

# Appendix: Technical and explanatory notes

## Technical notes

### Age-standardised rate ratios

In this report, age-standardised rate ratios, using the direct method of standardisation, were reported in Table 2.4 and Table 6.3. The standard population used was all women who gave birth in Australia in 2001.

The direct age-standardised method involves the following steps:

1. Calculate the age-specific rates for each age group. This is done by dividing the number of cases in each specified age group by the corresponding population in that age group. Multiply by 100 to express as a rate per 100.
2. Multiply each age-specific rate by the corresponding standard population in that age group.
3. Sum the results for each age group from Step 2 and divide this sum by the total standard population to obtain the age-standardised rate per 100.

Age-standardised rate ratios were calculated by dividing the Indigenous age-standardised rate by the non-Indigenous age-standardised rate. An age-standardised rate ratio of 1.0 indicates that Indigenous mothers had a rate similar to that of non-Indigenous mothers. An age-standardised rate ratio of 1.2 indicates that Indigenous mothers had a rate that was 20% higher than the rate for non-Indigenous mothers. An age-standardised rate ratio of 0.8 indicates that Indigenous mothers had a rate that was 20% lower than the rate for non-Indigenous mothers.

### Geographical location of usual residence

Data on remoteness area of usual residence are presented throughout Chapters 3 and 4. The data used in these tables 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 Statistical Local Area (SLA, a small unit within the ABS's Australian Standard Geographical Classification (ASGC)). 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.

The AIHW NPSU mapped the supplied area of usual residence information for each mother to remoteness area categories in the ASGC remoteness structure using a concordance between postcode and ASGC remoteness structure developed by the ABS. Postcode was used because this was available for all states and territories. This was done on a probabilistic basis, as necessary, using ABS concordance information describing the distribution of the population by postcode and remoteness area. Because of 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.

Records for mothers not usually resident in Australia and those whose area of usual residence was 'Not stated' were excluded from the tables.

## Socioeconomic status

Data on socioeconomic status are presented throughout Chapters 3 and 4. Socioeconomic Indexes for Areas (SEIFA) provide a summary measure for the socioeconomic conditions within an area. SEIFA were derived from the mother's postcode of usual residence because this was available for all states and territories. The index of advantage/disadvantage, which provides a continuum of advantage to disadvantage, was used. Low values indicate areas of disadvantage and high values indicate areas of advantage.

For 2001–2004, there were 598 records (1.7%) for which an index of advantage/disadvantage was not able to be assigned (Table 3.3). This was because the record was either missing a postcode or did not have a valid postcode.

## Linear regression

Linear regression was used for the analysis of trends in Chapter 6. Linear regression uses the least squares method to calculate a straight line that best fits the data and returns an array that best describes the line.

The simple linear regression line,  $Y = a + bX$ , is normally determined as an estimate from a collection of sample data values consisting of  $X$  values in the scope of the experiment and the corresponding  $Y$  values observed. One common way of estimating the line is the method of least squares. The goal of this method is to create a line that minimizes the summation of the residual error squared. The residual error values are the distances of each sample data point from the resulting best fit line.

Let us use  $ei$  to represent each residual error squared,  $yi$  to represent each observed value of  $y$ , and  $\hat{y}_i$  to represent the value of  $Y$  on the estimated line for each  $y_i$ . The method of least squares involves minimising  $\sum ei = \sum (y_i - \hat{y}_i)^2$ . This is done using partial derivatives, which yield the following formulas for  $a$  ( $y$  intercept estimate) and  $b$  (slope estimate):

$$b = (n\sum x_i y_i - (\sum x_i)(\sum y_i)) / (n\sum x_i^2 - (\sum x_i)^2)$$

$$a = (\sum y_i - b\sum x_i) / n$$

The slope estimate is the average annual change in the data over the period and was used in this report to determine whether there was an increase or decrease in the observed trends in perinatal data over the period 1991–2004. The standard error of the slope estimate was used to determine whether the apparent increases or decreases in the data were statistically significant at the  $p < 0.01$  level.

The formula used to calculate the slope estimate in Microsoft Excel is:

*LINEST* (*known\_y's*, *known\_x's*, *true*) entered as an array formula.

## Explanatory notes

This report does not publish cell sizes of three or less in state and territory tables. Exceptions to this are small numbers in 'Other' and 'Not stated' categories. The Australian Capital Territory requested that most cells where the number is less than 5 be suppressed. Where n.p. (not published) has been used to protect confidentiality, the suppressed numbers are included in the totals.

Throughout the report, for totals, percentages may not add up to 100, and for subtotals they may not add up to the sum of the percentages for the categories. This is due to rounding.

In this report the number of babies is marginally higher than the number of mothers because of multiple births. The terms 'mothers' or 'women who gave birth' have been used in this report when referring to maternal characteristics, whereas 'births' refers to babies.

For multiple pregnancies, items presented for mothers which may be different for each baby, such as place of birth and gestational age, are classified according to the characteristics of the firstborn baby. Where these items are presented for babies, each baby of a multiple birth is assigned the value of the firstborn baby.

# Glossary

**Aboriginal mothers:** women who gave birth who identified themselves as being of Aboriginal origin. May also include mothers identified as being of both Aboriginal and Torres Strait Islander origin.

**Aboriginal or Torres Strait Islander mothers:** women who gave birth who identified themselves as being of Aboriginal or Torres Strait Islander origin, or both.

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

**Assisted vaginal/instrumental delivery:** vaginal delivery using forceps or vacuum extraction.

**Augmentation of labour:** intervention during labour to assist the progress of labour.

**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 1 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.

**Fetal death (stillbirth):** death before the complete expulsion or extraction from its mother of a fetus 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:** metallic obstetric instrument used to assist birth.

**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.

**Indigenous mothers:** women who gave birth who identified themselves as being of Aboriginal or Torres Strait Islander origin, or both.

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

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

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

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

**Mother's length of stay:** number of days between admission date (during the admission resulting in a birth) and separation date (from the hospital where birth occurred). The interval is calculated by subtracting the date of admission from the date of separation.

**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.

**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.

**Plurality:** the number of births resulting from a pregnancy.

**Presentation at birth:** the part of the fetus that appears first at the mouth of the uterus during labour.

**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.

**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.

**Torres Strait Islander mothers:** women who gave birth who identified themselves as being of Torres Strait Islander origin. May also include mothers identified as being of both Torres Strait Islander and Aboriginal origin.

**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.

**Vertex presentation:** The most common and safest birth position where the baby's head is the presenting part.

# References

- ABS (Australian Bureau of Statistics) 2004. Experimental estimates and projections, Aboriginal and Torres Strait Islander Australians. ABS cat. no. 3238.0. Canberra: ABS.
- ABS & AIHW (Australian Institute of Health and Welfare) 2005. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples. ABS cat. no. 4704.0. Cat. no. IHW 14. Canberra: ABS & AIHW.
- AIHW (Australian Institute of Health and Welfare) 2005. Improving the quality of Indigenous identification in hospital separations data. Cat. no. HSE 101. (Health Services Series no. 25). Canberra: AIHW.
- Chan A, Keane R & Robinson J 2001. The contribution of maternal smoking to preterm birth, small for gestational age and low birthweight among Aboriginal and non-Aboriginal births in South Australia. *Medical Journal of Australia* 174(8): 389-93.
- Day P, Sullivan EA & Lancaster P 1999. Indigenous mothers and their babies, Australia 1994-1996. Cat. no. PER 9. Sydney: AIHW National Perinatal Statistics Unit.
- DHHS (Department of Health and Human Services) 2005. Council of Obstetric and Paediatric Mortality and Morbidity, Tasmania: annual report for 2003. Hobart: DHHS.
- DHHS 2006. Council of Obstetric and Paediatric Mortality and Morbidity, Tasmania: annual report for 2004. Hobart: DHHS.
- DHS (Department of Human Services) 2007. Koori health counts! 2005/06: Improving Care for Aboriginal and Torres Strait Islander Patients Program (ICAP). Melbourne: DHS.
- Graham S, Jackson Pulver LR, Wang YA, Kelly PM, Laws PJ, Grayson N & Sullivan EA 2007. The urban-remote divide for Indigenous perinatal outcomes. *Medical Journal of Australia* 186(10):509-12.
- HDSC (Health Data Standards Committee) 2006. National health data dictionary, Version 13. Cat. no. HWI 88. Canberra: AIHW.
- Jackson Pulver LR, Bush A & Ward J 2003. Identification of Aboriginal and Torres Strait Islander women using an urban obstetric hospital. *Australian Health Review* 26(2):19-25.
- Laws PJ, Grayson N & Sullivan EA 2006a. Australia's mothers and babies 2004. Cat. no. PER 34. Perinatal Statistics Series no. 18. Sydney: AIHW National Perinatal Statistics Unit.
- Laws PJ, Grayson N & Sullivan EA 2006b. Smoking and pregnancy. Cat. no. PER 33. Sydney: AIHW National Perinatal Statistics Unit.
- Middleton J, Halliday M & Sullivan M 2003. Mercy Hospital for Women report: data quality study on patient information (Aboriginal and Torres Strait Islander Status). Melbourne: Department of Human Services.
- Mohsin M, Wong F, Bauman A & Bai J 2003. Maternal and neonatal factors influencing premature birth and low birth weight in Australia. *Journal of Biosocial Science* 35(2):161-74.
- NHDC (National Health Data Committee) 2003. National health data dictionary, Version 12. Cat. no. HWI 43. Canberra: AIHW.
- Panaretto KS, Muller R, Patole S, Watson D & Whitehall JS 2002. Is being Aboriginal or Torres Strait Islander a risk factor for poor neonatal outcome in a tertiary referral unit in north Queensland? *Journal of Paediatrics and Child Health* 38:16-22.

Powell J & Dugdale AE 1999. Obstetric outcomes in an Aboriginal community: a comparison with the surrounding rural area. *Australian Journal of Rural Health* 7:13-17.

Taylor L & Lim K 2000. Quality of reporting of Aboriginality to the NSW Midwives Data Collection. *NSW Public Health Bulletin* 11(12):206-10.

WHO (World Health Organization) 1992. *International statistics classification of diseases and related health problems: 10<sup>th</sup> revision*. Geneva: WHO.

# List of tables

Table 2.1: Women who gave birth and births by Indigenous status and state and territory, 2001–2004.....	7
Table 2.2: Births to Indigenous mothers by birth status and year, 2001–2004 .....	8
Table 2.3: Live births by Indigenous status and state and territory, 2001–2003 .....	9
Table 2.4: Summary measures of perinatal health for Indigenous and non-Indigenous mothers and babies, 2001–2004 .....	10
Table 3.1: Indigenous mothers by maternal age and state and territory, 2001–2004 .....	14
Table 3.2: Indigenous mothers by maternal age and remoteness area of usual residence, 2001–2004 .....	15
Table 3.3: Indigenous mothers by maternal age and socioeconomic status, 2001–2004.....	16
Table 3.4: Indigenous mothers by parity and state and territory, 2001–2004 .....	17
Table 3.5: Indigenous mothers by maternal age and parity, 2001–2004 .....	18
Table 3.6: Indigenous mothers by parity and remoteness area of usual residence, 2001–2004 .....	20
Table 3.7: Indigenous mothers by parity and socioeconomic status, 2001–2004.....	21
Table 3.8: Indigenous mothers by tobacco smoking status during pregnancy and state and territory, 2001–2004.....	22
Table 3.9: Indigenous mothers by tobacco smoking status during pregnancy and remoteness area of usual residence, 2001–2004 .....	23
Table 3.10: Indigenous mothers by tobacco smoking status during pregnancy and socioeconomic status, 2001–2004 .....	24
Table 3.11 Indigenous mothers by tobacco smoking status during pregnancy and maternal age, 2001–2004 .....	25
Table 3.12: Indigenous mothers who smoked, by average number of cigarettes per day during the second half of pregnancy and state and territory, 2001–2004 .....	26
Table 3.13: Indigenous mothers who smoked during the second half of pregnancy by average number of cigarettes per day and maternal age, 2001–2004 .....	27
Table 3.14: Indigenous mothers by onset of labour, type of augmentation or induction and state and territory, 2001–2004.....	28
Table 3.15: Indigenous mothers by presentation of birth and state and territory, 2001–2004 .....	29
Table 3.16: Indigenous mothers by method of birth and state and territory, 2001–2004 .....	31
Table 3.17: Indigenous mothers by method of birth and remoteness area of usual residence, 2001–2004.....	32
Table 3.18: Indigenous mothers by method of birth and socioeconomic status, 2001–2004 .....	33

Table 3.19: Indigenous mothers by actual place of birth and state and territory, 2001–2004 .....	34
Table 3.20: Indigenous mothers who gave birth in hospital by hospital sector, 2001–2004 .....	35
Table 3.21: Indigenous mothers who gave birth in hospital by method of birth and hospital sector, 2001–2004.....	35
Table 3.22: Indigenous mothers who gave birth in hospital <sup>(a)</sup> by postnatal length of stay and maternal age, 2001–2004.....	36
Table 4.1: Live births to Indigenous mothers by sex and state and territory, 2001–2004.....	38
Table 4.2: Preterm births to Indigenous mothers by gestational age and state and territory, 2001–2004.....	39
Table 4.3: Births to Indigenous mothers by gestational age and plurality, 2001–2004.....	41
Table 4.4: Births to Indigenous mothers by gestational age and maternal age, 2001–2004 .....	42
Table 4.5: Live births to Indigenous mothers by birthweight and state and territory, 2001–2004 .....	43
Table 4.6: Live births to Indigenous mothers by birthweight and remoteness area of usual residence, 2001–2004 .....	44
Table 4.7: Live births to Indigenous mothers by birthweight and socioeconomic status, 2001–2004 .....	45
Table 4.8: Live births to Indigenous mothers by birthweight and maternal age, 2001–2004 .....	46
Table 4.9: Mean birthweight (g) of live births to Indigenous mothers by tobacco smoking status during pregnancy and state and territory, 2001–2004.....	47
Table 4.10: Live births to Indigenous mothers by Apgar score at 5 minutes and state and territory, 2001–2004.....	48
Table 4.11: Live births to Indigenous mothers by Apgar score at 5 minutes and remoteness area of usual residence, 2001–2004 .....	48
Table 4.12: Live births to Indigenous mothers in hospital by length of stay and state and territory, 2001–2004.....	50
Table 4.13: Live births to Indigenous mothers in hospital by length of stay and remoteness area of usual residence, 2001–2004 .....	51
Table 4.14: Live births to Indigenous mothers in hospitals, by length of stay and socioeconomic status, 2001–2004 .....	52
Table 4.15: Fetal, neonatal and perinatal deaths of babies born to Indigenous mothers by state and territory, 2001–2004 .....	54
Table 5.1: How the Indigenous status of the mother is obtained, by state and territory, 2007 .....	59
Table 5.2: Whether Indigenous status is commonly checked and/or validated by midwives, by state and territory, 2007 .....	60

Table 5.3: Women who gave birth by Indigenous status and state and territory, 1991 to 2004.....	62
Table 5.4: Resident and non-resident women who gave birth in the Australian Capital Territory by Indigenous status, 1993 to 2004 .....	64
Table 6.1: Rates (proportions) and rate ratios of Indigenous and non-Indigenous mothers by maternal age, 1991 to 2004 .....	73
Table 6.2: Rates (proportions) and rate ratios of Indigenous and non-Indigenous first-time mothers by maternal age, 1991 to 2004.....	75
Table 6.3: Age-standardised rate (proportion) and rate ratios of Indigenous and non-Indigenous women who gave birth by caesarean section, 1991 to 2004 .....	77
Table 6.4: Rates (proportion) and rate ratios of low birthweight babies born to Indigenous and non-Indigenous mothers, 1991 to 2004.....	79
Table 6.5: Rates (proportion) and rate ratios of preterm babies born to Indigenous and non-Indigenous mothers, 1991 to 2004.....	81
Table 6.6: Fetal deaths per 1,000 births to Indigenous and non-Indigenous mothers, 1991-1993 to 2002-2004.....	83

# List of figures

Figure 2.1: Age profile of women in the reproductive population by Indigenous status, 2001–2004 .....	6
Figure 2.2: Proportion of women who gave birth who were Indigenous by state and territory, 2001–2004 .....	7
Figure 2.3: Age-standardised proportions for selected perinatal outcomes by maternal Indigenous status, 2001–2004.....	11
Figure 3.1: Maternal age of Indigenous and non-Indigenous mothers, 2001–2004 (per cent) .....	13
Figure 3.2: Primiparous and multiparous Indigenous mothers by maternal age, 2001–2004 (per cent) .....	19
Figure 3.3: Smoking during pregnancy of Indigenous and non-Indigenous mothers, by remotene area of usual residence, 2001–2004 (per cent) .....	23
Figure 3.4: Method of birth for Indigenous and non-Indigenous mothers, 2001–2004 (per cent) .....	30
Figure 4.1: Gestational age group of babies born to Indigenous and non-Indigenous mothers, 2001–2004 (per cent).....	40
Figure 4.1: Perinatal and infant death periods .....	53
Figure 5.1a: Proportions of Indigenous mothers, by state and territory, 1991 to 2004.....	65
Figure 5.1b: Proportions of Indigenous mothers, by state and territory, 1991 to 2004.....	66
Figure 5.2a: Coefficient of variation for the number of Indigenous mothers, by state and territory, 1991–1995 to 2000–2004.....	67
Figure 5.2b: Coefficient of variation for the number of Indigenous mothers, by state and territory, 1991–1995 to 2000–2004.....	68
Figure 6.1: Age-standardised rate (proportion) of Indigenous and non-Indigenous women who gave birth by caesarean section, 1991 to 2004.....	76
Figure 6.2: Proportion of low birthweight singleton live babies born to Indigenous and non-Indigenous mothers, 1991 to 2004 .....	78
Figure 6.3: Rates (proportions) of preterm singleton live babies born to Indigenous and non-Indigenous mothers, 1991 to 2004 .....	80
Figure 6.4: Fetal death rate (per 1,000 births) for babies born to Indigenous and non-Indigenous mothers, 1991–1993 to 2002–2004 .....	82