

**Neonatal Network Series**  
**Number 2**

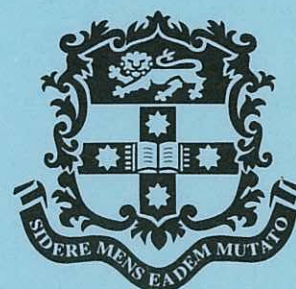
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**Australian & New Zealand  
Neonatal Network  
1995**

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**Deborah Donoghue**

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**Australian Institute of Health and Welfare  
National Perinatal Statistics Unit  
Neonatal Network Series  
Number 2**

**Australian & New Zealand  
Neonatal Network  
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**Deborah Donoghue**

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**Paul Lancaster  
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AIHW National Perinatal Statistics Unit  
Sydney, 1997  
ISSN 1326-012X  
AIHW Catalogue no. PER 5

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# Acknowledgements

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The Australian and New Zealand Neonatal Network could not exist without the hard work and perseverance of the many people who contribute to the network. In particular, we would like to thank the people and organisations who are listed below for their invaluable help with this data collection and the running of the network:

## New South Wales

John Hunter Hospital, Newcastle

Ms Kris Evans, Ms Michelle Giles, Dr Andrew Gill (Director)

King George V Memorial Hospital, Sydney

Dr Phil Beeby, Dr Nick Evans (Director), Ms Naomi Rynne

Liverpool Hospital, Sydney

Dr Robert Guaran (Director), Ms Catherine Medlin, Ms Kim Psaila

Nepean Hospital, Sydney

Dr Lyn Downe (Director), Ms Mee Fong Chin

Royal Alexandra Hospital for Children, Sydney

Dr Andrew Berry (Director), Dr Robert Halliday, Ms Sharon Laing, Dr Julian Wojtulewicz

Royal Hospital for Women, Sydney

Dr Howard Chilton (Director), Ms Clare Foreshaw

Royal North Shore Hospital, Sydney

Dr Martin Kluckow, Dr Garth Leslie (Director), Ms Pamela Ma

Sydney Children's Hospital (formerly Prince of Wales Children's Hospital), Sydney

Dr Barry Duffy (Director), Ms Janelle Young

Westmead Hospital, Sydney

Ms Jane Baird, Dr Elizabeth John (Director), Dr Kei Lui

## Victoria

Mercy Hospital for Women, Melbourne

Associate Professor John Drew (Director), Dr Simon Fraser

Monash Medical Centre, Melbourne

Ms Kaye Bawden, Ms Marie Hayes, Professor Victor Yu (Director)

Royal Children's Hospital, Melbourne

Dr Neil Campbell (Director), Ms Marilyn Cocciardi, Ms Roslyn Dineen, Dr Peter Loughnan,

Dr Peter MacDougall, Dr Mike Stewart.

Royal Women's Hospital, Melbourne

Dr Ellen Bowman, Dr Ananda Dharmalingham, Dr Robert Jankov, Dr Neil Roy (Director)

## Queensland

Kirwan Hospital for Women, Townsville

Dr Sally Almonte, Dr John Whitehall (Director)

Mater Misericordiae Mother's Hospital, Brisbane

Dr Peter Gray, Dr David Tudehope (Director)

Royal Women's Hospital, Brisbane

Ms Angela Barlow, Dr David Cartwright (Director), Professor Paul Colditz (Perinatal Research Centre), Ms Karen Hose, Ms Megan Robertson.

## South Australia

Flinders Medical Centre, Adelaide

Ms Joy Davies, Dr Simon James, Dr Peter Marshall (Director)

Women's & Children's Hospital (formerly Queen Victoria), Adelaide

Ms Elizabeth Gent, Ms Eileen Hancock, Dr Ross Haslam (Director), Mr Ron Russo



## **Western Australia**

King Edward Memorial Hospital for Women, Perth

Associate Professor Alfred Grauaug (Director), Dr Ronald Hagan, Dr Rolland Kohan

Princess Margaret Hospital for Children, Perth

Ms Lois Chave, Dr Paddy Pemberton (Director), Ms Theresa Whyatt

## **Tasmania**

Royal Hobart Hospital, Hobart

Dr Graham Bury (Director)

## **Australian Capital Territory**

The Canberra Hospital (formerly Woden Valley), Canberra

Mr John Edwards, Dr Guan Koh, Dr Graham Reynolds (Director)

## **Northern Territory**

Royal Darwin Hospital, Darwin

Dr David Brewster, Dr Ian Humphrey (Director), Dr Mike Williams

## **New Zealand**

Christchurch Women's Hospital, Christchurch

Ms Louise Brass, Associate Professor Brian Darlow, Dr Helen Liley (Director)

Dunedin Hospital, Dunedin

Dr Roland Broadbent (Director)

Middlemore Hospital, Auckland

Dr Jacki Stack (Director), Dr Maisie Wong (Director)

National Women's Hospital, Auckland

Dr David Knight (Director), Ms Nicole Shirley

Waikato Hospital, Hamilton

Dr David Bouchier (Director), Dr Phil Weston

Wellington Women's Hospital, Wellington

Dr Keith Fisher, Dr Vaughan Richardson (Director), Dr Roslyn Selby

and

NSW Neonatal Intensive Care Units Study, Sydney, NSW

Ms Barbara Bajuk, Dr Lee Sutton

NSW Perinatal Services Network, Sydney, NSW

Mr Neill Jones, Mr Amaro Roach.

We also wish to gratefully acknowledge the generous sponsorship from Glaxo Wellcome Australia Limited and Glaxo Wellcome New Zealand Limited, our primary benefactors. Through the *Breath of Life* program, they have assisted with the sponsorship of the network and enabled the Directors to attend meetings during 1995.

We thank Paul Lancaster, David Henderson-Smart and Brian Darlow for reviewing the report and making helpful comments on its contents. We also appreciate the invaluable assistance of Ms Jishang Huang from the NPSU for her computing assistance.

The AIHW National Perinatal Statistics Unit is a collaborating unit of the Australian Institute of Health and Welfare and is based at the University of Sydney.

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**Suggested citation:**

Donoghue DA 1997. Australian and New Zealand Neonatal Network, 1995. Sydney: AIHW National Perinatal Statistics Unit: Neonatal Network Series No. 2.

# Abbreviations

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AIHW	Australian Institute of Health and Welfare
ANZNN	Australian and New Zealand Neonatal Network
NH&MRC	National Health and Medical Research Council of Australia
NPSU	National Perinatal Statistics Unit
WHO	World Health Organisation
APH	Antepartum haemorrhage (an antenatal complication)—see definitions
BE	Base excess
BW	Birthweight (in grams)—see definitions
CPAP	Continuous positive airways pressure (a form of assisted ventilation)—see definitions
DOA	Date of admission
DOB	Date of birth
FiO <sub>2</sub>	Fractional inspired oxygen level (measures amount of supplemental oxygen)—see definitions
GA	Gestational age (in completed weeks)—see definitions
HMD	Hyaline membrane disease (a respiratory disorder)
ICD.9.CM	International Classification of Diseases, 9th revision, clinical modification
IPPR	Intermittent positive pressure respiration (a form of assisted ventilation)—see definitions
IUGR	Intrauterine growth restriction (an antenatal complication)—see definitions
IVF	In vitro fertilisation
IVH	Intraventricular haemorrhage (a brain disorder)—see definitions
Mec Asp n	Meconium aspiration syndrome (a respiratory disorder)—see definitions Number
NEC	Necrotising enterocolitis (a gut disorder)—see definitions
NICU	Neonatal Intensive Care Unit
O <sub>2</sub>	Oxygen
P <sub>a</sub> O <sub>2</sub>	Partial inspired oxygen (a method of measuring oxygenation)—see definitions
PIH	Hypertension in pregnancy (an antenatal complication)—see definitions
PMA	Post menstrual age (gestational age plus chronological age in weeks)
PPH	Pulmonary hypertension (a respiratory disorder)—see definitions
PPROM	Preterm pre-labour rupture of membranes (an antenatal complication)—see definitions
PROM	Prolonged rupture of membranes (an antenatal complication)—see definitions
PTL	Preterm labour (an antenatal complication)—see definitions
PVL	Periventricular leukomalacia (a brain disorder)—see definitions
ROP	Retinopathy of prematurity (an eye disorder)—see definitions
S <sub>a</sub> O <sub>2</sub>	Oxygen saturation (a method of measuring oxygenation)
T <sub>c</sub> PO <sub>2</sub>	Transcutaneous partial pressure of oxygen (a method of measuring oxygenation)
TTN	Transient tachypnoea of the newborn (a respiratory disorder)—see definitions
PO	Post Office
ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
Qld	Queensland
SA	South Australia
Tas	Tasmania
Vic	Victoria
WA	Western Australia



# Highlights

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- In 1995, all 29 level III Neonatal Intensive Care Units (NICUs) in Australia and New Zealand participated in and contributed data to the Australian and New Zealand Neonatal Network (ANZNN). One part of the network's function is an audit of infants admitted to NICUs who are thought to be most at risk of poor outcome. These infants include those born at less than 32 weeks' gestation, those born weighing less than 1500 grams, those who received assisted ventilation or those who have major surgery.
- A total of 5,771 infants who met the ANZNN criteria were born in 1995. Of these infants 2,863 were born at less than 32 weeks' gestation and 2,543 were born weighing less than 1,500 grams. A total of 4,856 infants received assisted ventilation and 775 had major surgery.
- Antenatal corticosteroids are a proven therapy that is given to mothers just before the birth to enhance fetal lung maturity. They were given to 78.8% of infants who were born at less than 32 weeks' gestation, in accordance with NH&MRC recommendations.
- The national rate of multiple birth is 2.7%, however 26.0% of infants born at less than 32 weeks' gestation were from a multiple pregnancy.
- For these infants admitted to a NICU, overall 74.5% were born in a perinatal centre. This proportion rose to 90.5% for those born at less than 32 weeks' gestation, meeting NH&MRC guidelines.
- Overall, 52.4% of these infants were born by caesarean section; this rate was similar for infants born at less than 32 weeks' gestation. Of the caesarean sections, 41.9% occurred prior to the onset of labour. The caesarean section rate for all confinements in Australia in 1994 was 19.4% with just over half of these occurring before labour.
- Assisted ventilation was given to 4,857 infants in a NICU during 1995. Of these infants 2,381 were born at less than 32 weeks' gestation. Intermittent positive pressure respiration (IPPR) was given for a total of 36,407 days; continuous positive airways pressure for 22,788 days. Exogenous surfactant was given to 80.0% of the infants who were intubated for respiratory distress syndrome.
- There were 775 infants who were admitted to a NICU prior to day 28 and had major surgery. Of these, 424 (54.7%) were born at term and these infants were in hospital for a median of 20 days. This was nearly a week longer than the total group of term infants admitted to a NICU.
- Sixty-four per cent of infants born at less than 32 weeks' gestation did not have any signs of intraventricular haemorrhage on early ultrasound. However, 7.4% of the infants examined did have a significant haemorrhage (grade III or IV).
- For infants born at less than 32 weeks' gestation and still in their registration hospital on day 42 of life, 64.3% were known to have no retinopathy of prematurity and 7.5% had significant eye disease (Stage III or IV).
- The majority of infants (89.5%) survived to go home. In general, the survival of infants admitted to a NICU increased by week of gestation from 39.6% at 23 weeks to 97.9% at 31 weeks. The data for the higher gestational age groups differ in that they reflect a selected population of infants who not only require NICU, but assisted ventilation or surgery. Here the survival rates vary from 79.2% to 96.9%.
- These data provide a basis from which our objectives (including feedback to NICUs of adjusted mortality / morbidity rates) can be fulfilled; further improving the care of these vulnerable infants.



# 1 History and structure

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## 1.1 History

After several meetings to discuss the concept of an Australian audit of clinical care in Neonatal Intensive Care Units (NICUs), the Directors of Australian NICUs decided in July 1993 that a network should be set up. Internationally, there had been an increasing tendency to form such networks to pool data on neonatal morbidity and mortality, and thus provide quality assurance for this resource-consuming care. Networking, collaboration and cooperation have been hallmarks of perinatal care in Australia and New Zealand. The Health Care Committee of the National Health and Medical Research Council's Expert Panel on Perinatal Morbidity had recommended, 'The Australian Institute of Health and Welfare National Perinatal Statistics Unit (AIHW NPSU), in collaboration with the directors and staff of all neonatal intensive care units, should develop a national minimum data set and implement data collection to monitor mortality and morbidity of infants admitted to such units' (Health Care Committee Expert Panel on Perinatal Morbidity 1995 p xvi).

The prospective data collection commenced for babies born from 1 January 1994. All level III units in Australia and New Zealand are contributing data for babies born from 1 January 1995.

## 1.2 Structure

The Australian and New Zealand Neonatal Network (ANZNN) is set up under the National Perinatal Statistics Unit (NPSU), a collaborating unit of the Australian Institute of Health and Welfare (AIHW) at the University of Sydney.

The structure of ANZNN comprises three Coordinators. Associate Professor Paul Lancaster is the Director of the Australian Institute of Health and Welfare National Perinatal Statistics Unit, University of Sydney; Professor David Henderson-Smart is a neonatologist at King George V Memorial Hospital, the Professor of Perinatal Medicine at the University of Sydney and Director of the NSW Perinatal Services Network and the NSW Centre for Perinatal Health Services Research; and Associate Professor Brian Darlow is a neonatologist at Christchurch Women's Hospital and at the Christchurch School of Medicine, University of Otago, New Zealand.

The Advisory Committee is made up of the Directors (or their nominees) of each participating Australian and New Zealand NICU. The ANZNN Advisory Committee met in Auckland in April, 1995 and again in Sydney in November 1995. This group now meets once a year, in association with the Perinatal Society of Australia and New Zealand's annual congress. The role of the Advisory Committee is to advise the ANZNN and to approve use of the data.

The full-time Senior Research Assistant at AIHW NPSU is currently funded by sponsorship from Glaxo Wellcome Australia. Deborah Donoghue was appointed to that position in late 1994. Duties include visiting the units and maintaining contact with them; data entry, verification, tabulation and presentation; taking minutes at the meetings and general administration. The part-time Research Nurse located in Christchurch was sponsored by Glaxo Wellcome New Zealand to establish the network. Louise Brass was appointed in April 1995 to deal with the local issues in New Zealand, including organising data collection, validation of data and general correspondence between Australian research units and New Zealand.

## 2 Data set

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### 2.1 Registration criteria

The cohort for 1995 included all liveborn babies who were admitted to a hospital with a level III Neonatal Intensive Care Unit (NICU) at less than 28 days, or who were transferred from a labour ward with the intention of admission to the unit and met the following criteria:

- < 32 completed weeks' gestation; or
- < 1500 grams birthweight; or
- required assisted ventilation (IPPR / CPAP) for more than or equal to four consecutive hours; or
- required major surgery.

Hospital of registration is the first NICU that the baby remained in for more than four hours. For the purpose of this report, babies transferred were considered to be in the hospital to which they were transferred to from the time the transport team arrived to collect them.

In 1995, 99% of the infants came from NICUs collecting data on the above cohort (see Appendix 3). One unit collected information only on those infants born weighing less than 1500 g birthweight criteria. This was due to previous commitments to other databases.

### 2.2 Data set variables

The sixty variables and their definitions for the 1995 collection are listed in Appendix 1. In 1995, most units collected the complete data set (see Appendix 3). In fact, 48 of the variables were recorded for at least 95.0% of the infants, and there were 22 items where the information was known for more than 95.0% of the infants. Thirty items were known for more than 90% of the infants. The only data items not known for at least 70.0% of the group were the three items relating to late head ultrasound, an item that is not often relevant for more mature infants. In a few minor instances, some units record only abnormal results, such as grade III retinopathy of prematurity, while normal findings at eye examinations are not recorded. Again, it was decided to use whatever data were available for the 1995 collection as long as it met the agreed definitions.

### 2.3 Data collection

Data are collected in the hospitals by either filling out the specific ANZNN forms or by incorporating the ANZNN data items into the local NICU audit. Data are transferred to the ANZNN database either on forms, or electronically. Confidentiality guidelines (Appendix 5) are followed.

### 2.4 Data verification

Missing or anomalous data are identified and queried soon after entry onto the main database. Quantification of errors and ways of minimising them have begun.

A full data verification process was instituted in 1996. Five randomly selected records are checked at each unit by the research staff who are blinded to their choice. The data for those infants who have moved from one NICU to another, and thus require 'merging' will need to be checked at the next round of visits to the unit. The preliminary results from the data validation study are available for 15 NICUs, 12 of which participated in the 1994 data collection, and all participated in the 1995 data collection. A Kappa statistic of greater than 7.0 was obtained for 29 of the 40 (72.5%) items where this statistic was considered appropriate. Further analysis of this data is underway and will be reported when all data are available.



# 3 Results

## 3.1 In general

A total of 5,771 infants who met the ANZNN criteria and were born in the 1995 calendar year were admitted to the twenty-nine contributing Neonatal Intensive Care Units (NICUs) throughout Australia and New Zealand. Of these infants 2,863 were born at less than 32 weeks' gestation (Table 1, Figure 1) and 2,543 were born weighing less than 1,500 grams (Table 2, Figure 2). A total of 4,856 infants were given assisted ventilation and 775 required major surgery (Table 3). While these data generally represent the sickest infants they do not represent all infants admitted to a NICU, as many infants require other assistance and observation. In 1995 there were 256,190 livebirths registered in Australia (Australian Bureau of Statistics 1997) and 57,791 in New Zealand (Statistics New Zealand 1996). The ANZNN cohort represents 1.8% of the 313,981 total births for the two countries.

Infants are referred to as preterm if they are born at less than 37 weeks' gestation. In this report, "term" refers to all infants of 37 weeks gestation or more as only one infant in this group was "post-term" at 44 weeks' gestation. Data in tables are by gestational age group (adapted from WHO groups and NSW role

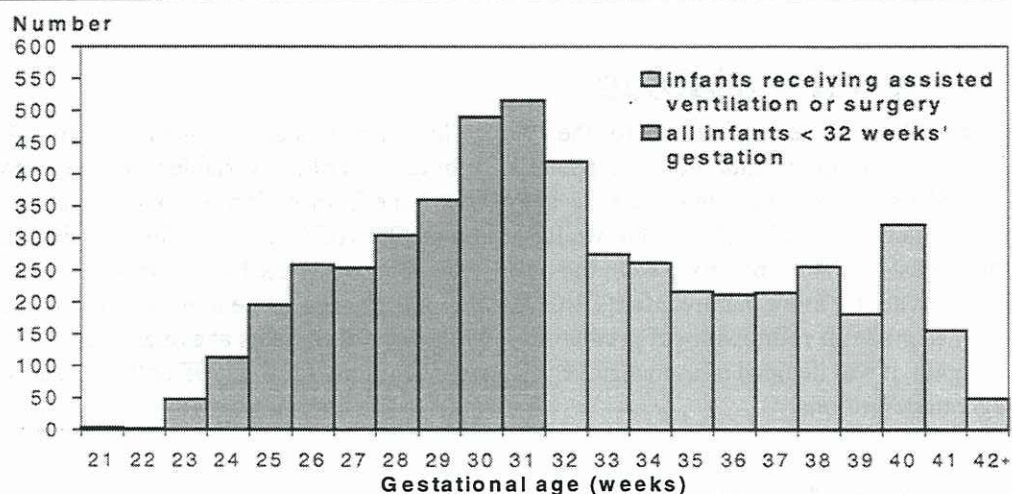


Figure 1: Number of infants in the ANZNN cohort admitted to the 29 NICUs by gestational age, 1995

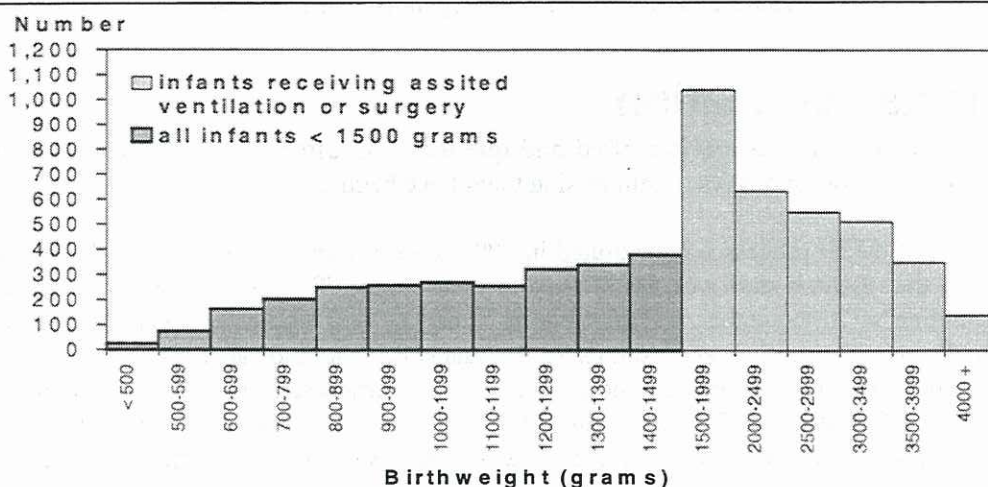


Figure 2: Number of infants in the ANZNN cohort admitted to the 29 NICUs by birthweight group, 1995

delineation guidelines) and by birthweight group. Data in the figures are represented by gestational age divisions as gestational age is thought to be well documented in these infants and is more useful during the antenatal period as it is more accurate than birthweight estimation.

While there has been a marked increase in the proportion of units collecting all the data items, it should be noted that not all units collect all data items and the data is not yet complete (Section 2.2, Appendix 3)

### 3.1.1 Neonatal care

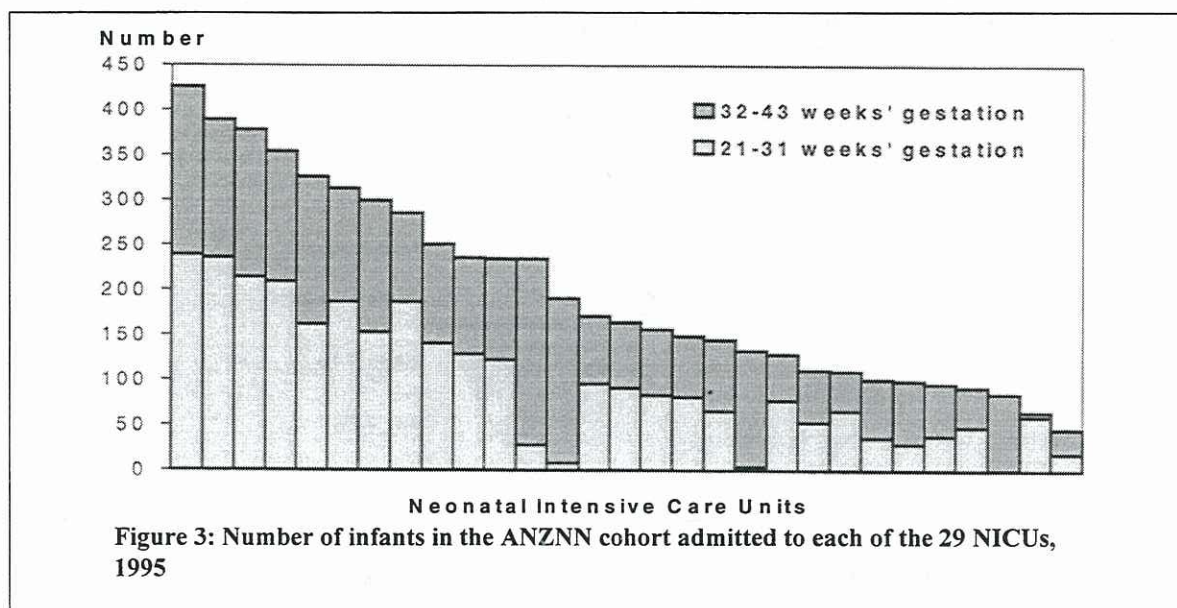
Neonatal care is provided at three levels. 'Level one' care is for normal healthy term infants, some of whom may require short term nursery observation during the first few hours of life. 'Level two' or 'special care' refers to the level of nursery that generally deals with infants who are born at 32 to 36 weeks' gestation or weighing less than 2,500 grams at birth. It includes the care for infants who require intravenous therapy or antibiotics, and/or those who are convalescing after intensive care, and/or those who need simple cardiorespiratory monitoring, and/or those who need short term oxygen therapy (generally a need of less than 40% oxygen). 'Level three' or intensive care refers to the needs of infants who require much more specialised care and treatment. It includes most infants born at less than 32 weeks' gestation, or less than 1,500 grams birthweight, and others that may require parenteral nutrition, and/or surgery, and/or cardiorespiratory monitoring for management of apnoea or seizures, and/or require assisted ventilation (IPPR or CPAP), and / or oxygen therapy over 40% or long-term oxygen.

Hospitals with a NICU provide all three levels of care. In 1995 there were 29 NICUs in Australia and New Zealand with 983 beds for neonates. It is important to note that in some hospitals there may be a number of other beds for neonates that do not come under the auspices of the NICU. Other hospitals which do not have a NICU may also provide the level two and level one care needed for newborn infants. These are referred to as non-tertiary hospitals in this report.

### 3.1.2 Number of infants

The number of infants who met the ANZNN registration criteria for each NICU in 1995 varied from just over fifty to more than four hundred (Figure 3). This reflects both the size of the unit and the mix of patients. Also, in one NICU the full cohort of infants was not collected.

The registration hospital is designated as the first NICU in which the baby remains for more than four hours. If a baby is born in a hospital with a NICU but is transferred to another NICU at two hours of age, say, for specialised surgery for a congenital malformation that has been diagnosed antenatally, then the infant is assigned to the second hospital. Every effort has been made to track infants from hospital to hospital to avoid duplication.





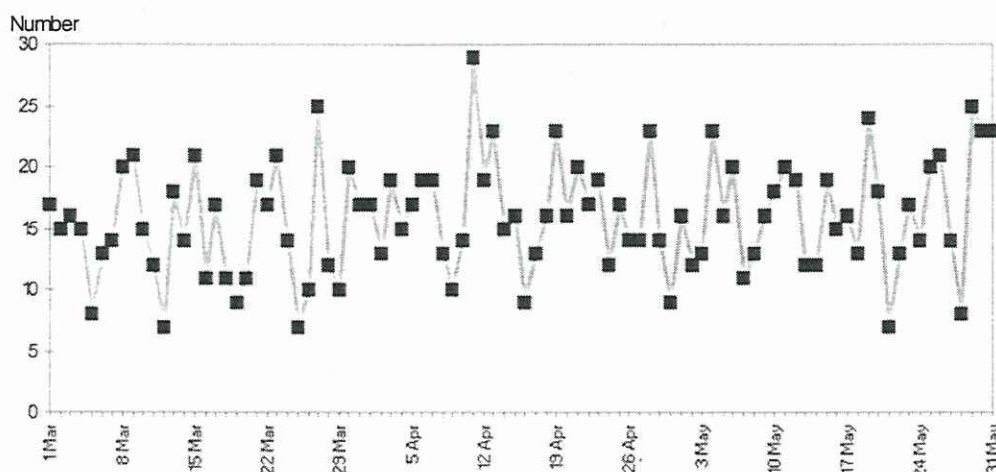


Figure 4: Number of infants in the ANZNN cohort admitted per day to the 29 NICUs, March to May 1995

### 3.1.3 Daily admissions to NICU

The total number of admissions of infants in this cohort to all 29 NICUs varied considerably from day to day during 1995 (ranging from 5 to 29 infants per day, mean = 15.8 infants). This variation is apparent in the daily admissions during the three month period from 1 March to 31 May 1995 (Figure 4). While these data do not include all admissions to the NICU, or the length of stay, they do suggest how variable the workload can be.

## 3.2 Mother

### 3.2.1 Maternal ethnicity

Maternal ethnicity was collected to monitor the proportion of infants from the major ethnic groups, especially the Indigenous populations. The mother's self report of ethnic origin was recorded for 4,337 infants (75.1%), an improvement from 60.8% for the 1994 data collection (Figure 5). These data representing three quarters of the cohort should still be interpreted cautiously. Data are presented as a proportion of all infants whose ethnicity is known.

In New Zealand in 1995, 12.5% of all liveborn infants were classified as NZ Maori, and another 7.5% were classified 'Pacific Island' (Statistics New Zealand Te Tari Tatau 1996). The coding of infant ethnicity by Statistics New Zealand will change to be based on 'self-identification' from 1996. In Australia, Indigenous ethnicity is by self-identification; the proportion of all births to Indigenous mothers was 2.8% over the period 1991-1993 (Plunkett, Lancaster & Huang 1996).

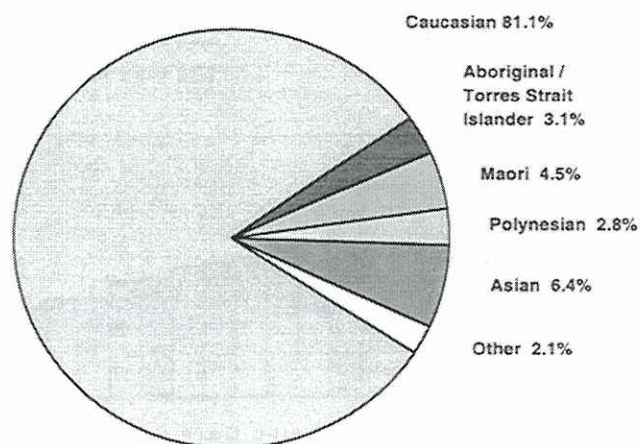
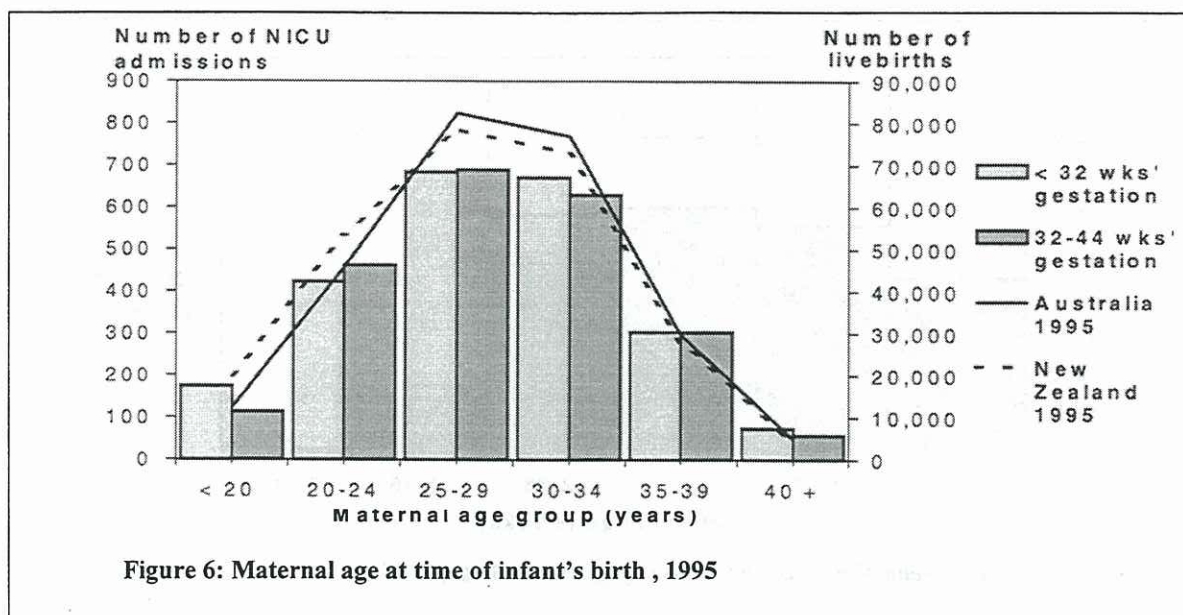


Figure 5: Maternal ethnicity (by self-report), ANZNN registrant, 1995



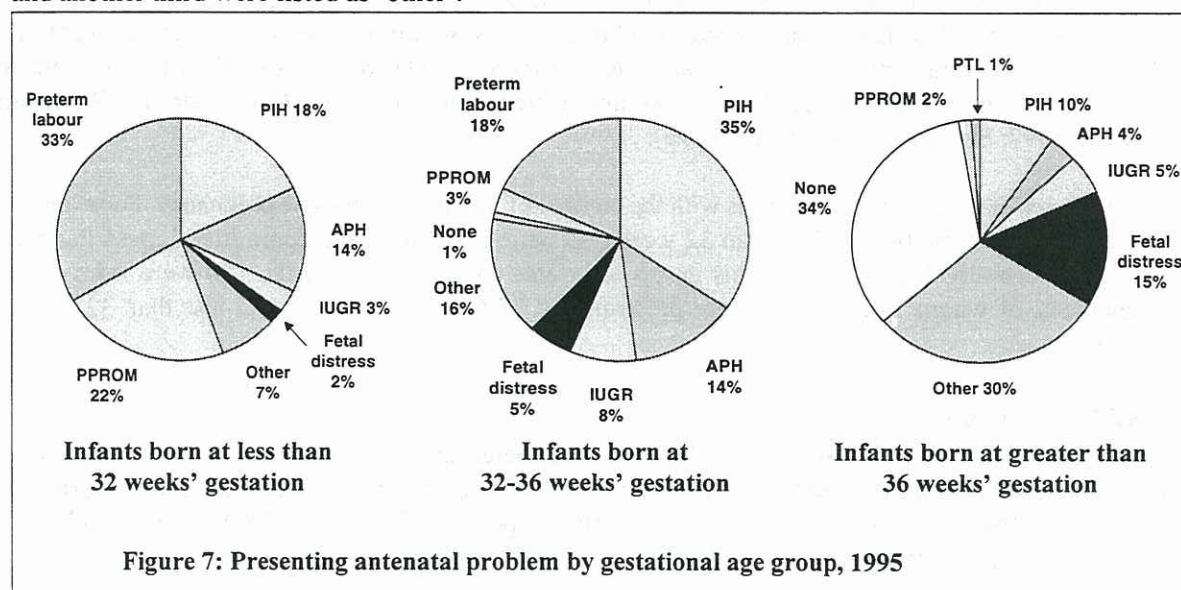
### 3.2.2 Maternal age

Maternal age ranged from 14 to 50 years and was similar for those born at less than 32 weeks' gestation to those born at 32 to 44 weeks' gestation. This is compared with published data for all infants born in Australia in 1995 (Australian Bureau of Statistics 1997) and those born in New Zealand in 1995 (Statistics New Zealand 1996) (Figure 6). Data were obtained for 4,577 (79.3%) infants, an improvement from the 57% obtained for 1994, but these differences must still be read with caution. Note that data for New Zealand is multiplied by a factor of 4.5 in Figure 6 to allow the data to be plotted on the same axis as that for Australia.

## 3.3 Antenatal

### 3.3.1 Presenting antenatal problem

Data were collected on the presenting obstetric problem that led to the infant's birth and subsequent admission to a NICU. Not unexpectedly preterm labour represented one-third of these problems for infants born at less than 32 weeks' gestation (Figure 7). Data were known for 82.8% of these infants. For the infants born at 32 weeks' gestation or greater, the information was recorded for 74.3% of infants. In the group born at 32 to 36 weeks' gestation, the presenting problem was more varied. For infants born at term, one-third had no antenatal problem that could be identified from the list (see Appendix 1, definitions), and another third were listed as 'other'.





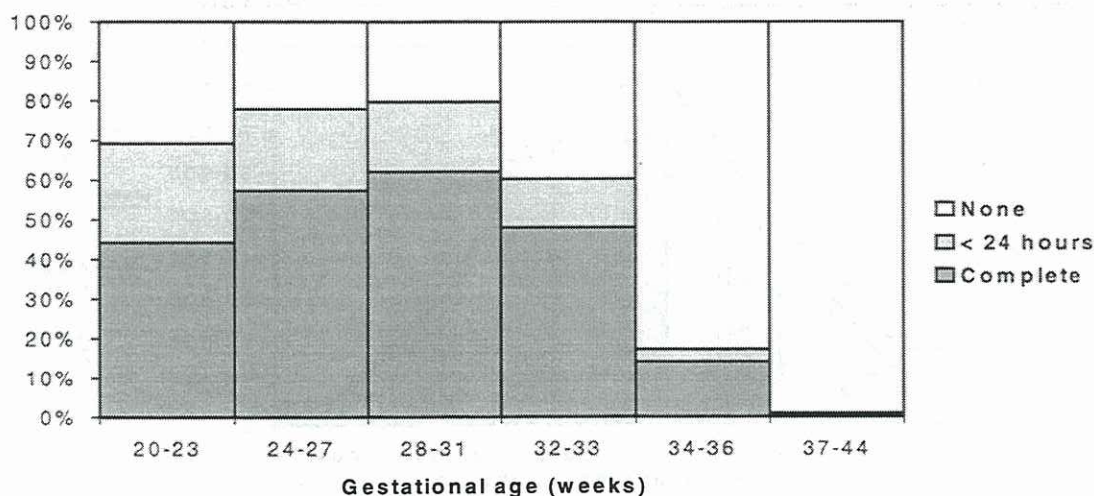


Figure 8: Antenatal corticosteroid use by gestational age, 1995

### 3.3.2 Antenatal corticosteroids

The first randomised controlled trial of the use of antenatal corticosteroids to enhance fetal lung maturation was conducted in New Zealand in 1970 (Liggins & Howie 1972). This therapy is administered at least 24 hours prior to birth and has been reported to have protective effects on other systems such as reducing the incidence of necrotising enterocolitis and intraventricular haemorrhage. It has been recommended that gluco-corticosteroids be administered to women in whom birth is likely before 34 weeks' gestation (Health Care Committee Expert Panel on Perinatal Morbidity 1995).

This treatment was used in 2,110 (78.8%) infants who were born at less than 32 weeks' gestation. Data were available for 97.9% of infants (Tables 4, 5; Figure 8). A coding error in the 1994 data incorrectly gave a steroid administration rate of 66.6%; this should have read 71.9%. The percentage was similar (74.9%) when infants who were born at less than 34 weeks' gestation in this cohort were considered. The inter-quartile range of usage of this treatment varied from 65.8% up to 84.0% (median = 80.9%) for the infants who were born in their registration hospital at less than 34 weeks' gestation.

## 3.4 Baby

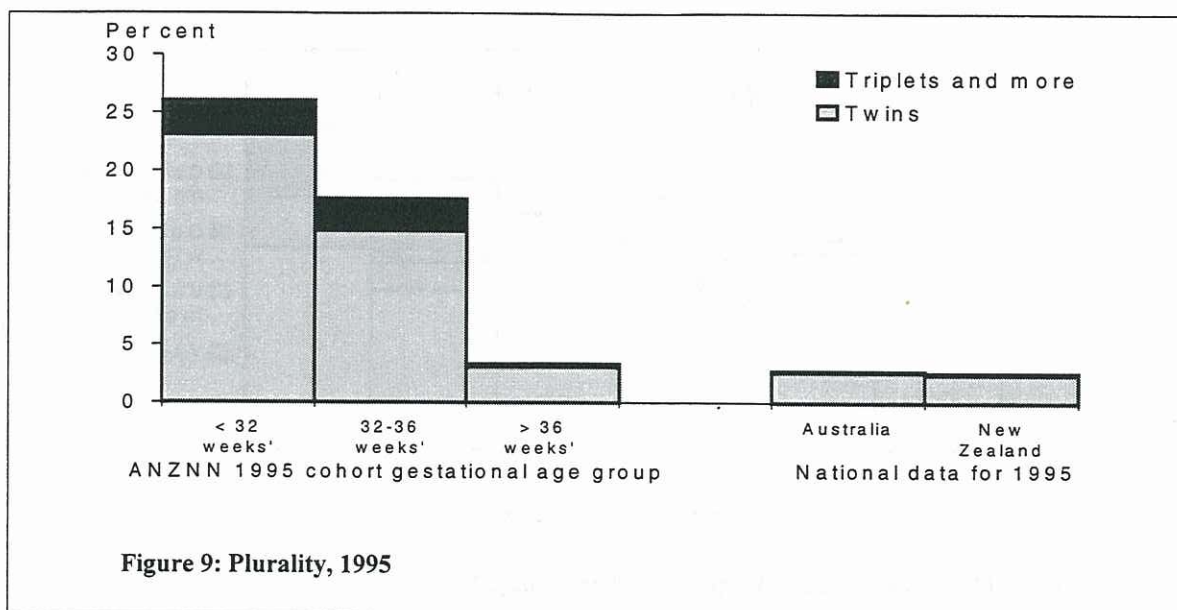
### 3.4.1 Multiple births

For infants born at less than 32 weeks' gestation, 743 (26.0%) were from a multiple birth. This proportion declined to 279 (17.5%) for the infants born at 32 to 36 weeks' gestation. For those infants born at term, 43 (2.3%) were from a multiple birth (Tables 6, 7; Figure 9). The proportion of all infants born to multiple births in Australia in 1995 was 2.7%, and in New Zealand it was 2.6% (Australian Bureau of Statistics 1997; Statistics New Zealand 1996).

The incidence of preterm birth increases with the number of infants in a multiple pregnancy. For example, 30% of all triplets are born at less than 32 weeks' gestation (Health Care Committee Expert Panel on Perinatal Morbidity 1995 p 22). In this group of infants admitted to a NICU, 120 were from triplet pregnancies, of whom 118 (98.3%) were preterm, and 77 (64.2%) were born at less than 32 weeks' gestation.

### 3.4.2 Gender

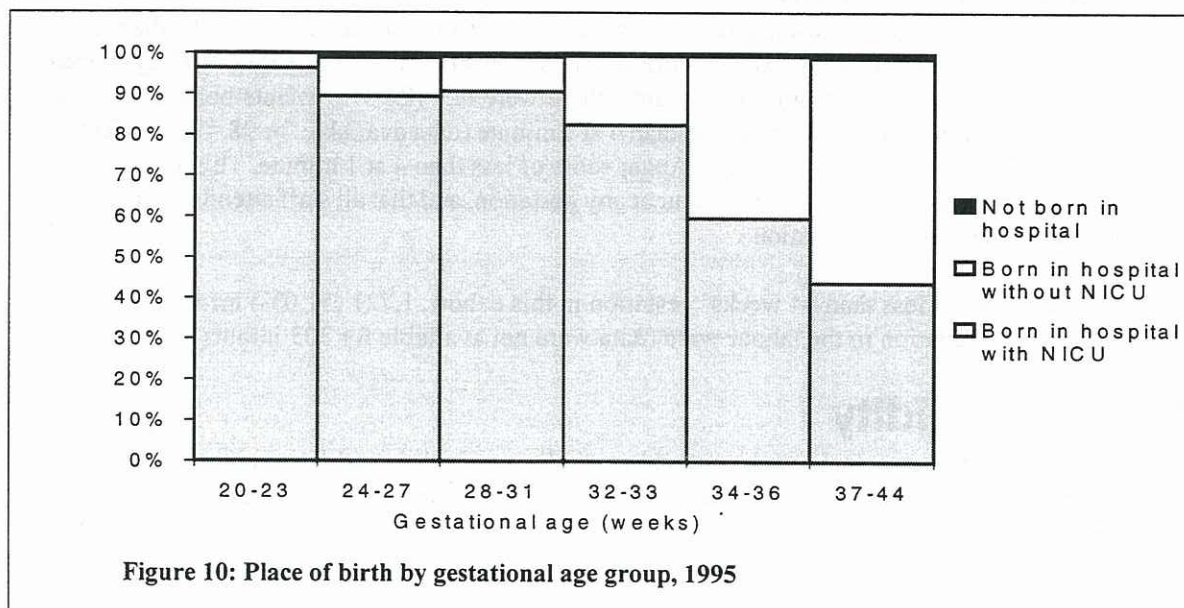
There were 3,255 (56.4%) males and 2,514 (43.6%) females among the infants in this cohort. For the infants born at less than 32 weeks' gestation 1,559 (54.4%) infants were male, the same proportion as reported in 1994. These figures are in excess of the proportion of males (51.3%) among all births in Australia (Australian Bureau of Statistics 1997).



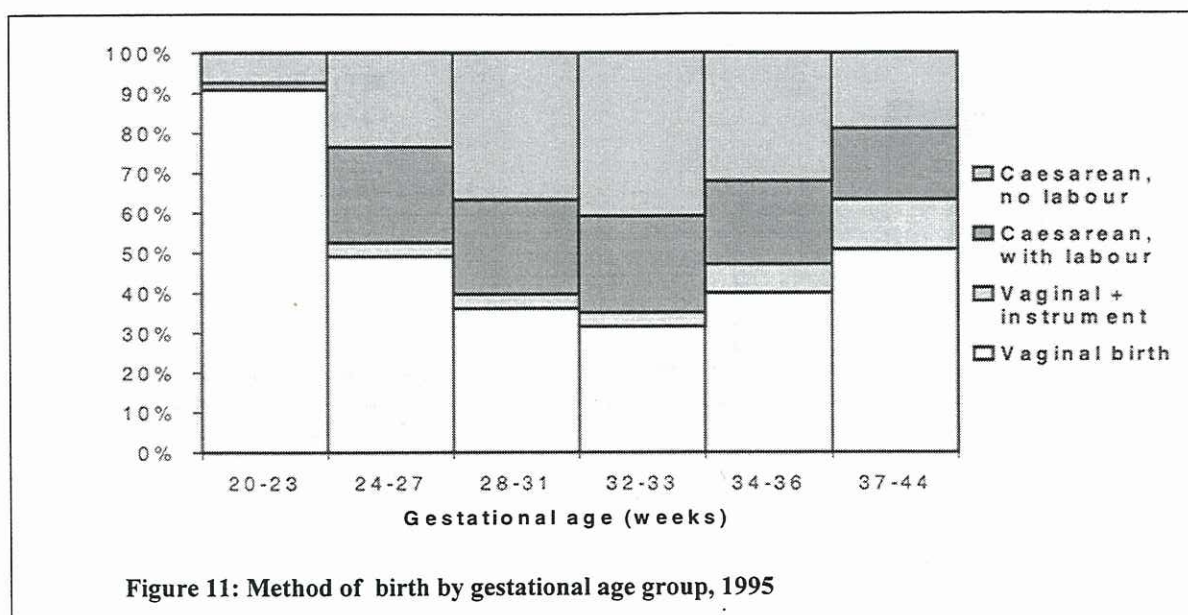
### 3.4.3 Place of birth

Infants usually receive their care in the hospital in which they are born. However, some infants may need to be transferred to a hospital with a NICU. In cases where this can be anticipated, the infant and mother can be transferred prior to the birth (in utero), or the mother can book in at the hospital. There is a recommendation by the Health Care Committee Expert Panel on Perinatal Morbidity (1995) that births at less than 32 weeks should take place in a perinatal centre with a neonatal intensive care unit (NICU). For infants born at less than 32 weeks' gestation and admitted to a NICU, 2,578 (90.5%) were born in such a centre. Overall, 74.5% of the infants in this cohort who required treatment in a NICU were born in a perinatal centre (Tables 8, 9; Figure 10).

After birth, 1,543 of these infants were transferred to a NICU accompanied by a retrieval team with specialist training in the care of sick newborn infants (Tables 10, 11). Of these infants 297 (19.2%) were born at less than 32 weeks' gestation and 757 (49.1%) were term. An additional 126 infants were transferred by a non-specialist team, such as in an ordinary ambulance. Seventy-four (58.7%) of these infants were term. The reason for an infant's transfer after birth may include a precipitous preterm birth in a hospital without a NICU or no bed space in the hospital of birth. Other reasons include a planned birth in a hospital with a NICU to ensure a managed transfer to a specialised children's unit, or the unexpected need for intensive care treatment in a term infant, such as after meconium aspiration.







## 3.5 Birth

### 3.5.1 Method of birth

The manner of birth of these infants varied with gestational age and birthweight group (Tables 12, 13; Figure 11). Overall, 52.4% of infants were born by caesarean section; this rate was 55.3% when only infants born at less than 32 weeks' gestation were considered. Of these caesarean sections, 41.9% occurred prior to the onset of labour. The caesarean section rate for all confinements in Australia in 1994 was 19.4% with just over half of these occurring prior to the onset of labour (Day, Lancaster & Huang 1997). Data were available for 96.1% of the ANZNN infants, but coded as 'unknown' for a further 72 infants.

The presentation at birth of the infants of the ANZNN cohort was predominantly cephalic (75.2%) while 21.6% were breech, and 3.2% were transverse or other. This information was collected for 90.7% of infants, but recorded as unknown for a further 372 (6.4%). For infants born at less than 32 weeks' gestation 1,651 (66.3%) infants presented as cephalic, 739 (29.7%) were breech and 4.1% were transverse or other. This is similar to the ANZNN data presented for 1994, but vastly different to that reported for the entire Australian population for 1994, where 95.3% were cephalic and 4.2% were breech (Day, Lancaster & Huang 1997).

### 3.5.2 Condition at birth

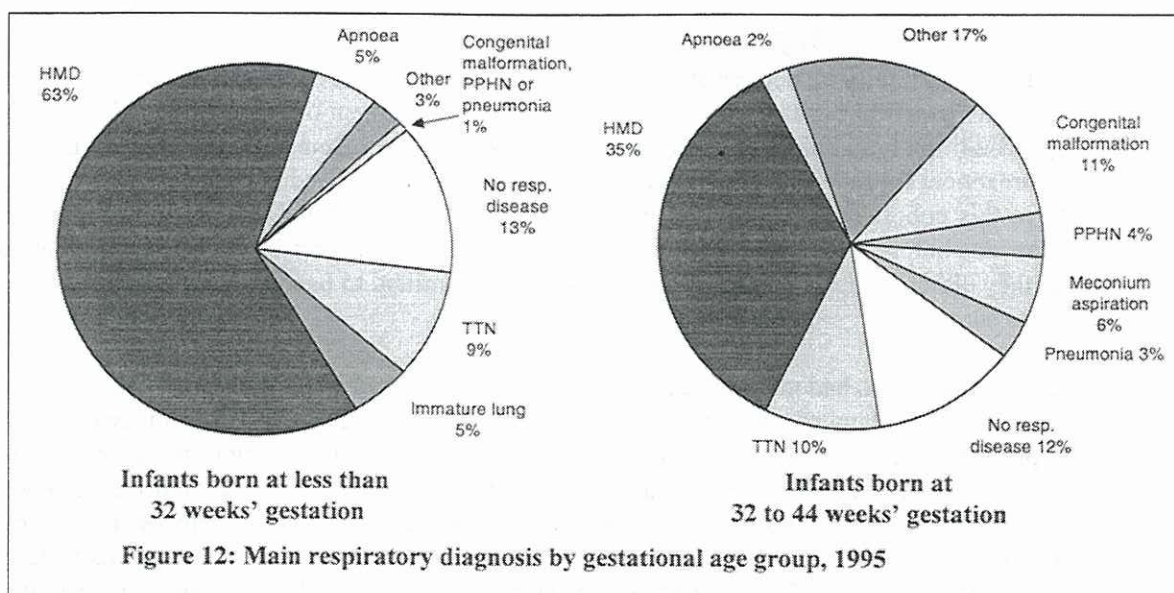
The Apgar score is a clinical indicator used to denote an infant's condition at birth. In 1994, the proportion of all Australian infants with a low Apgar score (i.e. less than 4) was 2.9% at 1 minute (Day, Lancaster & Huang 1997). In the ANZNN group of infants, there were 629 (22.3%) infants born at less than 32 weeks' gestation with an Apgar score of less than 4 at 1 minute (data available for 98.4% of infants). For the term group, 344 (29.4%) infants had an Apgar score of less than 4 at 1 minute. This suggests that an increased need for assistance at birth can occur at any gestation, and that all staff attending a birth should be accredited to perform resuscitation.

For the infants born at less than 34 weeks' gestation in this cohort, 1,721 (51.0%) infants were assisted by endotracheal intubation in the labour ward (data were not available for 303 infants).

## 3.6 Morbidity

Preterm birth is often associated with neonatal morbidity, as is the need for respiratory assistance or major surgery. Outcome measures that are identifiable while the infant is in hospital are a focus of this data collection.





### 3.6.1 Respiratory distress

Respiratory distress is a major cause of morbidity in these infants. Overall 2,607 (48.7%) infants had hyaline membrane disease (respiratory distress syndrome). As expected, the proportion of infants with other main causes of respiratory failure changed with gestational age (Figure 12). Six hundred and seventy-five (12.6%) infants were classified as 'no respiratory disease', i.e. requiring no respiratory support. Data were not available for 307 infants and 'unknown' for another 114 (a total of 7.3%).

Respiratory support provided for these infants takes many forms. There are two major categories of assisted ventilation, intermittent positive pressure respiration (IPPR) and continuous positive airways pressure (CPAP). Both require specialised nursing, medical and paramedical care and utilise a large amount of resources. The duration of these treatments increases, on average, with decreasing gestational age (Tables 14, 15). Four thousand, eight hundred and fifty-seven infants in Australia and New Zealand received assisted ventilation for more than 4 hours in a NICU during 1995. Of these infants, 2,381 were born at less than 32 weeks' gestation. The total duration of IPPR was 36,407 days, and CPAP was 22,788 days, a combined total of 59,195 ventilator 'days' (see Appendix 1, for definition of a ventilator day).

Supplemental oxygen requirements also increase with decreasing gestational age (Tables 14, 15). Overall, 195 infants were known to be treated with supplemental oxygen after they were discharged from hospital, and most (69.2%) of these infants were born at less than 28 weeks' gestation. Chronic lung disease is defined here as requiring respiratory support (either supplemental oxygen or assisted ventilation) at 36 weeks post-menstrual age for infants born at less than 32 weeks' gestation (post-menstrual age is gestational age plus age after birth). There were 512 infants who met this definition (Tables 16, 17). The total number of days that supplemental oxygen was administered to the 5,227 infants in this cohort who required it was 102,305 'oxygen days' (Appendix 1).

In addition, 314 (6.4%) infants had a pulmonary air-leak that required either transient or continuous drainage. One hundred and sixty of these infants were in the group born at less than 32 weeks' gestation.

Exogenous surfactant was introduced in Australia and New Zealand in 1991 as a treatment primarily for hyaline membrane disease (HMD). In 1995, the two types in use were *Exosurf* and *Survanta*, and they were given to 2,287 (39.8%) of the 99.7% of infants where this information was available (Tables 18, 19). Of the 2,607 infants with a main respiratory diagnosis of HMD; 2,350 infants were also intubated for assisted mechanical ventilation (IPPR). Eighty per cent of these infants received surfactant. The inter-quartile range of usage of exogenous surfactant among the NICUs which had more than 10 infants intubated for HMD was small (interquartile range 72.0% to 92.2%, with a median of 84.2%).



### 3.6.2 Neonatal surgery

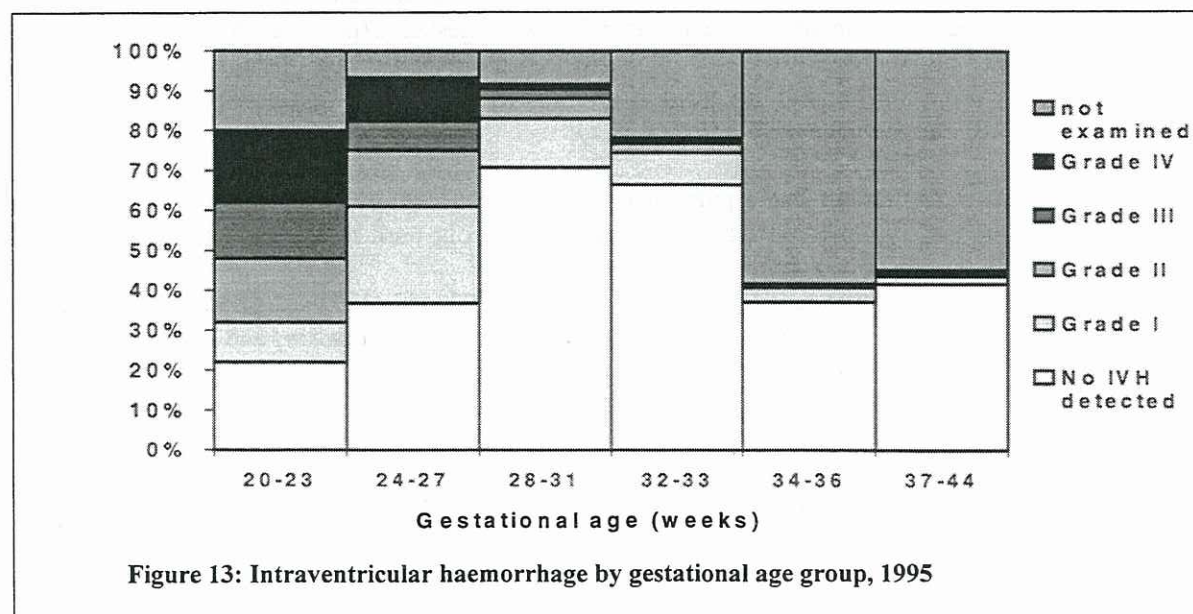
Neonatal surgery is generally carried out at specialist centres such as children's hospitals, or in perinatal centres attached to general hospitals. Infants who undergo such treatment often need specialist care to stabilise their condition both before and after the surgery is performed. Some minor forms of surgery, such as laser treatment for retinopathy of prematurity (section 3.6.5), are conducted at perinatal centres. The infants in this cohort include only those who were admitted to a NICU as part of their initial hospitalisation, and before day 28. Many other infants undergo surgery during the perinatal period (up to day 28), but they either go home first after their birth, or are admitted to paediatric units for treatment such as cardiac surgery.

There were 775 infants who had major surgery who were admitted to a NICU prior to day 28. Of these, 424 (54.7%) were term. Many of the term infants (40.1%) were born in a perinatal referral centre. This may follow prenatal diagnosis, enabling the birth to be planned so that it occurs close to expert care. In some cases, the perinatal centre was the woman's local hospital. A major congenital malformation was detected in 313 (73.8%) of these term infants, and this was lethal in 14 cases. Considering all term infants with surgery, 22 (5.2%) died. The respiratory support required by these term infants usually involved supplemental oxygen (73.1%, median = 8 days, range 1 to 246 days). Assisted mechanical ventilation (IPPR) was used for 218 infants (51.4%, median = 4 days, range 1 to 88 days). Discharge data are known for 94.2%. These infants were in hospital for a median of 20 days (range 2 to 336 days). This was nearly a week longer than the total group of term infants admitted to a NICU (Table 28).

### 3.6.3 Cerebral ultrasound

It is usual to perform a head ultrasound on very preterm infants to observe for both intraventricular haemorrhage (IVH) and the formation of cysts and ventricular dilatation (hydrocephalus). The initial ultrasound is generally done during the first week of life to detect signs of IVH. IVH is graded according to the Papile method (Papile et al. 1978), with grades III and IV of concern as they are markers of later disability (Tables 20, 21; Figure 13).

For infants born at less than 32 weeks' gestation, 1,775 (64.0%) did not have any such haemorrhage, compared with 68.0% in 1994. However, 204 (7.4%) of the infants examined did have significant haemorrhage. The range of significant IVH (grades III or IV) between NICUs for infants born at less than 32 weeks' gestation and alive after the first day of life (for those NICUs who had 10 or more infants in this category) was from a lower quartile of 5.6% up to 14.8% (median = 7.85%). Half (104) of the 206 (7.4%) infants who did not have a head ultrasound had died before their second day of life. Data were not available for 90 infants.





A later ultrasound is usually done at 4 to 6 weeks of age to detect cystic lesions and ventricular dilatation. The timing of this ultrasound was not always recorded. The results of a later ultrasound examination where a date was recorded to be after day 20 were available for 1,159 (51.0%) infants of less than 32 weeks' gestation. No abnormality on ultrasound was noted for 91.4% of these infants. Hydrocephalus was an uncommon event (2.8%), porencephalic cysts were noted in 2.8% and periventricular leukomalacia was seen in 4.3% of infants.

### **3.6.4 Necrotising enterocolitis**

Necrotising enterocolitis (NEC) is a disease of the gut, usually at the level of the colon, and is an important cause of death and morbidity in preterm infants, and occasionally occurs in term infants. Its cause is unknown, although studies have associated it with a variety of factors including very low gestational age and ischaemic events. There were 143 cases of NEC reported, 113 being in the group born at less than 32 weeks' gestation, a rate of 39.5 per thousand. Data was not available for 15 infants.

### **3.6.5 Eyes**

There is a recommendation that eye examinations should be carried out on infants born at less than 32 weeks' gestation, and preterm infants who have received supplemental oxygen (Health Care Committee Expert Panel on Perinatal Morbidity 1995). These examinations are carried out during the infant's hospitalisation to monitor the vascularisation of the eye. When this is disrupted, retinopathy of prematurity (ROP) can result. ROP is staged according to the international classification (International Committee for the Classification of Retinopathy of Prematurity 1984). If an infant's eyes reach Stages III or IV, therapy with a laser or cryotherapy may be necessary.

For the 1,475 infants born at less than 32 weeks' gestation and still in their registration hospital on day 42 of life, 764 (64.3%) were known to have no ROP (Tables 22, 23). One hundred and fifteen infants (7.8%) were recorded as not having an examination. Data were not available for 171 (11.6%) infants. Eighty-nine (7.5% of those examined) infants had significant eye disease (Stage III or IV). Significant ROP was seen in an additional 9 infants who were transferred prior to 42 day of life, but examined elsewhere. This level of retinopathy of prematurity was not seen in infants of greater than 34 weeks' gestation or more than 1500 grams birthweight, but this may be related to the criteria for examination.

## **3.7 Outcome**

### **3.7.1 Survival**

Data for survival to discharge from hospital is known for 5,110 (88.5%) infants; the date of discharge to home was not obtained for the remaining 661 infants (Tables 24, 25). While almost all of the deaths are likely to have been reported, the survival data have been analysed for the subset with discharge information. The majority of these infants (89.5%) survived to go home; if all infants are considered, including those whose final discharge date is unknown, this proportion was 90.7%. Five hundred and thirty-seven infants died while in hospital, 317 (59.0%) during the first six days of life. Survival to 28 days could confidently be calculated for those infants born at less than 32 weeks' gestation for the whole cohort, giving a survival rate of 79.4% versus 89.3% for those who have discharge data.

The survival of infants is dependent on many factors. For those infants who did not have lethal congenital malformations contributing to their death, gestational age at birth and birthweight are important. For this reason, data are generally presented for infants without lethal congenital malformations by both gestation and birthweight criteria. Our data are presented both with and without lethal congenital malformations as survival to discharge home (Tables 24, 25; Figures 14, 15). Birthweight data are presented in 100 gram increments up to 1,500 grams, then from 1,500 to more than 4,000 grams, the increments are 500 grams. Gestational age data are presented by week of gestation. To give a full picture of survival in these infants, data are provided as survival to 7 days, to 28 days (neonatal death) and to discharge to home.



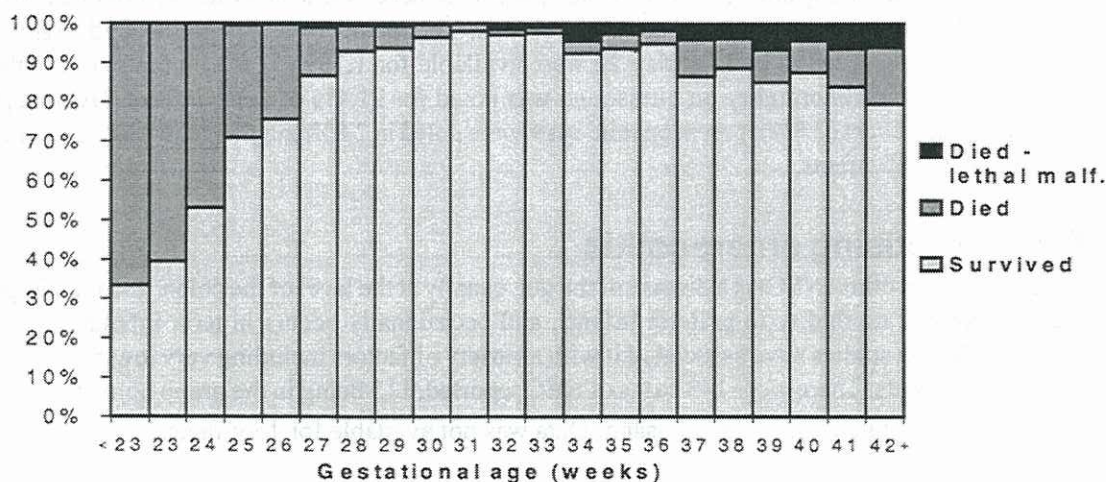


Figure 14: Survival to discharge from hospital by gestational age group, 1995

In general, the survival of infants admitted to a NICU increased by week of gestation from 39.6% at 23 weeks to 97.9% at 31 weeks (Table 24). The pattern is similar for survival by 100 gram birthweight increments; 20.0% of infants born weighing less than 500 grams are alive at discharge and 95.8% of infants born weighing 1,400 to 1,499 grams survive (Table 25). The data for the higher gestational age groups (and birthweight groups) differ in that they reflect a selected population of infants who not only require NICU, but assisted ventilation or surgery. Here the survival rates vary from 79.2% to 96.9% for data by gestational age criteria, or 89.2% to 96.4% for data by birthweight group.

The data in this report differ from those usually reported for State or national populations, as it represents only those infants admitted to a nursery in a hospital with a Neonatal Intensive Care Unit. The data do not include infants who were stillborn, who died in labour ward or who died in hospitals without NICU facilities.

### 3.7.2 Discharge from hospital

After their care in a hospital with a specialist neonatal unit, more than half (52.3%) of the infants were not transferred. Forty per cent of the infants were 'back-transferred' to other hospitals with less intensive nurseries (level one or level two) and the remainder (8.2%) were transferred to other NICUs either for surgery, or because that NICU was closer to home, or occasionally, because the neonatal unit of their

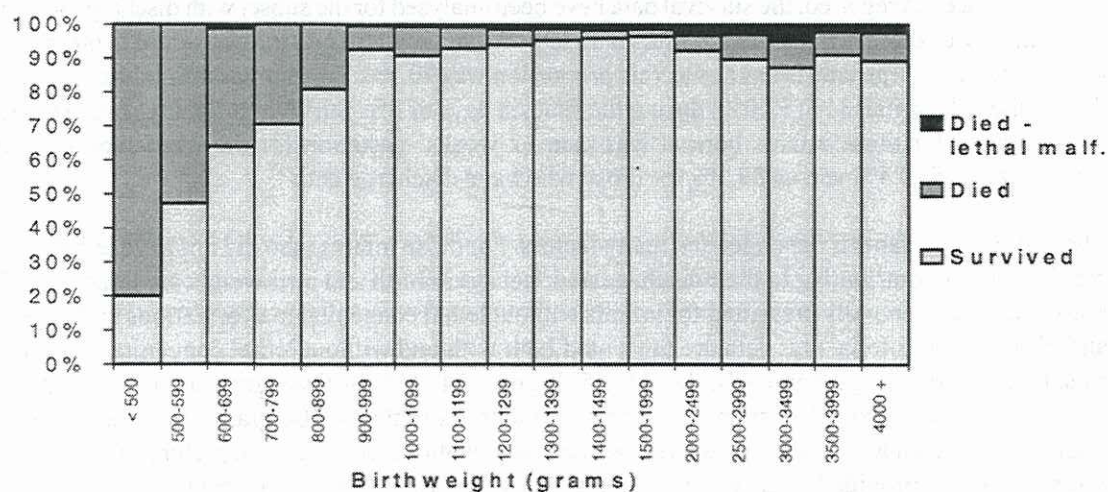
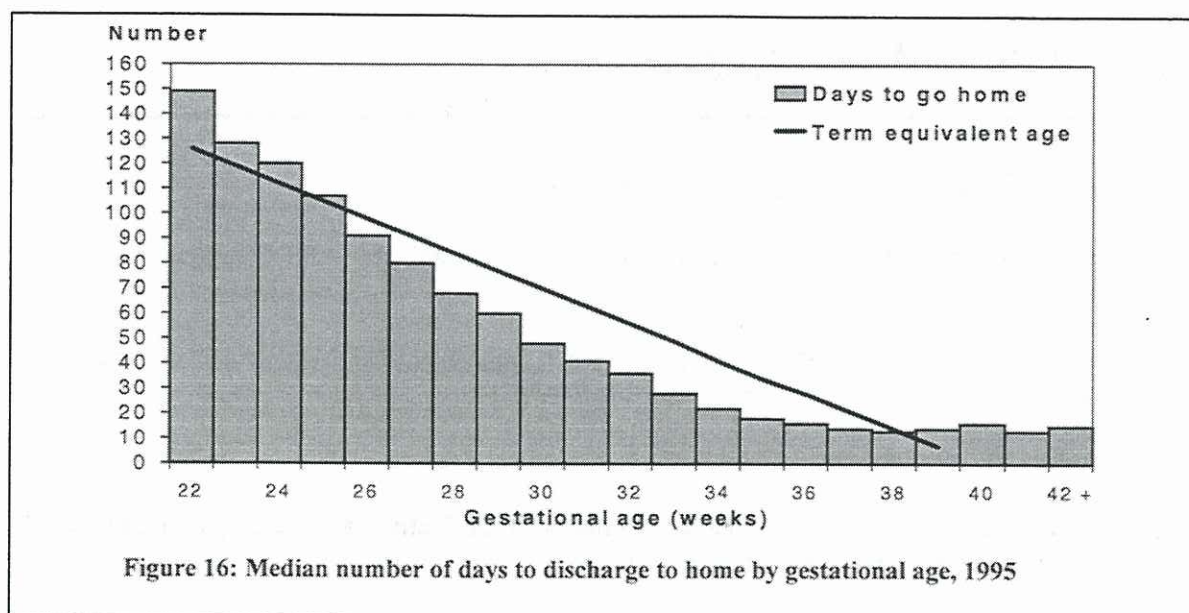


Figure 15: Survival to discharge from hospital by birthweight group, 1995



birth did not have an intensive care bed available (Tables 26, 27). Considering only the infants who survived to go home, half (49.8% of surviving infants) were transferred to level one or level two nurseries prior to their discharge home, while 10.4% required admission to other NICUs. Thus 39.8% remained in their hospital of registration until discharge.

Total duration of stay in hospital is also related to maturity at birth (Tables 28, 29; Figure 16). For the 21 surviving infants born at 20 to 23 weeks' gestation, this stay is approximately 18 weeks (median = 128 days, range 91 to 228 days). At term, the median length of stay is 14 days for those infants who require intensive care. Duration of stay is calculated for the whole hospitalisation; from birth to the infant's discharge to home, and may include stays in the hospital of birth, and hospitals with other levels of care as the infant's needs change. Thus, infants who survive are usually discharged home around their due date or term equivalent age (Figure 16).



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# 5 Tables

**Table 1: Number of infants in each gestational age group, 1995**

Gestational age (completed weeks)	Number	Cumulative per cent	Gestational age (completed weeks)	Number	Cumulative per cent
21	4	0.1	32	485	58.0
22	2	0.1	33	327	63.7
23	49	1.0	34	296	68.8
24	120	3.0	35	245	73.1
25	214	6.7	36	234	77.1
26	283	11.6	37	248	81.4
27	273	16.4	38	292	86.5
28	343	22.3	39	199	89.9
29	436	29.9	40	364	96.2
30	545	39.3	41	165	99.1
31	594	49.6	42	52	100.0
			43	—	100.0
			44	1	100.0
			<b>All infants</b>	<b>5,771</b>	

*Note:* 1. ANZNN cohort includes all infants born at less than 32 weeks' completed gestation. Those above this gestation must be born at less than 1500 grams birthweight, or must require assisted ventilation or major surgery.  
2. For one unit only, data was collected only for those infants born weighing less than 1500 grams.

**Table 2: Number of infants in each birthweight group, 1995**

Birthweight group (grams)	Number	cumulative per cent	Birthweight group (grams)	Number	Cumulative per cent
250-499	25	0.4	1500-1999	1,041	62.1
500-599	74	1.7	2000-2499	634	73.1
600-699	163	4.5	2500-2999	551	82.6
700-799	203	8.1	3000-3499	512	91.5
800-899	251	12.4	3500-3999	351	97.6
900-999	258	16.9	4000 and over	139	100.0
1000-1099	270	21.6	<b>All infants</b>	<b>5,771</b>	
1100-1199	256	26.0			
1200-1299	322	31.6			
1300-1399	340	37.5			
1400-1499	381	44.1			

*Note:* ANZNN cohort includes all infants born at less than 1500 grams. Those above this gestation must be born at less than 32 week's gestation, or must require assisted ventilation or major surgery.



**Table 3: Number and proportion of infants in each registration criteria group, 1995**

Registration criteria	Assisted ventilation	Major surgery	All infants
< 32 weeks' gestation	2,090	189	2,863
< 1500 gram birthweight	2,381	183	2,543
Assisted ventilation	4,856	557	4,856
Major surgery	557	775	775
Per cent of all infants	84.1%	13.4%	

Note: 1. These groups are not mutually exclusive. Total number of infants is 5,771.  
2. Numbers represent all infants in each subgroup.

**Table 4: Antenatal corticosteroid use by gestational age group, all infants, 1995**

Antenatal steroid use	20-23	24-27	28-31	32-33	34-36	37-44	All infants
<b>Number</b>							
None	16	195	382	292	574	1,114	2,573
Incomplete course	13	181	329	89	22	2	636
Course completed	23	477	1,097	327	71	8	2,003
Course completed >7 day	—	27	63	25	26	2	143
Unknown	3	5	34	29	12	19	102
Data not available	—	5	13	50	70	176	314
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
<b>Per cent</b>							
None	30.8	22.2	20.4	39.8	82.8	98.9	48.0
Incomplete course	25.0	20.6	17.6	12.1	3.2	0.2	11.9
Course completed	44.2	54.2	58.6	44.6	10.2	0.7	37.4
Course completed >7 day	—	3.1	3.4	3.4	3.8	0.2	2.7
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note:* 1. Corticosteroids given antenatally via any route to the mother at a time likely to enhance fetal lung maturation is considered complete when more than one dose of corticosteroids given, and first dose was given more than 24 hours and less than 8 days before baby's birth.  
2. 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 5: Antenatal corticosteroid use by birthweight group, all infants, 1995**

Antenatal steroid use	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
<b>Number</b>												
None	7	76	120	144	220	323	398	450	436	286	113	2,573
Incomplete course	3	66	122	127	126	146	37	7	1	1	—	636
Course completed	13	182	337	381	467	469	120	26	5	1	2	2,003
Course completed >7 day	—	8	20	17	33	36	17	10	2	—	—	143
Unknown	2	5	6	15	23	22	8	8	7	4	2	102
Data not available	—	3	4	3	13	45	54	50	61	59	22	314
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
<b>Per cent</b>												
None	30.4	22.9	20.0	21.5	26.0	33.2	69.6	91.3	98.2	99.3	98.3	48.0
Incomplete course	13.0	19.9	20.4	19.0	14.9	15.0	6.5	1.4	0.2	0.3	—	11.9
Course completed	56.5	54.8	56.3	57.0	55.2	48.2	21.0	5.3	1.1	0.3	1.7	37.4
Course completed >7 day	—	2.4	3.3	2.5	3.9	3.7	3.0	2.0	0.5	—	—	2.7
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note:* 1. Corticosteroids given antenatally via any route to the mother at a time likely to enhance fetal lung maturation is considered complete when more than one dose of corticosteroids given, and first dose was given more than 24 hours and less than 8 days before baby's birth.  
2. 'Unknown' and 'not available' data are excluded from per cent calculations.



**Table 6: Plurality by gestational age group, all infants, 1995**

Plurality	20-23	24-27	28-31	32-33	34-36	37-44	All infants
Number							
Singleton	42	646	1,431	622	686	1,277	4,703
Twins	13	209	436	154	81	40	933
Triplets	—	34	43	33	8	2	120
Quadruplets	—	—	8	3	—	2	12
Unknown	—	1	—	—	—	1	2
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
Per cent							
Singleton	76.4	72.7	74.6	76.6	88.5	96.7	81.5
Twins	23.6	23.5	22.7	19.0	10.5	3.0	16.2
Triplets	—	3.8	2.2	4.1	1.0	0.2	2.1
Quadruplets	—	—	0.4	0.4	—	0.2	0.2
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 7: Plurality by birthweight group, all infants, 1995**

Plurality	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
Number												
Singleton	21	252	440	519	636	784	554	516	498	347	137	4,703
Twins	4	82	140	147	200	237	75	32	14	2	—	933
Triplets	—	5	28	18	41	18	5	3	—	1	1	120
Quadruplets	—	—	1	3	5	2	—	—	—	1	—	12
Unknown	—	1	—	—	—	—	—	—	—	—	1	2
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
Per cent												
Singleton	84.0	74.3	72.2	75.5	72.1	75.3	87.4	93.6	97.3	98.9	99.3	81.5
Twins	16.0	24.2	23.0	21.4	22.7	22.8	11.8	5.8	2.7	0.6	—	16.2
Triplets	—	1.5	4.6	2.6	4.6	1.7	0.8	0.5	—	0.3	0.7	2.1
Quadruplets	—	—	0.2	0.4	0.6	0.2	—	—	—	0.3	—	0.2
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 8: Level of hospital of birth by gestational age group, all infants, 1995**

Level of hospital	20-23	24-27	28-31	32-33	34-36	37-44	All infants
<b>Number</b>							
Not born in a hospital	—	10	16	5	5	15	51
Hospital, no NICU	2	83	161	136	305	722	1,409
Hospital with a NICU	53	791	1,734	662	458	571	4,269
Unknown	—	5	6	5	6	12	34
Data not available	—	1	1	4	1	1	8
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
<b>Per cent</b>							
Not born in a hospital	—	1.1	0.8	0.6	0.7	1.1	0.9
Hospital, no NICU	3.6	9.4	8.4	16.9	39.7	55.2	24.6
Hospital with a NICU	96.4	89.5	90.7	82.4	59.6	43.7	74.5
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 9: Level of hospital of birth by birthweight group, all infants, 1995**

Level of hospital	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
<b>Number</b>												
Not born in a hospital	—	1	10	4	8	9	2	5	3	9	—	51
Hospital, no NICU	—	28	45	58	88	154	212	266	283	196	79	1,409
Hospital with a NICU	25	309	551	621	781	872	415	273	219	143	60	4,269
Unknown	—	1	3	4	3	4	3	7	6	3	—	34
Data not available	—	1	—	—	2	2	2	—	1	—	—	8
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
<b>Per cent</b>												
Not born in a hospital	—	0.3	1.7	0.6	0.9	0.9	0.3	0.9	0.6	2.6	—	0.9
Hospital, no NICU	—	8.3	7.4	8.5	10.0	14.9	33.7	48.9	56.0	56.3	56.8	24.6
Hospital with a NICU	100.0	91.4	90.9	90.9	89.1	84.3	66.0	50.2	43.4	41.1	43.2	74.5
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.



**Table 10: Method of transport for infants transferred after birth to registration hospital, by gestational age group, 1995**

Transportation method	20-23	24-27	28-31	32-33	34-36	37-44	All infants
<b>Number</b>							
Non-specialised transport <sup>a</sup>	—	7	10	15	20	74	126
Specialist transport team <sup>b</sup>	4	107	186	150	339	757	1,543
<b>All infants</b>	<b>4</b>	<b>114</b>	<b>196</b>	<b>165</b>	<b>359</b>	<b>831</b>	<b>1,669</b>
<b>Per cent</b>							
Non-specialised transport <sup>a</sup>	—	6.1	5.1	9.1	5.6	8.9	7.5
Specialist transport team <sup>b</sup>	100.0	93.9	94.9	90.9	94.4	91.1	92.5
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

(a) Infant is transferred from any other hospital, by a non-specialist transfer method, including transport by ambulance.

(b) Infant is retrieved by a specialist neonatal transport retrieval team using appropriate equipment.

*Note:* These data represent those infants who qualify for the ANZNN cohort only, and do not include neonates who are transferred to a paediatric intensive care unit, or who are transferred after the perinatal period.

**Table 11: Method of transport for infants transferred after birth to registration hospital, by birthweight group, 1995**

Transportation method	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
<b>Number</b>												
Non-specialised transport <sup>a</sup>	—	3	3	6	9	10	13	23	35	16	8	126
Specialist transport team <sup>b</sup>	—	36	61	68	97	176	238	287	285	214	81	1,543
<b>All infants</b>	<b>—</b>	<b>39</b>	<b>64</b>	<b>74</b>	<b>106</b>	<b>186</b>	<b>251</b>	<b>310</b>	<b>320</b>	<b>230</b>	<b>89</b>	<b>1,669</b>
<b>Per cent</b>												
Non-specialised transport <sup>a</sup>	—	7.7	4.7	8.1	8.5	5.4	5.2	7.4	10.9	7.0	9.0	7.5
Specialist transport team <sup>b</sup>	—	92.3	95.3	91.9	91.5	94.6	94.8	92.6	89.1	93.0	91.0	92.5
<b>All infants</b>	<b>—</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

(a) Infant is transferred from any other hospital, by a non-specialist transfer method, including transport by ambulance.

(b) Infant is retrieved by a specialist neonatal transport retrieval team using appropriate equipment.

*Note:* These data represent those infants who qualify for the ANZNN cohort only, and do not include neonates who are transferred to a paediatric intensive care unit, or who are transferred after the perinatal period.

**Table 12: Mode of birth by gestational age group, all infants, 1995**

Mode of birth	20-23	24-27	28-31	32-33	34-36	37-44	All infants
<b>Number</b>							
Vaginal	49	432	675	245	289	596	2,286
Vaginal - with instruments	—	30	66	27	51	145	319
Caesarean section - elective (no labour)	1	211	442	188	152	210	1,204
Caesarean section - emergency (labour)	4	207	688	317	231	222	1,669
Unknown	1	4	34	12	11	10	72
Data not available	—	6	13	23	41	138	221
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
<b>Per cent</b>							
Vaginal	90.7	49.1	36.1	31.5	40.0	50.8	41.7
Vaginal - with instruments	—	3.4	3.5	3.5	7.1	12.4	5.8
Caesarean section - elective (no labour)	1.9	24.0	23.6	24.2	21.0	17.9	22.0
Caesarean section - emergency (labour)	7.4	23.5	36.8	40.8	32.0	18.9	30.5
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 13: Mode of birth by birthweight group, all infants, 1995**

Mode of birth	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
<b>Number</b>												
Vaginal	9	169	241	219	304	402	242	239	224	167	70	2,286
Vaginal - with instruments	—	8	13	18	31	55	35	45	62	34	18	319
Caesarean section - elective (no labour)	1	43	143	169	211	238	144	107	68	56	24	1,204
Caesarean section - emergency (labour)	15	114	203	265	317	300	179	119	97	50	10	1,669
Unknown	—	3	6	13	14	17	4	5	9	—	2	72
Data not available	—	3	3	3	5	29	30	36	52	44	15	221
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
<b>Per cent</b>												
Vaginal	36.0	50.6	40.2	32.6	35.2	40.4	40.3	46.9	49.7	54.4	57.4	41.7
Vaginal - with instruments	—	2.4	2.2	2.7	3.6	5.5	5.8	8.8	13.7	11.1	14.8	5.8
Caesarean section - elective (no labour)	4.0	12.9	23.8	25.2	24.4	23.9	24.0	21.0	15.1	18.2	19.7	22.0
Caesarean section - emergency (labour)	60.0	34.1	33.8	39.5	36.7	30.2	29.8	23.3	21.5	16.3	8.2	30.5
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.



**Table 14: Respiratory status by gestational age group, all infants, 1995**

Type of respiratory support		20-23	24-27	28-31	32-33	34-36	37-44	All infants
IPPR	median (days)	12.5	16	4	3	3	3	
	range	0-101	0-102	0-77	0-257	0-154	0-88	0-257
	no therapy (n)	4	22	655	278	187	247	1,393
	data not available	—	—	—	—	—	—	—
CPAP	median (days)	16	17.5	4	2	2	1	
	range	0-54	0-109	0-101	0-279	0-24	0-67	0-279
	no therapy (n)	35	257	915	494	494	1,056	3,275
	data not available	—	—	1	30	—	2	33
Oxygen	median (days)	9	54	6	5	5	7	
	range	0-229	0-570	0-361	0-632	0-464	0-246	0-632
	no therapy (n)	3	10	227	124	64	116	544
	data not available	—	13	59	34	58	161	295
<b>All infants</b>		<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>

**Table 15: Respiratory status by birthweight group, all infants, 1995**

Type of respiratory support		250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
IPPR	median (days)	8	23	12	6	3	3	3	3	3	3	3
	range	0-101	0-100	0-102	0-100	0-77	0-257	0-64	0-154	0-88	0-37	0-44
	no therapy (n)	3	6	52	170	397	337	131	95	104	62	26
	data not available	—	—	—	—	—	—	—	—	—	—	—
CPAP	median (days)	30	21	14	7	3	2	2	2	2	1	1
	range	0-69	0-109	0-67	0-71	0-79	0-279	0-21	0-32	0-67	0-19	0-10
	no therapy (n)	21	123	178	249	482	627	394	408	403	247	116
	data not available	—	4	—	—	2	—	1	1	—	—	—
Oxygen	median (days)	9	70	42	14	4	4	4	5	5	5	5
	range	0-475	0-570	0-273	0-351	0-147	0-632	0-464	0-251	0-246	0-73	0-68
	no therapy (n)	3	4	24	74	183	143	44	35	43	29	11
	data not available	—	7	10	20	21	55	46	46	58	49	14
<b>All infants</b>		<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>

**Table 16: Oxygen dependency by gestational age group, all infants, 1995**

Oxygen dependency	20-23	24-27	28-31	32-33	34-36	37-44	All infants
Data not available	—	13	59	34	58	161	295
Oxygen therapy at day 28	22	576	359	46	25	45	1,075
Per cent survivors with oxygen therapy on day 28	100.0%	92.0%	23.1%	7.2%	4.2%	5.1%	25.0%
Chronic lung disease	19	312	181	—	—	—	512
Per cent of survivors with chronic lung disease <sup>a</sup>	86.4%	45.8%	10.1%	—	—	—	20.5%
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>

(a) Calculated for infants born at less than 32 week's gestation, total number with chronic lung disease (requiring respiratory assistance) as a percentage of those alive at 36 weeks post menstrual age (gestational age plus chronological age, n: 2,569) who have oxygen therapy information available (n: 2,497).

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 17: Oxygen dependency by birthweight group, all infants, 1995**

Oxygen dependency	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
Data not available	—	7	10	20	21	55	46	46	58	49	14	295
Oxygen therapy at day 28	5	216	349	247	98	76	26	19	21	14	4	1,075
Per cent survivors with oxygen therapy on day 28	100.0%	96.1%	67.0%	39.4%	11.9%	8.0%	4.8%	4.4%	6.0%	5.9%	4.3%	25.0%
Chronic lung disease	5	154	186	96	40	26	4	—	—	—	—	512
Per cent of survivors with chronic lung disease <sup>a</sup>	100.0%	69.7%	37.3%	17.2%	6.7%	4.5%	10.5%	—	—	—	—	20.5%
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1,041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>

(a) Calculated for infants born at less than 32 week's gestation, total number with chronic lung disease (requiring respiratory assistance) as a percentage of those alive at 36 weeks post menstrual age (gestational age plus chronological age, n: 2,569) who have oxygen therapy information available (n: 2,497).

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.



**Table 18: Exogenous surfactant use by gestational age group, all infants, 1995**

Surfactant use	20-23	24-27	28-31	32-33	34-36	37-44	All infants
Number							
None	10	181	1,111	503	498	1,150	3,453
<i>Exosurf</i>	20	313	386	148	129	75	1,071
<i>Survanta</i>	23	389	414	154	145	91	1,216
Other / both	1	6	4	4	1	—	16
Unknown	—	—	1	2	2	4	9
Data not available	1	1	2	1	—	1	6
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
Per cent							
None	18.5	20.4	58.0	62.2	64.4	87.4	60.0
<i>Exosurf</i>	37.0	35.2	20.2	18.3	16.7	5.7	18.6
<i>Survanta</i>	42.6	43.8	21.6	19.0	18.8	6.9	21.1
Other / both	1.9	0.7	0.2	0.5	0.1	—	0.3
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 19: Exogenous surfactant use by birthweight group, all infants, 1995**

Surfactant use	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
Number												
None	6	61	186	343	561	649	404	401	413	306	123	3,453
<i>Exosurf</i>	7	124	193	160	153	189	99	74	49	18	5	1,071
<i>Survanta</i>	11	152	227	181	164	195	129	74	47	26	10	1,216
Other / both	1	2	2	3	2	4	1	—	1	—	—	16
Unknown	—	—	—	—	1	2	1	2	2	1	—	9
Data not available	—	1	1	—	1	2	—	—	—	—	1	6
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1,041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
Per cent												
None	24.0	18.0	30.6	49.9	63.8	62.6	63.8	73.0	81.0	87.4	89.1	60.0
<i>Exosurf</i>	28.0	36.6	31.7	23.3	17.4	18.2	15.6	13.5	9.6	5.1	3.6	18.6
<i>Survanta</i>	44.0	44.8	37.3	26.3	18.6	18.8	20.4	13.5	9.2	7.4	7.2	21.1
Other / both	4.0	0.6	0.3	0.4	0.2	0.4	0.2	—	0.2	—	—	0.3
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Unknown' and 'not available' data are excluded from per cent calculations.

**Table 20: Intraventricular haemorrhage by gestational age group, all infants, 1995**

Head ultrasound result	20-23	24-27	28-31	32-33	34-36	37-44	All infants
<b>Number</b>							
None	11	452	1,312	475	314	460	3,024
Grade I	5	161	225	57	21	21	490
Grade II	8	94	95	16	3	5	221
Grade III	7	49	41	7	—	4	108
Grade IV	9	73	25	4	3	10	124
Not examined	10	44	152	155	335	603	1,299
Data not available	5	17	68	98	99	218	505
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
<b>Per cent</b>							
None	27.5	54.5	77.3	85.0	92.1	92.0	76.2
Grade I	12.5	19.4	13.3	10.2	6.2	4.2	12.4
Grade II	20.0	11.3	5.6	2.9	0.9	1.0	5.6
Grade III	17.5	5.9	2.4	1.3	—	0.8	2.7
Grade IV	22.5	8.8	1.5	0.7	0.9	2.0	3.1
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Not examined' and 'not available' data are excluded from per cent calculations.

**Table 21: Intraventricular haemorrhage by birthweight group, all infants, 1995**

Head ultrasound result	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
<b>Number</b>												
None	10	147	372	459	604	610	274	210	173	116	49	3,024
Grade I	5	57	96	100	100	85	19	10	11	5	2	490
Grade II	1	38	51	43	45	31	6	3	1	2	—	221
Grade III	1	23	19	25	18	16	2	—	3	1	—	108
Grade IV	1	38	37	15	15	2	7	3	4	2	—	124
Not examined	4	26	22	21	64	208	239	252	239	158	68	1,299
Data not available	3	11	12	24	36	89	87	75	81	67	20	505
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1,041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
<b>Per cent</b>												
None	55.6	48.5	64.7	71.5	77.2	82.0	89.0	92.9	90.1	92.1	96.1	76.2
Grade I	27.8	18.8	16.7	15.6	12.8	11.4	6.2	4.4	5.7	4.0	3.9	12.4
Grade II	5.6	12.5	8.9	6.7	5.8	4.2	1.9	1.3	0.5	1.6	—	5.6
Grade III	5.6	7.6	3.3	3.9	2.3	2.2	0.6	—	1.6	0.8	—	2.7
Grade IV	5.6	12.5	6.4	2.3	1.9	0.3	2.3	1.3	2.1	1.6	—	3.1
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Note: 'Not examined' and 'not available' data are excluded from per cent calculations.



**Table 22: Results of eye examination for ROP, infants born at less than 34 weeks' gestation who were in their registration hospital on day 42, by gestational age group, 1995**

Eye examination result	20-23	24-27	28-31	32-33	Infants < 34 weeks
<b>Number</b>					
No ROP	5	263	496	51	815
Stage I	4	109	64	2	179
Stage II	5	117	37	2	161
Stage III	3	68	11	—	82
Stage IV	3	4	—	—	7
Not examined	2	13	100	28	143
Data not available	1	42	128	19	190
<b>Infants in hosp. on day 42</b>	<b>23</b>	<b>616</b>	<b>836</b>	<b>102</b>	<b>1,577</b>
<b>Per cent</b>					
No ROP	25.0	46.9	81.6	92.7	65.5
Stage I	20.0	19.4	10.5	3.6	14.4
Stage II	25.0	20.9	6.1	3.6	12.9
Stage III	15.0	12.1	1.8	—	6.6
Stage IV	15.0	0.7	—	—	0.6
<b>Infants in hosp. on day 42</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note:* 1. Indicates worst stage of ROP seen  
2. Infants are generally not examined for ROP if born weighing more than 1500 grams.  
3. All infants in this group reported to have ROP of Stage III or IV were born at less than 33 weeks' gestation or less than 1500 g birthweight.  
4. 'Not examined' and 'not available' data are excluded from per cent calculations.

**Table 23: Results of eye examination for ROP, infants born at less than 1750 grams who were in their registration hospital on day 42, by birthweight group, 1995**

Eye examination result	250-499	500-749	750-999	1000-1249	1250-1499	1500-1749	Infants < 1750 g
<b>Number</b>							
No ROP	1	81	194	250	198	65	789
Stage I	2	32	79	51	10	4	178
Stage II	—	49	71	34	6	1	161
Stage III	2	41	29	10	—	—	82
Stage IV	—	4	3	—	—	—	7
Not examined	—	6	17	31	48	32	134
Data not available	—	13	41	45	49	30	179
<b>Infants in hosp. on day 42</b>	<b>5</b>	<b>226</b>	<b>434</b>	<b>421</b>	<b>311</b>	<b>132</b>	<b>1,530</b>
<b>Per cent</b>							
No ROP	20.0	39.1	51.6	72.5	92.5	92.9	64.8
Stage I	40.0	15.5	21.0	14.8	4.7	5.7	14.6
Stage II	—	23.7	18.9	9.9	2.8	1.4	13.2
Stage III	40.0	19.8	7.7	2.9	—	—	6.7
Stage IV	—	1.9	0.8	—	—	—	0.6
<b>Infants in hosp. on day 42</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note:* see Table 22.

**Table 24: Survival to discharge by gestational age, 1995**

Gestational age (weeks)	All infants admitted	No. with discharge data	No. with lethal cong malf.	No. alive at 7 days	No. alive at 28 days	No. alive at discharge	Per cent survival at discharge
21	4	4	—	—	—	—	0
22	2	2	—	2	2	2	100.0
23	49	48	—	27	20	19	39.6
24	120	113	—	79	66	60	53.1
25	214	196	1	170	150	139	70.9
26	283	259	1	220	200	196	75.7
27	273	254	3	234	226	220	86.6
28	343	305	2	294	285	283	92.8
29	436	360	1	346	342	339	94.2
30	545	490	3	479	474	471	96.1
31	594	516	1	512	509	505	97.9
32	485	420	7	413	407	407	96.9
33	327	275	3	271	269	268	97.5
34	296	262	12	253	246	242	92.4
35	245	217	6	210	206	203	93.6
36	234	212	4	203	203	201	94.8
37	248	216	9	197	188	186	86.6
38	292	256	10	239	228	227	88.7
39	199	181	12	165	158	154	85.1
40	364	321	14	296	285	281	87.8
41	165	156	10	141	134	131	84.0
42	52	48	3	41	39	38	79.2
43	—	—	—	—	—	—	—
44	1	1	—	1	1	1	100.0
<b>All infants</b>	<b>5,771</b>	<b>5,110</b>	<b>102</b>	<b>4,793</b>	<b>4,638</b>	<b>4,573</b>	<b>89.5%</b>

Note: Per cent survival to discharge is calculated from no. alive at discharge divided by the no. with discharge information (88.5% of all infants), ie includes infants with known congenital malformations that directly contributed to their death.



**Table 25: Survival to discharge by birthweight group, 1995**

Birthweight group (grams)	<i>All infants admitted</i>	No. with discharge data	No. with lethal cong malf.	No. alive at 7 days	No. alive at 28 days	No. alive at discharge	Per cent survival at discharge
250-499	25	25	—	13	5	5	20.0
500-599	74	72	—	50	39	34	47.2
600-699	163	152	2	116	104	97	63.8
700-799	203	183	—	153	138	129	70.5
800-899	251	224	—	201	187	181	80.8
900-999	258	229	1	219	213	212	92.6
1000-1099	270	238	2	227	221	216	90.8
1100-1199	256	222	2	212	207	206	92.8
1200-1299	322	282	4	272	267	265	94.0
1300-1399	340	299	4	292	286	285	95.3
1400-1499	381	331	6	323	317	317	95.8
1500-1999	1,041	909	14	891	881	876	96.4
2000-2499	634	563	19	537	525	519	92.2
2500-2999	551	490	15	462	445	439	89.6
3000-3499	512	461	23	420	407	402	87.4
3500-3999	351	311	7	295	288	283	91.0
4000 +	139	120	3	110	108	107	89.2
<b>All infants</b>	<b>5,771</b>	<b>5,110</b>	<b>102</b>	<b>4,793</b>	<b>4,638</b>	<b>4,573</b>	<b>89.5%</b>

- Note:*
1. Per cent survival to discharge is calculated from no. alive at discharge divided by the no. with discharge information (88.5% of all infants), ie includes infants with known congenital malformations that directly contributed to their death.
  2. Data are divided into 100 grams group from 500 grams to 1500 grams, then 500 grams groups.

**Table 26: Level of hospital of transfer by gestational age group, all infants, 1995**

Hospital level	20-23	24-27	28-31	32-33	34-36	37-44	All infants
<b>Number</b>							
Not transferred	48	522	986	382	395	775	3,018
Level 1 or 2 hospital	5	269	907	392	324	381	2,278
Hospital with NICU (level 3)	1	51	69	22	28	60	231
Children's hospital NICU	1	48	46	16	28	105	244
<b>All infants</b>	<b>55</b>	<b>890</b>	<b>1,918</b>	<b>812</b>	<b>775</b>	<b>1,321</b>	<b>5,771</b>
<b>Per cent</b>							
Not transferred	87.3	58.7	49.1	47.0	51.0	58.7	52.3
Level 1 or 2 hospital	9.1	30.2	45.2	48.3	41.8	28.8	39.5
Hospital with NICU (level 3)	1.8	5.7	3.4	2.7	3.6	4.5	4.0
Children's hospital NICU	1.8	5.4	2.3	2.0	3.6	7.9	4.2
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note:* Where an infant was transferred many times, the level of hospital was recorded for the stay of most significance, or as the level 1 or 2 transfer if this was not apparent. This was to allow computation of stay in level 3 NICUs compared to step-down or level 1 or 2 stay.

**Table 27: Level of hospital of transfer by birthweight group, all infants, 1995**

Hospital level	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
<b>Number</b>												
Not transferred	23	228	327	349	421	474	307	301	305	205	78	3,018
Level 1 or 2 hospital	—	83	218	290	412	505	276	198	156	98	42	2,278
Hospital with NICU (level 3)	—	13	30	31	33	35	29	17	19	17	7	231
Children's hospital NICU	2	16	34	17	16	27	22	35	32	31	12	244
<b>All infants</b>	<b>25</b>	<b>340</b>	<b>609</b>	<b>687</b>	<b>882</b>	<b>1041</b>	<b>634</b>	<b>551</b>	<b>512</b>	<b>351</b>	<b>139</b>	<b>5,771</b>
<b>Per cent</b>												
Not transferred	92.0	67.1	53.7	50.8	47.7	45.5	48.4	54.6	59.6	58.4	56.1	52.3
Level 1 or 2 hospital	—	24.4	35.8	42.2	46.7	48.5	43.5	35.9	30.5	27.9	30.2	39.5
Hospital with NICU (level 3)	—	3.8	4.9	4.5	3.7	3.4	4.6	3.1	3.7	4.8	5.0	4.0
Children's hospital NICU	8.0	4.7	5.6	2.5	1.8	2.6	3.5	6.4	6.3	8.8	8.6	4.2
<b>All infants</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note:* Where an infant was transferred many times, the level of hospital was recorded for the stay of most significance, or as the level 1 or 2 transfer if this was not apparent. This was to allow computation of stay in level 3 NICUs compared to step-down or level 1 or 2 stay.



**Table 28: Total days until discharge from hospital by gestational age group, 1995**

Days to discharge	20-23	24-27	28-31	32-33	34-36	37-44	All infants
Median (days)	128	94	53	34	19	14	
minimum	91	39	3	3	2	2	
maximum	228	569	411	631	284	335	
All survivors with discharge data	21	612	1,598	675	646	1,019	4,575

Note: 1. Discharge data is available for 87.4% of surviving infants  
2. Data are for all infants, regardless of level of hospital at discharge

**Table 29: Total days until discharge from hospital by birthweight group, 1995**

Days to discharge	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All infants
Median (days)	175	112	85	63	47	38	22	16	13	13	14	
minimum	111	57	37	3	5	8	3	2	2	3	4	
maximum	447	569	494	411	257	631	387	335	245	115	157	
All survivors with discharge data	5	199	454	555	734	876	519	439	402	284	107	4,575

Note: 1. Discharge data is available for 87.4% of surviving infants  
2. Data are for all infants, regardless of level of hospital at discharge

# Appendix 1 Definitions of data items in 1995

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## 1.1 Definition format

Definitions at the time of the 1995 data collection were in a format similar to the Australian National Data Dictionary. For brevity, only the sections relating to the definition, classification or coding methods used, guide for use any additional comments are presented. The full definitions are available from ANZNN.

## 1.2 Minimum dataset variables:

### Registration hospital:

The first hospital with an Neonatal Intensive Care Unit (NICU) that the baby remains in for longer than four hours.

Classification / coding:

numeric code representing the registration hospital.

Guide for use:

If baby is transferred, she/he is considered to be in the next hospital from the time the transport team arrives to collect her/him. If the baby dies within four hours, she/he is registered to unit where she/he dies.

### Maternal age:

Age in completed years of the woman giving birth on the date of her baby's birth.

Classification / coding:

2-digit number representing the number of completed years.

### Previous preterm birth:

This mother has had a previous birth that was at less than 37 completed weeks gestation and more than 20 completed weeks, regardless of outcome.

Classification / coding:

0 = no previous preterm birth

1 = yes, there was a previous preterm birth

\* = unknown

### Previous perinatal death:

This mother has had a previous perinatal loss.

Classification / coding:

0 = no previous perinatal death

1 = yes, has had a previous perinatal death

\* = unknown

Guide for use:

A perinatal loss is when a baby with a birthweight of more than 400 grams or a gestational age of > 20 completed weeks died during the first 28 days of life.

### Assisted conception in this pregnancy:

The type of infertility treatment used during the conception or used to conceive this pregnancy.

Classification / coding:

0 = *Unknown* - information not available.

1 = *None* - no infertility treatment used for this pregnancy.

2 = *Hyperovulation* - any hormone therapy used to stimulate ovulation.

3 = *IVF / GIFT etc.* - any method of in-vitro fertilisation. Includes in-vitro fertilisation, gamete intra-fallopian transfer, zygote IFT, etc.

4 = *Other* - other infertility treatment not mentioned above, including artificial insemination.

Guide for use:

Disregard any treatment for a previous pregnancy.

### Ethnicity of mother:

Ethnic origin of the mother of baby, as identified by the mother.

Classification / coding:

0 = *Unknown* - information not available.

1 = *Aboriginal or Torres Strait Islander* - is a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community with which she is associated (ABS 'working definition'). i.e. Aboriginality is determined by patient self-identification

2 = *Asian* - includes all whose ethnic background originates from the countries of Asia, South East Asia & Indian subcontinent. Includes say, Fijian Indian.

3 = *Caucasian* - includes all of Caucasoid heritage, including European, Russian, Middle Eastern, and Arabic.

4 = *Other* - includes African Negroes, American Blacks and Indians, Inuit and Melanesian. There is a separate category for Polynesian.

5 = *Other Polynesian* - all of Polynesian background, except

6 = *Maori* - a person of Maori descent who identifies as a Maori



**Source of referral::**

Source of referral to the NICU where baby is registered.

Classification / coding:

0 = *unknown* - information not available.

1 = *Booked at tertiary obstetric hospital* - Mother booked into a hospital with a NICU and was not transferred during the most recent admission.

2 = *In-utero transfer from obstetric hospital* - Mother transferred during most recent admission, baby in utero.

3 = *Ex-utero retrieval* - Baby retrieved from any other hospital by a specialist neonatal transport retrieval team using appropriate equipment.

4 = *Ex-utero transfer* - Baby transferred from any other hospital, by a non specialist transfer method. This includes transport by ambulance.

5 = *Other* - includes born in transit, not booked.

Guide for use:

Use most recent referral if more than one.

**Presenting antenatal problem:**

The antenatal complication that the mother presented with, in this pregnancy, that started the train of events that lead to the baby's birth.

Classification / coding:

0 = *Unknown* - presenting problem unknown.

1 = *Preterm pre-labour rupture of membranes (PPROM)* - confirmed spontaneous rupture of membranes occurring prior to the onset of labour, and before 37 completed weeks gestation. Rupture of the membranes is defined as the obvious gush or clear amniotic fluid from the vagina, or (if fluid is available) by differentiation with urine and vaginal secretions<sup>11</sup>

2 = *Preterm labour (PTL)* - see Preterm Labour.

3 = *Hypertension in Pregnancy (HDP)* - see 'Hypertension in Pregnancy'.

4 = *Antepartum Haemorrhage (APH)* - see 'Antepartum Haemorrhage'.

5 = *Suspected intrauterine growth restriction (IUGR)* - see 'Intra-Uterine Growth Restriction'.

6 = *Fetal distress* - see 'Fetal Distress'.

7 = *Other* - see 'Other antenatal complication'.

8 = *None* - No presenting problem. Baby must be born at term.

Guide for use:

Only one complication to be chosen. If the baby is preterm there must be a presenting problem.

**Other antenatal complications:**

The presence of any other antenatal complications, in addition to that listed in presenting antenatal problem.

Classification / coding:

0 = no other antenatal complications present

1 = yes other antenatal complications were present

\* = unknown

**Prolonged rupture of membranes (PROM):**

Confirmed spontaneous membrane rupture for more than 24 hours before birth of the baby. Rupture of the membranes is diagnosed by the obvious gush or clear amniotic fluid from the vagina, or (if fluid is available) by differentiation with urine and vaginal secretions<sup>11</sup>.

Classification / coding:

0 = no, membranes not ruptured or ruptured for less than 24 hours

1 = yes, membranes ruptured for more than 24 hours

\* = unknown

**Preterm labour (PTL):**

The presence of regular painful contractions, leading to progressive effacement and dilatation of the cervix, eventually leading to the birth of the baby<sup>5</sup>, and commencing before 37 completed weeks gestation.

Classification / coding:

0 = no, labour did not commence in the preterm period

1 = yes, labour commenced in the preterm period

\* = unknown

**Hypertension in pregnancy:**

Hypertension in pregnancy is defined as a systolic blood pressure  $\geq 140$  mmHg and / or diastolic blood pressure  $\geq 90$  mmHg, or rise in systolic blood pressure 25 mmHg and/or rise in diastolic blood pressure  $\geq 15$  mmHg from blood pressure reading before conception or in the first trimester (confirmed by 2 readings six hours apart)<sup>1</sup>.

Classification / coding:

0 = no hypertension in pregnancy detected

1 = yes, hypertension in pregnancy diagnosed

\* = unknown

**Antepartum haemorrhage (APH):**

Significant haemorrhage in the time from 20 weeks gestation to the end of second stage of labour. This excludes a 'show'.

Classification / coding:

0 = no antepartum haemorrhage noted

1 = yes, antepartum haemorrhage

\* = unknown

**Suspected intrauterine growth restriction (IUGR):**

Suspected intrauterine growth restriction of this fetus, a condition of the fetus in which it fails to reach its genetically predetermined full growth potential due to intrinsic or extrinsic factors<sup>14</sup> based on more than one obstetric ultrasound.

Classification / coding:

0 = no intrauterine growth restriction present

1 = yes, suspected intrauterine growth restriction

\* = unknown



**Fetal distress:**

Any 'distress' of this fetus leading to intervention by the obstetric team.

Classification / coding:

0 = no intervention necessary

1 = yes, obstetric intervention required

\* = unknown

**Other antenatal complication:**

Other significant antenatal complication, not specified.

Classification / coding:

0 = no other significant antenatal complication

1 = yes, other significant antenatal complication

**Antenatal corticosteroids for fetal lung enhancement:**

Corticosteroids given antenatally via any route to the mother at a time likely to enhance fetal lung maturation. Excludes steroids given for other reasons.

Classification / coding:

0 = *Unknown* - information not available.

1 = *None* - corticosteroids not ever given during this pregnancy at a time likely to enhance fetal lung maturation.

2 = *less than 24 hours* - first dose given at < 24 hours prior to this baby's birth.

3 = *Complete* - more than one dose of corticosteroids given, and first dose was given more than 24 hours and less than 8 days before baby's birth.

4 = *more than 7 days* - steroids given > 7 days before the baby's birth.

Guide for use:

If two courses given, and one is fulfils the 'complete' criteria, use 'complete'. If the information of the time of doses given is not available, but two doses are known to have been given appropriately, also use 'complete'.

**Plurality:**

The total number of births resulting from this pregnancy.

Classification / coding:

0 = *Singleton* - only one baby born.

1 = *Twins* - two babies

2 = *Triples* - three babies

3 = *Quads* - four babies

4 = *More!* - Quintuplets, sextuplets etc.,

Guide for use:

Plurality of a pregnancy is determined by the number of live births or by the number of fetuses that remain in utero at 20 weeks' gestation and that are subsequently born separately. In multiple pregnancies or, if gestational age is unknown, only live births of any birthweight or gestational age, or fetuses weighing 400 gram or more are taken into account in determining plurality.

Fetuses aborted before 20 completed weeks or fetuses compressed in the placenta at 20 or more weeks are excluded.

**Birth order:**

The order of each baby of a multiple birth.

Classification / coding:

A single digit numeric field representing the birth order.

0 = singleton.

1 = First of a multiple birth

2 = Second of a multiple birth.

3 = Third of a multiple birth, etc.

**Patient identifier (baby):**

Patient identifier unique within establishment.

Classification / coding: unspecified, 9 digit label

**Date of birth:**

Date of birth of the patient.

Classification / coding: DD / MM / YY

**Admission date:**

The date on which an inpatient or same-day patient commences an episode of care.

Classification / coding: DD / MM / YY

**Sex:**

The sex of the patient.

Classification / coding:

0 = *Unknown* - information not available.

1 = *Male* -

2 = *Female* -

3 = *Ambiguous* - or indeterminate.

**Birthweight:**

The first weight of the baby (stillborn or liveborn) obtained after birth (record in grams)

Classification / coding:

4 digit numbered field representing birthweight in grams

**Gestational age:**

The estimated gestational age of the baby in completed weeks as determined by clinical assessment immediately after birth.

Classification / coding:

2 digit numbered field representing the number of completed weeks.

Guide for use:

Derived from clinical assessment. Accurate information on the date of the last menstrual period (LMP) may not be available for every pregnancy. In these circumstances, clinical estimates of gestational age can be obtained during pregnancy or by examination of the baby immediately after birth.

**Place of birth:**

Place of baby's birth

Classification / coding:

0 = *unknown* - information not available

1 = *Non tertiary hospital* - born in a hospital without a neonatal intensive care nursery .

2 = *Tertiary hospital* - Born in a hospital with a Level 3 neonatal intensive care nursery.

3 = *Home birth* - birth planned for and occurred at home.

4 = *Born before arrival* - baby was born at home (unplanned), or in an ambulance, a car etc.

**Presentation at birth:**

Presenting part of the fetus (i.e. at lower segment of the uterus) at birth.

Classification / coding:

0 = *Unknown* - information not available, not stated

1 = *Cephalic* - including face and brow

2 = *Breech* - legs or feet were facing the cervix

3 = *Other* - includes transverse.

**Mode of birth:**

Mode of birth

Classification / coding:

0 = *Unknown* - information not available.

1 = *Vaginal* - Vaginal birth, includes vaginal breech

2 = *Instrument* - vaginal birth using instrument. Includes forceps, rotations, and vacuum extractions.

3 = *Caesarean section in labour* - caesarean performed after the commencement of labour (regular painful contractions, leading to progressive effacement and dilatation of cervix, eventually leading to the birth of the baby). Also known as emergency caesarean section.

4 = *Caesarean section, no labour* - caesarean section performed prior to labour commencing . Also known as elective caesarean section.

**Apgar (1 minute):**

Numerical score to evaluate the babies condition at 1 minute after birth.

Classification / coding:

2 digit numeric field representing the Apgar scores

Guide for use:

The score is based on the five characteristics of heart rate, respiratory condition, muscle tone, reflexes and colour.

**Apgar (5 minute):**

Numerical score to evaluate the babies condition at 5 minutes after birth.

Classification / coding:

2 digit numeric field representing the Apgar scores

Guide for use:

as for Apgar (1 minute)

**Intubated at resuscitation:**

An active measure taken shortly after birth to establish independent respiration and heart rate, or to treat depressed respiratory effort by endotracheal intubation.

Classification / coding:

0 = no, intubation not necessary in labour ward

1 = yes, intubation necessary in labour ward

\* = unknown

Guide for use:

This does not include intubation for tracheal aspiration or intubation in the NICU after resuscitation has been completed.

**Major congenital malformations:**

A structural abnormality (including deformation) was present at birth that was diagnosed prior to discharge to home.

Classification / coding:

0 = no major congenital malformations noted

1 = yes, major congenital malformations noted

\* = unknown

Guide for use:

An exclusion list of minor abnormalities is supplied in Appendix A.

Justification:

Required to monitor trends in the reported incidence of congenital malformations, to detect new drug & environmental teratogens, to analyse possible causes in epidemiological studies, & to determine survival rates & utilisation of paediatric services.

**Specified congenital malformations:**

Specified structural abnormalities (including deformation) that were present at birth that were diagnosed prior to discharge to home.

Classification / coding:

ICD-9-CM

Guide for use:

An exclusion list of minor abnormalities is supplied in Appendix A.

Comment:

There is no arbitrary limit on the number of conditions specified. Most perinatal groups and birth defects registers in the States and territories have used the 5-digit British Paediatric Association (BPA) Classification of Diseases to code congenital malformations since the early 1980s. This classification provided more specific codes than ICD-9 for some malformations. While it is appropriate to use ICD9-CM, State and Territory perinatal data groups using the BPA classification should continue to do so until ICD-10 is introduced nationally. There are no equivalent codes for all congenital malformations in the two coding systems.



**Temperature on admission:**

Temperature on admission to Neonatal Intensive Care Unit (NICU) or soonest to admission to registration unit. Use rectal temperature or, if not available, per axillae.

Classification / coding:

3-digit numbered field representing temperature measured in degrees Celsius, correct to 1 decimal place.

Guide for use:

If the baby is transported from a peripheral area by a specialist neonatal retrieval team, admission (for the purpose of this study) is considered to commence when the retrieval team arrive at the baby's bedside. If the baby is more than twelve hours old at admission to the registration unit or when the specialist neonatal team arrives (whichever is earlier), write 'M' to denote 'missing'. If an admission temperature is not recorded, write 'M'. If electronic data entry does not allow 'M', then, a data set marked as 'complete' with this field marked as missing, will indicate that the data is not available.

**Highest appropriate inspired oxygen (FiO<sub>2</sub>):**

Highest appropriate FiO<sub>2</sub>, recorded as percentage, between admission to NICU and 12 hours after birth. Appropriate range is when arterial PaO<sub>2</sub> or TcPO<sub>2</sub> is 50-80 mmHg, or if FiO<sub>2</sub> is more than 25%, SaO<sub>2</sub> is 88-95%, or if FiO<sub>2</sub> is less than 25%, SaO<sub>2</sub> is more than 88%.

Classification / coding:

3 digit numbered field representing FiO<sub>2</sub> recorded as a percentage.

Guide for use:

as for 'temperature on admission'.

**Lowest appropriate inspired oxygen (FiO<sub>2</sub>):**

Lowest appropriate FiO<sub>2</sub> recorded as percentage, between admission to NICU and 12 hours after birth. Appropriate range as for 'Highest appropriate inspired oxygen (FiO<sub>2</sub>)'

Classification / coding:

3 digit numbered field representing FiO<sub>2</sub> recorded as a percentage.

Guide for use:

as for 'temperature on admission'.

**Worst base excess:**

Worst base deficit (mmol/l) recorded between admission to Neonatal Intensive Care Unit and 12 hours after birth.

Classification / coding:

3 digits correct to one decimal place. May have negative values.

Guide for use:

as for 'temperature on admission'.

**Main respiratory diagnosis:**

Main respiratory diagnosis for baby.

Classification / coding:

0 = *Unknown* - information not available

1 = *Normal* - normal lungs, that is no respiratory disease and no respiratory support

2 = *Transient Tachypnoea of the Newborn (TTN)* - Respiratory distress presenting as tachypnoea (rates of 60-120 / min), with subcostal recession, slight grunting and cyanosis. CXR: increase in lung markings and opacification of transverse fissure and lungs generally hyperinflated, or confluent densities affecting one or more lobes<sup>6</sup>.

3 = *Hyaline membrane disease (HMD)* - increasing respiratory distress or O<sub>2</sub> requirements, or need for ventilator support from the first 6 hours of life with a chest Xray showing generalised reticulo-granular pattern ± air bronchogram.

4 = *Meconium aspiration* - Respiratory distress presenting from immediately after birth to 12 hours of age. Hypoxia, tachypnoea, gasping respirations and often signs of underlying asphyxia. CXR: overexpansion of lungs with widespread coarse, fluffy infiltrates.<sup>6</sup>

5 = *Pneumonia* - respiratory distress with proven or suspected infection (toxic blood count), and CXR showing persisting opacities.

6 = *Persistent pulmonary hypertension (PPH)* - echocardiatic (shunting) or clinical evidence (O<sub>2</sub> requirement unexplained by CXR or loud P<sub>2</sub>, or differential pre and post ductal TCPO<sub>2</sub>).

7 = *Immature lung* - pulmonary dysfunction in babies born at less than 29 weeks who require support by supplemental oxygen or ventilation. That is, a clear CXR with poorly defined branching / tapering pattern.

8 = *Apnoea* - recurrent pauses in breathing of more than 20 seconds, or for less than 20 seconds and associated with bradycardia or desaturation requiring intervention.

9 = *Congenital abnormality* - Congenital abnormality was the primary reason for respiratory distress, eg diaphragmatic hernia (abnormality needs to be listed under congenital malformation field).

10 = *Other* - unspecified other respiratory disease.

Guide for use:

For a diagnosis other than 'normal' the baby must have received some form of respiratory support (supplemental oxygen therapy and /or assisted ventilation for more than 4 consecutive hours, or died prior to 4 hours). If more than one diagnosis is possible, use the condition that was most serious. For example, severe HMD requiring surfactant replacement and mechanical ventilation plus later apnoea requiring CPAP would be coded as 'HMD'. However, severe lung hypoplasia with mild HMD would be coded as 'congenital abnormality'.



**Exogenous surfactant:**

The dose of any type of exogenous surfactant used to treat this baby.

Classification / coding:

0 = *Unknown* - information not available

1 = *None* - no artificial surfactant ever given to this baby

2 = *Exosurf* - any treatment using "Exosurf"

3 = *Survanta* - any treatment using "Survanta"

4 = *Other* - other artificial surfactant given

Guide for use:

Includes incomplete administration.

**Air leak requiring drainage:**

The presence of any form of air leak requiring drainage (either transient or continuous drainage). Pulmonary airleaks may include pneumothorax, pulmonary interstitial emphysema, pneumomediastinum, pneumopericardium, pneumoperitoneum, and subcutaneous or surgical emphysema<sup>12</sup> p359

Classification / coding:

0 = no air leak requiring drainage present.

1 = yes, air leak requiring drainage

\* = unknown

**Days of intermittent positive pressure ventilation (IPPR):**

Total number of days of IPPR via an endotracheal tube, at any rate. Four consecutive hours in any one 24 hour period constitutes a day.

Classification / coding:

3 digit numbered field representing IPPR days

Guide for use:

The highest level of assisted ventilation therapy for any 24 hour period is used. For example, if the baby has 8 hours of CPAP, then 5 hours of IPPR, then 11 hours of head box oxygen in any one 24 hour period, this is recorded as one 'IPPR' day.

**Days of continuous positive airways pressure (CPAP):**

Total number of days of CPAP via any route. Four consecutive hours in any one 24 hour period constitutes a day.

Classification / coding:

3 digit numbered field representing CPAP days

Guide for use:

as for 'Days of intermittent positive pressure ventilation (IPPR)'

**Date of final added oxygen therapy:**

Date supplemental oxygen (O<sub>2</sub>) finally ceased (appropriately).

Classification / coding:

DD / MM / YY

Guide for use:

Four consecutive hours in any one 24 hour period constitutes a day. Any route of oxygen administration is used. If oxygen is ceased, and then the baby required more supplemental O<sub>2</sub> for the same illness, use final day of all the days that supplemental oxygen was used. However, do not include days of oxygen for subsequent illnesses such as oxygenation after surgery, RSV etc. If the baby never received supplemental oxygen leave blank. If the baby received only say, 5 hours of oxygen on day one, use the date of birth. If the baby received supplemental oxygen after discharge from hospital use the discharge date here.

**Home oxygen therapy:**

Supplemental oxygen was used by the baby at home after discharge from hospital.

Classification / coding:

0 = no supplemental oxygen used at home

1 = yes, home oxygen therapy

\* = unknown

Guide for use:

Must have required supplemental oxygen in hospital, and date of final added oxygen therapy must be date of discharge to home.

**Proven necrotising enterocolitis (NEC):**

Diagnosis of necrotising enterocolitis (NEC) is definite.

Classification / coding:

0 = no NEC proven

1 = yes, NEC proven

\* = unknown

Guide for use:

Definite NEC includes having at least four of the symptoms listed below, plus a profile consistent with definite NEC as listed below, plus the baby warranted treatment which included nil by mouth and antibiotics. NEC symptoms must include at least one systemic sign (apnoea; bradycardia, temperature instability or lethargy) and one intestinal sign (residuals more than 25% of previous feed on two consecutive occasions, abdominal distension, vomiting or faecal blood) and may also include dilated bowel. A profile consistent with definite NEC includes at least one of the following: abdominal wall cellulitis and palpable abdominal mass, or pneumatosis intestinalis, or portal vein gas, or a persistent dilated loop on serial Xrays, or a surgical or post mortem diagnosis<sup>2</sup>.

**Number of episodes of proven infection:**

The total number of separate episodes of proven bacteria, fungal or viral systemic infections.

Classification / coding:

2 digit number representing the number of episodes of proven infection.

Guide for use:

Systemic sepsis is defined as a clinical picture consistent with sepsis, and either a positive bacterial or fungal culture of blood and/or cerebrospinal fluid, or a positive urine culture by sterile collection only. Infections with coagulase-negative staphylococci, and other potential contaminants, or group streptococcal antigen detected in urine were included only if the baby was considered clinically septic and there was supporting evidence such as raised white cell count or thrombocytopenia. Viral infections are proven by culture and/or haematological results consistent with infection. (adapted from <sup>10</sup>).

**Maximum grade of Intraventricular Haemorrhage (IVH):**

Worst level of intraventricular haemorrhage (IVH) seen on either side by either ultrasound or post mortem examination.

Classification / coding:

0 = *None* - ultrasound / post mortem shows no haemorrhage.

1 = *Grade 1* - subependymal germinal matrix haemorrhage.

2 = *Grade 2* - intraventricular haemorrhage with no ventricular dilatation.

3 = *Grade 3* - intraventricular haemorrhage with ventricle distended with blood.

4 = *Grade 4* - intraparenchymal haemorrhage <sup>13</sup>.

5 = *Not examined* - by ultrasound or post mortem.

**Neonatal surgery:**

Did this baby have major surgery.

Classification / coding:

0 = no

1 = yes

\* = unknown

Guide for use:

Appendix B lists exclusions.

**Date of late head ultrasound:**

Date of the worst cerebral ultrasound scan.

Classification / coding:

DD / MM / YY

**Ventricle size:**

Ventricular size at the ultrasound closest to six weeks of age as in above date. Ventricular index is measured (in mm) as the furthest lateral extent of each ventricle from the midline measured at level of Foramen of Monro <sup>12</sup>.

Classification / coding:

0 = *Unknown* - information not available, includes not scanned.

1 = *No dilatation* - ventricle size is less than or equal to 97<sup>th</sup> centile.

2 = *Dilatation* - ventricle size greater than 97<sup>th</sup> centile, but ≤ 4 mm greater than 97<sup>th</sup> centile.

3 = *Hydrocephalus* - ventricle size is more than 4 mm larger than 97<sup>th</sup> centile, or hydrocephalus present that required a shunt or any form of drainage (permanent or transient).

**Cerebral cystic formations :**

Changes in brain parenchyma seen at the worst scan.

Classification / coding:

0 = *Unknown* - information not available, includes not scanned.

1 = *No cysts* - none seen on ultrasound

2 = *Porencephalic cyst(s)* - Parenchymal lesions corresponding to grade 4 intraventricular haemorrhage.

3 = *Periventricular leukomalacia (PVL)* - refers to ischaemic brain injury affecting the periventricular white matter in the boundary zones supplied by terminal branches of the both the centripetal and centrifugal arteries <sup>8</sup>

**Retinopathy of prematurity (ROP):**

Worst stage of ROP in either eye prior to going home.

Classification / coding:

0 = *None seen* - no changes seen

1 = *Stage I* - Demarcation line.

2 = *Stage II* - Ridge.

3 = *Stage III* - Ridge with extra-retinal fibrovascular proliferation.

4 = *Stage IV* - Retinal detachment <sup>9</sup>.

5 = *Not examined* - no eye examination performed.

**Therapy for retinopathy of prematurity:**

Any therapy used to treat retinopathy of prematurity i.e. laser or cryotherapy.

Classification / coding:

0 = no therapy for ROP received

1 = yes, therapy given for ROP

\* = unknown



**Died:**

The death of this baby prior to discharge from hospital.

Classification / coding:

0 = no, survived to discharge to home.

1 = yes, died

\* = unknown

**Date of death:**

Date of death of baby if occurred prior to discharge to home.

Classification / coding: DD / MM / YY

**Post Mortem:**

A post mortem examination was performed.

Classification / coding:

0 = no post mortem performed

1 = yes, a post mortem was performed

\* = unknown

**Immediate cause of death :**

Immediate cause of death

Classification / coding:

unspecified free field

Guide for use:

Cause of death to be described in morbid anatomical terms

**Transferred to another hospital:**

The baby was transferred to another hospital nursery before going home.

Classification / coding:

0 = no, never transferred

1 = yes, transferred

\* = unknown

**Specify hospital of transfer:**

Specify the name of the hospital to which the baby was transferred.

Classification / coding:

unspecified free field

Guide for use:

If the baby is transferred many times, say to another hospital for surgery and then back, or for specialist assessment, and then is transferred to a peripheral hospital, use the latter.

**Date of transfer:**

Date on which a newborn baby completes an episode of care after birth in the hospital of registration.

Formal separation is the administrative process by which a hospital records the completion of treatment and / or care and accommodation of a patient.

Classification / coding: DD / MM / YY

Guide for use:

If the baby is transferred many times, say to another hospital for surgery and then back, or for specialist assessment, and then is transferred to a peripheral hospital, use the latter. Use the most significant date here.

**Discharge date:**

Date on which a same-day patient or an inpatient completes an episode of care.

Classification / coding: DD / MM / YY

Comment:

All data collection ceases when the baby is discharged to home.

## Appendix 2      Participating hospitals in 1995

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The Canberra Hospital (formerly Woden Valley Hospital), Canberra, Australian Capital Territory

Number of livebirths in 1995: 2,554  
Total number of beds for newborn infants: 24

Christchurch Women's Hospital, Christchurch, New Zealand

Number of livebirths in 1995: 3,631  
Total number of beds for newborn infants: 24

Dunedin Hospital, Dunedin, New Zealand

Number of livebirths in 1995: 1,779  
Total number of beds for newborn infants: 20

Flinders Medical Centre, Adelaide, South Australia

Number of livebirths in 1995: 2,474  
Total number of beds for newborn infants: 33

John Hunter Hospital, Newcastle, New South Wales

Number of livebirths in 1995: 3,597  
Total number of beds for newborn infants: 29

King Edward Memorial Hospital for Women, Perth, Western Australia

Number of livebirths in 1995: 5,022  
Total number of beds for newborn infants: 60

King George V Memorial Hospital, Sydney, New South Wales

Number of livebirths in 1995: 4,401  
Total number of beds for newborn infants: 32

Kirwan Hospital for Women, Townsville, Queensland

Number of livebirths in 1995: 1,600  
Total number of beds for newborn infants: 18

Liverpool Hospital, Sydney, New South Wales

Number of livebirths in 1995: 2,990  
Total number of beds for newborn infants: 17

Mater Misericordiae Mother's Hospital, Brisbane, Queensland

Number of livebirths in 1995: 7,363  
Total number of beds for newborn infants: 60

Mercy Hospital for Women, Melbourne, Victoria

Number of livebirths in 1995: 5,245  
Total number of beds for newborn infants: 54

Middlemore Hospital, Auckland, New Zealand

Number of livebirths in 1995: 4,212  
Total number of beds for newborn infants: 20

Monash Medical Centre, Melbourne, Victoria

Number of livebirths in 1995: 4,742  
Total number of beds for newborn infants: 44

National Women's Hospital, Auckland, New Zealand

Number of livebirths in 1995: 9,228  
Total number of beds for newborn infants: 64



Nepean Hospital, Penrith, New South Wales		
Number of livebirths in 1995:	2,742	
Total number of beds for newborn infants:	28	
Princess Margaret Hospital for Children, Perth, Western Australia		
Number of livebirths in 1995:	Children's centre	
Total number of beds for newborn infants:	20	
Royal Alexandra Hospital for Children, Sydney, New South Wales		
Number of livebirths in 1995:	Children's centre	
Total number of beds for newborn infants:	24	
Royal Children's Hospital, Melbourne, Victoria		
Number of livebirths in 1995:	Children's centre	
Total number of beds for newborn infants:	25	
Royal Darwin Hospital, Darwin, Northern Territory		
Number of livebirths in 1995:	1,480	
Total number of beds for newborn infants:	18	
Royal Hobart Hospital, Hobart, Tasmania		
Number of livebirths in 1995:	1,910	
Total number of beds for newborn infants:	16	
Royal Hospital for Women, Sydney, New South Wales		
Number of livebirths in 1995:	3,726	
Total number of beds for newborn infants:	32	
Royal North Shore Hospital, Sydney, New South Wales		
Number of livebirths in 1995:	2,322	
Total number of beds for newborn infants:	26	
Royal Women's Hospital, Brisbane, Queensland		
Number of livebirths in 1995:	4,792	
Total number of beds for newborn infants:	66	
Royal Women's Hospital, Melbourne, Victoria		
Number of livebirths in 1995:	7,426	
Total number of beds for newborn infants:	58	
Sydney Children's Hospital (formerly Prince of Wales Children's Hospital), Sydney, NSW		
Number of livebirths in 1995:	Children's centre	
Total number of beds for newborn infants:	24	
Waikato Hospital, Hamilton, New Zealand		
Number of livebirths in 1995:	3,147	
Total number of beds for newborn infants:	26	
Wellington Women's Hospital, Wellington, New Zealand		
Number of livebirths in 1995:	3,173	
Total number of beds for newborn infants:	30	
Westmead Hospital, Sydney, New South Wales		
Number of livebirths in 1995:	4,139	
Total number of beds for newborn infants:	41	
Women's and Children's Hospital (formerly Queen Victoria Hospital), Adelaide, South Australia		
Number of livebirths in 1995:	3,002	
Total number of beds for newborn infants:	50	



## Appendix 3 Data items collected

key:	data collected		per cent of all infants for whom the data item was known calculated from number of 'missing' and 'unknown' data divided by total number of infants (n: 5,771).
	data partially collected		
	no data collected		
All infants			* 97.6%
Maternal age			79.4%
Previous preterm birth			79.5%
Previous perinatal loss			79.4%
Infertility treatment			73.4%
Ethnicity			75.2%
Referral source			99.0%
Presenting ante. problem			78.5%
Other antenatal problem			89.8%
PROM			88.5%
Preterm labour			94.9%
Hypertension in pregn.			88.5%
Antepartum haem.			88.5%
IUGR			82.7%
Fetal distress			88.6%
Others			85.1%
Steroids			92.8%
Multiple gestation			100.0%
Birth order			100.0%
Date of birth			100.0%
Date of admission			100.0%
Gender			100.0%
Birth weight			100.0%
Gestational age			100.0%
Place of birth			99.3%
Presentation at birth			84.2%
Type of birth			94.9%
Apgar at 1 minute			94.3%
Apgar at 5 minute			82.9%
Intubation at birth			89.9%
Congenital malformation			94.2%
Specify cong. malform.			94.2%
Admission temperature			83.0%
High appropriate FiO <sub>2</sub>			71.2%
Low appropriate FiO <sub>2</sub>			71.0%
Worst base excess			71.4%
Main resp. diagnosis			92.7%
Surfactant			99.7%
Airleak req. drainage			99.7%
Days of IPPR			100.0%
Days of CPAP			100.0%
Date O <sub>2</sub> ceased			95.3%
Home O <sub>2</sub>			99.4%
Proven NEC			99.7%
Systemic infection			100.0%
IVH			91.2%
Major surgery			99.7%
Date late head USS			49.9%
Ventricle size			54.0%
Cysts			53.6%
ROP			84.4%
ROP treatment			95.4%
Died			88.5%
Date died			88.5%
Post mortem			88.5%
Cause of death			81.0%
Transferred out			100.0%
Transfer hospital level			100.0%
Transfer date			100.0%
Discharge date			88.5%



## Appendix 4 Publications in 1995 by NICU staff in Australia and New Zealand

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### 4.1 Articles

ACTOBAT Study group 1995. Australian collaborative trial of antenatal thyrotropin-releasing hormone (ACTOBAT) for prevention of neonatal respiratory disease. *Lancet* 345:877-882.

Australian and New Zealand Perinatal Societies 1995. The origins of cerebral palsy. *J Paediatr Child Health*. 31:284-289.

Australian and New Zealand Perinatal Societies 1995. The origins of cerebral palsy: a consensus statement. *Med J Aust* 162:85-90.

Australasian Study Group for Neonatal Infections 1995. Early onset group B streptococcal infections in Aboriginal and non-Aboriginal infants. *Med J Aust*. 163:302-306.

The Victorian Infant Collaborative Study Group: Doyle LW 1995. Neurosensory outcome at five years and extremely low birthweight. *Arch. Dis. Child*. 73:F143-146.

The Victorian Infant Collaborative Study Group: Doyle LW 1995. Outcome to five years of age of children born at 24 - 26 weeks gestational age in Victoria. *Med J Aust* 163:11-14.

Adamson SJ, Alessandri LM, Badawi N, Burton PR, Pemberton PJ & Stanley F 1995. Predictors of neonatal encephalopathy in full term infants. *BMJ*. 311:598-602.

Anderson NG, Hay R, Hutchings M, Whitehead M & Darlow B 1995. Posterior fontanelle cranial ultrasound: anatomic and sonographic correlation. *Early Hum Dev*. 42:141-152.

Bruce S, Downe L, Devonald K & Ellwood D 1995. Noninvasive investigation of infantile hepatic hemangioma: a case study. *Pediatrics*. 95:595-597.

Capes DF, Dunster KR, Sunderland VB, McMillan D, Colditz PB & McDonald C 1995. Fluctuations in syringe pump infusions: association with blood pressure variations in infants. *Am J Health Syst Pharm*. 52:1646-1653.

Chye JK & Gray PH 1995. Rehospitalization and growth of infants with bronchopulmonary dysplasia: a matched control study. *J Paediatr Child Health*. 312:105-111.

Costello SA, Nyikal J, Yu VY & McCloud P 1995. BiliBlanket phototherapy system versus conventional phototherapy: a randomized controlled trial in preterm infants *J Paediatr Child Health*. 31:11-13.

Darlow BA, Inder TE, Graham PJ, Sluis KB, Malpas TJ, Taylor BJ & Winterbourn CC 1995. The relationship of selenium status to respiratory outcome in the very low birth weight infant. *Pediatrics*. 96:314-319.

Darlow BA, Inder TE, Sluis KB, Nuthall G, Mogridge N & Winterbourn CC 1995. Selenium status of New Zealand infants fed either a selenium supplemented or a standard formula *J Paediatr Child Health*. 31: 339-344.

Dockerty JD, Broadbent R & McNoe B 1995. New Zealand hospital records insufficient for vitamin K study. *NZ Med J*. 108:169-170.

Doran O, Austin NC & Taylor BJ 1995. Vitamin K administration in neonates: survey of compliance with recommended practices in the Dunedin area. *N Z Med J*. 108:337-339.

- Dyke MP, Kohan R & Evans S 1995. Morphine increases synchronous ventilation in preterm infants. *J Paediatr Child Health*. 31:176-179.
- Elder DE, Minutillo C & Pemberton PJ 1995. Neonatal herpes simplex infection: keys to early diagnosis. *J Paediatr Child Health*. 31:307-311.
- Evans N & Iyer P 1995. Longitudinal changes in the diameter of the ductus arteriosus in ventilated preterm infants: correlation with respiratory outcomes. *Arch Dis Child Fetal Neonatal Ed*. 72:F156-F161.
- Forbes LV, Brown LJ, Scott RS, Darlow BA 1995. Immunogenetic, clinical and demographic characterisation of childhood type 1 diabetes in New Zealand. *Diabetes Care*. 18: 1428-1433.
- French NP, Parry TS & Evans S 1995. Improving outcome for Western Australian infants with birthweights 500-999 g. *Med J Aust*. 162:295-296, 298-299.
- Gray PH, Burns YR, Mohay HA, O'Callaghan MJ & Tudehope DI 1995. Neurodevelopmental outcome of preterm infants with bronchopulmonary dysplasia. *Arch Dis Child Fetal Neonatal Ed*. 73:F128-F134.
- Gupta RK, Naran S & Selby RE 1995. Fine needle aspiration cytodiagnosis of subcutaneous fat necrosis of newborn. A case report. *Acta Cytol*. 39:759-761.
- Gunn TR, Mora JD & Pease P, 1995. Antenatal diagnosis of urinary tract abnormalities by ultrasonography after 28 weeks' gestation: incidence and outcome. *Am J Obstet Gynecol*. 172:479-486.
- Harbord MG & Weston PF 1995. Somatosensory evoked potentials predict neurologic outcome in full-term neonates with asphyxia. *J Paediatr Child Health*. 312:148-151.
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## 4.3 Books

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## Appendix 5 Aims, objectives and guidelines

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### 5.1 Aim

The aim of the Australian & New Zealand Neonatal Network (ANZNN) is 'to improve the care of high-risk newborn infants and their families in Australia and New Zealand through collaborative audit and research'.

*As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2 April 1995.*

### 5.2 Objectives

The objectives of the Australian & New Zealand Neonatal Network (ANZNN) are

1. To provide a core data set that will:
  - i Identify trends and variations in morbidity or mortality warranting further study.
  - ii Enhance the ability to carry out multicentre studies and randomised controlled trials.
  - iii Provide information on neonatal outcomes adjusted for case mix and disease severity to participating neonatal units to assist with quality improvement.
2. Monitor the use of new technologies eg surfactant usage by patient type and outcome.
3. Develop and evaluate a clinical risk score for babies in Australian and New Zealand neonatal units (mortality and morbidity).
4. Develop and assess clinical indicators for perinatal care through neonatal outcomes.

*As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2 April 1995.*

### 5.3 Confidentiality guidelines

Confidentiality guidelines were devised and agreed to by the Advisory Committee to provide an unambiguous framework for the handling of data that met the strict criteria of governing bodies. These guidelines are set out in full below.

Confidentiality guidelines for the collection, processing, and analysis of data from the national minimum data set of the Australian & New Zealand Neonatal Network.

*As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2 April 1995.*

The purpose of these guidelines is to set out the principles under which the National Minimum Data set (NMD) for Neonatal Intensive Care Units is formulated and the conditions that apply to the use of these data and release to parties internal and external to the Australian & New Zealand Neonatal Network (ANZNN). As the ANZNN is part of the AIHW National Perinatal Statistics Unit, it is bound by Australian Institute of Health and Welfare Act, and thus confidentiality of any information covering another person must be upheld. The Act also allows for the data provider to place conditions on the use, release and publication of information. Data will be only released to the Australian Institute of Health and Welfare in a form agreed to by the Advisory Committee.

The essential purpose of the NMD is to provide national unit record data on babies meeting specified criteria who have been admitted to Neonatal Intensive Care Units (NICU), or affiliated nurseries, in Australia and New Zealand. In general, this will be achieved through distribution of an annual report containing summary tables without identifying characteristics, either of a personal, institutional or State / Territory / national nature. In certain other instances, data may be provided internally in the following manner:

- as de-identified summary tables not provided in the annual report, but available upon request;
- as de-identified unit record data for analytical purposes as approved by the ANZNN; and
- as identifiable summary and / or unit record data for clinical audit purposes by the respective NICU providing the data.

These guidelines will cover the collection and provision of the data retrospectively from 1 January 1994.



## **A Principles of ownership and maintenance of the data**

1. The ANZNN will be responsible for collection and maintenance of the data set and decision-making with respect to its use, under the auspices of the AIHW National Perinatal Statistics Unit.
2. The Custodians of the data will be the ANZNN Coordinators, David Henderson-Smart at King George V Hospital, Sydney, Paul Lancaster at the AIHW National Perinatal Statistics Unit, University of Sydney, and Brian Darlow at the Christchurch School of Medicine, Christchurch, New Zealand. All queries related to the NMD should be referred to a Custodian, who will address them personally or refer them to the appropriate source person.

## **B Conditions for collection of the data**

It is expected that all participating NICUs will collect an agreed-upon minimum set of data in a standardised format. Data entry on to hard-copy data forms or into an electronic data form will be performed at the respective NICU. The Clinical Reporting System (CRS) data management system is being used for data processing and all data sent to the coordinating centre will be in the form of CRS data files, as ASCII data, or on appropriate forms.

## **C Conditions for use and release of the data**

1. Use of the data would entail agreement by the Advisory Committee (Directors, or their nominee, of each contributing NICU) and the Coordinators (David Henderson-Smart, Paul Lancaster and Brian Darlow).
2. Data will not be published or supplied with any patient identifying information.
3. Data will not be published or supplied with any NICU or State / Territory / nation identifying information without the written approval of all the NICU Directors of the State / Territory or nation concerned.
4. External requests for a hard copy of patient de-identified data will be made in writing to the data custodians. Any requests for data that could potentially identify a unit or State / Territory / nation will be referred to the Advisory Committee.

External requests for patient de-identified data on computer disk will be made in writing to the data custodians, and then referred to the Advisory Committee.

Requests in writing must be in the form of a one page research proposal. A confidentiality agreement must be signed by the person(s) requesting data prior to the release of the data.

5. Publication of data in any form must be endorsed in writing by seventy-five percent (75%) of the Advisory Committee prior to the material being submitted for publication. The mechanism for this will be by prior notification and then endorsement at an Advisory Committee meeting, or by faxing each Committee member.

All published data must acknowledge the ANZNN Advisory Committee and Coordinators.

6. Data will be released annually in a report provided free to each participating Director. This report will summarise the pooled, de-identified data. This report will be distributed widely after the majority of the Advisory Committee agree on content and form.

Data will also be released to each Director in electronic form with their own unit data identified, and the rest of the data completely de-identified.

## **D Conditions for security of the data**

Patient-identifiable data should not leave the site of the ANZNN. The electronic version of this data will be maintained on a single central computer protected by password. All hard copy patient identifiable data and electronic backup files will be kept in locked cabinets. Master lists of code material will be kept in a separate locked area.

All rooms and offices used by ANZNN are locked when not in use. Filing cabinets containing data are locked when not in use. Computerised data are protected by passwords known only to each person who has access to computerised data. Security disposal of data is available through use of designated bags or a shredding machine.