothers who smoked 10 or less cigarettes per day. The average birthweight of babies of mothers who smoked more than 10 cigarettes per day was 3,189 grams compared to 3,245 grams for babies of mothers who smoked 10 or less cigarettes per day.

This dose-response has been found in other studies. For example, in a 1993 study conducted in a canton in Switzerland on births over a 12-month period, the proportion of singleton babies (live births) with low birthweight was 10.7% among women who smoked during pregnancy compared with 3.9% among women who did not smoke (Chiolero et al. 2005). The proportion of low birthweight babies increased as daily cigarette consumption increased. The proportions were 6.7% for women who smoked 1–9 cigarettes per day, 11.6% for women who smoked 10–19 cigarettes per day and 13.5% for women who smoked 20 or more cigarettes per day.

A US study of births in 2000 abstracted from birth certificate data found the proportion of low birthweight singletons born to women who smoked during pregnancy was almost double that in women who did not smoke (10.4% and 5.6% respectively) (Ventura et al. 2003). The proportion of low birthweight babies increased with daily cigarette consumption. Among women who smoked at least one-and-a-half packs of cigarettes a day the proportion of low birthweight babies was 15.1%, compared with 9.7% of babies among women who smoked fewer than five cigarettes per day.

The proportion of low birthweight babies among women who smoked during pregnancy in a study of all births in Sweden in the period 1983–1996 was 5.4% compared with 2.8% for women who did not smoke. There was a dose-response, with the proportion of low birthweight babies among women who smoked less than 10 cigarettes per day being lower (4.9%) than the proportion among women who smoked 10 or more cigarettes per day (6.3%) (Kallen 2001).

The proportion of low birthweight babies has been found to increase with increasing maternal age among women who smoke during pregnancy. A US study using birth certificates for singleton births in 1984–1988 found that, among women who smoked during pregnancy, the proportion of low birthweight babies was 7.5% for women aged less than 20 years, 6.8% for women aged 20–24 years and increased with advancing age to 9.5% for women aged 35 years or older (Fox et al. 1994). The pattern was different among women who did not smoke during pregnancy. The proportion of low birthweight babies was highest among women aged less than 20 years (4.8%) and lowest among women aged 25–29 years (2.7%).

## Preterm birth

Preterm birth is defined as birth before 37 completed weeks of gestation (WHO 1992). Overall, preterm births are associated with poorer perinatal outcomes than term births.

The proportion of preterm birth has been found to be higher among women who smoked during pregnancy than among women who did not smoke. The association between smoking and pregnancy, and preterm birth was also examined in some of the studies presented above which looked at low birthweight.

Bai and colleagues (2000) found that the proportion of preterm births (both live births and stillbirths, singletons) was 13.9% among women who smoked during pregnancy and 9.7% among women who did not smoke. Mohsin and colleagues (2003) found that the proportion of preterm births (live births) among women who smoked during pregnancy was 7.6%, compared with 5.7% among women who did not smoke (OR = 1.32, $p<0.001$). For singleton births (live births), the proportions of preterm births were lower than in all live births, but the proportion was higher among women who smoked during pregnancy (6.7%) than among women who did not smoke (4.6%) (OR = 1.42, $p<0.001$).

Wong and Bauman (1997) found that the proportion of preterm births among women who smoked during pregnancy was 8.2% compared with 5.9% among women who did not smoke. The odds ratio (after adjusting for potential confounders such as maternal age, socioeconomic status, parity, plurality, obstetric complications and maternal medical conditions) was 1.38 (95% CI = 1.28, 1.49), indicating that women who smoked had almost 40% greater odds of having their baby preterm than women who did not smoke. Women who smoked 10 or more cigarettes per day had a higher proportion of preterm births than women who smoked less than 10 cigarettes per day (8.5% and 7.7% respectively).

In a Swiss study, the proportion of singleton babies (live births) born preterm was higher among women who smoked during pregnancy (8.1%) compared with women who did not smoke during pregnancy (5.3%) (Chiolero et al. 2005). The odds ratio was 1.4 (95% CI = 1.1, 2.9) (after adjustment for potential confounders such as maternal age, parity, occupation, sex and nationality). The proportion of preterm births increased with higher daily cigarette consumption. The proportions were 6.2% for women who smoked 1–9 cigarettes per day, 8.4% for women who smoked 10–19 cigarettes per day and 12.6% for women who smoked 20 or more cigarettes per day.

In a case-control study conducted in two hospitals in Sweden during the period 1988 to 1992, very preterm babies (22–32 completed weeks of gestation) were compared with term babies (37 completed weeks or more of gestation). Only singleton live births were included. Of very preterm births, 21% had mothers who smoked 1–9 cigarettes during pregnancy and 15% had mothers who smoked 10 or more cigarettes per day. This compares to 15% and 6% respectively for term births. The odds ratios (adjusted for potential confounders such as

maternal age, parity, previous preterm birth, induced and spontaneous abortions, socioeconomic status, body mass index and height) for very preterm birth were 1.4 (95% CI = 0.8, 2.4) for women who smoked 1–9 cigarettes per day and 2.9 (95% CI = 1.5, 5.7) for women who smoked 10 or more cigarettes per day (Kyrklund-Blomberg et al. 2005).

### Perinatal mortality

Perinatal deaths include stillbirths and neonatal deaths.

In a study using the NSW Midwives Data Collection for 1994, the proportion of perinatal deaths among women who smoked during pregnancy was 1.1%, which was higher than the 0.8% of perinatal deaths among women who did not smoke. The odds ratio (adjusted for potential confounders such as maternal age, socioeconomic status, parity, plurality, obstetric complications and maternal medical conditions) was 1.20 (95% CI = 1.00, 1.45), so the odds of perinatal death was 20% greater for babies of women who smoked than for babies of women who did not smoke (Wong & Bauman 1997).

A Swedish study of registered births in the Medical Birth Registry for the period 1983–1995, found that the babies of women who smoked during pregnancy had a 24% greater risk of perinatal death than babies of women who did not smoke (OR = 1.24, 95% CI = 1.18, 1.30) (Winbo et al. 2001). In this study, stillbirths were defined as fetal deaths of at least 28 completed weeks gestation.

### Low Apgar score

An Apgar score is a clinical indicator of the baby's condition shortly after birth, based on assessment of the heart rate, breathing, colour, muscle tone and reflex irritability. Between 0 and 2 points are given for each of these five characteristics, and the total score is between 0 and 10. The Apgar score is routinely assessed at 1 and 5 minutes after birth. A low Apgar score may be defined as less than 7.

Several studies have investigated whether mothers who smoke during pregnancy have a higher proportion of babies with low Apgar scores than mothers who do not smoke.

In a study on all births from the Swedish Medical Birth Registry in the period 1983–1996, the proportion of babies with a low Apgar score at 5 minutes was found to be similar among mothers who smoked during pregnancy and mothers who did not smoke (Kallen 2001). This study found that 1.1% of women who smoked during pregnancy had a baby with an Apgar score of less than 7 at 5 minutes compared with 0.9% of women who did not smoke during pregnancy. The odds ratio (adjusted for maternal age, parity and educational level) for women who smoked less than 10 cigarettes per day was 1.13 (95% CI = 1.07, 1.18) and for women who smoked 10 or more cigarettes per day it was 1.24 (95% CI = 1.18, 1.32). Similar results were found in another study using data from the Swedish Medical Birth Registry for the period 1988–1997, however this study excluded preterm babies, stillbirths and babies with severe congenital anomalies that may affect Apgar scores. The odds ratios were 1.11 (95% CI = 1.03, 1.19) for women who smoked less than 10 cigarettes per day during pregnancy and 1.17 (95% CI = 1.07, 1.28) for women who smoked 10 or more cigarettes per day. The odds ratio for all women who smoked was 1.16 (95% CI = 1.10, 1.24) (Thorngren-Jerneck & Herbst 2001).

In Australia, a study using data from the NSW Midwives Data Collection for 1994 found that 16.6% of babies of women who smoked during pregnancy had an Apgar score at 1 minute of less than 7 compared with 15.1% of babies of women who did not smoke during pregnancy. The odds ratio (adjusted for potential confounders such as maternal age,

socioeconomic status, parity, plurality, obstetric complications and maternal medical conditions) was 1.01 (95% CI = 0.96, 1.06) (Wong & Bauman 1997). Bai and colleagues (2000) found that the proportion of babies (singletons) with an Apgar score of less than 7 at 5 minutes was similar for babies of mothers who smoked during pregnancy (4.3%) and babies of mothers who did not smoke (3.9%). For Apgar scores of less than 7 at 1 minute, the proportions were 21.0% for babies of mothers who smoked and 19.8% for babies of mothers who did not smoke.

### Admission to special care nurseries or neonatal intensive care units

Babies are admitted to special care nurseries (SCN) or neonatal intensive care units (NICU) if they require more specialised medical care and treatment than is available on the postnatal ward (Abeywardana 2005).

In two studies using data from the NSW Midwives Data Collection, the proportion of live births admitted to SCN/NICU was found to be higher for babies of women who smoked during pregnancy than for babies of women who did not smoke (Wong & Bauman 1997, Mohsin et al. 2003). Mohsin and colleagues (2003) found that 20.3% of babies of women who smoked during pregnancy were admitted to SCN/NICU compared with 17.5% of babies of women who did not smoke. Wong and Bauman (1997) found that for babies of women who smoked during pregnancy, the proportion admitted to SCN/NICU was 20.4% compared with 18.0% for babies of women who did not smoke. The odds ratio (adjusted for potential confounders) was 1.17 (95% CI = 1.11, 1.23).

### Congenital anomalies

The results of studies examining the association between smoking in pregnancy and the presence of a congenital anomaly in babies have been inconsistent (Lieff et al. 1999, Chung et al. 2000, Woods & Raju 2001, Man & Chang 2006).

For example, associations between smoking during pregnancy and having a baby with a cleft lip/palate (Chung et al. 2000) or with a congenital digital anomaly (Man & Chang 2006) have been found in two large case-control studies using data from the US Natality database for 1996, and 2001 and 2002 respectively. The odds ratio (adjusted for potential confounders such as maternal educational level, age, race, maternal medical conditions) of having a child with a cleft lip/palate was 1.34 (95% CI = 1.16, 1.54) for women who smoked during pregnancy compared with women who did not smoke (Chung et al. 2000). The odds ratio (adjusted for potential confounders such as marital status and maternal medical conditions) of having a child with a congenital digital anomaly was 1.31 (95% CI = 1.18, 1.45) for women who smoked during pregnancy compared with women who did not smoke (Man & Chang 2006).

In other studies, no association has been found between smoking in pregnancy and having a baby with a congenital anomaly. For example a US case-control study on cleft lip/palate using data from the Slone Epidemiology Unit Birth Defects Study, found no associations with maternal smoking and cleft/lip palate anomalies. However, a dose-response among infants with cleft lip and palate who had other congenital anomalies was found. In this group, the odds ratio compared to non-smokers was 1.09 (95% CI = 0.6, 1.9) for women who smoked 1–14 cigarettes per day, 1.84 (95% CI = 1.2, 2.9) for women who smoked 15–24 cigarettes per day and 1.85 (95% CI = 1.0, 3.5) for women who smoked more than 24 cigarettes per day (Lieff et al. 1999).

In a retrospective cohort study conducted in the TriHealth hospital system in Cincinnati (US), no associations were found between maternal smoking and 21 of the 22 congenital anomaly groups examined. An association was found in the cardiovascular system group with the risk of cardiovascular system congenital anomalies for babies of women who smoked during pregnancy being about one-and-a-half times the risk for babies of women who did not smoke (RR = 1.56, 95% CI = 1.12, 2.19) (Woods & Raju 2001).

### Babies of Indigenous mothers

In Australia, Aboriginal and Torres Strait Islander women have higher proportions of preterm births and low birthweight babies than non-Indigenous women (Laws & Sullivan 2005). In a study using the South Australian Perinatal Statistics Collection, the proportions of preterm birth, small for gestational age (SGA) and low birthweight were higher among babies of Aboriginal and Torres Strait Islander women than among non-Indigenous women (Chan et al. 2001). The proportions of preterm birth, SGA and low birthweight attributable to smoking in the second half of pregnancy were also higher for Aboriginal and Torres Strait Islander women (20%, 48% and 35% respectively) than non-Indigenous women (11%, 21% and 23% respectively) (Chan et al. 2001).

## Infant and childhood outcomes

The effects of smoking during pregnancy persist into infancy and childhood. Smoking during pregnancy has been found to be associated with sudden infant death syndrome (SIDS) (Golding 1997) and conditions in childhood such as asthma (Jaakkola & Gissler 2004), attention deficit hyperactivity disorder (ADHD) (Thapar et al. 2003, Linnet et al. 2005) and obesity (Toschke et al. 2002, Toschke et al. 2003, Adams et al. 2005).

### Sudden infant death syndrome

In Australia, there has been a dramatic decrease in the rate of infant deaths from SIDS. Since 1982, the rate has decreased from 180 per 100,000 live births to 46 per 100,000 live births in 2002—a decrease of 74%. Most of the decrease occurred in the early 1990s following the 1991 introduction of the National SIDS Council of Australia's public education campaign on the sleeping position of infants, which advised that babies should be placed on their back or on their side in such a way that they cannot roll onto their stomach (AIHW 2004).

A review by Golding (1997) of a number of cohort and case-control studies examining the relationship between smoking in pregnancy and SIDS found that the results of the studies were largely consistent in that SIDS was found, in most cases, to be at least twice as likely among infants of women who smoked during pregnancy than among infants of women who did not smoke. This effect increased with higher levels of smoking (Golding 1997). It was noted in this review that mothers who smoke during pregnancy also tend to smoke postnatally, making it difficult to ascertain whether the effect is prenatal or postnatal.

In a matched case-control study using data from the Swedish Medical Birth Registry, the odds of SIDS were higher among infants of mothers who smoked during pregnancy than among infants of mothers who did not smoke and this effect was markedly higher following a 1992 campaign to reduce the risk of SIDS (Chong et al. 2004). For SIDS infants compared to liveborn controls, in the period 1982–1991 (pre-campaign) the odds (adjusted for potential confounders) of SIDS among infants of mothers who smoked during

pregnancy was 1.7 times the odds among infants of mothers who did not smoke (OR = 1.70, 95% CI = 1.46, 1.99). The odds ratio in the period 1993–1998 (post-campaign) was 4.88 (95% CI = 3.29, 7.29).

# Data sources

## National Perinatal Data Collection

The National Perinatal Data Collection (NPDC) contains data collected by each state and territory on mothers and their babies. Data are collected for all births in hospitals, birth centres and the community, and are provided to the NPSU annually. The data set includes information on both live births and stillbirths of at least 400 grams birthweight or at least 20 weeks gestation. Aggregate data are published annually in the *Australia's mothers and babies* report (e.g. Laws & Sullivan 2005).

The Perinatal National Minimum Data Set (NMDS) is a specification for perinatal data elements for mandatory collection and reporting at a national level, and depends on a national agreement to collect the data in a uniform way. It includes data items relating to the mother, including demographic characteristics and factors relating to the pregnancy, labour and birth, and data items relating to the baby, including birth status, sex and birthweight. More data elements are included in the NPDC than are specified in the NMDS. Currently there are no data elements relating to smoking during pregnancy in the NMDS, however, some information is obtained as part of the NPDC.

Nationally collated perinatal data on smoking during pregnancy were available for this report from five states and territories: New South Wales, Western Australia, South Australia, the Australian Capital Territory and the Northern Territory, and are presented in Chapter 3.

### Limitations of the data

Potential confounding factors have not been controlled for in the data presented in this report because it is descriptive and because the NPDC does not contain information on all possible confounders for smoking in pregnancy. For example, it does not contain information on educational level, socioeconomic status and private health insurance status. Paternal information, including smoking status, is also not included in the NPDC. Data are not presented on maternal medical conditions which are also potential confounders.

## National Drug Strategy Household Survey

The National Drug Strategy Household Survey is the most comprehensive survey on licit and illicit drug use undertaken in Australia. It provides information on drug use patterns, attitudes and behaviours. The 2004 survey was the eighth conducted under the auspices of the National Drug Strategy (AIHW 2005). The survey asked women whether they were pregnant, breastfeeding, or pregnant and breastfeeding, in the past 12 months. Results from this survey are reported in several AIHW publications, available at <http://www.aihw.gov.au/publications>.

## Western Australian Aboriginal Child Health Survey

The Western Australian Aboriginal Child Health Survey is an epidemiological survey of the health and wellbeing of a large sample of Aboriginal and Torres Strait Islander children living in Western Australia. The survey was conducted in 2001 and 2002 by the Telethon Institute for Child Health Research. Data collected were linked to other datasets, including the Maternal and Child Health Research Database (based on birth registration data and the WA Midwives Notification of Births database), and the Hospital Morbidity Data System, to provide a comprehensive picture of health and health service use of both children and their carers (Zubrick et al. 2004).

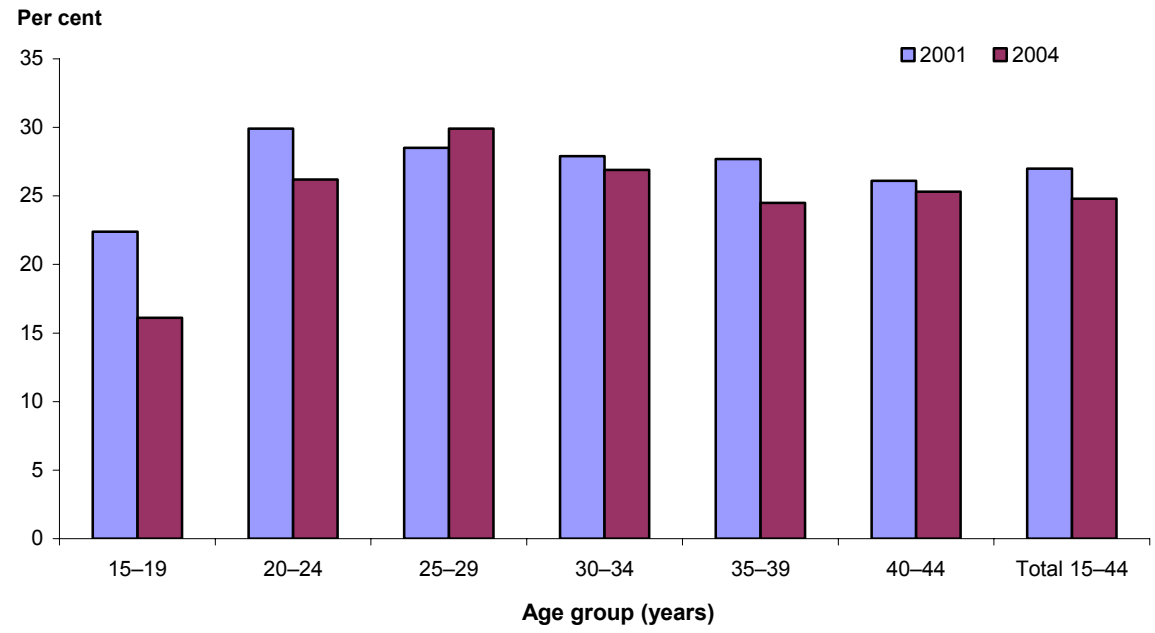
# 2 Australian survey data

## Trends in smoking for women of reproductive age

This section presents data from the 2001 and 2004 National Drug Strategy Household Surveys (NDSHS) for smoking status of women of reproductive age in the general population. The 2004 Survey found that 24.8% of women aged 15–44 years were current smokers. Current smokers include those who smoke daily, weekly, or less than weekly. Non-smokers were those who had never smoked, who had smoked less than 100 cigarettes in total, or who had quit. The highest proportion of current female smokers was found among those aged 25–29 years (29.9%). In 2003, the average age of first-time mothers was within this age group (27.6 years; Laws & Sullivan 2005). The lowest proportion of current smokers was among those aged 15–19 years (16.1%), which differed markedly to the smoking profile of teenage pregnant women (42.1%) reported in the National Perinatal Data Collection for 2003.

The 2001 NDSHS found that 27.0% of females aged 15–44 years were current smokers. The highest proportion of current smokers was aged 20–24 years (29.9%) and the lowest proportion was aged 15–19 years (22.4%) (Figure 2.1).

Figure 2.1 shows that between 2001 and 2004 there was a decrease in the proportion of females aged 15–44 years who were current smokers, from 27.0% in 2001 to 24.8% in 2004. There was a decrease in all age groups except for an increase in the 25–29 years age group.




*Source:* Table A1.

**Figure 2.1: Proportion of females who were current smokers by age group, 2001 and 2004**

# Smoking in pregnant or breastfeeding women

## National Drug Strategy Household Survey

The 2004 NDSHS found that women who were pregnant and/or breastfeeding in the past 12 months reported lower levels of consumption of tobacco while they were pregnant and/or breastfeeding (20%) compared with when they were not pregnant and/or breastfeeding (22%) (AIHW 2005: 63).

These rates were lower than those found in the 2001 survey, in which 23% of women who were pregnant and/or breastfeeding consumed tobacco while they were pregnant and/or breastfeeding and 24% did so when they were not pregnant and/or breastfeeding (AIHW 2003: 55).

## Western Australian Aboriginal Child Health Survey

Data from the Western Australian Aboriginal Child Health Survey (WAACHS) showed that 46.5% of Aboriginal children—whose primary carer was their birth mother—had a mother who smoked tobacco during pregnancy. The average birthweight of these children was 3,110 grams, lower than that of babies of mothers who did not consume tobacco (3,260 grams) (Zubrick et al. 2004).

# 3 National Perinatal Data Collection data

## Available data

Seven of the states and territories currently collect at least one smoking question as part of their routine perinatal data collections. Tasmania and Queensland began collecting smoking data in 2005, so data for these states will potentially be available for national reporting in 2007 and 2008 respectively. The smoking questions currently collected by the states and territories are presented in Table 3.1.

**Table 3.1: Current smoking questions and data domains on perinatal forms, by state and territory**

| | NSW | Vic | Qld[(a)] | WA | SA | Tas[(a)] | ACT | NT |
|---|---|---|---|---|---|---|---|---|
| Question 1. | Did the mother smoke at all during pregnancy? | n.a. | Did the mother smoke at all during this pregnancy? | Smoking during pregnancy | Tobacco smoking status at first visit | During this pregnancy has the mother smoked tobacco | Did mother smoke during pregnancy? | Smoking at 1st antenatal visit |
| Data domain | Yes/no | — | Yes/no | Yes/no | Smoker<br>Quit in pregnancy before first visit<br>Non smoker<br>Unknown smoking status | Yes/no | Yes/no | Yes/no /unknown |
| Question 2. | If yes, how many cigarettes each day on average in the second half of pregnancy? | — | If yes, how many cigarettes were smoked each day on average after 20 weeks gestation? | — | Average number of tobacco cigarettes smoked per day in 2nd half of pregnancy | If yes, amount of tobacco smoked | Average number of cigarettes per day during the second half of pregnancy | Smoking at 36 weeks |
| Data domain | None<br>≤ 10 per day<br>> 10 per day<br>Unknown | — | None<br>≤ 10 per day<br>> 10 per day<br>Unknown | — | None<br>No. per day = …….<br>< 1 (occasional)<br>Unknown no. | < 10 cigarettes per day<br>> 10 cigarettes per day | NN<br>(numeric field) | Yes/no /unknown |

(a) For Tasmania and Queensland, questions on smoking have been collected since 1 January 2005 and 1 July 2005 respectively. Therefore, data for these states are not yet available for reporting.

n.a. Not available. For Victoria, data on smoking in pregnancy are not currently collected as part of the perinatal collection. Victoria currently uses other mechanisms to monitor smoking in pregnancy.

For Victoria, data on smoking in pregnancy are not currently collected as part of the perinatal collection; however, other mechanisms for monitoring smoking in pregnancy are used (DHS 2002).

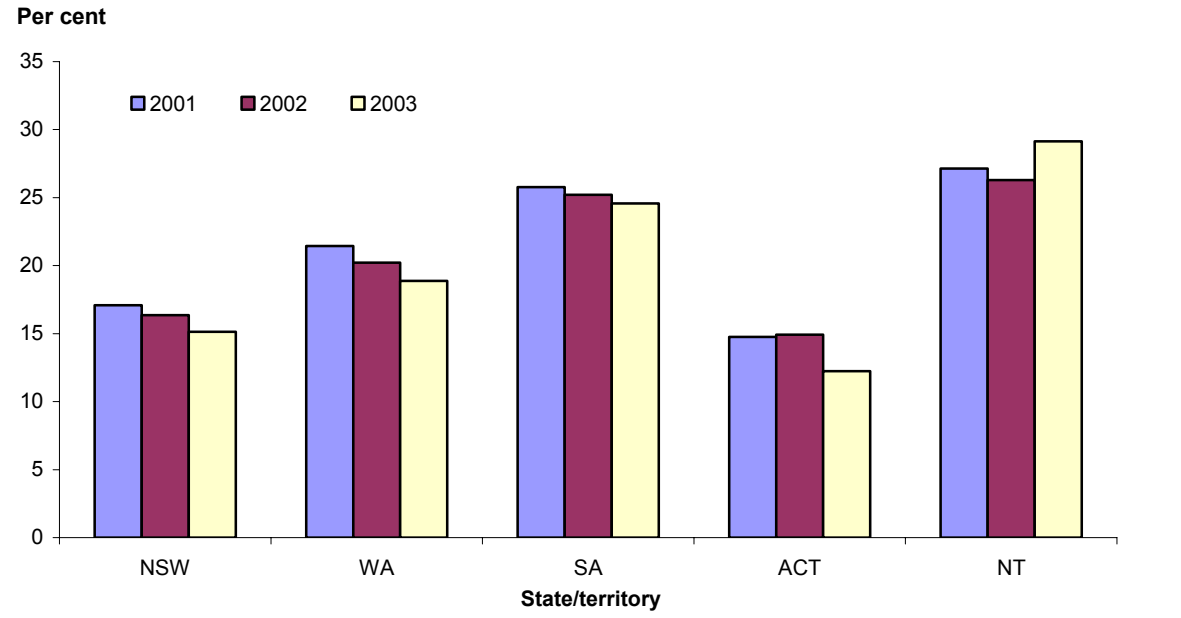
There are currently no nationally agreed data items on smoking during pregnancy in Australia. The development of such items will be undertaken through the National Perinatal Data Development Committee (NPDDC), which operates within the National Health Information Agreement (NHIA) governance arrangements.

Data were available for this chapter from five states and territories: New South Wales, Western Australia, South Australia, the Australian Capital Territory and the Northern Territory. These jurisdictions contained 53.5% of women who gave birth in Australia in 2003.

The data for the Northern Territory and South Australia relate to smoking status at the first antenatal visit. This may result in higher rates of smoking being reported for these jurisdictions because, for example, the first antenatal visit may precede harm minimisation interventions designed to stop smoking in pregnancy. There may be a greater tendency in the other jurisdictions for women to report not smoking if they smoked early in pregnancy, perhaps before knowing they were pregnant, and subsequently quit.

# Prevalence of smoking in pregnancy

The proportion of women giving birth in 2003 who reported smoking while pregnant ranged from 12.2% in the Australian Capital Territory, to 29.1% in the Northern Territory. Overall, 17.3% of women in the five states and territories smoked at some time during pregnancy (Table 3.2). There was an overall decrease in the proportion of women smoking during pregnancy, from 19.2% in 2001 to 17.3% in 2003, although there was an increase in the Northern Territory and the fall in the Australian Capital Territory was not progressive across the three years (Figure 3.1).




*Source:* Table 3.2.

**Figure 3.1: Proportion of mothers smoking during pregnancy, by state and territory, 2001 to 2003**

**Table 3.2: Mothers' tobacco smoking status during pregnancy, by state and territory, 2001 to 2003**

| Year/smoking status | NSW | WA | SA[(a)] | ACT[(b)] | NT[(c)] | Total |
|---|---|---|---|---|---|---|
| | | | Number | | | |
| **2001** | | | | | | |
| Smoked | 14,424 | 5,254 | 4,492 | 651 | 1,012 | 25,833 |
| Did not smoke | 69,938 | 19,240 | 12,619 | 3,623 | 2,298 | 107,718 |
| Not stated | 17 | — | 316 | 140 | 419 | 892 |
| **Total** | **84,379** | **24,494** | **17,427** | **4,414** | **3,729** | **134,443** |
| **2002** | | | | | | |
| Smoked | 13,829 | 4,932 | 4,393 | 703 | 966 | 24,823 |
| Did not smoke | 70,745 | 19,464 | 12,722 | 3,884 | 2,276 | 109,091 |
| Not stated | 13 | — | 306 | 121 | 432 | 872 |
| **Total** | **84,587** | **24,396** | **17,421** | **4,708** | **3,674** | **134,786** |
| **2003** | | | | | | |
| Smoked | 12,875 | 4,585 | 4,305 | 586 | 1,054 | 23,405 |
| Did not smoke | 72,141 | 19,694 | 12,940 | 4,194 | 2,210 | 111,179 |
| Not stated | 17 | — | 272 | 4 | 354 | 647 |
| **Total** | **85,033** | **24,279** | **17,517** | **4,784** | **3,618** | **135,231** |
| | | | Per cent | | | |
| **2001** | | | | | | |
| Smoked | 17.1 | 21.5 | 25.8 | 14.7 | 27.1 | 19.2 |
| Did not smoke | 82.9 | 78.5 | 72.4 | 82.1 | 61.6 | 80.1 |
| Not stated | 0.0 | — | 1.8 | 3.2 | 11.2 | 0.7 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **2002** | | | | | | |
| Smoked | 16.3 | 20.2 | 25.2 | 14.9 | 26.3 | 18.4 |
| Did not smoke | 83.6 | 79.8 | 73.0 | 82.5 | 61.9 | 80.9 |
| Not stated | 0.0 | — | 1.8 | 2.6 | 11.8 | 0.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **2003** | | | | | | |
| Smoked | 15.1 | 18.9 | 24.6 | 12.2 | 29.1 | 17.3 |
| Did not smoke | 84.8 | 81.1 | 73.9 | 87.7 | 61.1 | 82.2 |
| Not stated | 0.0 | — | 1.6 | 0.1 | 9.8 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

(a) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(b) 13.7% of women who gave birth in the ACT in 2001 were non-ACT residents, and this increased to 15.4% in 2002, and 15.2% in 2003. Care must be taken when interpreting percentages.

(c) For NT, smoking status was recorded at the first antenatal visit.

Three states and territories also provided data on the average number of cigarettes smoked per day during the second half of pregnancy. Of smokers in these jurisdictions, 49.7% smoked 10 or less cigarettes per day, while 39.3% smoked more than 10 cigarettes per day.

# Demographic profile

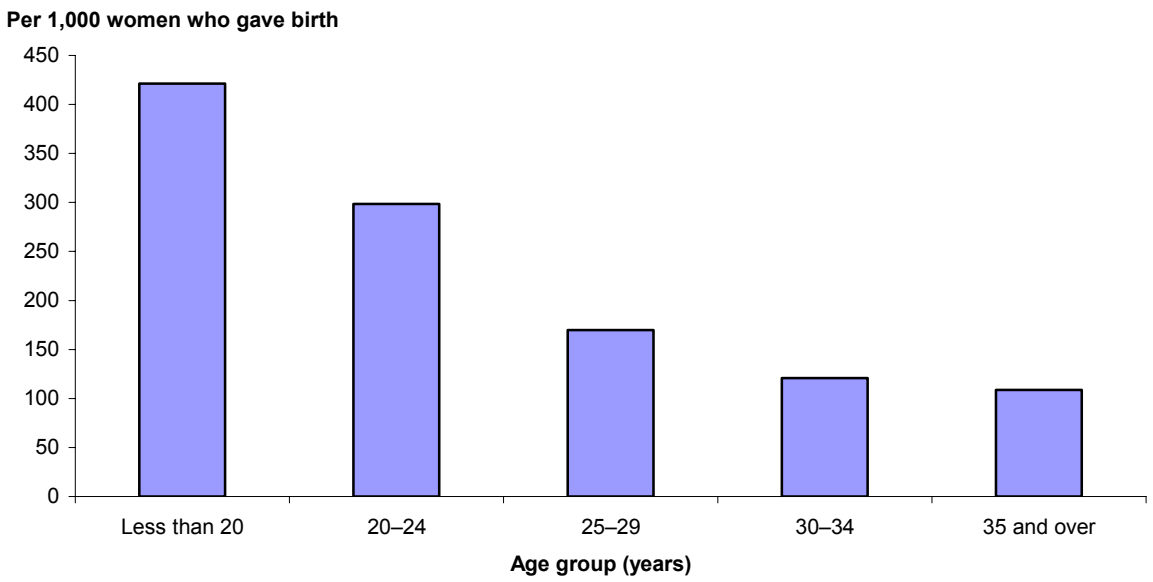
## Maternal age

In 2003, the average age of mothers who smoked during pregnancy was 27.0 years compared with 30.0 years for those who did not smoke. Teenage mothers accounted for 11.4% of all mothers who reported smoking during pregnancy, and of teenage mothers, 42.1% reported smoking during pregnancy. This is consistent with previous research findings that showed teenage mothers had a higher smoking rate than adult mothers (e.g. Dodds 1995, Wong & Bauman 1997, Bai et al. 2000, Dewan et al. 2003, Ventura et al. 2003, Gilchrist et al. 2004). The proportion of smokers in each age group decreased as maternal age increased. The lowest proportion of smokers was aged 40 years and older (10.7%) (Table 3.3).

**Table 3.3: Mothers' tobacco smoking status during pregnancy, by maternal age, 2003**

| | Age group (years) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Smoking status** | **Less than 20** | **20–24** | **25–29** | **30–34** | **35–39** | **40 and over** | **Not stated** | **Total** |
| | | | | **Number** | | | | |
| Smoked | 2,665 | 6,068 | 6,468 | 5,446 | 2,292 | 465 | 1 | 23,405 |
| Did not smoke | 3,564 | 14,135 | 31,494 | 39,458 | 18,653 | 3,886 | 9 | 111,179 |
| Not stated | 96 | 128 | 151 | 164 | 94 | 14 | — | 647 |
| **Total** | **6,325** | **20,331** | **38,113** | **45,068** | **21,039** | **4,345** | **10** | **135,231** |
| | | | | **Per cent** | | | | |
| Smoked | 42.1 | 29.8 | 17.0 | 12.1 | 10.9 | 10.7 | 10.0 | 17.3 |
| Did not smoke | 56.3 | 69.5 | 82.6 | 87.6 | 88.7 | 89.0 | 90.0 | 82.2 |
| Not stated | 1.5 | 0.6 | 0.4 | 0.4 | 0.4 | 0.3 | — | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

Figure 3.2 shows age-specific rates of smoking during pregnancy for 2003. Smoking decreased progressively with age, from 421.3 per 1,000 mothers aged less than 20 years, to 108.6 per 1,000 mothers aged 35 years and older.




*Source:* Table A2.

**Figure 3.2: Mothers reporting smoking during pregnancy, per 1,000 women who gave birth, by age group, 2003**

## Indigenous status

The data presented here on Indigenous status are influenced by the quality and completeness of Indigenous identification, which may vary among jurisdictions.

Studies have shown rates of smoking of Indigenous mothers to be higher than those of non-Indigenous mothers in Australia (Roberts & Algert 2000, Chan et al. 2001, Westenberg et al. 2002). Of mothers in the five jurisdictions who reported data on smoking during pregnancy, 12.5% identified as being Aboriginal and Torres Strait Islander in 2003. Of Aboriginal and Torres Strait Islander mothers in these jurisdictions, 52.2% reported smoking during pregnancy. This proportion ranged from 43.1% in the Northern Territory, to 59.2% in South Australia. Of non-Indigenous mothers, 15.8% reported smoking during pregnancy (Table 3.4). Figure 3.3 shows the proportions of Aboriginal and Torres Strait Islander mothers and non-Indigenous mothers who smoked during pregnancy in each of the five states and territories for 2003. Table A3 presents data for 2001 and 2002.

Indirectly age-standardised ratios of smoking during pregnancy were calculated by Indigenous status and state and territory for 2003, using as the standard, the age specific rates of smoking during pregnancy for all non-Indigenous women who gave birth in 2003 in the five states and territories (Table 3.5). If the ratio is greater than 1.0, then the rate of smoking in pregnancy for each group of women who gave birth was higher than the rate for all non-Indigenous women who gave birth and if the ratio is less than 1.0, then the rate of smoking in pregnancy was lower in each group of women compared to the rate for all non-Indigenous women who gave birth. Also included is the 95% confidence interval of the ratio which shows the range of values the ratio could be expected to fall within due to chance. If the confidence interval includes 1.0 then a difference in the smoking rate (in each group of women who gave birth) compared to the rate for all non-Indigenous women who gave birth is considered less likely.

**Table 3.4: Mothers' tobacco smoking status during pregnancy, by Indigenous status and state and territory, 2003**

| Indigenous status/smoking status | NSW | WA | SA[(a)] | ACT[(b)] | NT[(c)] | Total |
|---|---|---|---|---|---|---|
| | | | **Number** | | | |
| **Indigenous** | | | | | | |
| Smoked | 1,228 | 794 | 277 | 36 | 602 | 2,937 |
| Did not smoke | 933 | 732 | 163 | 44 | 565 | 2,437 |
| Not stated | — | — | 28 | — | 229 | 257 |
| **Total** | **2,161** | **1,526** | **468** | **80** | **1,396** | **5,631** |
| **Non-Indigenous** | | | | | | |
| Smoked | 11,645 | 3,791 | 4,028 | 549 | 449 | 20,462 |
| Did not smoke | 71,175 | 18,962 | 12,777 | 4,130 | 1,643 | 108,687 |
| Not stated | 12 | — | 244 | 4 | 124 | 384 |
| **Total** | **82,832** | **22,753** | **17,049** | **4,683** | **2,216** | **129,533** |
| | | | **Per cent** | | | |
| **Indigenous** | | | | | | |
| Smoked | 56.8 | 52.0 | 59.2 | 45.0 | 43.1 | 52.2 |
| Did not smoke | 43.2 | 48.0 | 34.8 | 55.0 | 40.5 | 43.3 |
| Not stated | — | — | 6.0 | — | 16.4 | 4.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Non-Indigenous** | | | | | | |
| Smoked | 14.1 | 16.7 | 23.6 | 11.7 | 20.3 | 15.8 |
| Did not smoke | 85.9 | 83.3 | 74.9 | 88.2 | 74.1 | 83.9 |
| Not stated | 0.0 | — | 1.4 | 0.1 | 5.6 | 0.3 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

(a) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(b) 15.2% of women who gave birth in the ACT in 2003 were non-ACT residents. Care must be taken when interpreting percentages.

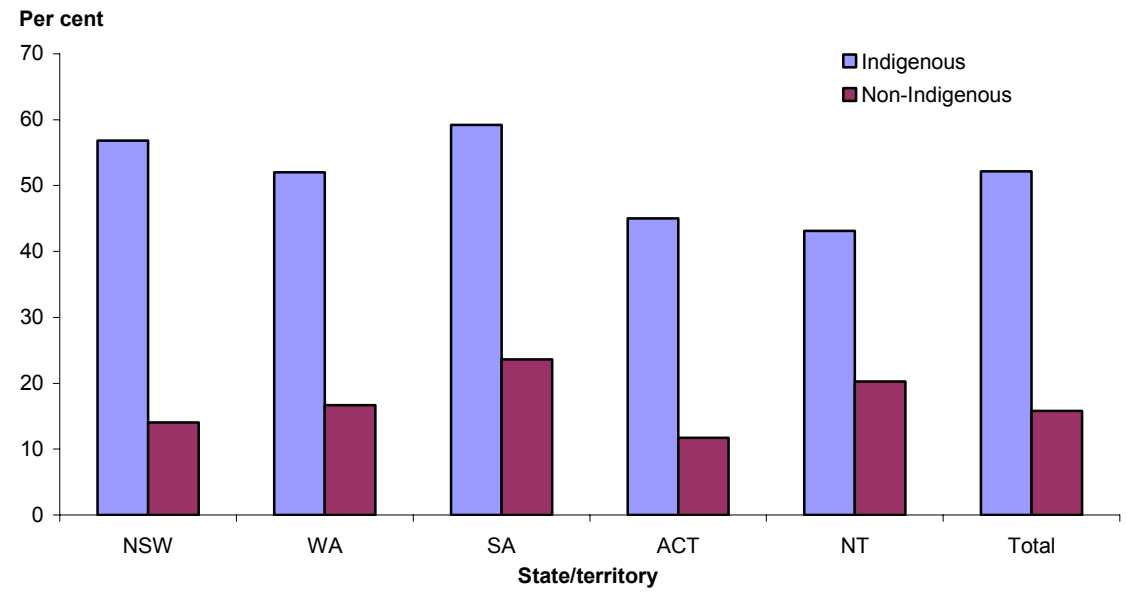
(c) For NT, smoking status was recorded at the first antenatal visit.

Overall, the rate of smoking in pregnancy for all Aboriginal and Torres Strait Islander women who gave birth in the five states and territories was 2.15 times that of all non-Indigenous women who gave birth. The 95% confidence interval was 2.07–2.23 indicating that the difference was statistically significant.

Compared to all non-Indigenous women who gave birth, the rates of smoking in pregnancy among Aboriginal and Torres Strait Islander women who gave birth were higher for all states and territories and ranged from 1.68 times as high in the Northern Territory to 2.49 times as high in South Australia. For each state and territory, the difference from all non-Indigenous women who gave birth was statistically significant.

For non-Indigenous women who gave birth in Western Australia, South Australia and the Northern Territory, rates of smoking in pregnancy were higher than the rate for all non-Indigenous women (5%, 46% and 22% higher respectively). The rates were lower for women who gave birth in New South Wales (10%) and the Australian Capital Territory

(22%). For each state and territory, the difference from all non-Indigenous women who gave birth was statistically significant.




*Source:* Table 3.4.

**Figure 3.3: Proportion of mothers smoking during pregnancy, by Indigenous status and state and territory, 2003**

**Table 3.5: Age-standardised ratios[(a)] of smoking during pregnancy, by Indigenous status and state and territory, 2003**

| Indigenous status | NSW | WA | SA[(b)] | ACT[(c)] | NT[(d)] | Total |
|---|---|---|---|---|---|---|
| **Indigenous** | | | | | | |
| Age-standardised ratio | 2.43 | 2.12 | 2.49 | 2.25 | 1.68 | 2.15 |
| 95% confidence interval | 2.29–2.57 | 1.97–2.27 | 2.21–2.80 | 1.58–3.12 | 1.55–1.82 | 2.07–2.23 |
| **Non-Indigenous** | | | | | | |
| Age-standardised ratio | 0.90 | 1.05 | 1.46 | 0.78 | 1.22 | 1.00 |
| 95% confidence interval | 0.88–0.91 | 1.01–1.08 | 1.41–1.50 | 0.72–0.85 | 1.11–1.33 | |

(a) The ratios were indirectly age-standardised using as the standard, age-specific rates of smoking in pregnancy for non-Indigenous women who gave birth in 2003.

(b) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(c) 15.2% of women who gave birth in the ACT in 2003 were non-ACT residents. Care must be taken when interpreting ratios.

(d) For NT, smoking status was recorded at the first antenatal visit.

## Geographical location of the mother's usual residence

Data on the geographical location of the usual residence of the mother were provided as Statistical Local Area (a small unit within the Australian Bureau of Statistics' Australian Standard Geographical Classification (ASGC)) and/or postcode. These data have been mapped to levels of remoteness using the ASGC remoteness structure (see Appendix 2).

The proportion of mothers who smoked was lowest for mothers usually resident in Major cities (14.0%) and increased with increasing remoteness to 38.3% for mothers usually

resident in Very remote areas (Table 3.6). This was only partially explained by the higher proportion of Aboriginal and Torres Strait Islander women resident in more remote areas.

Indirectly age-standardised ratios were calculated using as the standard the age-specific smoking rates of women who gave birth in 2003 whose area of usual residence was Major cities. The rate of smoking during pregnancy was 50%, 70%, 69% and 86% higher for women usually resident in Inner regional, Outer regional, Remote and Very remote areas, respectively, than for women usually resident in Major cities. The smoking rate for women usually resident in each Remoteness area was statistically significantly different from that of women usually resident in Major cities.

**Table 3.6: Mothers' tobacco smoking status during pregnancy, by remoteness area, 2003**

| Smoking status | Major cities | Inner regional | Outer regional | Remote | Very remote | Not stated | Total |
|---|---|---|---|---|---|---|---|
| | | | | **Number** | | | |
| Smoked | 13,675 | 4,707 | 3,252 | 916 | 821 | 6 | 23,377 |
| Did not smoke | 84,012 | 15,454 | 8,283 | 2,188 | 1,150 | 15 | 111,102 |
| Not stated | 181 | 31 | 164 | 86 | 171 | 1 | 634 |
| **Total** | **97,868** | **20,192** | **11,699** | **3,190** | **2,142** | **22** | **135,113** |
| | | | | **Per cent** | | | |
| Smoked | 14.0 | 23.3 | 27.8 | 28.7 | 38.3 | 27.3 | 17.3 |
| Did not smoke | 85.8 | 76.5 | 70.8 | 68.6 | 53.7 | 68.2 | 82.2 |
| Not stated | 0.2 | 0.2 | 1.4 | 2.7 | 8.0 | 4.5 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| | | | | **Age-standardised ratio[(a)]** | | | |
| Smoked | 1.00 | 1.50 | 1.70 | 1.69 | 1.86 | — | 1.19 |
| 95% confidence interval | | 1.45–1.54 | 1.65–1.76 | 1.58–1.80 | 1.73–1.99 | — | 1.17–1.20 |

(a) The ratios were indirectly age-standardised using as the standard, the age-specific rates of smoking in pregnancy for women who gave birth in 2003 whose area of usual residence was Major cities.

*Note:* Excludes 118 non-resident mothers.

## Maternal country of birth

All five jurisdictions used the Standard Australian Classification of Countries (SACC) to classify maternal country of birth. Table 3.7 presents data for the three most populous countries of birth for women who gave birth in 2003. Mothers born in New Zealand reported marginally higher rates of smoking than mothers born in Australia (23.3% and 20.5% respectively). Of mothers born in the United Kingdom, 12.6% smoked during pregnancy.

Of European born mothers, including those born in former Yugoslavia and the former USSR, 9.6% smoked during pregnancy. Of mothers born in the Middle East and North Africa, 6.5% reported smoking in pregnancy. Lower proportions of mothers born in Northern America and Asia reported smoking during pregnancy (4.8% and 2.3% respectively).

**Table 3.7: Mothers' tobacco smoking status during pregnancy, by country of birth, 2003**

| Smoking status | Australia | New Zealand | United Kingdom | Other countries | Not stated | Total |
|---|---|---|---|---|---|---|
| | | | Number | | | |
| Smoked | 20,577 | 734 | 642 | 1,238 | 214 | 23,405 |
| Did not smoke | 79,345 | 2,406 | 4,428 | 23,953 | 1,047 | 111,179 |
| Not stated | 582 | 8 | 16 | 39 | 2 | 647 |
| **Total** | **100,504** | **3,148** | **5,086** | **25,230** | **1,263** | **135,231** |
| | | | Per cent | | | |
| Smoked | 20.5 | 23.3 | 12.6 | 4.9 | 16.9 | 17.3 |
| Did not smoke | 78.9 | 76.4 | 87.1 | 94.9 | 82.9 | 82.2 |
| Not stated | 0.6 | 0.3 | 0.3 | 0.2 | 0.2 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

# Maternal characteristics

## Parity

Parity is the number of previous pregnancies that resulted in live births or stillbirths, excluding the current pregnancy. In 2003, the proportion of mothers who smoked was lowest for primiparous mothers and mothers who had given birth once previously (15.0% for both) and highest for mothers who had given birth four or more times previously (36.4%).

**Table 3.8: Mothers' tobacco smoking status during pregnancy, by parity, 2003**

| Smoking status | None | One | Two | Three | Four or more | Not stated | Total |
|---|---|---|---|---|---|---|---|
| | | | | Number | | | |
| Smoked | 8,520 | 6,862 | 4,177 | 2,072 | 1,773 | 1 | 23,405 |
| Did not smoke | 48,082 | 38,690 | 16,090 | 5,233 | 3,045 | 39 | 111,179 |
| Not stated | 234 | 201 | 96 | 48 | 56 | 12 | 647 |
| **Total** | **56,836** | **45,753** | **20,363** | **7,353** | **4,874** | **52** | **135,231** |
| | | | | Per cent | | | |
| Smoked | 15.0 | 15.0 | 20.5 | 28.2 | 36.4 | 1.9 | 17.3 |
| Did not smoke | 84.6 | 84.6 | 79.0 | 71.2 | 62.5 | 75.0 | 82.2 |
| Not stated | 0.4 | 0.4 | 0.5 | 0.7 | 1.1 | 23.1 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

## Place of birth

A birth may occur in a hospital or non-hospital setting. In 2003, 17.4% of women who gave birth in hospitals reported smoking during pregnancy, compared with 13.3% of women

who gave birth in birth centres. Women who had an intended homebirth reported a minimal rate of smoking (4.8%). The highest rate of smoking was seen in mothers who gave birth in other settings, such as remote community health centres or before arrival in hospital (35.9%) (Table 3.9).

**Table 3.9: Mothers' tobacco smoking status during pregnancy, by actual place of birth, 2003**

| Smoking status | Hospital | Birth centre | Home | Other[(a)] | Not stated | Total |
|---|---|---|---|---|---|---|
| | | | **Number** | | | |
| Smoked | 22,704 | 467 | 17 | 217 | — | 23,405 |
| Did not smoke | 107,451 | 3,044 | 332 | 351 | 1 | 111,179 |
| Not stated | 606 | 1 | 4 | 36 | — | 647 |
| **Total** | **130,761** | **3,512** | **353** | **604** | **1** | **135,231** |
| | | | **Per cent** | | | |
| Smoked | 17.4 | 13.3 | 4.8 | 35.9 | — | 17.3 |
| Did not smoke | 82.2 | 86.7 | 94.1 | 58.1 | 100.0 | 82.2 |
| Not stated | 0.5 | 0.0 | 1.1 | 6.0 | — | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

(a) Includes births in remote community health centres in the NT, and births occurring before arrival in hospital or in other settings.

## Hospital sector

Of hospital births in 2003, mothers who gave birth in public hospitals reported a higher rate of smoking during pregnancy (22.1%), compared with mothers who gave birth in a private hospital (6.3%) (Table 3.10). For mothers who smoked the odds of giving birth in a public hospital were 4.3 times that of mothers who did not smoke (OR = 4.25, 95% CI = 4.07, 4.44).

**Table 3.10: Mothers' tobacco smoking status during pregnancy, by hospital sector for women who gave birth in hospitals, 2003**

| Smoking status | Public | Private | Total |
|---|---|---|---|
| | | **Number** | |
| Smoked | 20,232 | 2,472 | 22,704 |
| Did not smoke | 70,705 | 36,746 | 107,451 |
| Not stated | 525 | 81 | 606 |
| **Total** | **91,462** | **39,299** | **130,761** |
| | | **Per cent** | |
| Smoked | 22.1 | 6.3 | 17.4 |
| Did not smoke | 77.3 | 93.5 | 82.2 |
| Not stated | 0.6 | 0.2 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** |

## Method of birth

In 2003, 24.1% of mothers who smoked while pregnant had a caesarean section delivery, while 75.9% had a vaginal birth, either assisted or unassisted. Of mothers who did not smoke, 28.5% had a caesarean section delivery, and 71.5% had vaginal births.

Women who had a vaginal breech birth included the highest proportion of mothers who smoked during pregnancy (27.2%), followed by those who had a spontaneous vaginal birth (19.2%). Mothers who had a caesarean section or instrumental delivery had the lowest rates of smoking (Table 3.11).

**Table 3.11: Mothers' tobacco smoking status during pregnancy, by method of birth, 2003**

| Smoking status | Spontaneous vaginal | Forceps | Vacuum extraction | Vaginal breech | Caesarean section | Not stated | Total |
|---|---|---|---|---|---|---|---|
| | | | | Number | | | |
| Smoked | 15,864 | 557 | 185 | 170 | 5,629 | — | 23,405 |
| Did not smoke | 66,305 | 4,114 | 8,601 | 438 | 31,710 | 11 | 111,179 |
| Not stated | 382 | 20 | 23 | 18 | 203 | 1 | 647 |
| **Total** | **82,551** | **4,691** | **9,809** | **626** | **37,542** | **12** | **135,231** |
| | | | | Per cent | | | |
| Smoked | 19.2 | 11.9 | 12.1 | 27.2 | 15.0 | — | 17.3 |
| Did not smoke | 80.3 | 87.7 | 87.7 | 70.0 | 84.5 | 91.7 | 82.2 |
| Not stated | 0.5 | 0.4 | 0.2 | 2.9 | 0.5 | 8.3 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

*Note:* For multiple births, the method of birth of the first born baby was used.

# Baby outcomes

## Birth status

Babies born to mothers who smoked during pregnancy accounted for 17.3% of all babies born in the five states and territories in 2003. Of liveborn babies, 17.2% had a mother who smoked, while of stillborn babies, 23.3% had a mother who smoked (Table 3.12).

Stillbirth has been shown to be more likely among mothers who smoked during pregnancy (Tuthill et al. 1999, Winbo et al. 2001). The fetal death rate for babies of mothers who smoked was 9.2 per 1,000 births in 2003, which was higher than the 6.1 per 1,000 births for mothers who did not smoke. The risk of fetal death in babies of mothers who smoked was 1.5 times that in babies of mothers who did not smoke (RR = 1.50, 95% CI = 1.29, 1.74).

**Table 3.12: Birth status of babies, by mothers' tobacco smoking status during pregnancy, 2003**

| Smoking status | Live birth | Fetal death | Total |
|---|---|---|---|
| | | **Number** | |
| Smoked | 23,510 | 218 | 23,728 |
| Did not smoke | 112,391 | 694 | 113,085 |
| Not stated | 639 | 25 | 664 |
| **Total** | **136,540** | **937** | **137,477** |
| | | **Per cent** | |
| Smoked | 17.2 | 23.3 | 17.3 |
| Did not smoke | 82.3 | 74.1 | 82.3 |
| Not stated | 0.5 | 2.7 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** |

## Gestational age at birth

In 2003, the average gestational age for babies born to mothers who smoked during pregnancy was 38.7 weeks, marginally less than that for babies of non-smokers (39.0 weeks). Of babies of mothers who smoked, 10.4% were born preterm (less than 37 weeks gestation), 88.0% were born at term and 1.6% were post-term. Of babies of mothers who did not smoke, 6.9% were born preterm, 91.2% at term and 2.0% post-term.

Preterm birth is associated with neonatal problems that cause significant morbidity and mortality in newborn babies. It is more common in mothers who smoke during pregnancy, than in mothers who do not smoke (e.g. Wong & Bauman 1997, Bai et al. 2000, Kyrklund-Blomberg et al. 2005). Table 3.13 shows that babies of mothers who smoked during pregnancy were overrepresented in all categories of preterm birth: 25.2% in the 20–27 week group, 23.3% in the 28–31 week group, and 23.5% in the 32–36 week group. The odds of preterm birth in 2003 was 60% higher in babies of mothers who smoked, than in babies of non-smoking mothers (OR = 1.58, 95% CI = 1.50, 1.65). Of term babies, 16.8% had a mother who reported smoking during pregnancy, while 14.6% of post-term babies had a mother who smoked.

**Table 3.13: Gestational age at birth, by mothers' tobacco smoking status during pregnancy, 2003**

| Smoking status | Gestational age group (weeks) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 20–27[(a)] | 28–31 | 32–36 | 37–41 | 42 and over | Not stated | Total |
| | | | | Number | | | |
| Smoked | 267 | 245 | 1,953 | 20,878 | 382 | 3 | 23,728 |
| Did not smoke | 757 | 771 | 6,227 | 103,096 | 2,223 | 11 | 113,085 |
| Not stated | 35 | 37 | 118 | 467 | 6 | 1 | 664 |
| **Total** | **1,059** | **1,053** | **8,298** | **124,441** | **2,611** | **15** | **137,477** |
| | | | | Per cent | | | |
| Smoked | 25.2 | 23.3 | 23.5 | 16.8 | 14.6 | 20.0 | 17.3 |
| Did not smoke | 71.5 | 73.2 | 75.0 | 82.8 | 85.1 | 73.3 | 82.3 |
| Not stated | 3.3 | 3.5 | 1.4 | 0.4 | 0.2 | 6.7 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

(a) Includes 6 babies of less than 20 weeks gestation.

*Note:* For multiple births, the gestational age of the first born baby was used for all subsequent babies.

## Birthweight

A baby's birthweight is a key indicator of health status. Babies are defined as low birthweight if their birthweight is less than 2,500 grams. Within this category, those weighing less than 1,500 grams are defined as very low birthweight (WHO 1992).

There is good evidence that babies of mothers who smoke during pregnancy have lower birthweights than babies of mothers who do not smoke (e.g. Wong & Bauman 1997, Bai et al. 2000, Mohsin et al. 2003, Chiolero et al. 2005). In 2003, the proportion of liveborn, low birthweight babies of mothers who smoked was 10.6%, twice that of babies of non-smoking mothers (5.1%). Similarly, babies of mothers who smoked had over twice the odds of low birthweight compared to babies of mothers who did not smoke (OR = 2.21, 95% CI = 2.11, 2.32). Very low birthweight occurred in 1.5% of liveborn babies of mothers who smoked during pregnancy compared with 0.8% of liveborn babies of mothers who did not smoke (Table 3.14).

**Table 3.14: Birthweight of live births, by mothers' tobacco smoking status during pregnancy and state and territory, 2003**

| Smoking status/ birthweight (g) | NSW | WA | SA[(a)] | ACT[(b)] | NT[(c)] | Total |
|---|---|---|---|---|---|---|
| | | | **Number** | | | |
| **Smoked** | | | | | | |
| Less than 1,500 | 188 | 55 | 72 | 15 | 18 | 348 |
| 1,500–2,499 | 1,199 | 435 | 335 | 66 | 118 | 2,153 |
| 2,500–4,499 | 11,432 | 4,071 | 3,875 | n.p. | n.p. | 20,787 |
| 4,500 and over | 111 | 46 | 47 | n.p. | n.p. | 219 |
| Not stated | 3 | — | — | — | — | 3 |
| **Total** | **12,933** | **4,607** | **4,329** | **590** | **1,051** | **23,510** |
| *Less than 2,500* | *1,387* | *490* | *407* | *81* | *136* | *2,501* |
| **Did not smoke** | | | | | | |
| Less than 1,500 | 625 | 166 | 93 | 42 | 11 | 937 |
| 1,500–2,499 | 3,000 | 912 | 570 | 187 | 136 | 4,805 |
| 2,500–4,499 | 67,900 | 18,449 | 12,167 | 3,890 | 2,042 | 104,448 |
| 4,500 and over | 1,395 | 363 | 277 | 107 | 37 | 2,179 |
| Not stated | 21 | — | — | 1 | — | 22 |
| **Total** | **72,941** | **19,890** | **13,107** | **4,227** | **2,226** | **112,391** |
| *Less than 2,500* | *3,625* | *1,078* | *663* | *229* | *147* | *5,742* |
| | | | **Per cent** | | | |
| **Smoked** | | | | | | |
| Less than 1,500 | 1.5 | 1.2 | 1.7 | 2.5 | 1.7 | 1.5 |
| 1,500–2,499 | 9.3 | 9.4 | 7.7 | 11.2 | 11.2 | 9.2 |
| 2,500–4,499 | 88.4 | 88.4 | 89.5 | n.p. | n.p. | 88.4 |
| 4,500 and over | 0.9 | 1.0 | 1.1 | n.p. | n.p. | 0.9 |
| Not stated | 0.0 | — | — | — | — | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| *Less than 2,500* | *10.7* | *10.6* | *9.4* | *13.7* | *12.9* | *10.6* |
| **Did not smoke** | | | | | | |
| Less than 1,500 | 0.9 | 0.8 | 0.7 | 1.0 | 0.5 | 0.8 |
| 1,500–2,499 | 4.1 | 4.6 | 4.3 | 4.4 | 6.1 | 4.3 |
| 2,500–4,499 | 93.1 | 92.8 | 92.8 | 92.0 | 91.7 | 92.9 |
| 4,500 and over | 1.9 | 1.8 | 2.1 | 2.5 | 1.7 | 1.9 |
| Not stated | 0.0 | — | — | 0.0 | — | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| *Less than 2,500* | *5.0* | *5.4* | *5.1* | *5.4* | *6.6* | *5.1* |

(a) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(b) 15.2% of women who gave birth in the ACT in 2003 were non-ACT residents. Care must be taken when interpreting percentages.

(c) For NT, smoking status was recorded at the first antenatal visit.

n.p. Data not published due to small numbers.

In 2003, the average birthweight for liveborn babies of mothers who did not smoke was higher than that of liveborn babies of mothers who smoked (3,413 grams compared with 3,181 grams), irrespective of Indigenous status (Table 3.15). The lowest average birthweight was for liveborn babies of Aboriginal and Torres Strait Islander mothers who smoked (3,035 grams). Liveborn babies of non-Indigenous mothers who smoked had an average birthweight of 3,202 grams. Babies of mothers who did not smoke were about 200 grams heavier than babies of smoking mothers in all categories.

**Table 3.15: Average birthweight of live births, by mothers' tobacco smoking status during pregnancy and Indigenous status, by state and territory, 2003**

| Indigenous status/smoking status | NSW | WA | SA[(a)] | ACT[(b)] | NT[(c)] | Total |
|---|---|---|---|---|---|---|
| **Indigenous** | | | | | | |
| Smoked | 3,065 | 3,032 | 2,921 | 3,010 | 3,035 | 3,035 |
| Did not smoke | 3,377 | 3,227 | 3,349 | 3,227 | 3,229 | 3,293 |
| **Total[(d)]** | **3,200** | **3,125** | **3,056** | **3,130** | **3,091** | **3,140** |
| **Non-Indigenous** | | | | | | |
| Smoked | 3,193 | 3,217 | 3,232 | 3,104 | 3,146 | 3,202 |
| Did not smoke | 3,418 | 3,400 | 3,423 | 3,438 | 3,404 | 3,416 |
| **Total[(d)]** | **3,386** | **3,369** | **3,370** | **3,399** | **3,343** | **3,381** |
| **All babies[(e)]** | | | | | | |
| Smoked | 3,181 | 3,185 | 3,212 | 3,099 | 3,081 | 3,181 |
| Did not smoke | 3,417 | 3,393 | 3,422 | 3,435 | 3,359 | 3,413 |
| **Total[(d)]** | **3,382** | **3,354** | **3,362** | **3,394** | **3,246** | **3,371** |

(a) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(b) 15.2% of women who gave birth in the ACT in 2003 were non-ACT residents. Care must be taken when interpreting averages.

(c) For NT, smoking status was recorded at the first antenatal visit.

(d) Includes records where smoking status was not stated.

(e) Includes records where Indigenous status was not stated.

## Apgar score at 5 minutes

Apgar scores are clinical indicators of the baby's condition shortly after birth, based on assessment of the heart rate, breathing, colour, muscle tone and reflex irritability. Between 0 and 2 points are given for each of these five characteristics, and the total score is between 0 and 10. An Apgar score of less than 7 at 5 minutes after birth is considered to be an indicator of complications and of compromise for the baby.

In 2003, 1.7% of liveborn babies born to mothers who smoked had a 5-minute Apgar score of less than 7, compared with 1.2% of babies of non-smokers (Table 3.16). The odds of a low Apgar score was 40% higher for liveborn babies of mothers who smoked compared with babies of mothers who did not smoke (OR = 1.35, 95% CI = 1.21, 1.51).

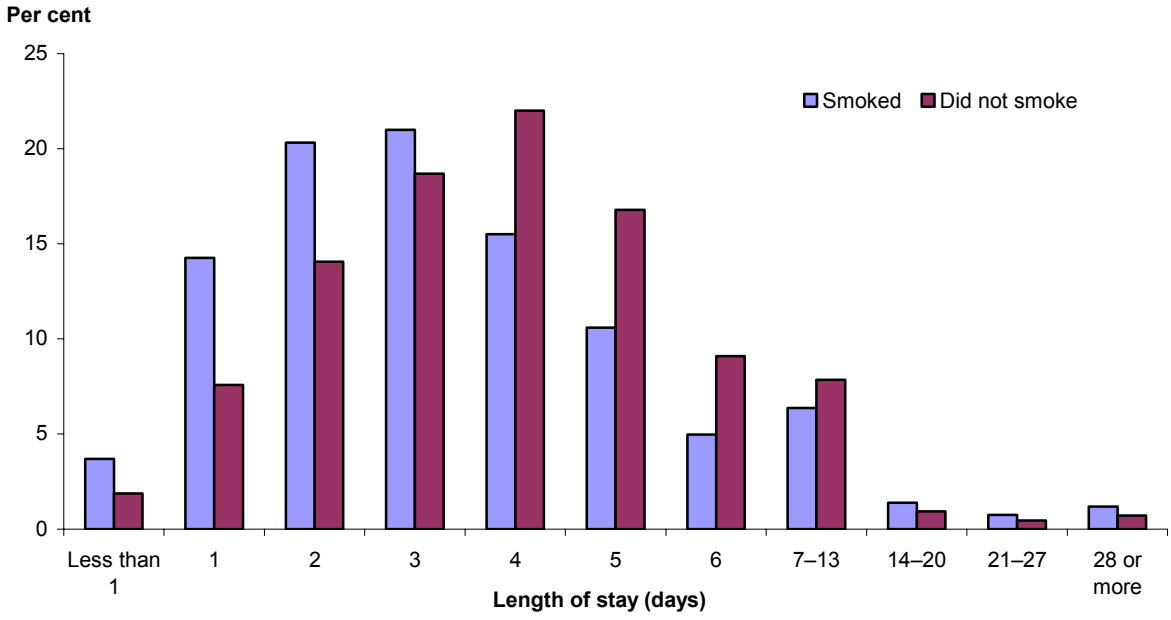
One in five liveborn babies with an Apgar score of less than 7 at 5 minutes had a mother who smoked during pregnancy (21.7%). Of liveborn babies with an Apgar score of 7–10, 17.1% had a mother who smoked.

**Table 3.16: Apgar score at 5 minutes for live births, by mothers' tobacco smoking status during pregnancy, 2003**

| Smoking status | 0–3 | 4–6 | 7–10 | Not stated | Total |
|---|---|---|---|---|---|
| | | | Number | | |
| Smoked | 74 | 328 | 23,019 | 89 | 23,510 |
| Did not smoke | 266 | 1,164 | 110,802 | 159 | 112,391 |
| Not stated | 13 | 9 | 607 | 10 | 639 |
| **Total** | **353** | **1,501** | **134,428** | **258** | **136,540** |
| | | | Per cent | | |
| Smoked | 0.3 | 1.4 | 97.9 | 0.4 | 100.0 |
| Did not smoke | 0.2 | 1.0 | 98.6 | 0.1 | 100.0 |
| Not stated | 2.0 | 1.4 | 95.0 | 1.6 | 100.0 |
| **Total** | **0.3** | **1.1** | **98.5** | **0.2** | **100.0** |

## Length of stay in hospital

Babies born in hospital in 2003 to mothers who smoked during pregnancy had a median length of stay of 3.0 days, while babies of mothers who did not smoke had a median length of stay of 4.0 days. Compared with babies of non-smokers, babies of mothers who smoked had higher proportions of hospital stays of 3 days or less (59.3% compared with 42.2%) and 14 days or more (3.3% compared with 2.1%). These data were not adjusted for method of birth or maternal age. The distributions of length of stay of babies born in hospitals are presented by smoking status of the mother in Figure 3.4.




*Source:* Table A4.

**Figure 3.4: Distribution of babies' length of stay in hospital, by mothers' tobacco smoking status during pregnancy, 2003**

Table 3.17 also shows that babies of smokers had either very short or very long stays in hospital. Babies staying less than one day or one day had the highest proportions of mothers who smoked (28.8% and 27.8% respectively).

**Table 3.17: Length of stay of babies born in hospitals[(a)], by mothers' tobacco smoking status during pregnancy, 2003**

| | Smoked | Did not smoke | Not stated | Total | Smoked | Did not smoke | Not stated | Total |
|---|---|---|---|---|---|---|---|---|
| **Length of stay** | **Number** | | | | **Per cent** | | | |
| Less than 1 day | 808 | 1,988 | 11 | 2,807 | 28.8 | 70.8 | 0.4 | 100.0 |
| 1 day | 3,123 | 8,091 | 24 | 11,238 | 27.8 | 72.0 | 0.2 | 100.0 |
| 2 days | 4,453 | 15,015 | 68 | 19,536 | 22.8 | 76.9 | 0.3 | 100.0 |
| 3 days | 4,602 | 19,964 | 92 | 24,658 | 18.7 | 81.0 | 0.4 | 100.0 |
| 4 days | 3,397 | 23,503 | 77 | 26,977 | 12.6 | 87.1 | 0.3 | 100.0 |
| 5 days | 2,320 | 17,924 | 78 | 20,322 | 11.4 | 88.2 | 0.4 | 100.0 |
| 6 days | 1,089 | 9,709 | 39 | 10,837 | 10.0 | 89.6 | 0.4 | 100.0 |
| 7–13 days | 1,396 | 8,373 | 67 | 9,836 | 14.2 | 85.1 | 0.7 | 100.0 |
| 14–20 days | 303 | 984 | 21 | 1,308 | 23.2 | 75.2 | 1.6 | 100.0 |
| 21–27 days | 161 | 477 | 9 | 647 | 24.9 | 73.7 | 1.4 | 100.0 |
| 28 or more days | 259 | 751 | 43 | 1,053 | 24.6 | 71.3 | 4.1 | 100.0 |
| Not stated | 2 | 38 | 1 | 41 | 4.9 | 92.7 | 2.4 | 100.0 |
| **Total** | **21,913** | **106,817** | **530** | **129,260** | **17.0** | **82.6** | **0.4** | **100.0** |

(a) Only babies who were discharged home are included.

## Admission to special care nurseries or neonatal intensive care units

Babies of mothers who smoked during pregnancy have been found to have higher levels of admission to a special care nursery (SCN) or neonatal intensive care unit (NICU) (Wong & Bauman 1997, Mohsin et al. 2003). In 2003, 20.4% of babies admitted to a SCN or NICU had a mother who smoked, compared with 16.7% for liveborn babies not admitted (Table 3.18). Of liveborn babies born to mothers who smoked, 17.2% were admitted to an SCN or NICU, compared with 13.8% of liveborn babies born to non-smoking mothers.

The odds for admission to a SCN or NICU was 30% higher for liveborn babies of mothers who smoked compared with those of non-smoking mothers (OR = 1.29, 95% CI = 1.24, 1.34).

**Table 3.18: Admission to special care nursery or neonatal intensive care unit for live births, by mothers' tobacco smoking status during pregnancy, 2003**

| Smoking status | Admitted | Not admitted | Not stated | Total |
|---|---|---|---|---|
| | | Number | | |
| Smoked | 4,041 | 19,468 | 1 | 23,510 |
| Did not smoke | 15,563 | 96,815 | 13 | 112,391 |
| Not stated | 234 | 404 | 1 | 639 |
| **Total** | **19,838** | **116,687** | **15** | **136,540** |
| | | Per cent | | |
| Smoked | 20.4 | 16.7 | 6.7 | 17.2 |
| Did not smoke | 78.5 | 83.0 | 86.7 | 82.3 |
| Not stated | 1.2 | 0.3 | 6.7 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** |

## Perinatal mortality

The fetal death rate in 2001–2003 was 8.8 per 1,000 births for babies born to mothers who smoked during pregnancy and 5.9 per 1,000 births for babies born to mothers who did not smoke. The risk of fetal death was 50% higher for babies of mothers who smoked compared with babies of mothers who did not smoke (RR = 1.50, 95% CI = 1.37, 1.64). Among the states and territories, fetal death rates for babies of mothers who smoked ranged from 7.6 to 10.6 per 1,000 births in 2001–2003 (Table 3.19).

Neonatal death data from the Northern Territory were unavailable. The overall neonatal death rate for the remaining jurisdictions was 3.5 per 1,000 live births for babies of mothers who smoked, compared with 2.5 per 1,000 live births for babies of non-smokers.

The perinatal death rate for babies born in 2001–2003 to mothers who smoked was 12.2 per 1,000 births. This was higher than the perinatal death rate of 8.4 per 1,000 births for babies of mothers who did not smoke (Table 3.19). Babies of mothers who smoked were 50% more likely to die during the perinatal period than babies of mothers who did not smoke (RR = 1.46, 95% CI = 1.36, 1.58).

**Table 3.19: Fetal, neonatal and perinatal deaths[a], by mothers' tobacco smoking status during pregnancy and state and territory, 2001–2003**

| Smoking status | NSW | WA | SA[b] | ACT[c] | NT[d] | Total |
|---|---|---|---|---|---|---|
| | | | Number | | | |
| **Fetal deaths** | | | | | | |
| Smoked | 376 | 132 | 102 | 21 | 31 | 662 |
| Did not smoke | 1,195 | 393 | 237 | 99 | 38 | 1,962 |
| **Neonatal deaths[e]** | | | | | | |
| Smoked | 139 | 61 | 41 | 16 | n.a. | 257 |
| Did not smoke | 566 | 119 | 97 | 52 | n.a. | 834 |
| **Perinatal deaths** | | | | | | |
| Smoked | 515 | 193 | 143 | 37 | n.a. | 919 |
| Did not smoke | 1,761 | 512 | 334 | 151 | n.a. | 2,796 |
| | | | Number per 1,000 births[f] | | | |
| **Fetal deaths** | | | | | | |
| Smoked | 9.0 | 8.8 | 7.6 | 10.6 | 10.1 | 8.8 |
| Did not smoke | 5.5 | 6.6 | 6.1 | 8.3 | 5.5 | 5.9 |
| **Neonatal deaths[e]** | | | | | | |
| Smoked | 3.4 | 4.1 | 3.1 | 8.2 | n.a. | 3.5 |
| Did not smoke | 2.6 | 2.0 | 2.5 | 4.4 | n.a. | 2.5 |
| **Perinatal deaths** | | | | | | |
| Smoked | 12.4 | 12.9 | 10.7 | 18.7 | n.a. | 12.2 |
| Did not smoke | 8.1 | 8.6 | 8.6 | 12.6 | n.a. | 8.4 |

(a) Perinatal deaths are based on deaths reported to the NPDC and differ from registered deaths compiled by the Australian Bureau of Statistics.

(b) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(c) 14.8% of women who gave birth in the ACT in 2001–2003 were non-ACT residents. Care must be taken when interpreting rates.

(d) For NT, smoking status was recorded at the first antenatal visit.

(e) Except in WA, these may exclude neonatal deaths within 28 days of birth for babies transferred to another hospital or readmitted to hospital and those dying at home.

(f) Fetal and perinatal death rates were calculated using all births (live births and stillbirths). Neonatal death rates were calculated using all live births.

n.a. Not available.

# 4 Data development for monitoring smoking in pregnancy

The *Report on the Evaluation of the Perinatal National Minimum Data Set* recommended that a national data element on smoking status during pregnancy be developed as a high priority (Laws & Sullivan 2004). This is supported by the association of smoking in pregnancy with poorer perinatal outcome that has been established in the literature and the current Australian data presented in this report. The National Advisory Group on Smoking and Pregnancy initiative is providing a framework for this data development work to be undertaken. This work would be undertaken by the National Perinatal Data Development Committee (NPDDC) which comprises representatives from the AIHW National Perinatal Statistics Unit, the Australian Bureau of Statistics, the Department of Health and Ageing, and perinatal data managers from each state and territory government health authority. The Committee also has a clinical reference group which provides clinical comment on data elements when required. The NPDDC is working towards the development of one or more standard national data elements on smoking status during pregnancy, with the intention of national collection of data on smoking during pregnancy.

These items would be included in the National Health Data Dictionary (NHDD) and AIHW's online metadata registry, METeOR, with a view to including them in the Perinatal National Minimum Data Set (NMDS). This would lead to nationally consistent and comparable data on smoking in pregnancy. The work would involve reaching national consensus on the information required and the stage/s of pregnancy for which data should be collected. The NPDDC will work in collaboration with other stakeholders and projects such as the Core Maternity Indicators Project to achieve this. The NPDDC would then develop standard definitions and rules for collection, in consultation with stakeholders, followed by a plan for implementation at the national level.

# Appendix 1: Tables

**Table A1: Females' smoking status by age group, 2001 and 2004 (per cent)**

| | 2001 | | | 2004 | | |
|---|---|---|---|---|---|---|
| **Age group** | **Current smoker** | **Non-smoker** | **Total** | **Current smoker** | **Non-smoker** | **Total** |
| 15–19 | 22.4 | 77.6 | 100.0 | 16.1 | 83.9 | 100.0 |
| 20–24 | 29.9 | 70.1 | 100.0 | 26.2 | 73.8 | 100.0 |
| 25–29 | 28.5 | 71.5 | 100.0 | 29.9 | 70.1 | 100.0 |
| 30–34 | 27.9 | 72.1 | 100.0 | 26.9 | 73.1 | 100.0 |
| 35–39 | 27.7 | 72.3 | 100.0 | 24.5 | 75.5 | 100.0 |
| 40–44 | 26.1 | 73.9 | 100.0 | 25.3 | 74.7 | 100.0 |
| **Total** | **27.0** | **73.0** | **100.0** | **24.8** | **75.2** | **100.0** |

*Note:* Current smokers include those who smoke daily, weekly, or less than weekly. Non-smokers were those who had never smoked, who had smoked less than 100 cigarettes in total, or who had quit.

*Source:* NDSHS unpublished data.

**Table A2: Mothers reporting smoking during pregnancy, by age, 2003**

| **Age group** | **Number** | **Number per 1,000 women who gave birth** |
|---|---|---|
| Less than 20 | 2,665 | 421.3 |
| 20–24 | 6,068 | 298.5 |
| 25–29 | 6,468 | 169.7 |
| 30–34 | 5,446 | 120.8 |
| 35 and over | 2,757 | 108.6 |

**Table A3: Mother's tobacco smoking status during pregnancy, by Indigenous status and state and territory, 2001 and 2002**

| Indigenous status/smoking status | NSW | WA | SA[(a)] | ACT | NT[(b)] | Total |
|---|---|---|---|---|---|---|
| | | | Number | | | |
| **Indigenous** | | | | | | |
| **2001** | | | | | | |
| Smoked | 1,245 | 801 | 247 | 22 | 577 | 2,892 |
| Did not smoke | 862 | 726 | 140 | 29 | 629 | 2,386 |
| Not stated | 3 | — | 11 | 1 | 279 | 294 |
| **Total** | **2,110** | **1,527** | **398** | **52** | **1,485** | **5,572** |
| **2002** | | | | | | |
| Smoked | 1,249 | 796 | 257 | 34 | 497 | 2,833 |
| Did not smoke | 901 | 810 | 166 | 38 | 621 | 2,536 |
| Not stated | 5 | — | 20 | — | 291 | 316 |
| **Total** | **2,155** | **1,606** | **443** | **72** | **1,409** | **5,685** |
| **Non-Indigenous** | | | | | | |
| **2001** | | | | | | |
| Smoked | 13,176 | 4,453 | 4,245 | 625 | 432 | 22,931 |
| Did not smoke | 69,035 | 18,514 | 12,479 | 3,589 | 1,658 | 105,275 |
| Not stated | 12 | — | 305 | 139 | 138 | 594 |
| **Total** | **82,223** | **22,967** | **17,029** | **4,353** | **2,228** | **128,800** |
| **2002** | | | | | | |
| Smoked | 12,578 | 4,136 | 4,136 | 665 | 465 | 21,980 |
| Did not smoke | 69,797 | 18,654 | 12,556 | 3,825 | 1,630 | 106,462 |
| Not stated | 8 | — | 286 | 120 | 138 | 552 |
| **Total** | **82,383** | **22,790** | **16,978** | **4,610** | **2,233** | **128,994** |

*(continued)*

**Table A3 (continued): Mother's tobacco smoking status during pregnancy, by Indigenous status and state and territory, 2001 and 2002**

| Indigenous status/smoking status | NSW | WA | SA[(a)] | ACT | NT[(b)] | Total |
|---|---|---|---|---|---|---|
| | | | Per cent | | | |
| **Indigenous** | | | | | | |
| **2001** | | | | | | |
| Smoked | 59.0 | 52.5 | 62.1 | 42.3 | 38.9 | 51.9 |
| Did not smoke | 40.9 | 47.5 | 35.2 | 55.8 | 42.4 | 42.8 |
| Not stated | 0.1 | — | 2.8 | 1.9 | 18.8 | 5.3 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **2002** | | | | | | |
| Smoked | 58.0 | 49.6 | 58.0 | 47.2 | 35.3 | 49.8 |
| Did not smoke | 41.8 | 50.4 | 37.5 | 52.8 | 44.1 | 44.6 |
| Not stated | 0.2 | — | 4.5 | — | 20.7 | 5.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Non-Indigenous** | | | | | | |
| **2001** | | | | | | |
| Smoked | 16.0 | 19.4 | 24.9 | 14.4 | 19.4 | 17.8 |
| Did not smoke | 84.0 | 80.6 | 73.3 | 82.4 | 74.4 | 81.7 |
| Not stated | 0.0 | — | 1.8 | 3.2 | 6.2 | 0.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **2002** | | | | | | |
| Smoked | 15.3 | 18.1 | 24.4 | 14.4 | 20.8 | 17.0 |
| Did not smoke | 84.7 | 81.9 | 74.0 | 83.0 | 73.0 | 82.5 |
| Not stated | 0.0 | — | 1.7 | 2.6 | 6.2 | 0.4 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

(a) For SA, 'Smoked' includes women who quit before the first antenatal visit.

(b) For NT, smoking status was recorded at the first antenatal visit.

**Table A4: Babies' length of stay in hospital, by mother's tobacco smoking status during pregnancy, 2003 (per cent)**

| Length of stay | Smoked | Did not smoke |
|---|---|---|
| Less than 1 day | 3.7 | 1.9 |
| 1 day | 14.3 | 7.6 |
| 2 days | 20.3 | 14.1 |
| 3 days | 21.0 | 18.7 |
| 4 days | 15.5 | 22.0 |
| 5 days | 10.6 | 16.8 |
| 6 days | 5.0 | 9.1 |
| 7–13 days | 6.4 | 7.8 |
| 14–20 days | 1.4 | 0.9 |
| 21–27 days | 0.7 | 0.4 |
| 28 or more days | 1.2 | 0.7 |
| Not stated | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** |

# Appendix 2: Technical notes

## Relative risk and odds ratio

In this report, relative risk and odds ratios were reported in Chapter 3 for birth in a public hospital and for baby outcomes. Relative risk was reported for perinatal mortality and odds ratios were reported for birth in a public hospital and the baby outcomes preterm birth, low birthweight, Apgar score at 5 minutes of less than 7, and admission to special care nursery or neonatal intensive care unit.

The relative risk is the ratio of the risk of a health outcome in the presence of an exposure to the risk of the outcome in the absence of the exposure. For example, it is a measure of the risk of perinatal death in babies of mothers who smoked during pregnancy compared to babies of mothers who did not smoke.

An odds ratio quantifies the relationship between an exposure and a health outcome. For example, it is a measure of the odds of low birthweight among babies of mothers who smoked during pregnancy compared to the odds of low birthweight among babies of mothers who did not smoke during pregnancy.

The odds ratio can be used as an estimate of relative risk when the occurrence of the outcome is rare.

Relative risk (RR) and odds ratios (OR) are calculated as:

**Table A5: Baby outcome by smoking status**

| Smoking status | Baby outcome | |
|---|---|---|
| | Yes | No |
| Smoked | a | c |
| Did not smoke | b | d |

$RR = (a \div (a+c)) \div (b \div (b+d))$

$OR = (a \div c) \div (b \div d)$

$= (a \times d) \div (b \times c)$

Where:

a = babies with the outcome of interest (e.g. low birthweight, perinatal death) whose mothers smoked during pregnancy.

b = babies with the outcome of interest whose mothers did not smoke during pregnancy.

c = babies without the outcome of interest whose mothers smoked during pregnancy.

d = babies without the outcome of interest whose mothers did not smoke during pregnancy.

A relative risk of 1.0 indicates that the outcome of interest is likely to occur equally for those with the exposure and those without the exposure (i.e. the risk is similar for those exposed and not exposed). A relative risk of 1.5 indicates that the outcome of interest is 1.5 times or 50% more likely to occur for those exposed compared to those not exposed and a

relative risk of 0.5 indicates that the outcome of interest is 0.5 times or 50% less likely to occur for those exposed compared to those not exposed.

An odds ratio of 1.0 indicates that the odds of the outcome of interest occurring for those with the exposure is similar to the odds of the outcome occurring for those without the exposure. An odds ratio of 1.5 indicates that the odds of the outcome occurring is 1.5 times or 50% greater for those exposed than the odds for those who were not exposed and an odds ratio of 0.5 indicates that the odds of the outcome occurring is 0.5 times or 50% less for those exposed than the odds for those not exposed.

## Age-standardisation

For this report, age-standardisation has been undertaken for Table 3.5 and Table 3.6. This has been done using the indirect method of standardisation because the populations of interest are small.

For Table 3.5, which presents indirectly age-standardised ratios of smoking during pregnancy by Indigenous status and state and territory, the standard population used was all non-Indigenous women who gave birth (i.e. the total for the five states and territories). This was because the proportion of non-Indigenous women who smoked during pregnancy was lower than the proportion for Aboriginal and Torres Strait Islander women who gave birth.

Table 3.6 presents data on smoking and not smoking during pregnancy by remoteness area of the mother's usual residence. The data were classified according to levels of remoteness of the mother's usual residence using the Australian Standard Geographical Classification's (ASGC) remoteness structure. The remoteness areas are Major cities, Inner regional, Outer regional, Remote and Very remote. The indirectly age-standardised ratios of smoking during pregnancy are presented by Remoteness area. The standard population used was women who gave birth whose area of usual residence was in the remoteness area of Major cities. This population was used because the proportion of women who smoked during pregnancy was lower for these women compared to women whose area of usual residence was in another area.

The indirect method involves the following steps:

- calculation of age-specific rates of smoking in pregnancy for the standard population;
- calculation of the number of women who were expected to have smoked during pregnancy if the standard age-specific rates applied to the populations of interest;
- comparison of the total number of smokers observed in the populations of interest to the number expected (that is, the ratio of observed to expected smokers in each population).

An indirectly age-standardised ratio for smoking during pregnancy of 1.0 indicates that the population of interest (for example, all Aboriginal and Torres Strait Islander women who gave birth) had a smoking rate similar to that of the comparison group (for example, all non-Indigenous women who gave birth). An indirectly age-standardised ratio for smoking during pregnancy of 1.2 indicates that the population of interest had a rate that was 20% greater than that of the comparison population and an indirectly age-standardised ratio for smoking during pregnancy of 0.8 indicates a rate 20% less.

## Confidence intervals

For the relative risk and odds ratios presented in Chapter 3 and the indirectly age-standardised ratios presented in Table 3.5 and Table 3.6, 95% confidence intervals were calculated. The 95% confidence interval is the range of values for these measures with a 95% probability of including the true value of these measures.

In general, if the 95% confidence interval contains 1.0, then there is considered to be no statistically significant difference between the groups, and if the 95% confidence interval does not contain 1.0 there is considered to be a statistically significant difference.

For relative risk and odds ratios presented in Chapter 3, if the 95% confidence interval contains 1.0, then the difference in the risk or the odds of the outcome (e.g. perinatal death, low birthweight) occurring in those exposed (ie. babies whose mothers smoked) compared to those not exposed (babies whose mothers did not smoke) is not considered to be statistically significant (at the 95% confidence level). Similarly, if the confidence interval does not contain 1.0, then the difference in the risk or the odds of the outcome occurring is considered to be statistically significant (at the 95% confidence level).

For the indirectly age-standardised ratios presented in Table 3.5 and Table 3.6, if the 95% confidence interval of the ratio contains 1.0, the smoking rate for the population of interest is not significantly different (at the 95% confidence level) from that of the comparison population. Similarly, if the 95% confidence interval does not contain 1.0, then there is a significant difference (at the 95% confidence level).

## Geographical location of usual residence

Data on Remoteness area of usual residence are presented in Table 3.6. The data used in this table were derived from data supplied by the states and territories on the area of usual residence of the mother. The area of usual residence is usually defined as the state or territory and SLA of usual residence. Although data for most mothers included the state or territory of usual residence, not all states and territories were able to provide this information in the form of an SLA code. Of the five jurisdictions for which data are presented in this report, New South Wales, South Australia, the Australian Capital Territory and the Northern Territory were able to provide SLA codes. These jurisdictions and Western Australia provided postcode information.

The AIHW NPSU mapped the supplied area of usual residence information for each mother to Remoteness area categories. Postcode was used because this was available for all five states and territories. This was undertaken on a probabilistic basis, as necessary, using ABS concordance information describing the distribution of the population by postcode and Remoteness area. Due to the probabilistic nature of this mapping, the Remoteness area data for individual mothers may not be accurate, however, the overall distribution of mothers by geographical areas is considered useful.

# Glossary

**Age standardisation:** A method of removing the influence of age when comparing populations with different age structures.

**Apgar score:** numerical score used to indicate the baby's condition at 1 minute and 5 minutes after birth.

**Baby's length of stay:** number of days between date of birth and date of separation from the hospital of birth (calculated by subtracting the date of birth from the date of separation).

**Birth status:** status of the baby immediately after birth.

**Birthweight:** the first weight of the baby (stillborn or liveborn) obtained after birth (usually measured to the nearest 5 grams and obtained within one hour of birth).

**Caesarean section:** operative birth by surgical incision through the abdominal wall and uterus.

**Confidence interval:** a range of values for a variable of interest with a specified probability of including the true value of the variable. In this report, 95% confidence intervals are used.

**Confounders:** factors that may mask the association between an exposure and an outcome.

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

**Forceps:** assisted birth using a metallic obstetric instrument.

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

**Gravidity:** number of previous pregnancies.

**Indirectly age-standardised ratio:** The ratio of the observed and expected numbers of women who smoked during pregnancy. The expected number of women who smoked during pregnancy is calculated as the number that would be expected if age-specific rates from the 'standard' population applied to the population of interest. The standard population is the one with which comparisons are to be made.

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

**Low birthweight:** birthweight of less than 2,500 grams.

**Maternal age:** mother's age at the birth of her baby.

**Multigravida:** pregnant woman who has had at least one previous pregnancy.

**Multipara:** pregnant woman who has had at least one previous pregnancy resulting in a live birth or stillbirth.

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

**Odds ratio:** a measure of association which quantifies the relationship between an exposure and health outcome. The odds ratio can be used as an estimate of relative risk when the occurrence of the outcome is rare.

**Parity:** number of previous pregnancies resulting in live births or stillbirths, excluding the current pregnancy.

**Perinatal death:** a fetal or neonatal death of at least 20 weeks gestation or at least 400 grams birthweight.

**Placenta praevia:** condition where the placenta is positioned over the neck of the cervix.

**Placental abruption:** premature separation of the placenta from the uterine wall.

**Post-term birth:** birth at 42 or more completed weeks of gestation.

**Pre-eclampsia:** a condition characterised by hypertension, protein in the urine, thinning of the blood and liver dysfunction.

**Preterm birth:** birth before 37 completed weeks of gestation.

**Primipara:** pregnant woman who has had no previous pregnancy resulting in a live birth or stillbirth.

**Relative risk:** the ratio of the risk of a health-related outcome in the presence of an exposure to the risk of the outcome in the absence of the exposure.

**Significant:** Statistically significant at the 95% level of confidence.

**Spontaneous vaginal:** birth without intervention in which the baby's head is the presenting part.

**Stillbirth:** see Fetal death.

**Teenage mother:** mother aged less than 20 years at the birth of her baby.

**Vacuum extraction:** assisted birth using a suction cap applied to the baby's head.

**Vaginal breech:** vaginal birth in which the baby's buttocks or lower limbs are the presenting parts.

**Very low birthweight:** birthweight of less than 1,500 grams.

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*Smoking and pregnancy* was commissioned by the National Advisory Group on Smoking and Pregnancy as part of an overall strategy to reduce smoking in pregnancy in Australia.

This report presents data on the characteristics of mothers who smoke in pregnancy and describes the perinatal outcomes of their babies. Data presented are principally from the National Perinatal Data Collection, and were available from five Australian states and territories.