

report of the

# Australian and New Zealand Neonatal Network

# 2006



**UNSW**  
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This publication is part of the Australian and New Zealand Neonatal Network annual reports series. A complete list of the ANZNN's publications is available from the Network's website <[www.preru.unsw.edu.au/ANZNN](http://www.preru.unsw.edu.au/ANZNN)>.

## REPORT COVER

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ISBN 978-0-9807290-0-9

## Suggested citation

ANZNN (Australian and New Zealand Neonatal Network) 2009. Report of the Australian and New Zealand Neonatal Network 2006. Sydney, ANZNN.

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Published by the Australian and New Zealand Neonatal Network

Printed by Fuji Xerox

Please note that there is the potential for minor revisions of data in this report. Please check the online version at <[www.preru.unsw.edu.au/ANZNN](http://www.preru.unsw.edu.au/ANZNN)> for any amendments.

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# Abbreviations

ABS	Australian Bureau of Statistics
ANZNN	Australian and New Zealand Neonatal Network
APH	antepartum haemorrhage
CPAP	continuous positive airways pressure
CI	confidence intervals
CLD	chronic lung disease
CRIB	Clinical Risk Index for Babies
ECMO	extracorporeal membrane oxygenation
g	gram
HFOV	high frequency oscillatory ventilation
HMD	hyaline membrane disease – a disorder of the respiratory system
ICD-10-AM	The International Statistics Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
IPPR	intermittent positive pressure respiration
IUGR	intrauterine growth restriction
IVH	intraventricular haemorrhage
IQR	interquartile range
LOS	length of stay
NEC	necrotising enterocolitis
NICU	neonatal intensive care unit
NO	nitric oxide
O <sub>2</sub>	oxygen – normal air is 21% oxygen
PMA	post menstrual age (completed weeks). Gestational age plus postnatal age – e.g. when a baby born at 25 weeks gestation is 15 weeks old, they are 40 weeks PMA (also known as term equivalent age)
PPROM	premature prelabour rupture of membranes
PVL	periventricular leukomalacia
RDS	respiratory distress syndrome
ROP	retinopathy of prematurity – a disorder of the developing eye
Sepsis	overwhelming infection of the bloodstream by toxin-producing bacteria (also known as septicaemia)

# Acknowledgements

This report is based on data from all level III neonatal intensive care units in both Australia and New Zealand, all level II special care units in New Zealand and the special care unit in Tasmania. This is the twelfth report for the Australian and New Zealand Neonatal Network and the first prepared following its relocation to PRERU at the University of New South Wales. Following the relocation a decision was taken by the Advisory Committee of ANZNN that the 2006 report should be prepared substantially based on preceding reports prepared at the Centre for Perinatal Health Research at the University of Sydney. Therefore we would like to acknowledge the intellectual input of the NSW Pregnancy and Newborn Services Network and the Centre for Perinatal Health Research at the University of Sydney who prepared previous reports. A new report template and format will be designed for the 2007/2008 combined report.

The Australian and New Zealand Neonatal Network (ANZNN) wishes to formally acknowledge all those who are involved in collecting information for this report, thank them for their continuing support. We have listed these individuals according to their nursery of affiliation. There are people in nearly 300 hospitals across both countries who also give us their time to track the outcomes of the audited babies and we would like to thank all of them.

We also thank the members of the ANZNN Advisory Committee who continue to provide conceptual, intellectual and financial contributions, all of which have helped make this network the respected and world recognised organisation that it is today. We especially thank the following members of the ANZNN Executive: Brian Darlow (Chairperson), Kaye Bawden, David Cartwright, Jenny Corban, Nick Evans, Ross Haslam, David Henderson-Smart, Kei Lui, William Tarnow-Mordi, Elizabeth Sullivan and Kenneth Tan for their commitment and guidance for all the activities of the ANZNN. We thank our data managers Megan Evans and Angela Carberry for their hard work and attention to detail and Lisa Hilder for peer reviewing this report.

We would like to acknowledge the financial support of Abbott Australasia Pty Ltd and Q Healthcare Pty Ltd for supporting the ongoing ANZNN collection. We acknowledge our colleagues from the Perinatal and Reproductive Epidemiology Research Unit for their continued support and encouragement.

# Participating units and the supporting staff

## Australia

### Level III nurseries:

#### New South Wales

##### Children's Hospital at Westmead

*(Nursery beds: 23)*

Nadia Badawi (Director), Karen Walker, Caroline Karskens

##### John Hunter Hospital

*(Nursery beds: 41)*

Chris Wake (Director), Lynne Cruden

##### Liverpool Health Service

*(Nursery beds: 31)*

Robert Guaran (Director), Ian Callendar, Catherine Medlin, Jacqui Stack, Sara Wilson

##### Nepean Hospital

*(Nursery beds: 35)*

Mark Tracy (Acting Director), Mee Fong Chin

##### Royal Hospital for Women

*(Nursery beds: 42)*

Kei Lui (Director), Diane Cameron

##### Royal North Shore Hospital

*(Nursery beds: 26)*

Tushar Bhuta (Director), Jennifer Bowen, Sara Sedgley, Martin Kluckow

##### Royal Prince Alfred Hospital Women and Babies

*(Nursery beds: 34)*

Nick Evans (Director), Philip Beeby, Shelley Reid

##### Sydney Children's Hospital

*(Nursery beds: 4)*

Andrew Numa (Director), Janelle Young

##### Westmead Hospital

*(Nursery beds: 39)*

William Tarnow-Mordi (Director and Professor of Neonatal Medicine), Marilyn Rochefort (Director), Jane Baird, John Vandyk

## Australian Capital Territory

### The Canberra Hospital

*(Nursery beds: 24)*

Zsuzsoka Kecskes (Director), John Edwards

## Victoria

### Mercy Hospital for Women

*(Nursery beds: 58)*

Andrew Watkins (Director), Catherine Fleming, Jim Holberton, Julie Keng

### Monash Medical Centre

*(Nursery beds: 52)*

Andrew Ramsden (Director), Kenneth Tan, Kaye Bawden, Rose Li

### Royal Children's Hospital

*(Nursery beds: 22)*

Peter McDougall (Director), Jo Brooks, Peter Loughnan, Liz Perkins

### Royal Women's Hospital

*(Nursery beds: 52)*

Carl Kuschel (Director), Caroline Collis, Lex Doyle (Professor of Neonatology), Sheryle Rogerson, Esther Wong

## Tasmania

### Royal Hobart Hospital

*(Nursery beds: 26)*

Peter Dargaville (Director), Karen Butterley

## Queensland

### Mater Mothers' Hospital

*(Nursery beds: 79)*

David Knight (Director), Peter Gray, Lyndon Kay

### Royal Brisbane and Women's Hospital

*(Nursery beds: 71)*

David Cartwright (Director), Paul Colditz (Professor of Perinatal Medicine), Lyn Chapple, Kate Bobbermein, Tim Donovan, Lesley Eliason, Sue Jenkins-Manning, Kellie McGrory

## **The Townsville Hospital**

*(Nursery beds: 32)*

John Whitehall (Director), Gary Alcock, Caroline Allen, Jenny Binney, Donna Gandini, Guan Koh, Jacinta Lee, Cheri Boniface

## **South Australia**

### **Flinders Medical Centre**

*(Nursery beds: 35)*

Peter Marshall (Director), Cordula Blank

### **Women's and Children's Hospital**

*(Nursery beds: 49)*

Ross Haslam (Director), Elizabeth Gent, Rosemary Brown, Andy McPhee

## **Western Australia**

### **King Edward Memorial and Princess Margaret Hospitals**

*(Nursery beds: 105)*

Karen Simmer (Director and Professor of Neonatal Medicine), Annette Butler, Noel French, Ronnie Hagan, Rolland Kohan, Shripada Rao, Sandy Miller, Glenda Novakovic and Pauline Kilburn.

## **Northern Territory**

### **Royal Darwin Hospital**

*(Nursery beds: 18)*

Charles Kilburn (Director), Alan Ruben, Gurmeet Singh (Director), Margaret Stewart

## **Newborn Emergency Transport Services**

### **New South Wales Newborn and Paediatric Emergency Transport Service**

Andrew Berry (Director)

### **Newborn Emergency Transport Service (Victoria)**

Michael Stewart (Director)

### **Western Australia Neonatal Transport Service**

Jenni Sokol

## **New Zealand**

### **Christchurch Women's Hospital**

*(Nursery beds: 38)*

Nicola Austin (Director), Brian Darlow (Professor of Paediatrics), Nina Mogridge

## **Dunedin Hospital**

*(Nursery beds: 16)*

Roland Broadbent (Director), Suzanne Blackley

## **Middlemore Hospital**

*(Nursery beds: 30)*

Lindsay Mildenhall (Director), Maisie Wong

## **National Women's Health (at Auckland City Hospital)**

*(Nursery beds: 46)*

Malcolm Battin (Director), Jane Harding (Professor of Neonatology), Coila Bevan

## **Waikato Hospital**

*(Nursery beds: 41)*

David Bouchier (Director), Phil Weston, Deborah Harris

## **Wellington Women's Hospital**

*(Nursery beds: 40)*

Vaughan Richardson (Director), Dawn Elder, Keith Fisher, Michael Hewson

## **Level II nurseries:**

## **Tasmania**

### **Launceston General Hospital**

*(Nursery beds: 12)*

Chris Bailey (Director), Jennifer James, Robyn Morey

## **New Zealand**

### **Gisborne Hospital**

*(Nursery beds: 6)*

Heinrich Stander (Director)

### **Hawkes Bay Hospital**

*(Nursery beds: 12)*

Jenny Corban (Director), Kay Hodson, Jennifer Gibson

### **Lower Hutt Hospital**

*(Nursery beds: 8)*

Robyn Shaw (Director), Debbie Bashaw, Adele Sullivan

### **Nelson Hospital**

*(Nursery beds: 10)*

Peter McIlroy (Director)

### **North Shore Hospital**

*(Nursery beds: 12)*

Bobby Tsang (Director), Diane Chesney



### **Palmerston North Hospital**

*(Nursery beds: 17)*

Jeff Brown (Director), Amy Hinder

### **Rotorua Hospital**

*(Nursery beds: 10)*

Stephen Bradley (Director), Jacquie Koberstein,  
Gaye France

### **Southland Hospital**

*(Nursery beds: 6)*

Paul Tomlinson (Director)

### **Taranaki Base Hospital**

*(Nursery beds: 8)*

John Doran (Director)

### **Tauranga Hospital**

*(Nursery beds: 10)*

Hugh Lees (Director), Heather McAlley

### **Timaru Hospital**

*(Nursery beds: 3)*

Philip Morrison (Director), Bid Esler, Mark Liddy

### **Wairau Hospital**

*(Nursery beds: 4)*

David Bond (Director)

### **Wanganui Hospital**

*(Nursery beds: 4)*

Tony de Sylva (Director)

### **Whakatane Hospital**

*(Nursery beds: 5)*

Chris Moyes (Director), Margret Norris

### **Whangarei Area Hospital**

*(Nursery beds: 8)*

Janine Whale (Director), Lynne Clarke

### **Waitakere Hospital**

*(Nursery beds: 4)*

Richard Matsas (Director)



# Summary

This is the 12<sup>th</sup> annual report of the Australian and New Zealand Neonatal Network and presents information on the network's 2006 annual audit of high risk neonates. All level III NICUs in Australia and New Zealand participate in the networks quality assurance measure. This audit includes information on all babies born at less than 32 weeks gestation or with a birth weight of less than 1500 grams and babies who received assisted ventilation or major surgery.

In 2006 there were 6,494 mothers in Australia and New Zealand who gave birth to babies who were admitted to a level III or level II nursery. Among babies born in 2006, 7,592 were admitted to a level III NICU in Australia or New Zealand and 441 were admitted to one of the fifteen participating level II nurseries in Tasmania and New Zealand. These babies made up 2.2% of the 339,271 live births in the two countries in 2006.

## ANZNN Clinical Indicators

There were 180 very preterm babies reported to have grade 3 or 4 IVH representing 5.2% of the babies born before 32 weeks gestation, a higher proportion than in 2005 (4.7%). The majority (97.3%) of these very preterm babies was born between 24 and 26 weeks gestation.

There were 659 babies (8.7%) who had symptomatic, blood culture positive sepsis, of whom 522 (79.2%) were born at less than 28 weeks gestation.

There were 3,277 babies eligible for retinopathy of prematurity examination with 2,491 (76%) babies who had the results of their eye examination recorded. 105 of these babies (4.2%) had stage 3 or 4 retinopathy of prematurity (ROP) with 78 (74.2%) of them receiving treatment.

The incidence of chronic lung disease among babies born before 32 weeks gestation was 13.7%, lower than among registrants in 2005 (18.6%).

Of the 2,346 babies who received IPPV for hyaline membrane disease (HMD), 2,122 (90.5%), were given exogenous surfactant, an increase on 2005 (88.5%).

The overall rate of breastfeeding among surviving babies at discharge from the level III unit was 70%.



# 1. Organisation of the ANZNN

## History

In July 1993, the directors of the Australian level III neonatal intensive care units collaborated to establish a network to monitor the care of high-risk newborn infants. This was to be accomplished by pooling data to provide quality assurance for this resource consuming type of care. The National Health and Medical Research Council's (NHMRC) Expert Panel on Perinatal Morbidity recommended that 'The Australian Institute of Health and Welfare National Perinatal Statistics Unit, in collaboration with the directors and staff of all neonatal intensive care units, should develop a national minimum data set and implement a data collection to monitor mortality and morbidity of infants admitted to such units'.

The prospective audit of high-risk infants commenced for babies born from 1 January 1994. All level III units in Australia and New Zealand have contributed to the audit for babies born from 1 January 1995. In 1998, all the level II units in New Zealand joined the network and began contributing to the audit. The level II unit from Tasmania joined the ANZNN in 1999.

## Structure

The governance structure of the ANZNN is made up of the Advisory Committee, the Data Collection and Operations Committee and the Management Committee. The Advisory Committee is the governing body of ANZNN and includes the directors (or their nominee) of each participating unit and the academic neonatologists / neonatal nurses in the region. The role of the Advisory Committee is to monitor ANZNN and to approve the use of the data. The Data Collection and Operations Committee coordinates the operations of the ANZNN data collection, monitors the workload and progress for the annual report and reports to the Management Committee and Advisory Committee. The Management Committee is an elected committee that has representation from Directors, Data Managers and Nurses from across the network and is concerned with the general functioning of the network and decision-making.

## Aims and objectives

The ANZNN aims 'to improve the care of high-risk newborn infants and their families in Australia and New Zealand through collaborative audit and research'.

The objectives of the ANZNN are:

- To provide a core data set that will:
  - provide information on neonatal outcomes, adjusted for case mix and disease severity to participating neonatal units to assist with quality improvement
  - identify trends and variations in morbidity or mortality warranting further study
  - enhance the ability to carry out multicentre studies and randomised controlled trials
- Monitor the clinical indicators for perinatal care and improve clinical practice.
- Monitor the use of new technologies, e.g. surfactant usage by patient type and outcome.

## Registration criteria

The ANZNN's audit of high-risk neonates born in 2006 included babies admitted to a newborn nursery who met the following criteria:

- born at less than 32 completed weeks gestation, or
- weighed less than 1,500 grams at birth, or
- received assisted ventilation (mechanical ventilation) including intermittent positive pressure ventilation (IPPV) or continuous positive airways pressure (CPAP) for four or more consecutive hours, or died while receiving mechanical ventilation prior to four hours of age, or
- received major surgery (surgery that involved opening a body cavity).

Babies who were discharged home and readmitted to a NICU during their neonatal period were not registered to the ANZNN audit. The hospital of registration for a baby was the first level III NICU that the baby remained in for four or more hours during the first 28 days of life. Babies who received their entire care in a level II hospital or who were not transferred to a level III NICU during the first 28 days were registered to the first level II centre that they remained in for four or more hours.

## **Data set variables**

The variables used for the 2006 audit are listed in Appendix 3 and are also available on the website [www.preru.unsw.edu.au/ANZNN](http://www.preru.unsw.edu.au/ANZNN).

## **Structure of this report**

This chapter provides background information on the structure of ANZNN.

The remainder of this report is divided into the following chapters:

- Chapter 2: Babies registered to level III nurseries  
This chapter contains information and characteristics on the ANZNN registrants from each of the 28 level III NICUs within Australia and New Zealand. Registrants also include babies born in other hospitals and transferred to a level III NICU within the first 28 days of life.
- Chapter 3: Babies registered to level II nurseries  
This chapter contains information and characteristics on the ANZNN registrants from the level II nurseries.

Appendix 1 presents data tables by birth weight

Appendix 2 outlines the methods employed for this report

Appendix 3 presents the Minimum Data Set for ANZNN.

## **Funding support**

A major share of the funding for ANZNN comes from an annual contribution from each of the hospitals with a level III nursery. This contribution covers the cost of the annual individual unit feedback which forms an integral part of their audit arrangements. This was a voluntary and unanimous decision undertaken by the level III nurseries.

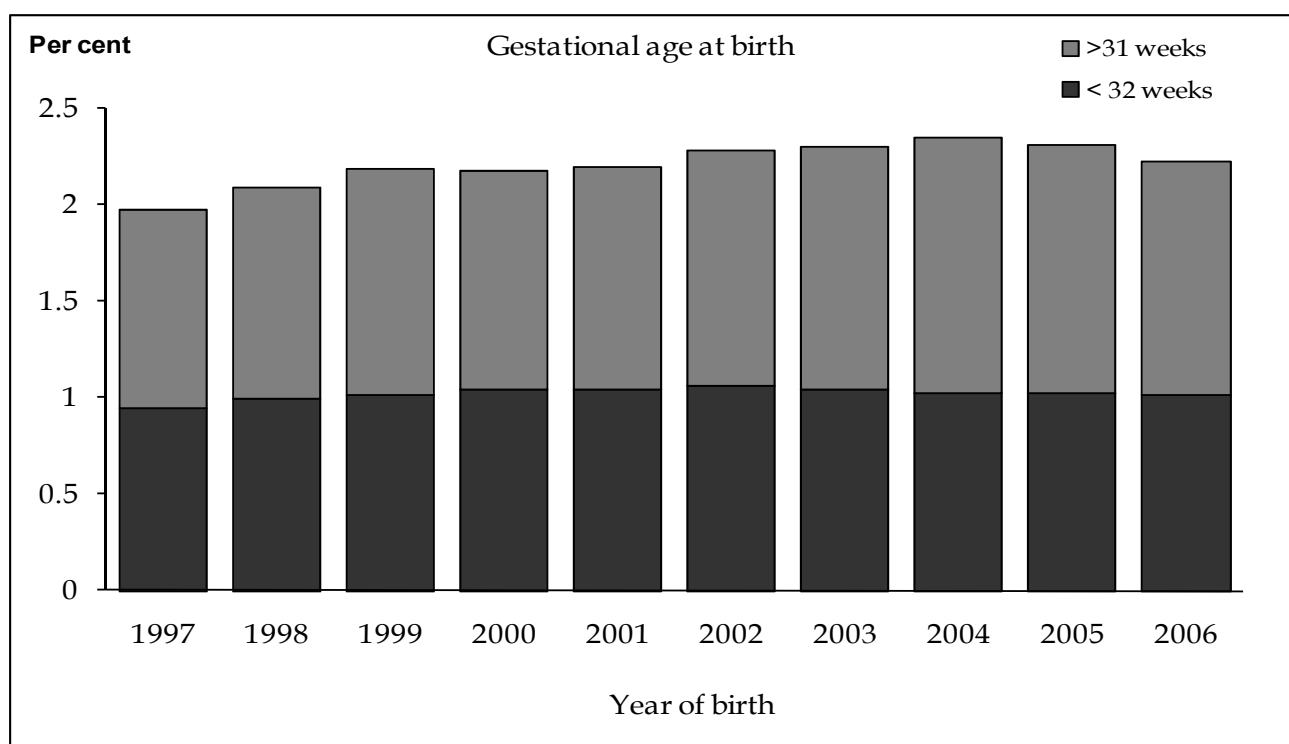
Funds have also been received from Abbott Australasia Pty Ltd who has contributed since 1997 and Q Healthcare who has contributed since 2008. The ANZNN thanks them for their ongoing and generous support.

## 2. Babies registered to level III nurseries

This section includes data of the ANZNN registrants from each of the 28 level III NICUs in Australia and New Zealand (Figure 4). These registrants also include babies born in other hospitals and transferred to a level III NICU within the first 28 days of life.

In 2006, 7,592 of the babies admitted to a NICU in Australia and New Zealand fulfilled the registration criteria for inclusion in the ANZNN audit. The population represents 2.2% of the 339,271 live births in the two countries in 2006 <sup>1,2</sup>(Figure 1). Overall, there was a slight decrease in the total number of ANZNN registrants in 2006, with 58 fewer registrants than in 2005.

**FIGURE 1: Babies registered to ANZNN audit of level III nurseries each year as a percentage of live born babies in Australia and New Zealand**



The 3,464 (45.6%) babies born before 32 weeks gestation were the largest criterion group (Figure 2), and the only group to increase in size since the 2005 audit (43.9%). The 4,127 babies born after 31 weeks accounted for just over half of all registrants (54.4%). Of these 3,329 (43.8%) received assisted ventilation, but did not require surgery; 194 (2.6%) weighing less than 1,500 grams at birth did not require assisted ventilation; and 593 (14.3%) babies born after 31 weeks gestation had major surgery. Among registrants born at less than 32 weeks gestation, 275 (7.9%) also had major surgery. In 2006, 91.3% of all registrants were given assisted ventilation (IPPV or CPAP). One baby, whose gestation was missing, could not be categorised.

The distribution of gestational age at birth and birth weight for babies qualifying for inclusion in the 2006 level III audit of babies, are set out in Tables 1 and 2 respectively. Since 1995 the increase in the number of babies included in the level III audit has been most marked for babies born at 32 and 35 weeks gestation (Figure 3).

The largest level III neonatal intensive care units (NICUs) in Australia and New Zealand registered more than 500 babies born in 2006 (Figure 4) and the smallest less than 100.

**TABLE 1: Level III registrants born at each completed week of gestation, 2006**

<b>Gestational age in weeks</b>	<b>Number of babies</b>	<b>Per cent</b>	<b>Cumulative per cent</b>
22	4	0.1	0.1
23	39	0.5	0.6
24	160	2.1	2.7
25	209	2.7	5.4
26	322	4.3	9.7
27	325	4.2	13.9
28	467	6.2	20.1
29	538	7.1	27.2
30	611	8	35.2
31	789	10.4	45.6
<b>Babies &lt; 32 wks</b>	<b>3464</b>		
32	689	9.1	54.7
33	522	6.9	61.6
34	546	7.2	68.8
35	439	5.8	74.6
36	316	4.1	78.7
37	316	4.2	82.9
38	395	5.2	88.1
39	323	4.2	92.3
40	324	4.3	96.6
41	222	2.9	99.5
42	33	0.5	100
43	2	0	100
<b>All babies</b>	<b>7591</b>		<b>100</b>

*Note: No gestation recorded for one baby.*

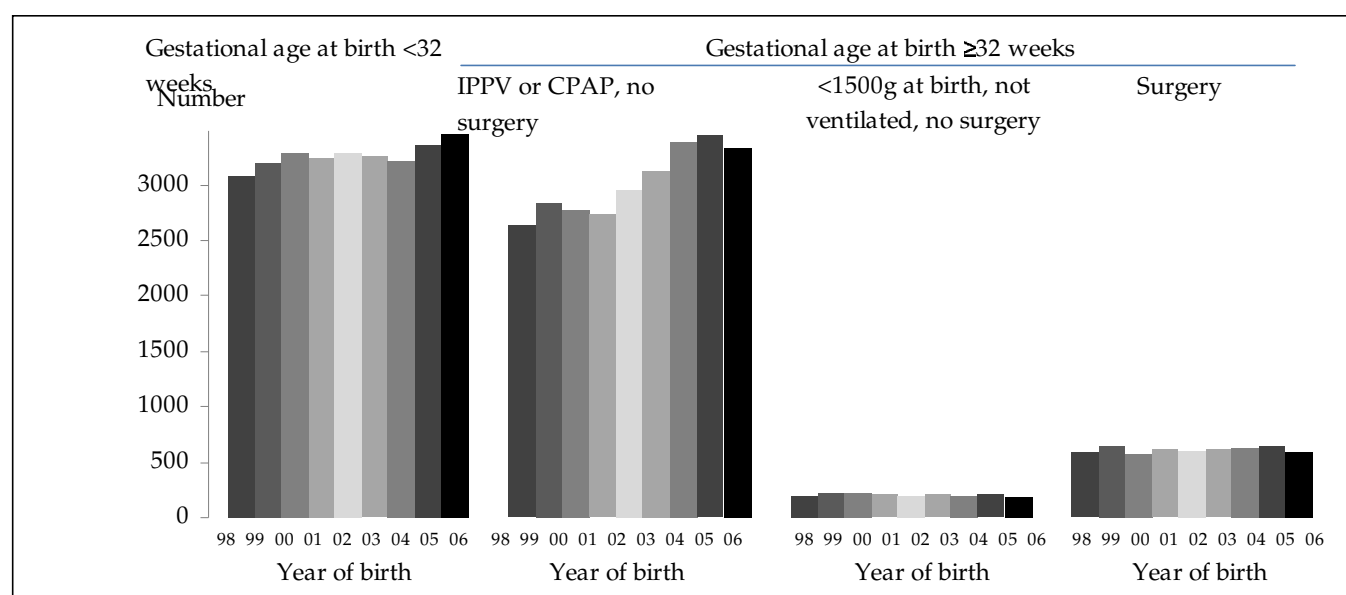


**TABLE 2: Level III registrants in each birth weight group, 2006**

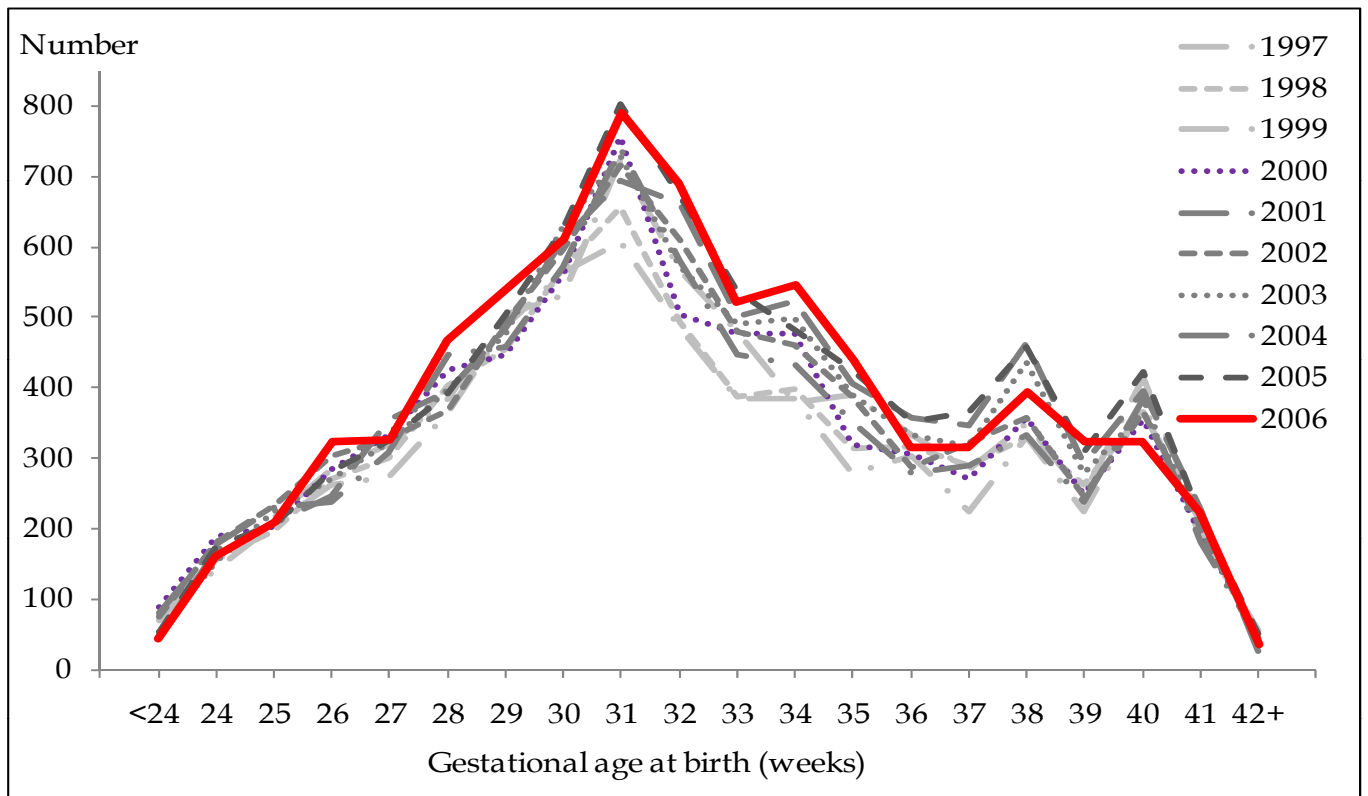
Birth weight in grams	Number of babies	Per cent	Cumulative per cent
<500	39	0.5	0.5
500–599	77	1.0	1.5
600–699	179	2.4	3.9
700–799	250	3.3	7.2
800–899	246	3.2	10.4
900–999	290	3.8	14.2
1000–1099	321	4.2	18.5
1100–1199	323	4.3	22.7
1200–1299	387	5.1	27.8
1300–1399	425	5.6	33.4
1400–1499	407	5.4	38.8
<b>Babies &lt;1500g</b>	<b>2944</b>		
1500–1999	1462	19.3	58.1
2000–2499	979	12.9	70.9
2500–2999	802	10.6	81.5
3000–3499	680	9.0	90.5
3500–3999	476	6.3	96.7
4000+	247	3.3	100.0
<b>All babies</b>	<b>7590</b>		<b>100.0</b>

*Note: No birth weight recorded for two babies.*

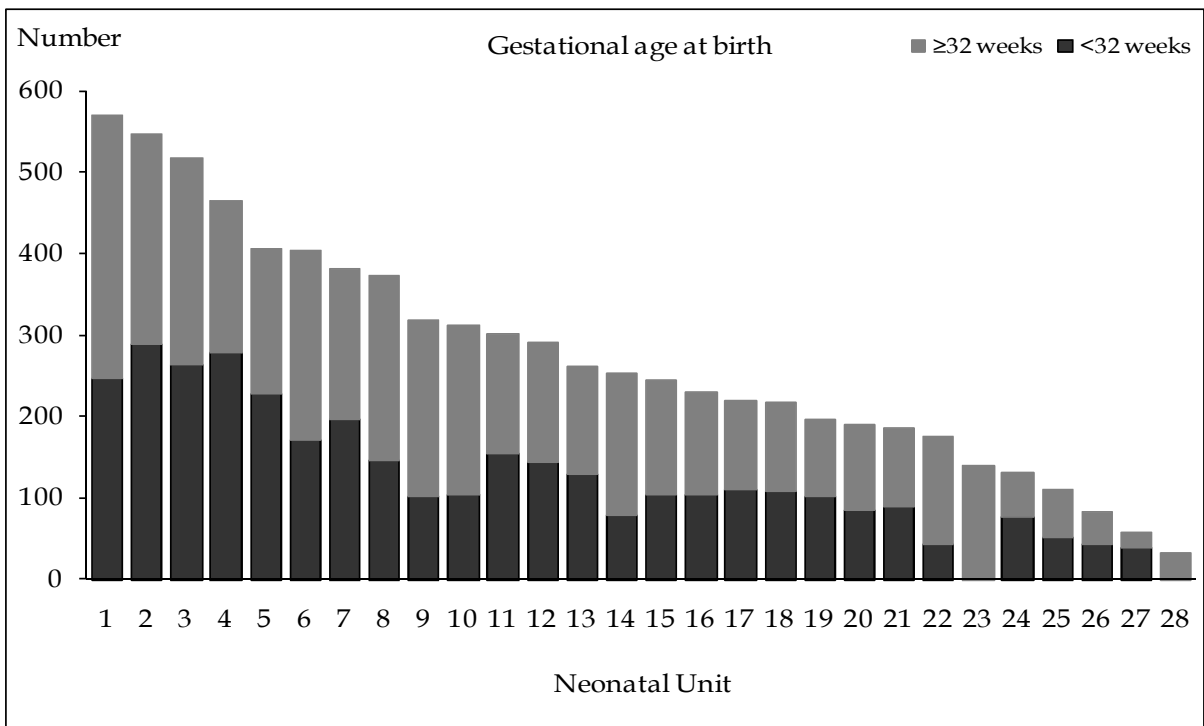
**FIGURE 2: Number of registrants by criterion in the ANZNN 2006 audit**



**FIGURE 3: Trends in gestational age at birth, level III registrants 1997-2006**



**FIGURE 4: Registrants in level III neonatal intensive care units 2006**



## Babies born in Australia

There were 5,982 babies registered to ANZNN from 22 level III NICUs in Australia representing 2.1% of live births in 2006<sup>1</sup>. Of these registrants, 75.9% were born in a hospital with tertiary care facilities. There were 2,100 babies born before 32 weeks gestation representing 35% of Australian registrants.

Assisted ventilation was provided for 5,418 babies (1.9% of live births) and Continuous Positive Airways Pressure (CPAP) was the only form of respiratory assistance for 2,262 babies. Surgery was carried out on 731 babies. Maternal ethnicity was provided for 93% of mothers. 78% of the mothers of these babies identified as Caucasian, 5.8 % as Asian and 4.9% as Aboriginal or Torres Strait Islander similar to 5% of all births in Australia in 2006<sup>1</sup>. Among Australian NICU admissions registered to ANZNN, 1,788 were from multiple births representing 29.8% of ANZNN admissions in Australia in 2006. Male babies were over-represented among NICU admissions – 57.8% of the Australian ANZNN registrants, compared with 51.5% among live births in Australia<sup>1</sup>.

## Babies born in New Zealand

Among the babies admitted to one of the six level III NICUs in New Zealand, 1,610 met ANZNN registration criteria. These births accounted for 2.7% of 59,193 live births registered in New Zealand in 2006<sup>2</sup>. Of those babies, 667 were born at less than 32 weeks gestation (1.13% of all live births). Assisted ventilation was given to 1,511, representing 2.6% of live births in New Zealand with 1,053 babies (1.8%) receiving CPAP only. There were 320 babies from multiple births. The number of babies who had major surgery was 138.

The ethnicity of the mother was reported for 97.9% of the New Zealand registrants. The proportion of Caucasian mothers in the ANZNN cohort was 55.6%. A higher proportion of mothers identified themselves as Maori (21.9%) than in 2005 (20.6%). Another 9.8% of mothers identified as Pacific Islander and 8.1% as Asian.

## Maternal characteristics

In the ANZNN 2006 cohort, 5.6% of the babies were born to teenage mothers (Table 3), slightly higher than the 4.9% of births to teenage mothers in Australia and New Zealand. Among the ANZNN registrants with teenage mothers, 49.8% were born at less than 32 weeks gestation, an increase of more than 6% on 2005. There were 1,790 babies (23.8% of the 2006 cohort) whose mothers were aged 35 years or older and

**TABLE 3: Age of mothers of level III registrants born at different gestations, 2006**

Maternal age (years)	Gestational age group						All
	20–23	24–27	28–31	32–33	34–36	37–43	
Number							
10–19	4	68	139	59	64	90	424
20–24	6	184	368	153	206	244	1161
25–29	11	234	610	295	320	411	1881
30–34	13	290	723	385	371	478	2260
35–39	8	195	439	253	256	290	1441
40 and over	1	40	99	59	72	78	349
Not stated	0	5	27	7	12	24	75
All babies	43	1016	2405	1211	1301	1615	7591
Per cent							
10–19	9.3	6.7	5.8	4.9	5.0	5.7	5.6
20–24	14.0	18.2	15.5	12.7	16.0	15.3	15.4
25–29	25.6	23.1	25.7	24.5	24.8	25.8	25.0
30–34	30.2	28.7	30.4	32.0	28.8	30.0	30.1
35–39	18.6	19.3	18.5	21.0	19.9	18.2	19.2
40 and over	2.3	4.0	4.2	4.9	5.6	4.9	4.6
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby.*

43.1% of those babies were born before 32 weeks gestation, a slightly lower proportion than in 2005 (44.2%).

A previous preterm delivery was reported by 957 (12.6%) mothers of babies registered to ANZNN in 2006 and 283 (3.7%) of mothers reported a previous perinatal loss.

There were 702 (9.2%) mothers who reported assisted conception and 282 (40.2%) of them were above 34 years of age. In-vitro fertilisation was the method of assisted conception used by 546 mothers representing a small increase on 2005 (521).

## Presenting antenatal problem

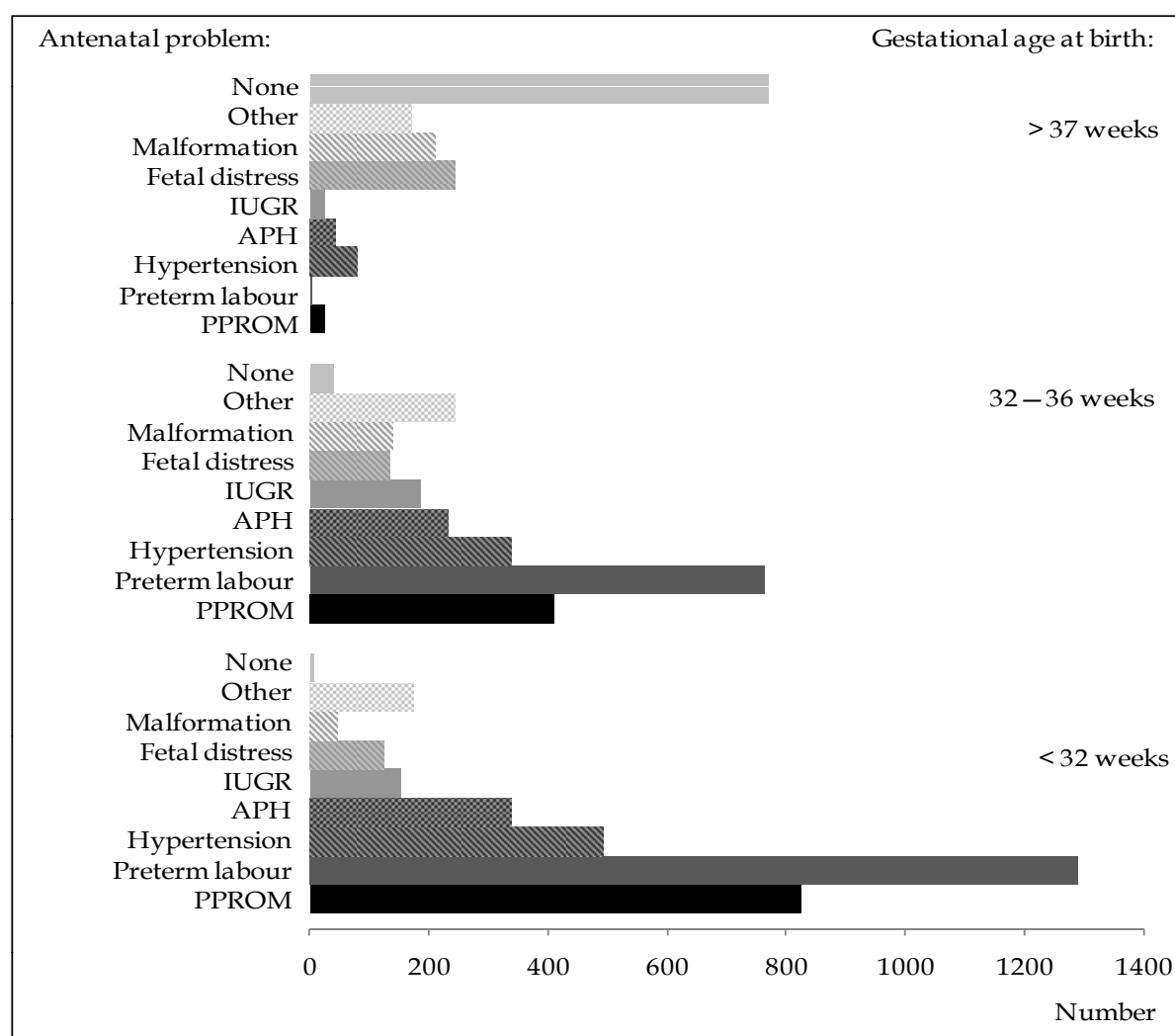
Information about the presenting problem for the mother's most recent stay in the hospital was available for 99% of babies. The most common presenting antenatal problem for the 1,289 mothers in the ANZNN 2006 cohort who gave birth before 32 weeks was preterm labour (37.2%). Another 823 mothers (23.8%) presented with preterm pre-labour rupture of the membranes while 491 mothers (14.1%) presented with hypertension in pregnancy (Table 4 and Figure 5). These are similar to the 2005 findings.

**TABLE 4: Mother's presenting antenatal problem by gestational age group, 2006**

Presenting antenatal problem	Gestational age group							All
	<26	26– 27	28– 29	30– 31	32– 33	34– 36	37– 43	
PPROM	94	163	237	329	210	202	26	1261
Preterm labour	223	252	360	454	355	408	3	2055
Hypertension in pregnancy	30	81	148	232	202	134	78	905
Antepartum haemorrhage	45	66	83	144	119	113	44	614
IUGR	2	26	48	78	101	85	24	364
Fetal distress	4	17	43	61	60	73	243	501
Other problem	8	32	61	72	112	132	171	588
No antenatal problems	0	1	2	3	8	33	771	818
Congenital anomalies	3	6	17	19	37	102	211	395
Not stated	3	3	6	8	7	19	44	90
<b>All babies</b>	<b>412</b>	<b>647</b>	<b>1005</b>	<b>1400</b>	<b>1211</b>	<b>1301</b>	<b>1615</b>	<b>7591</b>

*Notes: No gestation recorded for one baby. Reports of babies born at term with PPRom will be queried.*

**FIGURE 5: Presenting antenatal problem by gestational age group 2006**



Among registrants born at 32–36 weeks gestation the most common maternal antenatal presentation remained preterm labour (30.4%), followed by preterm prelabour rupture of the membranes (16.4%) and hypertension in pregnancy (13.4%).

Among 771 registrants born at term the majority were recorded as having no maternal presenting antenatal problem (47.7%) while 243 mothers (15.1%) presented with fetal distress and 211 mothers (13.4%) presented because a fetal anomaly was detected during the antenatal period.

## Antenatal corticosteroid use

In 1997, the NHMRC recommended consideration of maternal antenatal corticosteroids administration for all births at less than 34 completed weeks of gestation. The treatment is aimed at improving neonatal outcomes by enhancing newborn lung maturation.

In 2006, 86.3% of mothers of ANZNN registrants born before 34 weeks gestation received one or more doses of antenatal corticosteroids. Among the babies born before 32 weeks gestation, 93.2% of mothers received one or more doses of antenatal corticosteroids. The proportion of babies born before 24 weeks gestation whose mothers received corticosteroids decreased from 74.4% in 2005 to 70.8% in 2006. Among babies born at 24–31 weeks, 85% of mothers received at least one dose of corticosteroids (Table 5).

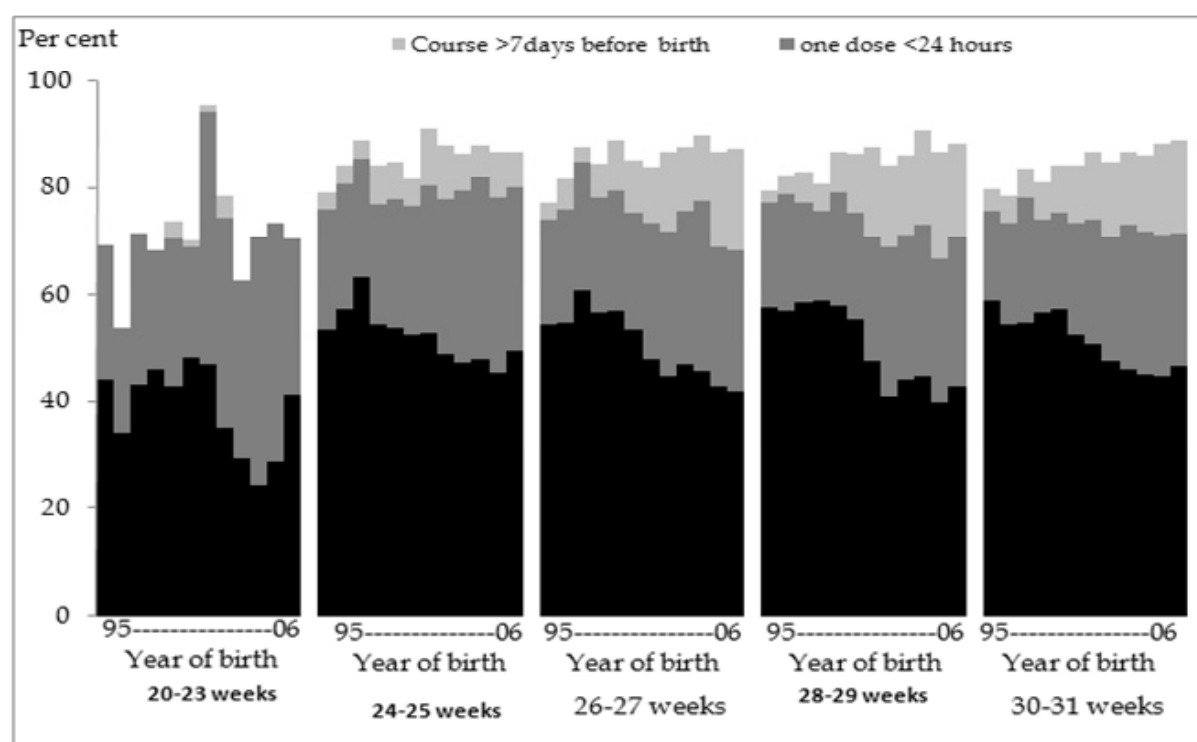
The proportion of babies born before 32 weeks gestation whose mothers received corticosteroids more than one week prior to birth has increased over the years. In 2006 there was a reversal in the trends of declining proportions of babies at all gestations whose mothers were given corticosteroids within a week of their birth (Figure 6). Of the babies born before 32 weeks gestation in a tertiary care centre, 90% had received at least one dose of antenatal corticosteroids. Only 51.2% of mothers of very preterm (less than 32 weeks) out-born babies were given at least one dose of corticosteroids.

**TABLE 5: Antenatal corticosteroid use by gestational age group, level III registrants 2006**

Antenatal corticosteroids	Gestational age group							All
	20–23	24–25	26–27	28–29	30–31	32–33	>34	
Number								
None	12	47	81	115	148	227	2244	2874
Incomplete course	12	108	168	272	333	302	85	1280
Course completed	17	175	265	415	627	414	149	2062
Completed > 7 days	0	24	119	167	234	220	165	929
Not stated	2	15	14	36	58	48	273	446
All babies	43	369	647	1005	1400	1211	2916	7591
Per cent								
None	29.3	13.3	12.8	11.9	11.0	19.5	84.9	40.2
Incomplete course	29.3	30.5	26.5	28.1	24.8	26.0	3.2	17.9
Course completed	41.5	49.4	41.9	42.8	46.7	35.6	5.6	28.9
Completed > 7 days	0.0	6.8	18.8	17.2	17.4	18.9	6.2	13.0
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**Notes:** No gestation recorded for one baby. 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 is given & the first dose was given more than 24 hours and less than 8 days before baby's birth.

**FIGURE 6: Trends in the use of corticosteroids for mothers of babies less than 32 weeks gestation, 1995-2006**



**Notes:** Corticosteroid treatment to enhance fetal lung maturation is considered 'complete' when two doses are given, the first dose more than 24 hours and less than 8 days before baby's birth. Stacked bars represent annual cumulative percentages.

## Method of delivery

The method of delivery varies with gestational age, presenting part of the baby and other factors. The most common method of delivery for babies born in 2006 and registered to an ANZNN level III unit remains caesarean section (61%), and 38% were before the onset of labour. The rate of birth by caesarean section has gradually increased from 49.8% since the first data collection in 1995 (Figure 7).

In 2006, the most common method of delivery for babies born before 24 weeks was vaginal (79%) and only two of these births were assisted with instruments (Table 6).

Of the babies born in hospitals with tertiary care facilities, 4,645 (61.2%) were born by caesarean section and 2,889 (62.2%) of those caesarean deliveries were performed before the onset of labour. Among babies born elsewhere, 803 (51.3%) were born by caesarean section.

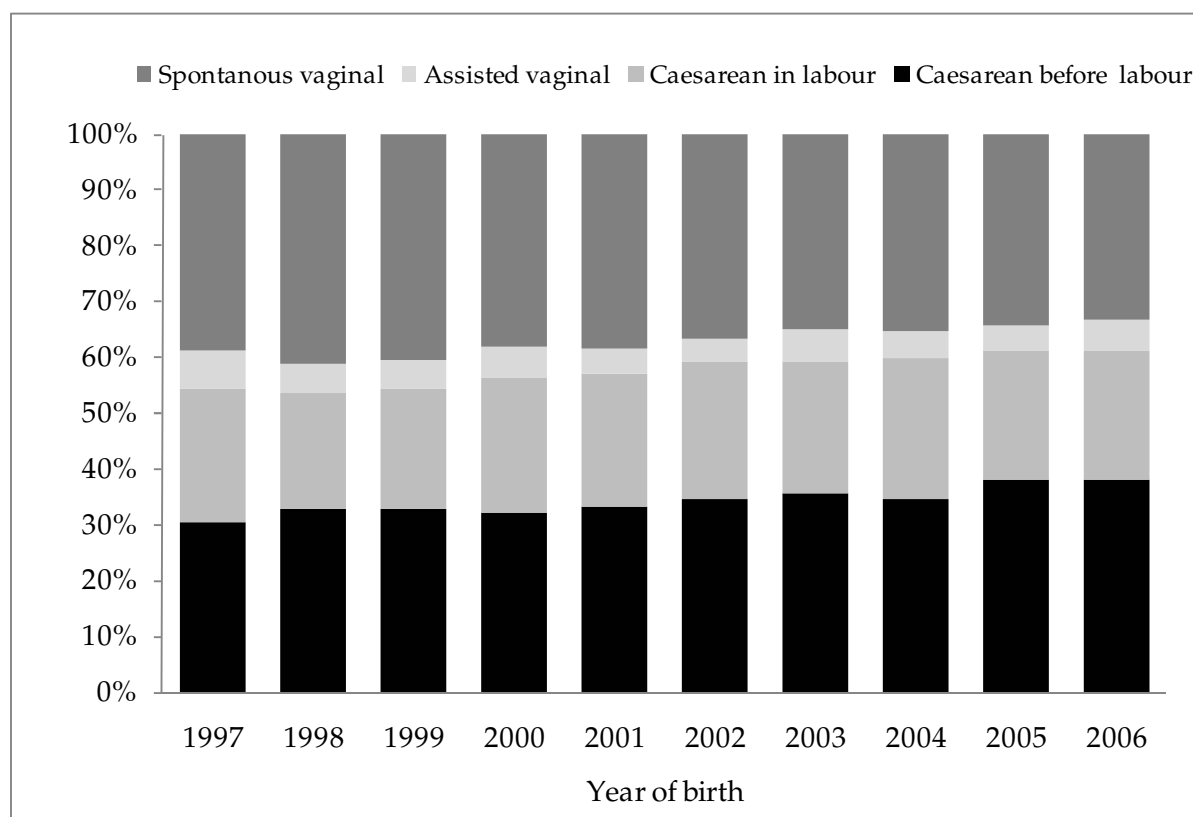
In 2006, the head was the presenting part for 1,405 (88.9%) of the term babies. Another 114 (7.1%) were breech presentations and 95 (83.3%) of these babies were born by caesarean section (Table 6).

**TABLE 6: Method of delivery by gestational age at birth, level III registrants, 2006**

Method of delivery	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Vaginal	34	175	215	269	419	302	435	662	2511
Vaginal instrumental	2	30	28	39	62	46	57	155	419
Caesarean in labour	3	95	186	261	309	271	281	350	1756
Caesarean no labour	4	69	218	434	606	591	523	444	2889
Unavailable	0	0	0	2	4	1	5	4	16
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
Vaginal	79.1	47.4	33.2	26.8	30.0	25.0	33.6	41.1	33.1
Vaginal instrumental	4.7	8.1	4.3	3.9	4.4	3.8	4.4	9.6	5.5
Caesarean in labour	7.0	25.7	28.7	26.0	22.1	22.4	21.7	21.7	23.2
Caesarean no labour	9.3	18.7	33.7	43.3	43.4	48.8	40.4	27.6	38.1
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby.*

**FIGURE 7: Method of delivery by year of birth, level III registrants 2006**





## Place of birth

In the 2006 ANZNN cohort 2,044 (43.7%) of mothers had booked into a tertiary hospital ie a hospital with a NICU and 3,925 (84%) of the 4,675 babies born at less than 34 weeks gestation were born in a tertiary hospital with a NICU (Table 7). A small number of babies (74) were delivered at home or were born before arrival at a hospital.

Of the babies weighing below 1,250 grams at birth, 1,635 (85.4%) were born in a tertiary care hospital, similar to the 2005 cohort (1,636). There were 2,569 babies born at less than 32 weeks gestation or weighed less than 1,500g at birth. Most of these babies (84.4%) were born in a tertiary care hospital.

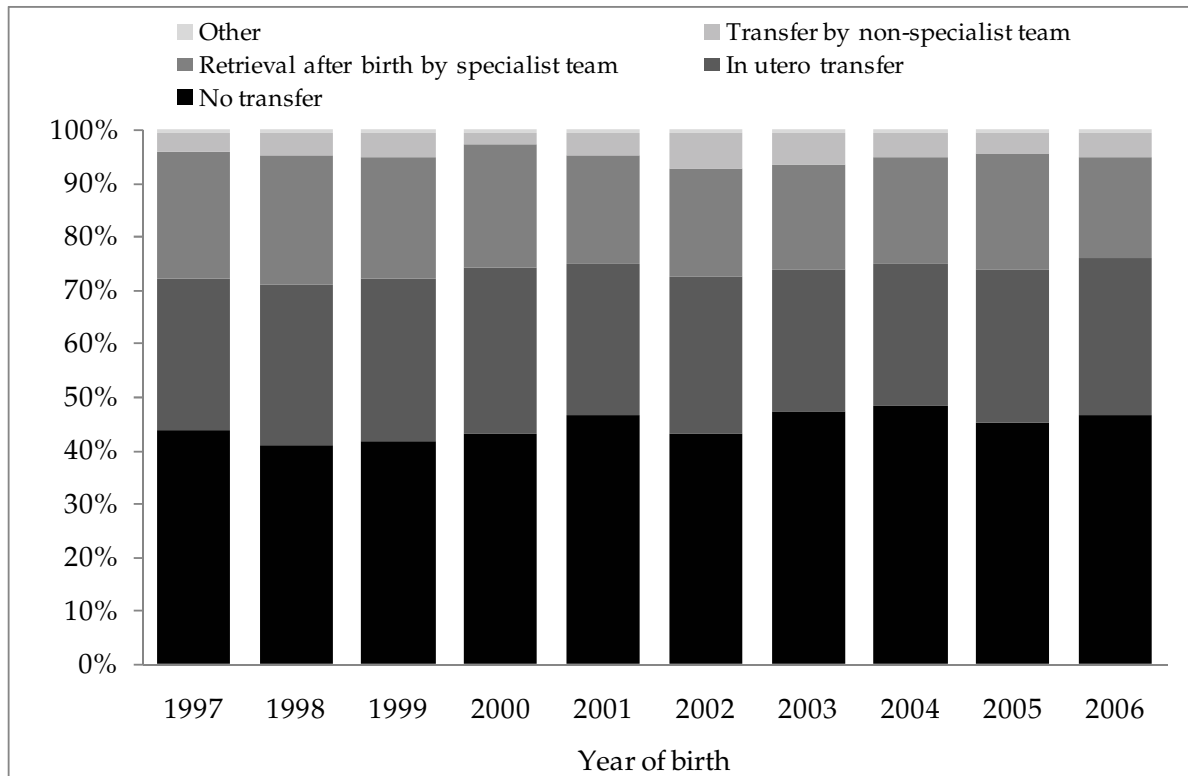
**TABLE 7: Hospital of birth by gestational age group, level III registrants 2006**

Level of hospital of birth	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Non-tertiary hospital	4	41	91	134	140	153	336	592	1491
Tertiary hospital	38	314	531	832	1204	1006	901	936	5762
Not born in hospital	0	2	7	14	9	6	10	26	74
Not stated	1	12	18	25	47	46	54	61	264
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
Non-tertiary hospital	9.5	11.5	14.5	13.7	10.3	13.1	26.9	38.1	20.3
Tertiary hospital	90.5	88.0	84.4	84.9	89.0	86.4	72.3	60.2	78.6
Not born in hospital	0.0	0.56	1.1	1.4	0.7	0.5	0.8	1.7	1.0
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby.*

Overall, 2,227 (29.3%) of ANZNN registrants born in 2006 were transferred in-utero to a tertiary hospital and 1,511 of them (67.8%) were born before 32 weeks gestation, (Table 8, Figures 8 and 9).

**FIGURE 8: Referral source of babies to NICU by year of birth, 2006**



## Transfer after birth to a level III NICU

A baby may need to be transferred after birth due to a precipitate preterm birth in a hospital without a NICU or because no cot was available in the hospital of birth. Some babies may need to be transferred to a specialised children's unit, or a term baby may have an unexpected need for intensive care treatment, such as ventilation for meconium aspiration syndrome.

Among the 2006 ANZNN level III registrants, 1,770 were transferred to a NICU after birth (23.3%). A specialist transport team retrieved 1,410 (79.7%) of those babies (Table 8).

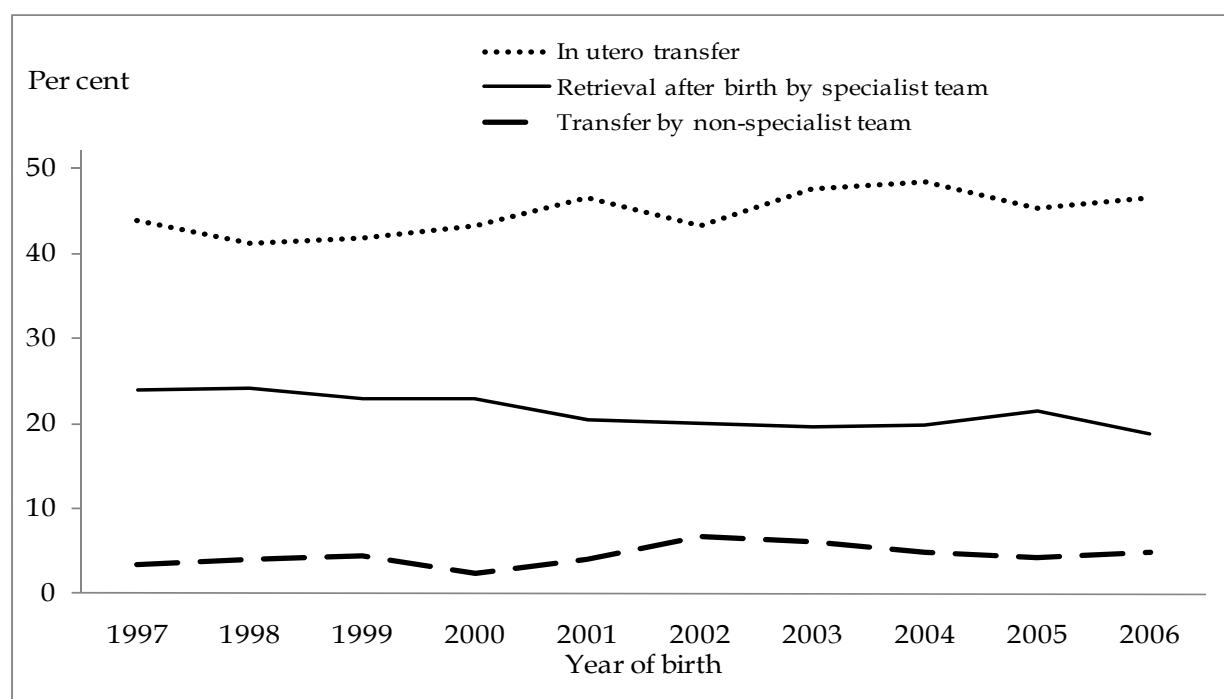
Since 1997 there has been a gradual decline in retrievals by a specialist team and an increase in transfers after birth by a non-specialist team (Figure 9).

**TABLE 8: Mode of transport to level III NICU after birth, level III registrants 2006**

Mode of transfer to level III NICU after birth	Gestational age group							All
	<26	26–27	28–29	30–31	32–33	34–36	37–43	
Number								
Specialist team	49	94	132	124	148	326	537	1410
Non-specialist team	10	14	27	49	25	60	175	360
Not transferred	350	539	836	1214	1031	910	898	5778
Not stated	3	0	10	13	7	5	5	43
All babies	412	647	1005	1400	1211	1301	1615	7591
Per cent								
Specialist team	83.1	87.0	83.0	71.7	85.5	84.5	75.4	79.7
Non-specialist team	16.9	13.0	17.0	28.3	14.5	15.5	24.6	20.3
Per cent								
Any mode of transfer	14.4	16.7	16.0	12.5	14.4	29.8	44.2	23.4

*Note: No gestation recorded for one baby.*

**FIGURE 9: Trends in mode of transfer to level III NICU, 1997-2006**



## Baby gender

In Australia and New Zealand, there were more male babies born than female babies in 2006, with males accounting for 51.4% of live births in both countries<sup>1,2</sup>. Among the ANZNN level III cohort, there were 4,400 male (58%) and 3,185 female babies (41.9%). Of the babies born at less than 32 weeks gestation, 1,922 (55.5%) were male babies.

Among the term babies, there were 1,002 (62%) male babies. There were 1,133 male babies among multiple births (53.7%), the same proportion as in 2005. Gender was not able to be determined for one baby and a gender was not recorded for six babies.

## Multiple births

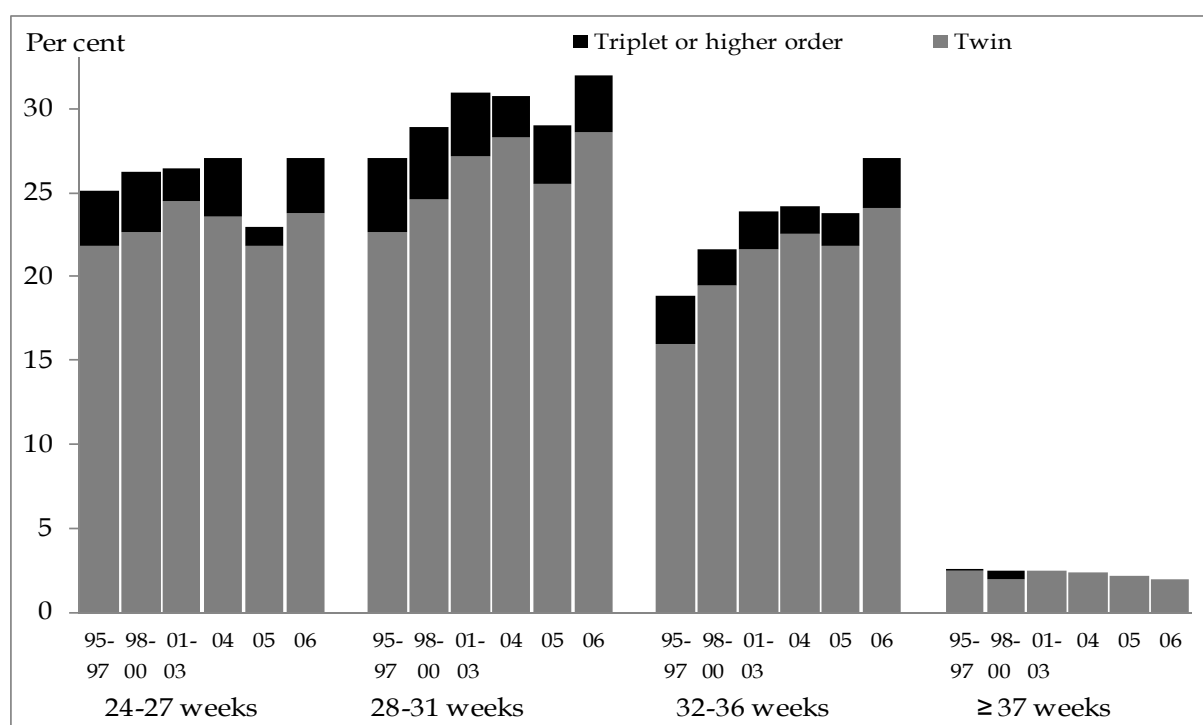
Babies from multiple pregnancies have an increased risk of being preterm and of having co-morbidities independent of their prematurity. There were 1,762 (23.2%) records for babies in the cohort reported as being from multiple pregnancies which is a higher proportion than in 2005. They represent an estimated 27.6% of the total number of multiple births in Australia and New Zealand in 2006 <sup>1,2</sup>. Of the ANZNN registrants from multiple births 1,051 (59.6%) were born before 32 weeks gestation and 1,730 (98.2%) were born before 37 weeks gestation (Table 9, Figure 10). A half of the babies from a multiple birth, 1,050 (59.6%) weighed less than 1,500 grams.

**TABLE 9: Plurality by gestational age group, level III registrants 2006**

Plurality	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Singleton	33	250	424	657	873	753	970	1523	5483
Twins	7	105	194	301	457	384	300	91	1839
Triplets	3	10	25	38	68	71	31	1	247
Quadruplets or more	0	4	4	9	2	3	0	0	22
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
Singleton	76.7	67.8	65.5	65.4	62.4	62.2	74.6	94.3	72.2
Twins	16.3	28.5	30.0	30.0	32.6	31.7	23.1	5.6	24.2
Triplets	7.0	2.7	3.9	3.8	4.9	5.9	2.4	0.1	3.3
Quadruplets or more	0.0	1.1	0.6	0.9	0.1	0.2	0.0	0.0	0.3
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby*

**FIGURE 10: Trends in multiple births by gestational age group, level III registrants 1995–2006**



## Admission temperature

Temperature at admission to the NICU is reported to the network for all babies. For babies born before 32 weeks gestation the admission temperature is one of the elements used to calculate the CRIB (Clinical Risk Index for Babies) II score. This score is a measure of initial illness severity and a predictor of survival until discharge. The median temperature at admission to the NICU increased with increasing gestational age at birth (Table 10), but for all babies born before 32 weeks gestation was 36.5°C.

**TABLE 10: Admission temperature by gestational age, 2006**

Gestational age at birth (weeks)	Temperature	
	Median (°C)	IQR
<23	34.9	34.7–35.0
23	35.2	34.7–35.9
24	35.7	35.0–36.6
25	36.2	35.6–36.6
26	36.2	35.7–36.8
27	36.4	35.8–36.8
28	36.4	35.9–36.8
29	36.5	36.0–36.8
30–31	36.5	36.0–36.8
≥32	36.6	36.2–37.0
<b>All gestations</b>	<b>36.5</b>	<b>36.0–36.9</b>

*Note: Only non-missing values were used in calculations.*

## Apgar score at birth

The Apgar score is a clinical indicator recording a baby's condition at birth with a score from 0 to 10. It is a numerical score based on five characteristics: heart rate, respiratory condition, muscle tone, reflexes and colour. A low score (less than 4) at one minute indicates that the baby needs specialised resuscitation.

**TABLE 11: Apgar scores at birth for babies by gestational age group, level III registrants 2006**

Apgar score	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Apgar at 1 minute									
<4	25	116	146	159	119	131	148	332	1176
4 – 7	14	202	370	500	650	512	492	526	3266
≥8	4	47	125	339	627	566	656	752	3116
Not stated	0	4	6	7	4	2	5	5	33
Apgar at 5 minutes									
<4	6	16	23	24	16	17	41	109	252
4 – 7	24	172	235	230	200	190	233	395	1679
≥8	13	178	383	745	1180	1002	1022	1105	5628
Not stated	0	3	6	6	4	2	5	6	32
All babies	43	369	647	1005	1400	1211	1301	1615	7591

*Note: No gestation recorded for one baby.*

An Apgar score of less than 4 at one minute of age was recorded for 1,176 level III registrants (15.4%) and 252 registrants had an Apgar score of less than 4 at five minutes of age (3.3%). Among the babies who had low Apgar scores at 1 minute, 48% were born at less than 32 weeks and 28.2% were term babies (Table 11).

## Respiratory assistance

There were 1,822 babies (24%) who were intubated in the labour ward to aid resuscitation at birth, including 1,287 babies (17%) of less than 32 weeks and 269 babies (3.5%) born at term.

## Type of assisted ventilation

The two major forms of assisted ventilation used are intermittent positive pressure ventilation (IPPV) and continuous positive airways pressure (CPAP). IPPV is assisted ventilation given via an endotracheal tube, while CPAP can be administered via an endotracheal tube or via nasopharyngeal prongs (nasal CPAP). For the purposes of this audit CPAP is recorded via any route. Both IPPV and CPAP require specialised nursing, medical and paramedical care and utilise a large component of the available resources. Of the babies registered to the 2006 ANZNN cohort, 6,934 (91.3%) were given assisted ventilation for four or more hours.

**TABLE 12: Assisted ventilation by gestational age group, level III registrants 2006**

Type of ventilation	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
IPPV	40	359	564	601	382	335	476	857	3614
CPAP	25	295	587	909	1045	990	988	984	5823
O2	25	235	392	503	522	468	599	772	3516
HFOV	18	142	107	71	28	20	29	88	503
NO	6	34	36	20	23	10	29	126	284
ECMO	0	0	0	0	0	0	0	5	5
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
IPPV	93.0	97.3	87.2	59.8	27.3	27.7	36.6	53.1	47.6
CPAP	58.1	79.9	90.7	90.4	74.6	81.8	75.9	60.9	76.7
O2	58.1	63.7	60.6	50.0	37.3	38.6	46.0	47.8	46.3
Per cent of babies given IPPV									
HFOV	45.0	39.6	19.0	11.8	7.3	6.0	6.1	10.3	13.9
NO	15.0	9.5	6.4	3.3	6.0	3.0	6.1	14.7	7.9
ECMO								0.3	0.1

**Notes:** No gestation recorded for one baby. Groups are not mutually exclusive. The proportion of babies given HFOV and NO are given as a proportion of the babies given IPPV.

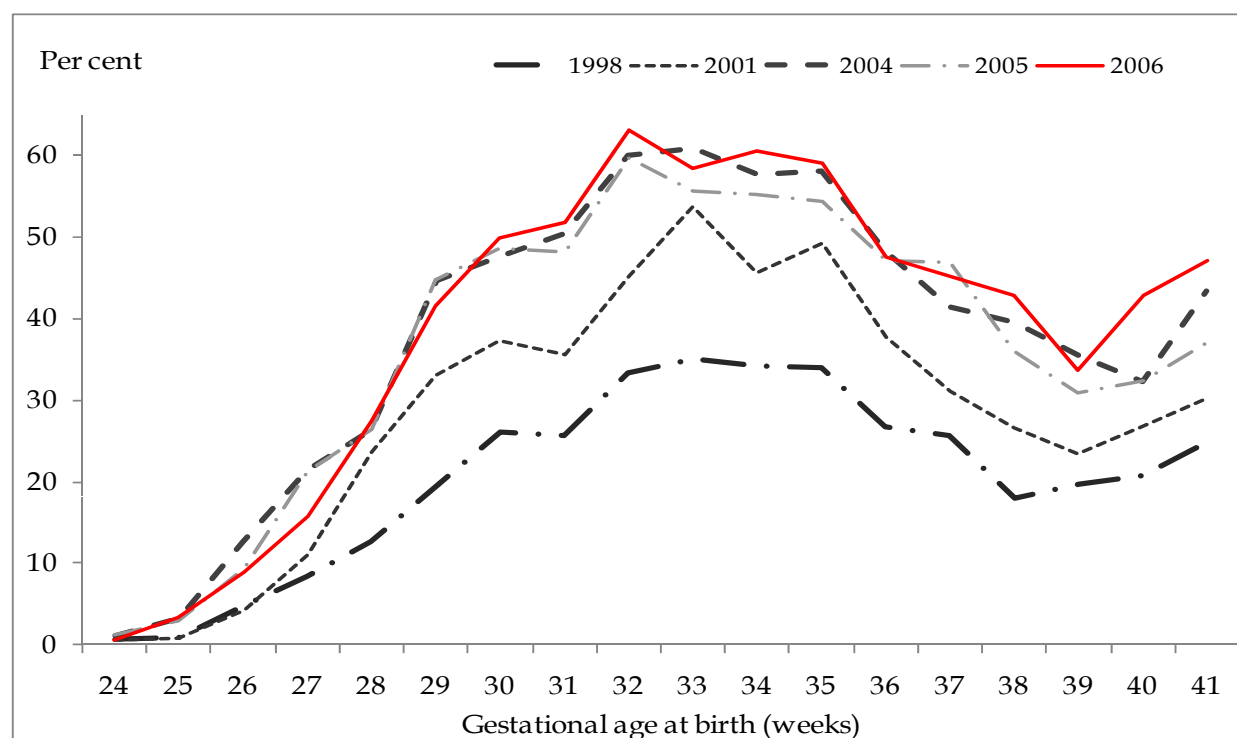
In 2006, IPPV was given for a total of 590,842 hours to the babies in the cohort and CPAP was given for 1,211,813 hours. These 1,802,655 hours equate to each baby receiving 10.8 days of assisted ventilation.

The median number of days of assisted ventilation is inversely related to the gestational age at birth (Table 13).

**TABLE 13: Duration of assisted ventilation and oxygen use by gestational age group, level III registrants 2006**

	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
IPPV (hours)									
Median	253.5	360	80	37	28	33	46	48	49
IQR	61-911.5	96-781	24-295	16-102	17-67	15-63	12 - 62	23-93	21-137
CPAP (hours)									
Median	535.5	888	633	164	46	28	28	18	49
IQR	260-1092	480-1224	344-981	59-459	18-104	13-70	12-62	8-44	16-170
Oxygen (days)									
Median	54	63	34	7	2	2	3	3	4
IQR	5 - 116	19 - 102	9 - 69	2 - 35	1- 5	1 - 5	1 - 5	1 - 7	1 - 15

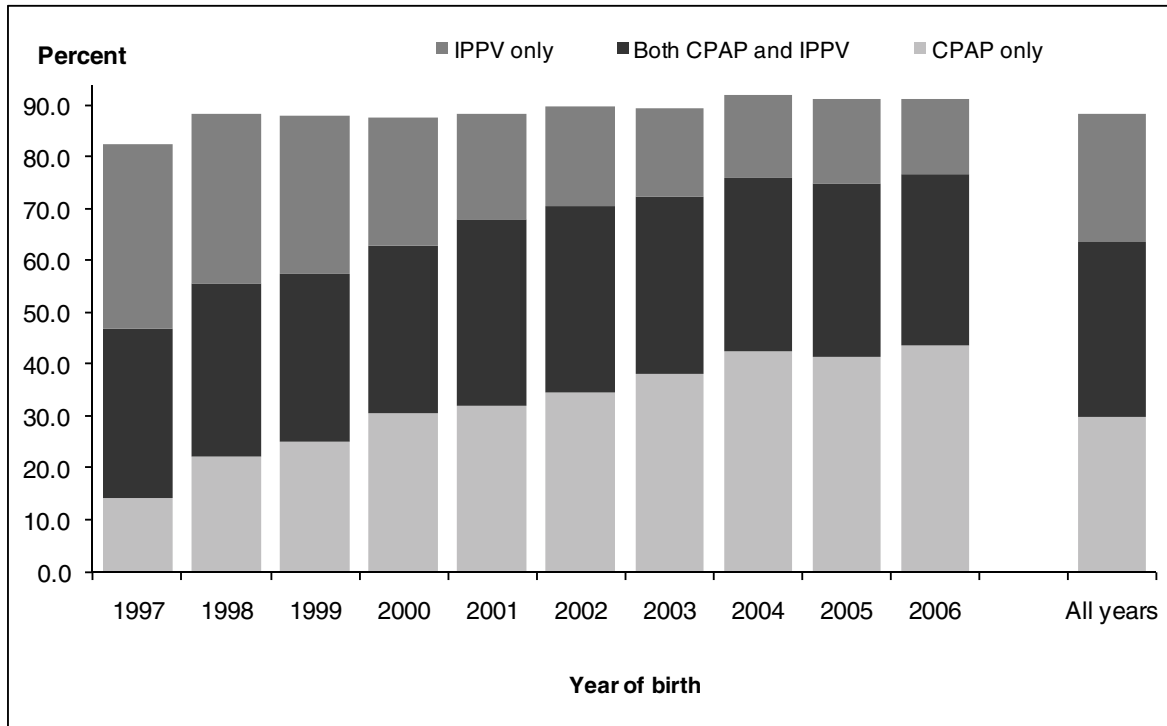
*Notes: Calculated for records with non-missing values.*

**FIGURE 11: Trends in the use of CPAP as the only form of ventilation by gestational age, level III registrants 1998-2006**

The most common form of ventilation given to babies in 2006 was CPAP. The use of CPAP as the only form of ventilator support rose steadily from 1995 but has levelled off in recent years (Figures 11 and 12). In 2006, CPAP, as the only form of ventilation, was given to 3,315 babies (47.8%). A combination of IPPV and CPAP was given to 2,508 babies (36.2%) (Figure 12). IPPV, as the only form of ventilation, was given to 1,106 babies (16%).

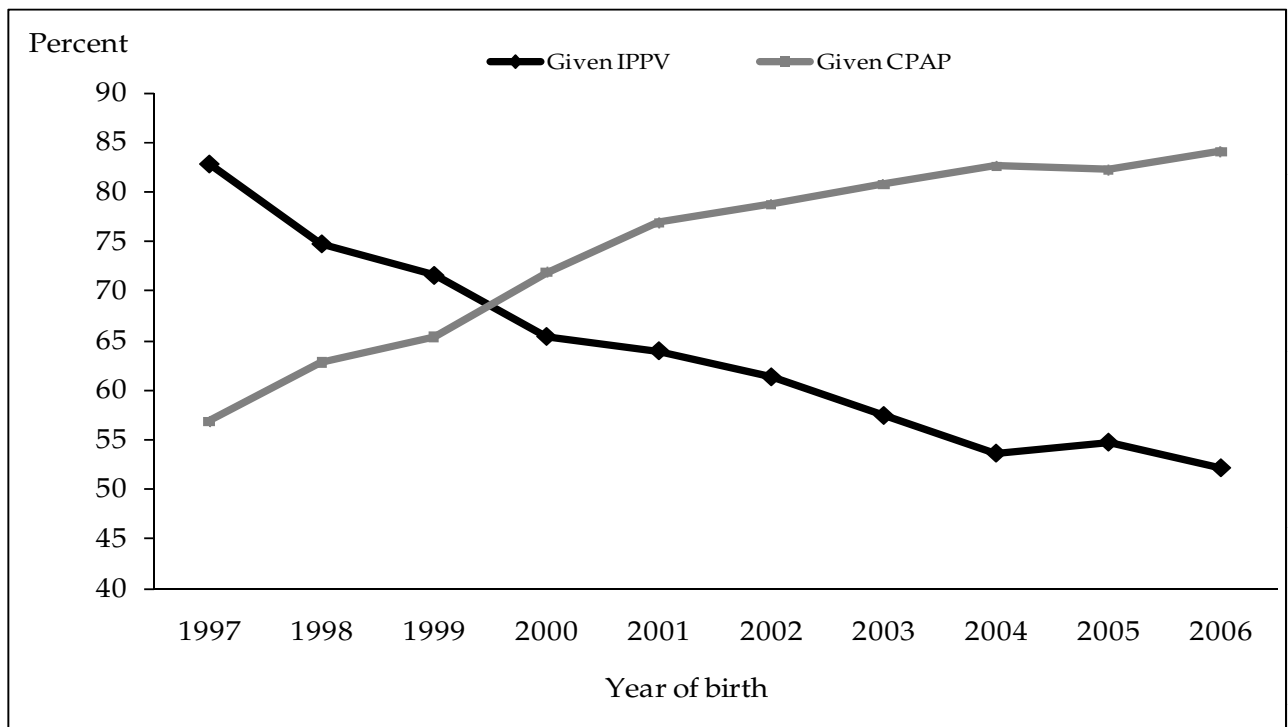
In addition to IPPV and CPAP babies may have received oxygen (O<sub>2</sub>), high frequency oscillatory ventilation (HFOV), nitric oxide (NO) or extracorporeal membrane oxygenation (ECMO). HFOV without IPPV is very rarely given therefore the rates of HFOV and NO are given as a proportion of the babies who received IPPV. The use of HFOV had been relatively stable at 12–14% since 1999 as evident in 2006 with 13.9% of registrants who received IPPV also receiving HFOV. The use of HFOV among individual units can vary between 0.3 – 17% with the highest proportion of babies receiving HFOV being born at less than 32 weeks gestation.

**FIGURE 12: Trends in mode of assisted ventilation, level III registrants 1997–2006**



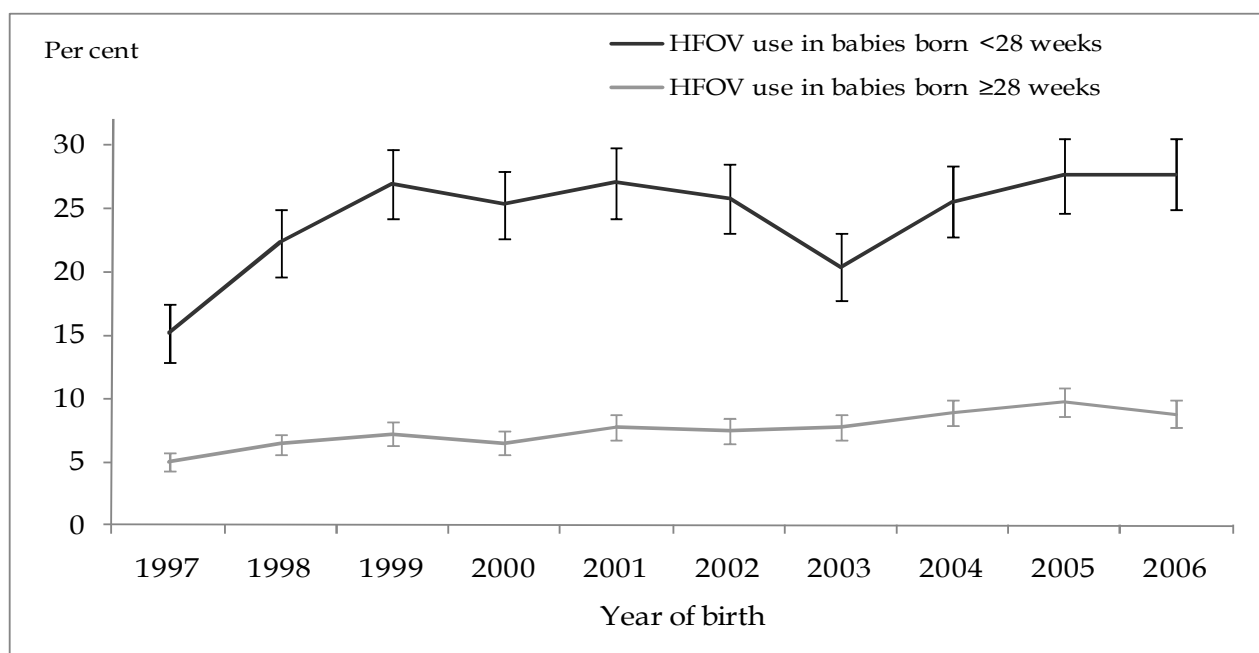
Nitric Oxide (NO) was received by 284 registrants (3.7%). The use of NO shows a U-shaped distribution with the highest proportion of babies receiving NO being born before 24 weeks gestation but the highest number of babies receiving NO was seen among those babies born at term.

**FIGURE 13: Trends in provision of intermittent positive pressure ventilation (IPPV) and continuous positive pressure ventilation (CPAP) by year of birth, level III registrants ventilated 1997–2006**



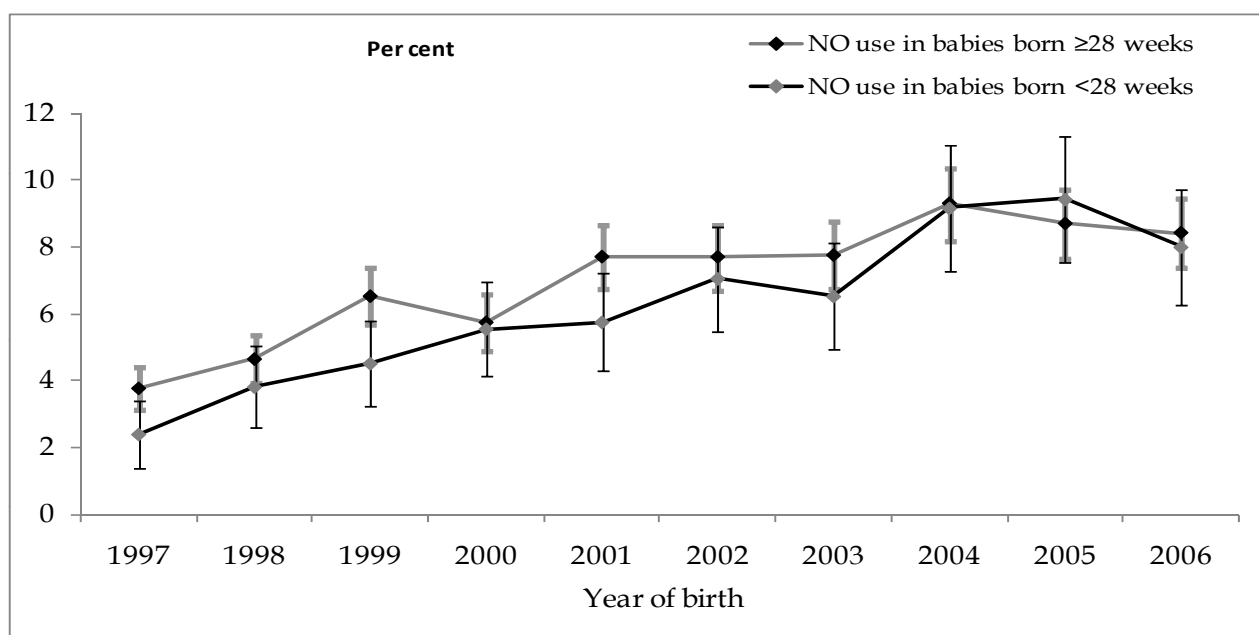


**FIGURE 14: Trends in provision of high frequency oscillatory ventilation (HFOV) for babies born before 28 weeks and 28 or more weeks gestation, level III registrants 1997– 2006**



*Note: The results are given as the percentage of babies given IPPV.*

**FIGURE 15: Trends in nitric oxide provision for babies born before 28 weeks and 28 or more weeks gestation, 1997–2006**



*Note: Results are given as the percentage of babies given IPPV.*

Hyaline membrane disease was the most common reason for respiratory support for babies in 2006 and together with non-specific respiratory distress, accounted for 70% of babies (Table 14). For babies born preterm, hyaline membrane disease was the most common indication for respiratory support. Non-specific respiratory distress accounted for the highest proportion of babies born at term (25.3%), peri-surgery, meconium aspiration, congenital anomaly and newborn encephalopathy accounted for most of the remaining reasons for ventilation among term babies in 2006. Only 549 babies (7.2%) did not receive any respiratory support.

**TABLE 14: Indication for respiratory support by gestational age group level III registrants 2006**

Indication for respiratory support	Gestational age group						All
	<28	28–29	30–31	32–33	34–36	37–43	
Number							
No respiratory support	3	39	237	113	79	78	549
Non-specific respiratory distress	22	103	288	328	403	409	1553
Hyaline membrane disease	977	796	723	559	518	204	3777
Meconium aspiration syndrome	0	0	0	1	6	168	175
Pnuemonia	1	1	5	9	6	32	54
Persistent pulmonary hypertension	4	4	2	2	11	53	76
Apnoea	17	30	55	45	19	20	186
Congenital anomaly	4	5	10	14	69	161	263
Peri-surgery	6	3	6	22	69	193	299
Newborn encephalopathy	1	0	3	11	31	140	186
Other	14	16	42	90	72	131	365
Not stated	10	8	29	17	18	26	108
All babies	1059	1005	1400	1211	1301	1615	7591
Per cent							
No respiratory support	0.3	3.9	16.9	9.3	6.1	4.8	7.3
Non-specific respiratory distress	2.1	10.3	21.0	27.5	31.4	25.7	20.8
Hyaline membrane disease	93.1	79.8	52.7	46.8	40.4	12.8	50.5
Meconium aspiration syndrome	0.0	0.0	0.0	0.1	0.5	10.6	2.3
Pnuemonia	0.1	0.1	0.4	0.8	0.5	2.0	0.7
Persistent pulmonary hypertension	0.4	0.4	0.1	0.2	0.9	3.3	1.0
Apnoea	1.6	3.0	4.0	3.8	1.5	1.3	2.5
Congenital anomaly	0.4	0.5	0.7	1.2	5.4	10.1	3.5
Peri-surgery	0.6	0.3	0.4	1.8	5.4	12.1	4.0
Newborn encephalopathy	0.1	0.0	0.2	0.9	2.4	8.8	2.5
Other	1.3	1.6	3.1	7.5	5.6	8.2	4.9
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby.*

## **Ventilation in babies born at less than 32 weeks gestation**

The major indication for assisted ventilation in babies born at less than 32 weeks gestation was hyaline membrane disease (2,496). Among the 3,464 babies born before 32 weeks gestation, 3,101 were given IPPV or CPAP. CPAP as the only form of ventilation was given to 1,155 babies (33.3%) and IPPV as the only form of ventilation was given to 240 babies (6.9%) of less than 32 weeks gestation. Both IPPV and CPAP were given to 1,706 of these babies (49.2%). The duration of ventilation increased on average, with decreasing gestational age.

In 2006, the total duration of IPPV for these very preterm babies was 371,540 hours (15,481 days) and the duration of CPAP was 961,596 hours (40,067 days). The total duration of IPPV and CPAP for 2006 babies was less than for 2005 registrants.

High frequency ventilation was given to 360 babies of this group representing 11.6% of the babies who were given IPPV, a lower proportion than in 2005. Nitric oxide was given to 178 (5.7%) of the babies who were given IPPV.

Oxygen therapy was given to 1,677 babies (48%) for four or more hours and a total of 52,271 'oxygen days' were required by them. A small proportion of babies who received assisted ventilation required home oxygen (128). This number represents 4.0% of the survivors discharged to home. Of the survivors born at less than 24 weeks, 9% required home oxygen (Table 17).

## **Ventilation in babies born at 32 to 36 weeks gestation**

Among the babies born at 32–36 weeks gestation 2,290 babies (91.2%) received assisted ventilation for four or more hours. Hyaline membrane disease was the main reason for ventilation. Total duration of CPAP use among babies in this gestational age group was 105,463 hours and IPPV use was 71,696 hours. CPAP use in this gestational age group decreased during 2006.

High frequency ventilation was given to 4.3% of the babies who received IPPV. Nitric oxide was given to 3.4% of the babies and this is a slightly lower proportion than in 2005. Supplementary oxygen was given to 1,062 babies (42.2%).

## **Ventilation in babies born at term**

The main indication for respiratory support was non-specific respiratory distress (25.3%). This group required 112,169 hours of IPPV and 44,135 hours of CPAP.

High frequency ventilation was given to 10.2% of the term babies who were given IPPV. Nitric oxide was given to 14.7% who had IPPV, a lower proportion than in 2005. There were five babies who received extracorporeal membrane oxygenation (ECMO).

## **Exogenous surfactant**

There were 2,346 babies who received IPPV for hyaline membrane disease (HMD) in 2006. Exogenous surfactant was given to 2,122 of these babies (90.5%), an increase on past years (Table 15). Overall, 3,219 registrants received exogenous surfactant representing 42.4% of the ANZNN cohort (Table 15).

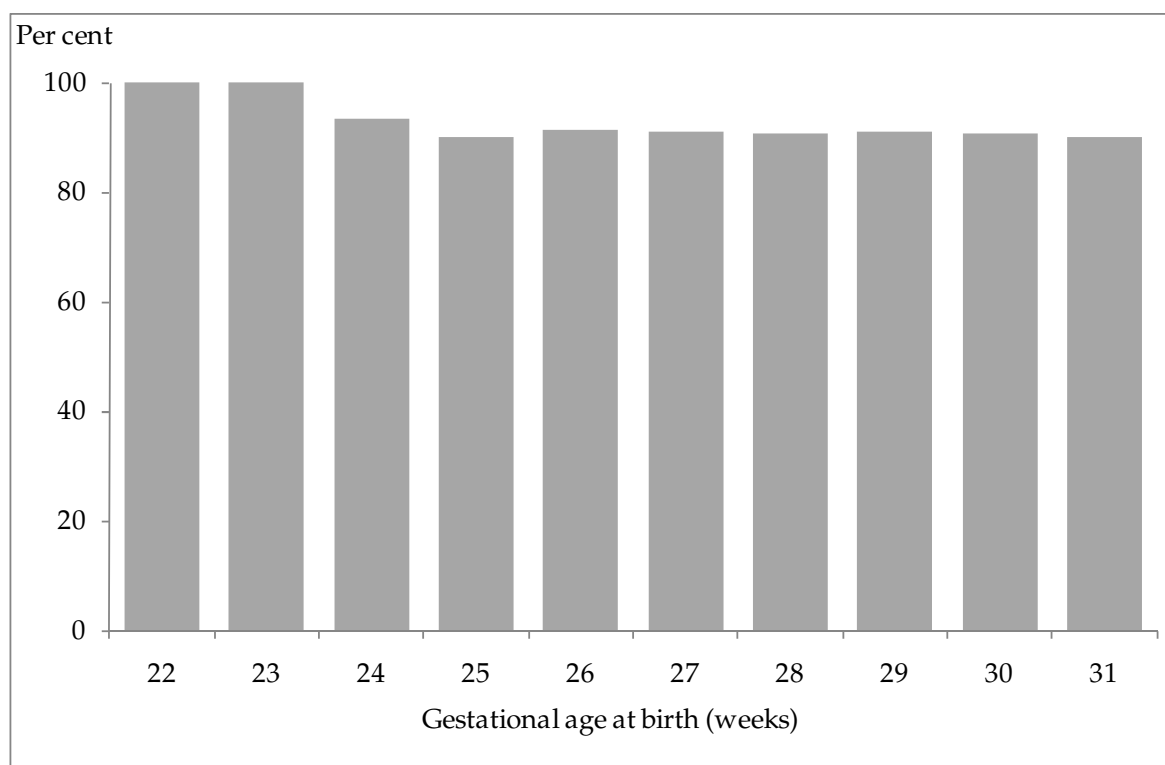
**TABLE 15: Exogenous surfactant use by gestational age group level III registrants 2006**

Exogenous surfactant used	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
None	4	39	123	413	994	900	985	1371	4829
Survanta	18	132	234	259	195	134	163	97	1232
Exosurf & Survanta	7	24	34	25	19	9	11	1	130
Curosurf	14	168	242	268	116	94	79	61	1042
Other	0	2	10	9	3	10	1	4	39
Not stated	0	4	4	31	73	64	62	81	319
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
None	9.3	10.7	19.1	42.4	74.9	78.5	79.5	89.4	66.4
Survanta	41.9	36.2	36.4	26.6	14.7	11.7	13.2	6.3	16.9
Exosurf & Survanta	16.3	6.6	5.3	2.6	1.4	0.8	0.9	0.1	1.8
Curosurf	32.6	46.0	37.6	27.5	8.7	8.2	6.4	4.0	14.3
Other	0.0	0.5	1.5	0.9	0.2	0.8	0.1	0.2	0.5
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**Notes:** No gestation recorded for one baby. The 'Other' category combines results for 2 babies given Exosurf, 1 baby given an unspecified surfactant, and 36 given a combination of Curosurf and Survanta.

There were 77 babies diagnosed with HMD who were given exogenous surfactant, but did not continue with IPPV. Exogenous surfactant was given to 791 other babies for reasons other than HMD. They include babies who had meconium aspiration syndrome, non-specific respiratory distress, persistent pulmonary hypertension, congenital anomalies and newborn encephalopathy.

**FIGURE 16: Exogenous surfactant use for babies born at less than 32 weeks with hyaline membrane disease and given IPPV level III registrants 2006**



## Chronic lung disease

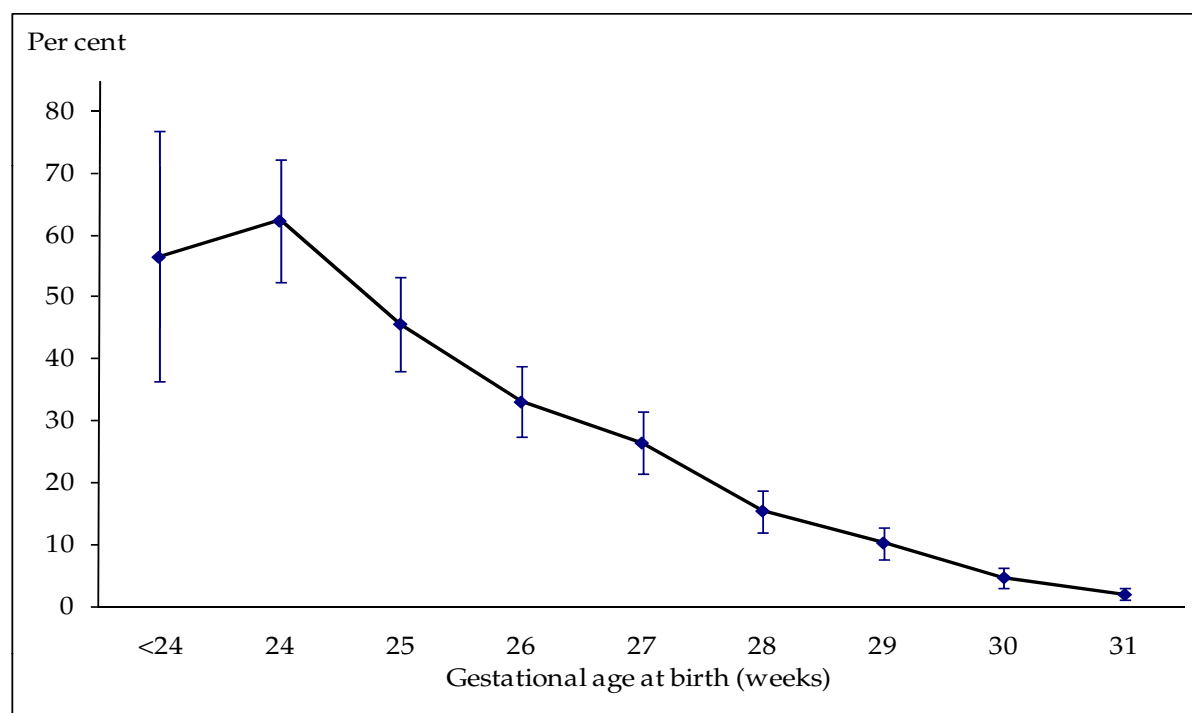
Chronic lung disease (CLD) is diagnosed in babies born at less than 32 weeks gestation, who receive any form of respiratory support (supplemental oxygen and/or assisted ventilation) for their initial respiratory disease and continue to require respiratory support at 36 weeks post menstrual age.

**TABLE 16: Chronic lung disease by gestational age group 2006**

Chronic lung disease	Gestational age										All
	<24	24	25	26	27	28	29	30	31	>32	
Eligible babies	Number										
Chronic lung disease	13	58	74	89	77	68	54	28	15	0	476
No chronic lung disease	9	33	78	168	205	359	454	551	751	0	2608
Ineligible babies	21	67	47	53	34	27	13	11	11	4050	4334
Not stated	0	2	10	12	9	13	17	21	12	77	173
<b>All babies</b>	<b>43</b>	<b>160</b>	<b>209</b>	<b>322</b>	<b>325</b>	<b>467</b>	<b>538</b>	<b>611</b>	<b>789</b>	<b>4127</b>	<b>7591</b>
	Per cent										
Chronic lung disease	59.1	63.7	48.7	34.6	27.3	15.9	10.6	4.8	2.0		9.4

**Notes:** No gestation recorded for one baby. Eligible babies are those born before 32 weeks who survive to 36 weeks post menstrual age.

**FIGURE 17: Incidence of chronic lung disease by gestational age level III registrants 2006**



In 2006, there were 476 babies who had respiratory support at 36 weeks PMA (Table 16) representing 13.7% of babies born before 32 weeks gestation, a lower proportion than in 2005 (18.6%). Chronic lung disease is inversely related to the gestational age at birth (Table 16 and Figure 17), with 59.2% of babies born before 24 weeks and 38.9% born before 28 weeks gestation affected.

## Supplemental Oxygen

Supplemental oxygen can be critical for the survival of some babies especially those with respiratory problems and those born prematurely. Babies requiring treatment in a level III unit usually require long-term oxygen administration as part of their specialised care. The use of supplemental oxygen may vary between babies, from as little as a few hours to several weeks or months, for the purpose of the ANZNN audit four consecutive hours in any one 24 hour period constitutes the use of supplemental oxygen on that day.

Among 2006 registrants, 949 babies (12.5%) received supplemental oxygen on day 28 (Table 17) a lower proportion than in 2005 (1178 or 15.4%). There were 147 babies (1.9%) who were given home oxygen, also a lower proportion than in 2005 (218 or 2.8%).

**TABLE 17: Supplemental oxygen (O2) therapy by gestational age group 2006**

Supplemental oxygen therapy	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
In oxygen on day 28	17	228	325	223	54	31	25	56	959
Survived to go home	16	198	307	204	51	28	15	47	866
Died before discharge	1	30	18	9	3	3	10	9	83
Not in oxygen on day 28	26	141	322	792	1346	1180	1276	1559	6642
Babies given home oxygen	2	37	50	33	6	3	2	14	147
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
Babies in oxygen on day 28	39.5	61.8	50.2	22.2	3.9	2.6	1.9	3.5	12.6
Per cent									
Survived to go home	94.1	86.8	94.5	91.5	94.4	90.3	60.0	83.9	90.3

**Note:** No gestation recorded for one baby.

## Air leak

Babies born before 28 weeks gestation had the largest proportion of air leaks (6.3%) that required drainage. All of those babies, except one, were reported receiving IPPV at the time the air leak was diagnosed (Table 18).

**TABLE18: Babies who had an airleak by gestational age group 2006**

Presence of an air leak & baby's ventilation status	Gestational age group								All babies
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Air leak	9	24	35	42	30	31	60	98	329
No air leak	34	343	612	959	1370	1177	1235	1512	7242
Not stated	0	2	0	4	0	3	6	5	20
<b>All babies</b>	<b>43</b>	<b>369</b>	<b>647</b>	<b>1005</b>	<b>1400</b>	<b>1211</b>	<b>1301</b>	<b>1615</b>	<b>7591</b>
Per cent									
Air leak	20.9	6.5	5.4	4.2	2.1	2.6	4.6	6.1	4.3

*Note: No gestation recorded for one baby.*

## Retinopathy of prematurity

The classification of stage of retinopathy of prematurity (ROP) for ANZNN registrants is that recommended by the International Committee for the Retinopathy of Prematurity. The criteria most commonly used for ROP screening in the 2006 cohort were birth at less than 31 weeks gestation or birth weight of less than 1,250 grams. There were 3,277 babies eligible for ROP examination with 2,491 (76%) babies who had the results of their eye examination recorded. Among the 715 babies not examined 385 were born at more than 30 weeks gestational age indicating that different local criteria were used to qualify for ROP examination (Table 19).

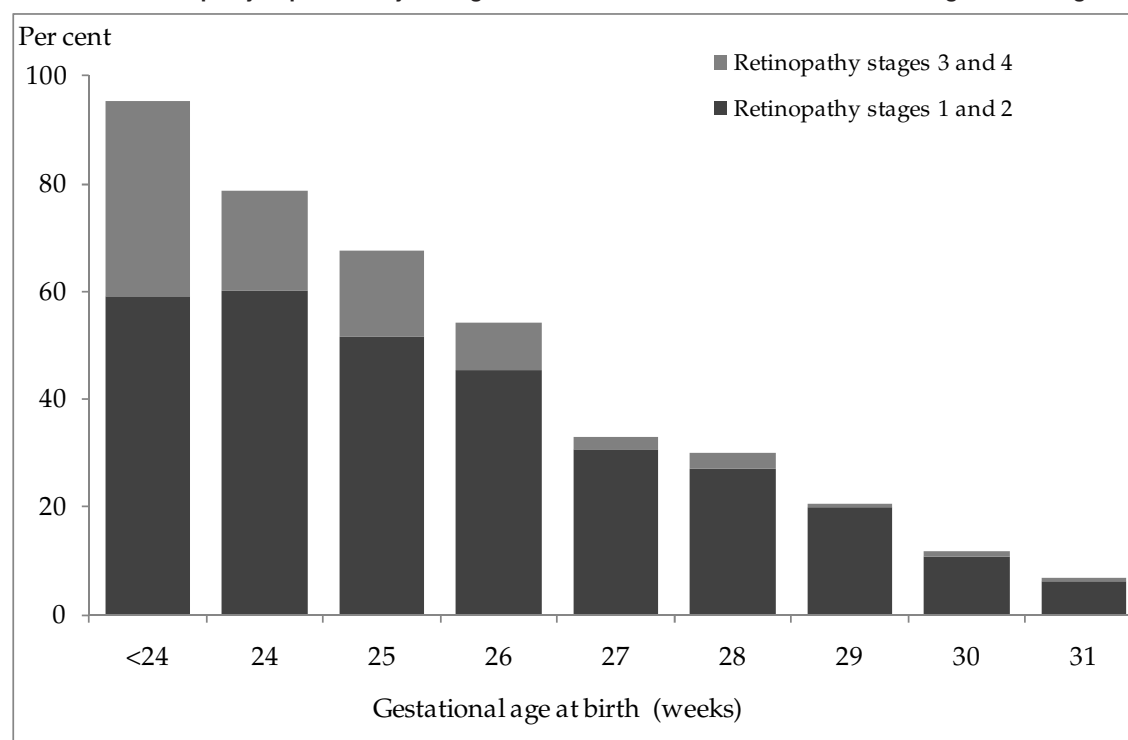
**TABLE 19: Retinopathy of prematurity by gestational age 2006**

Retinopathy of prematurity (ROP)	Gestational age										All
	<24	24	25	26	27	28	29	30	31	≥32	
	Number										
No Retinopathy	2	25	56	123	190	297	376	340	335	296	2040
ROP Stage 1	5	22	37	65	53	83	66	29	15	10	385
ROP Stage 2	9	36	48	58	37	28	27	13	7	3	266
ROP Stage 3	8	19	25	20	6	10	4	3	2	1	98
ROP Stage 4	0	2	0	3	1	2	0	0	0	0	8
Not examined	19	56	43	52	38	47	65	200	385	3591	4496
Not stated	0	0	1	0	0	0	0	26	45	226	298
All babies	43	160	210	321	325	467	538	611	789	4127	7591
Treatment for ROP	5	18	21	13	6	10	2	3	0	0	78
Per cent											
No Retinopathy	8.3	24.0	33.7	45.7	66.2	70.7	79.5	88.3	93.3	95.5	72.9
ROP Stage 1	20.8	21.2	22.3	24.2	18.5	19.8	14.0	7.5	4.2	3.2	13.8
ROP Stage 2	37.5	34.6	28.9	21.6	12.9	6.7	5.7	3.4	1.9	1.0	9.5
ROP Stage 3	33.3	18.3	15.1	7.4	2.1	2.4	0.8	0.8	0.6	0.3	3.5
ROP Stage 4	0.0	1.9	0.0	1.1	0.3	0.5	0.0	0.0	0.0	0.0	0.3
Per cent of babies with Stage 3 or Stage 4 ROP											
Treatment for ROP	62.5	85.7	84.0	56.5	85.7	83.3	50.0	100.0	0.0	0.0	73.6

*NB: No gestation recorded for one baby.*

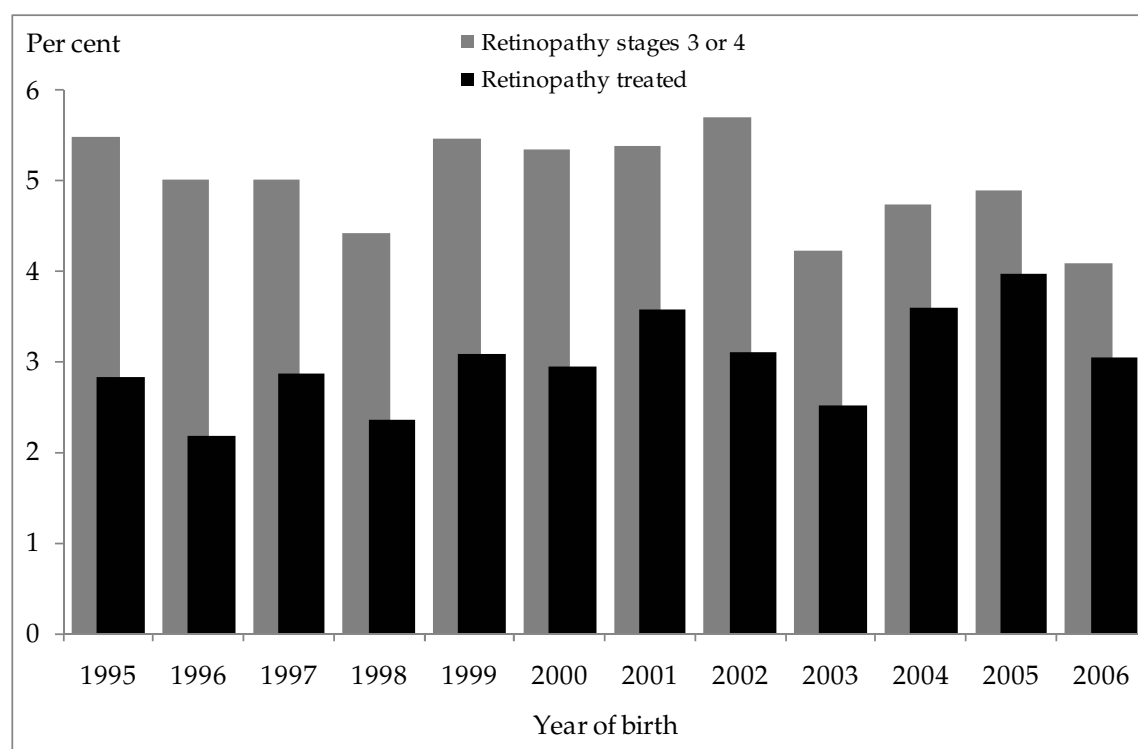
Some of the infants who did not have eye examination had died (257) before reaching 36 weeks corrected age. Of those examined, 102 babies (4.1%) had stage 3 or 4 ROP and 76 of these babies received treatment (Figure 18, Figure 19).

**FIGURE 18: Retinopathy of prematurity among babies who survived to 36 weeks corrected age level III registrants 2006**





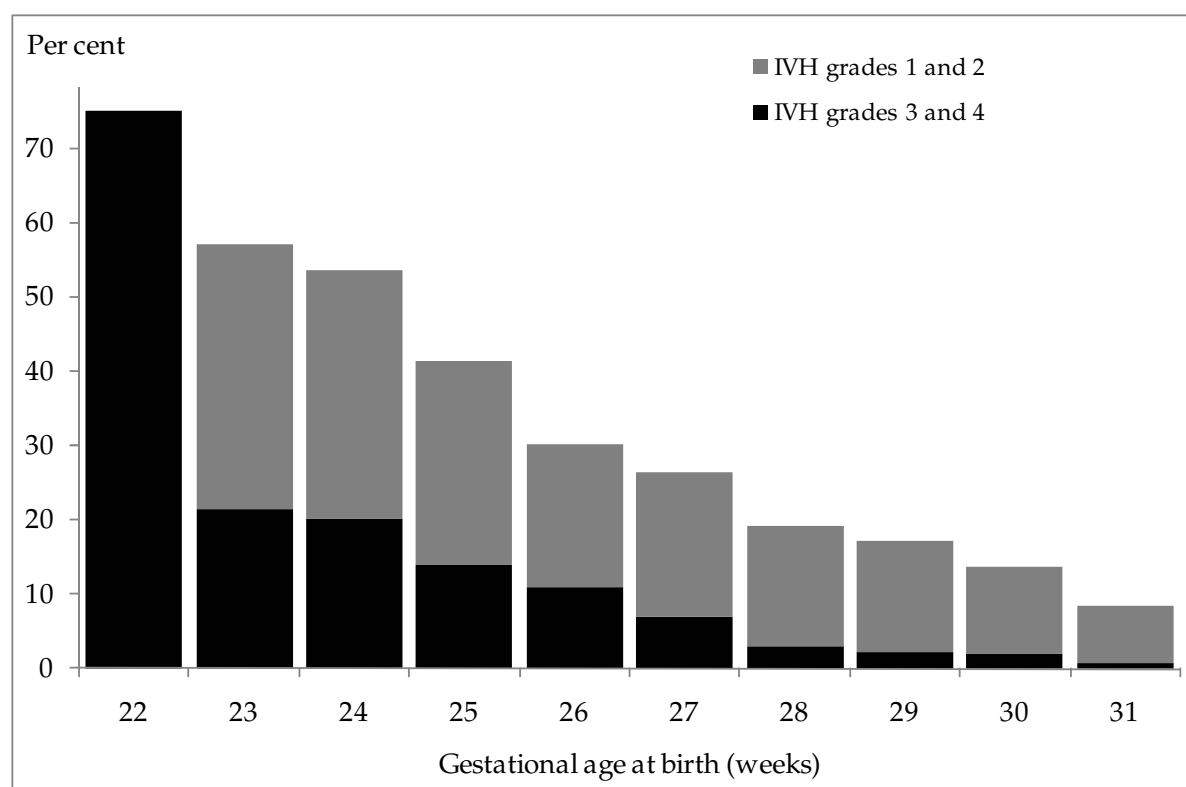
**FIGURE 19: Stage 3 or 4 retinopathy of prematurity and treated retinopathy among babies born before 32 weeks gestation who survived to 36 weeks corrected age level III registrants 2006**



## Cerebral ultrasound and intraventricular haemorrhage

An initial ultrasound is generally performed during the first week of life to detect signs of intraventricular haemorrhage (IVH) and is graded according to an internationally recognised method (Papile et al 1978). Late cerebral ultrasound data are based on changes seen in brain parenchyma at the cerebral ultrasound scan nearest to six weeks of age.

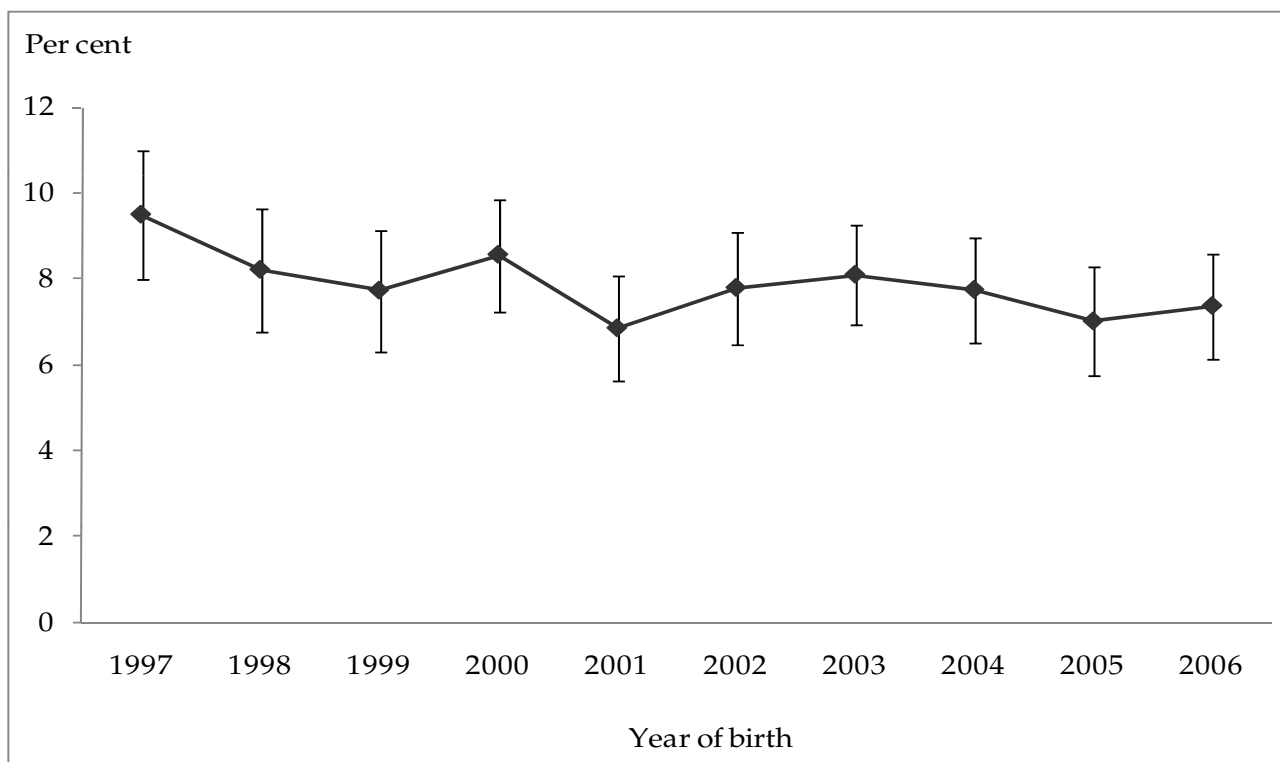
**FIGURE 20: Intraventricular haemorrhage in babies born at less than 32 weeks gestation who survived to day 3, level III registrants 2006**



There were 180 very preterm babies reported to have grade 3 or 4 IVH representing 3.9% of the babies born before 32 weeks gestation, a lower proportion than in 2005. Twenty-two of them (16.3%) died before discharging home. The proportion of babies with significant haemorrhage increases as gestation decreases (Table 20, Figure 20).

The highest proportion of babies who had severe IVH was born before 27 weeks gestational age, with the majority (97.3%) of the babies born between 24 and 26 weeks gestation. Of the babies who weighed less than 750 grams, 49 babies had severe IVH (12.8%), a lower proportion than in 2005. Of the 334 babies who did not have an early ultrasound report, 252 were born at more than 29 weeks gestation (75.4%) indicating that some units are screening only the babies born at less than 30 weeks gestation.

**FIGURE 21: Trends in grade 3 or 4 intraventricular haemorrhage in babies born at less than 32 weeks gestation who survived to day 3, level III registrants 1997–2006**



**Note:** Babies who did not have an ultrasound report are not included in the proportions.

**TABLE 20: Intraventricular haemorrhage by gestational age for babies born at less than 32 weeks level III registrants 2006**

IVH status	Gestational age									All
	< 24	24	25	26	27	28	29	30	31	
Number										
None	16	66	115	214	233	364	423	462	558	2,451
Grade 1	4	29	31	33	41	52	56	54	43	343
Grade 2	7	21	23	27	19	22	20	8	4	151
Grade 3	2	14	9	16	7	7	7	5	2	69
Grade 4	8	20	22	22	15	10	5	6	3	111
Not examined	6	10	9	10	10	12	25	73	179	334
Not stated	0	0	0	0	0	0	2	3	0	5
All babies	43	160	209	322	325	467	538	611	789	3464
Per cent										
None	43.2	44.0	57.5	68.6	74.0	80.0	82.8	86.4	91.5	78.4
Grade 1	10.8	19.3	15.5	10.6	13.0	11.4	11.0	10.1	7.0	11.0
Grade 2	18.9	14.0	11.5	8.7	6.0	4.8	3.9	1.5	0.7	4.8
Grade 3	5.4	9.3	4.5	5.1	2.2	1.5	1.4	0.9	0.3	2.2
Grade 4	21.6	13.3	11.0	7.1	4.8	2.2	1.0	1.1	0.5	3.6
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby.*

There were 3,369 babies born at less than 32 weeks gestation who were eligible for a cerebral ultrasound with 3,125 (90.2%) having an examination recorded. There were 2,887 babies who had an ultrasound dated at least three weeks after birth and 2,433 of them had a normal report. Cysts on the late cerebral ultrasounds were reported for 64 babies (Table 21). Of these, 14 (0.6%) babies had porencephalic cysts, 43 (1.7%) had periventricular leukomalacia (PVL) and 7 babies (0.3%) had encephaloclastic porencephaly, a higher number than reported in 2005. Hydrocephalus was reported for 20 babies (Table 21).

**TABLE 21: Late cerebral ultrasound results by gestational age for babies born at less than 32 weeks gestation level III registrants 2006**

Late cerebral ultrasound results	Gestational age									All
	<24	24	25	26	27	28	29	30	31	
Number										
No cysts	26	104	143	243	249	368	411	413	476	2,433
Cysts detected	1	4	9	11	12	9	9	5	4	64
Unknown cyst status	6	33	29	35	33	54	55	72	73	390
Hydrocephalus	0	4	5	3	3	3	0	1	1	20
Late cerebral ultrasound	33	141	181	289	294	431	475	490	553	2,887
Per cent										
Cysts detected	3.0	2.8	5.0	3.8	4.1	2.1	1.9	1.0	0.7	2.2
Hydrocephalus		2.8	2.8	1.0	1.0	0.7		0.2	0.2	0.7

*Notes: No gestation recorded for one baby. Babies with hydrocephalus may have had cysts detected on late cerebral ultrasound.*

## Necrotising enterocolitis

Necrotising enterocolitis (NEC) is a rare disease, more common in preterm infants and has a high rate of morbidity and mortality (Table 22). There were 161 babies among ANZNN registrants who had diagnostically proven NEC. This accounted for 1.9% of the 2006 cohort, a slightly higher proportion than in 2005 (1.7%). More than half (57.4%) of the babies were born before 28 weeks gestation and almost all (99.2%) were born before 32 weeks gestation. The proportion who had NEC among babies born before 28 weeks was 13.3% in 2006, higher than the 2005 cohort (7.9%).

In total 52 babies diagnosed with NEC died, of whom 40 (76.9%) were born before 28 weeks gestation. 83 babies (58.9%) underwent surgery for NEC and 29 (34.9%) of them died. Of those babies who had surgery for NEC, 49 were born at less than 28 weeks.

**TABLE 22: Babies with necrotising enterocolitis (NEC) by year of birth 2006**

Gestational age at birth and NEC	Year of birth									
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
	Number									
<b>&lt;28 weeks NEC</b>	51	74	56	68	78	75	78	85	85	95
No NEC	901	928	989	1028	952	1042	943	941	951	944
Not stated	5	0	3	1	1	0	2	0	0	20
<b>≥28 weeks NEC</b>	68	72	55	57	57	65	77	63	50	72
No NEC	5005	5257	5776	5682	5718	5861	6091	6316	6560	6428
Not stated	183	156	7	4	5	2	4	2	0	32
<b>All babies</b>	<b>6213</b>	<b>6487</b>	<b>6886</b>	<b>6840</b>	<b>6811</b>	<b>7045</b>	<b>7195</b>	<b>7407</b>	<b>7646</b>	<b>7591</b>
	Per cent									
NEC <28 weeks	5.3	7.4	5.3	6.2	7.6	6.7	7.6	8.3	8.2	9.0
NEC ≥28 weeks	1.3	1.2	0.9	1.0	1.0	1.1	1.2	1.0	0.8	1.1

*Note: No gestational age for one baby in 2006 and four babies in 2005.*

## Neonatal surgery

The information given in this report includes only the baby's initial admission to a NICU before discharge home after birth. The babies who were discharged home and readmitted for surgery during the neonatal period are not included in this audit. In 2006, there were 868 ANZNN registrants with known gestational age (Table 23) who had major surgery, of whom 45.3% were born at term and more than two-thirds (69.4%) were born at a tertiary hospital. There were 571 babies (65.8%) among those who had surgery who had a congenital anomaly and 291 (51%) of these were diagnosed during the antenatal period. Of the infants born with congenital anomalies and had surgery, 40 died. In 2006, the average length of stay in the hospital for the term babies requiring surgery was 38 days.

**TABLE 23: Characteristics of all ANZNN registrants who underwent surgery 2006**

Characteristic	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Babies who had surgery	9	78	92	52	44	48	152	393	868
Number									
Male	3	46	60	35	23	34	74	223	498
Female	6	32	32	17	20	14	78	170	369
Congenital anomaly present	1	5	10	16	22	33	135	349	571
Congenital anomaly diagnosed antenatally	0	3	4	11	7	19	90	157	291
Hospital of birth									
Tertiary hospital	9	67	77	46	36	31	109	227	602
Other hospitals	0	9	12	5	6	14	42	160	248
Necrotising enterocolitis	0	22	19	10	4	5	4	6	70
Died before discharge home	1	19	15	9	5	6	18	17	90
Per cent									
Congenital anomaly present	11.1	6.4	10.9	30.8	50	68.8	88.8	88.8	65.8
Diagnosed antenatally	0	3.8	4.3	21.2	15.9	39.6	59.2	39.9	33.5
Hospital of birth									
Tertiary hospital	100	85.9	83.7	88.5	81.8	64.6	71.7	57.8	69.4
Other hospitals	0	11.5	13	9.6	13.6	29.2	27.6	40.7	28.6
Necrotising enterocolitis	0	28.2	20.7	19.2	9.1	10.4	2.6	1.5	8.1
Died before discharge home	11.1	24.4	16.3	17.3	11.4	12.5	11.8	4.3	10.4

**Note:** No gestation recorded for one baby. One baby had ambiguous genitalia.

Surgery was the main indication for the use of assisted ventilation in 299 babies (Table 14). Among the babies born preterm who had surgery, 455 were given IPPV for a total of 84,448 hours. Among the 225 very preterm babies and those with a birth weight of less than 1,500 grams who had surgery 49 (18%) of them died.

## Neonatal sepsis

Each episode of sepsis is recorded as either early or late onset. Early onset sepsis is defined as the presence of at least one episode of systemic sepsis with the initial symptoms occurring prior to 48 hours after birth. Late onset sepsis is the presence of at least one episode of systemic sepsis with the initial symptoms occurring from 48 hours after birth. In addition each episode involving the same organism must be at least 14 days apart. In 2006, there were 659 babies (8.7%) who had symptomatic, blood culture positive sepsis (Table 24). Of these babies, 522 (79.2%) were born at less than 28 weeks gestation.

**TABLE 24: Neonatal sepsis by gestational age group 2006**

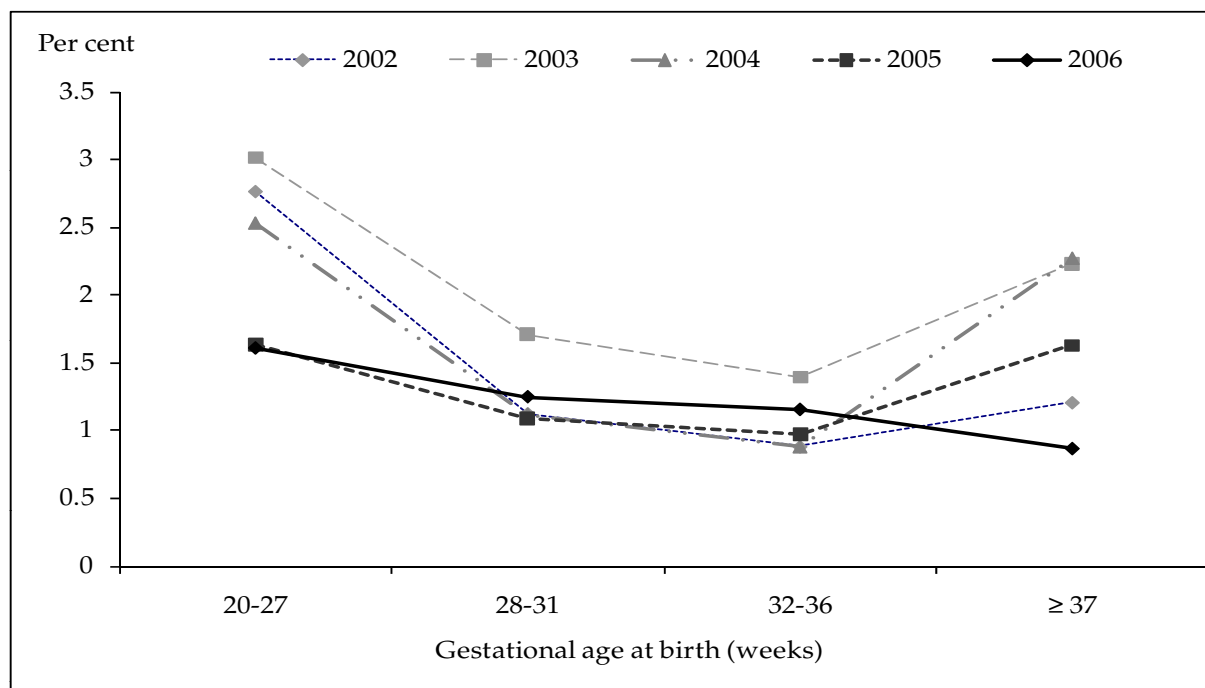
Sepsis	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
No Infection	28	228	469	871	1346	1170	1253	1567	6932
Early sepsis (< 48 hrs)	3	6	8	19	11	18	11	14	90
Late sepsis (> 48hrs)	12	135	170	115	43	23	37	34	569
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Babies alive on day 2	22	254	557	965	1377	1177	1238	1492	7082
Per cent									
No infection	65.1	61.8	72.5	86.7	96.1	96.6	96.3	97.0	91.3
Early sepsis (< 48 hrs)	7.0	1.6	1.2	1.9	0.8	1.5	0.8	0.9	1.2
Per cent of babies alive on day 2									
Late sepsis (> 48 hrs)	54.5	53.1	30.5	11.9	3.1	2.0	3.0	2.3	8.0

*Note: No gestation recorded for one baby.*

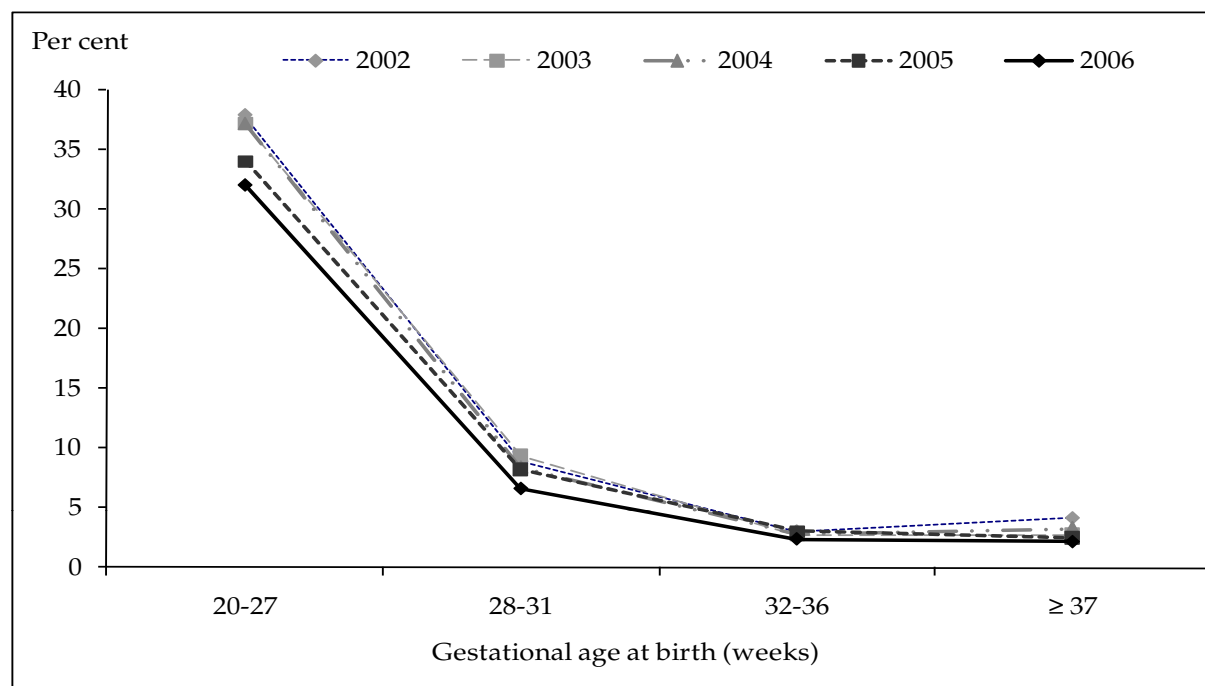
Of the babies born at less than 32 weeks gestation, 47 had early sepsis (7.1%), while 475 babies were diagnosed with late sepsis and 384 babies survived beyond day two (80.8%). The proportion of babies who had late sepsis among babies born after 31 weeks is 94 (2.3%). Of the babies diagnosed with sepsis, 169 died.

Early onset sepsis (Figure 22) shows relatively little variation with gestational age. In contrast late onset sepsis (Figure 23) is seven times higher among babies born before 28 weeks gestation than among babies born at later gestations.

**FIGURE 22: Incidence of early onset sepsis by gestational age group 2002–2006**



**FIGURE 23: Incidence of late onset sepsis by gestational age group 2002–2006**



## Congenital anomalies

In 2006, there were 979 ANZNN registrants (12.9%) who had congenital anomalies.

Among them were 494 term babies and 134 babies born before 32 weeks. There were 397 whose anomaly was diagnosed during the antenatal period. Approximately 71.6% of them were born in a hospital with a level III NICU. Almost one third (32.8%) of babies born with congenital anomalies were born to mothers aged over 35 years. The same proportion of babies with congenital anomalies were male (58.8%) compared with all registrants (58%).

In the 2006 cohort 890 (90.1%) babies with congenital anomalies were given mechanical ventilation. Of these, 153 (17.2%) were given CPAP alone while 108 babies had high frequency ventilation. Of the 571 babies who had surgery 54 of them were born before 32 weeks gestation and 36 died.

## Breastfeeding at discharge

Data on breastfeeding at discharge were available for 6,152 babies (87% of the babies who survived to go home). Among babies who had data on breastfeeding 4,124 (70%) were breastfed at discharge.

## Transfer from level III NICUs to other nurseries

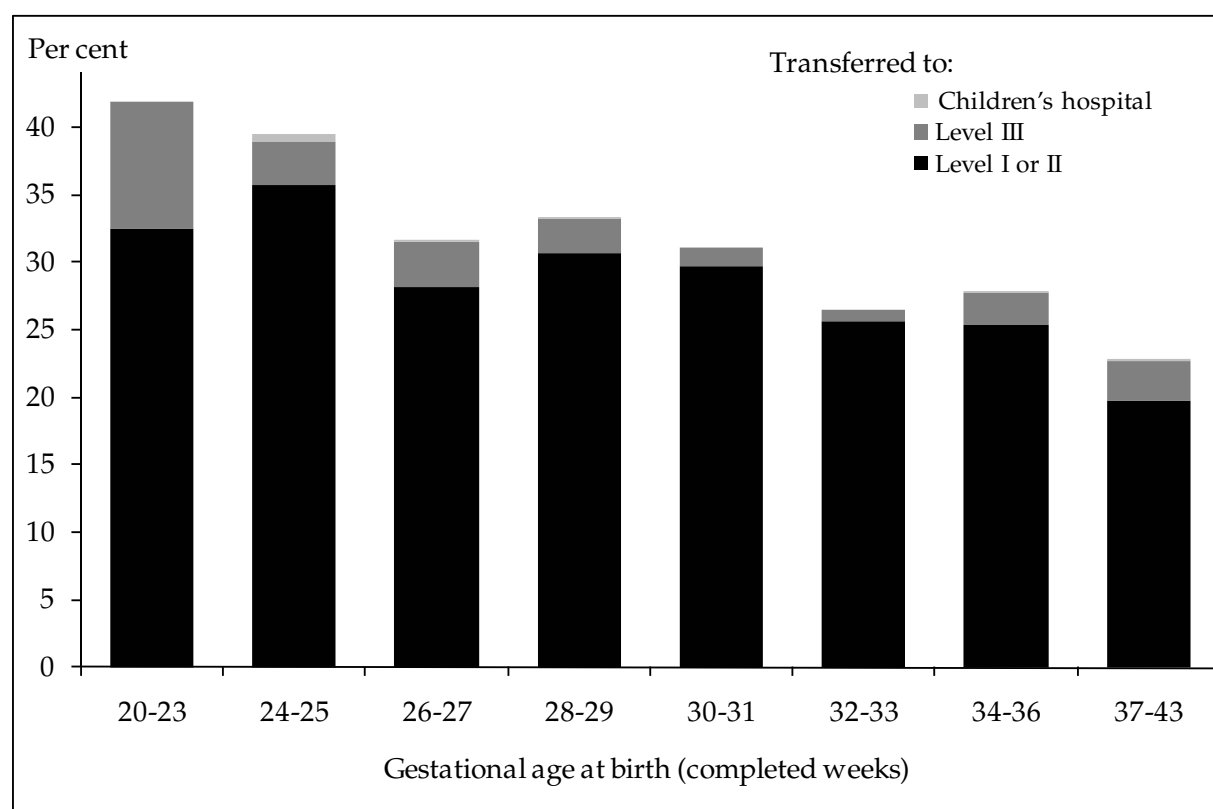
Some babies cared for in level III NICUs are transferred to level I or II nurseries within the same hospital or elsewhere to convalesce before discharging to home. In 2006, 2,010 babies (28.4%) (Table 25, Figure 24) were transferred to a level I or II unit before discharge. More than half (52.3%) of these transferred babies were born at less than 32 weeks gestation compared to 19.7% at term.

**TABLE 25: Transfer status and level of hospital by gestational age group 2006**

Transfer status	Gestational age group								All
	20–23	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Not transferred	32	223	335	414	505	504	738	1037	3788
To level I or II Unit	7	101	237	513	814	659	467	369	3167
To level III Unit	4	24	51	61	62	32	67	115	416
To Children's hospital	0	21	24	17	19	16	29	94	220
Not stated	0	0	0	0	0	0	0	0	0
All babies	43	369	647	1005	1400	1211	1301	1615	7591
Per cent									
Not transferred	74.4	60.4	51.8	41.2	36.1	41.6	56.7	64.2	49.9
To level I or II Unit	16.3	27.4	36.6	51.0	58.1	54.4	35.9	22.8	41.7
To level III Unit	9.3	6.5	7.9	6.1	4.4	4.3	5.1	7.1	5.5
To Children's hospital	0.0	5.7	3.7	1.7	1.4	1.3	2.2	5.8	2.9
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: No gestation recorded for one baby.*

**FIGURE 24: Transfers after registration by level of hospital and gestational age group level III registrants 2006**





## Length of stay until discharge home

The length of stay (LOS) includes the period of time a baby spends in any hospital during their first admission. When a baby was transferred from the registration unit to a second or subsequent unit before discharge, the transfer information includes the additional LOS so that the final date of discharge is the date the baby was discharged home.

**TABLE 26: Length of stay (LOS) for those babies who survived until discharge home by gestation 2006**

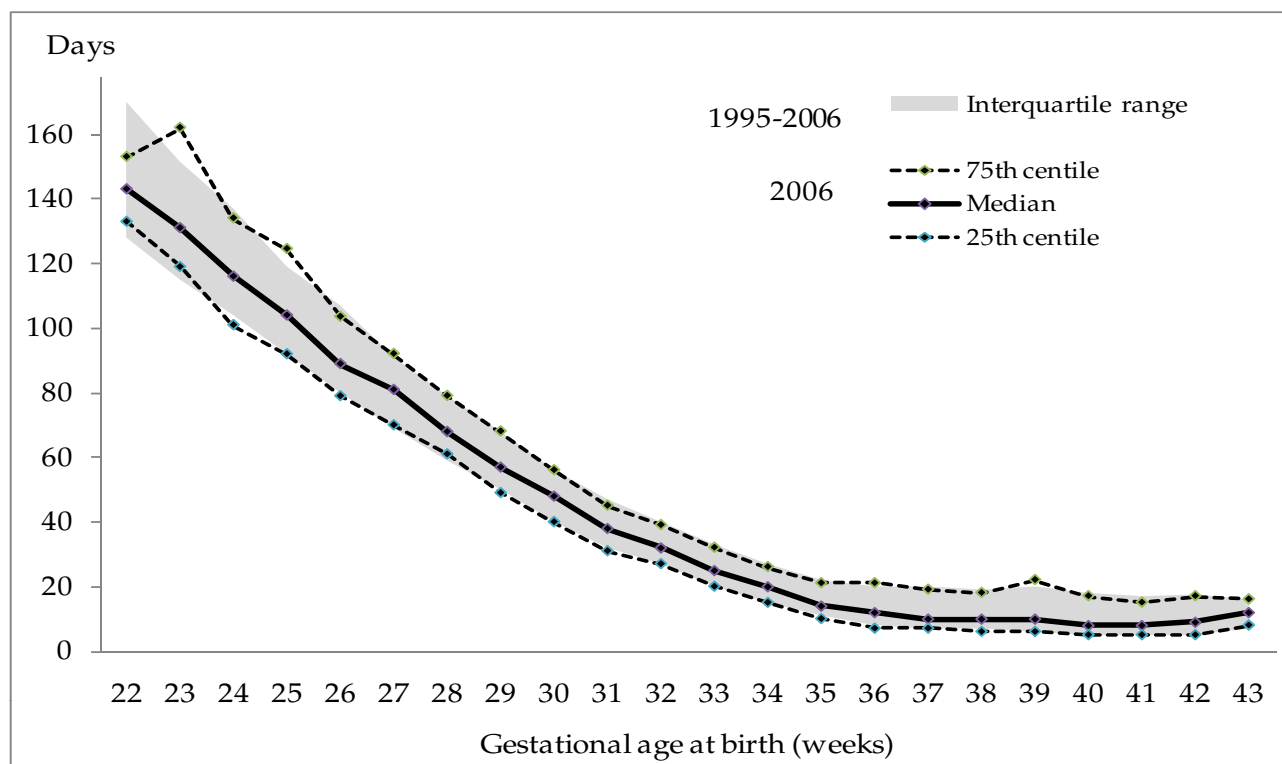
Gestational age in (completed weeks)	Number of babies	Median LOS (days)	Inter-Quartile Range (days)
22	2	143	133 – 153
23	20	131	119 – 162
24	93	116	101 – 134
25	161	104	92 – 125
26	268	89	79 – 104
27	289	81	70 – 92
28	440	68	61 – 79
29	525	57	49 – 68
30	598	48	40 – 56
31	778	38	31 – 45
32	671	32	27 – 39
33	504	25	20 – 32
34	522	20	15 – 26
35	422	14	10 – 21
36	293	12	7 – 21
37	297	10	7 – 19
38	359	10	6 – 18
39	297	10	6 – 22
40	299	8	5 – 17
41	207	8	5 – 15
42	30	9	5 – 17
43	2	12	8 – 16
<b>All babies</b>	<b>7077</b>	<b>34</b>	<b>16 – 58</b>

*NB: No gestation recorded for one baby and no vital status recorded for two other babies.*

The LOS varies according to the baby's gestational age and the complications experienced during the antenatal, intrapartum and postnatal periods. In 2006 the LOS was very similar to previous years (Figure 25). The median length of stay for the complete cohort was 34 days (Table 25), similar to 2005.

Discharge information was available for 6,922 babies (91.2%). The duration of stay in the baby's unit of registration was varied with one in twenty babies staying longer than 105 days. Extremely preterm babies are usually discharged home by the time they reach 40 weeks corrected age. Babies born at or beyond 34 weeks were discharged home at a median of 11 days after birth. Approximately three-quarters of the term babies (1,379, 76%) were discharged home by seventeen days.

**FIGURE 25: Median length of stay by gestational age 2006**



The babies born at less than 32 weeks gestation spent approximately 206,867 hospital bed days in hospital and babies born between 32 and 36 weeks spent 67,117 hospital bed days in hospital. Term babies required 34,028 bed days.

## Survival of the ANZNN registrants

In 2006, 93.2% of the ANZNN registrants survived to go home. A discharge date was available for 7,584 babies (Table 27). These data include babies who were transferred to level I or level II units, those who were transferred to another level III unit and those babies transferred to a Children's hospital. The survival rate to discharge as detailed in Table 27 does not encompass the following: fetal deaths, neonatal deaths that occurred on a labour ward, babies born in level II hospitals and not transferred to a NICU.

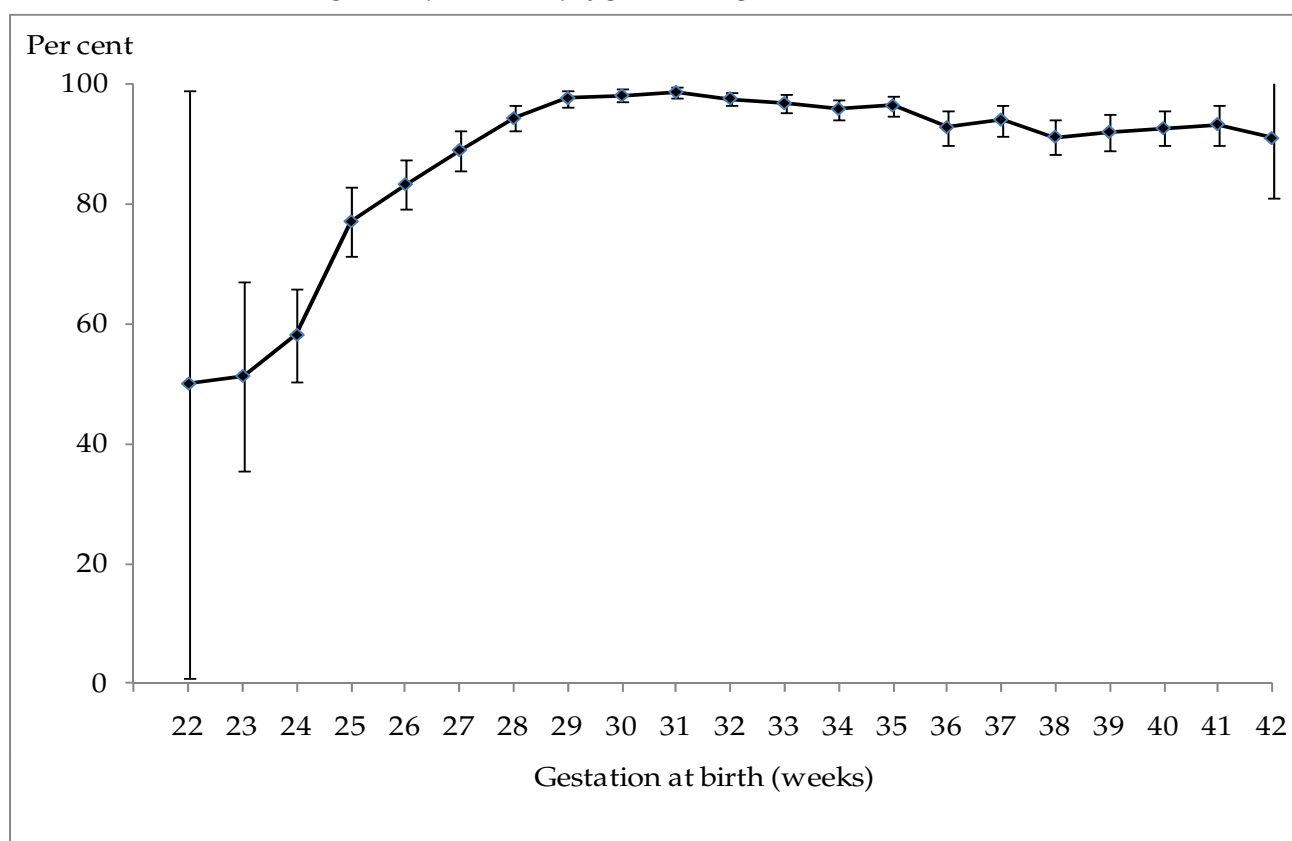
**TABLE 27: Survival to discharge home at each completed week of gestation 2006**

Gestational age in completed weeks	All babies	Babies with lethal congenital anomaly	Babies alive at 7 days	Babies alive at 28 days	Babies alive at discharge home	Per cent survival at discharge home
22	4	0	3	2	2	50.0
23	39	0	24	21	20	51.3
24	160	2	130	115	93	58.1
25	209	1	188	173	161	77.0
26	322	4	299	281	268	83.2
27	325	6	308	302	289	88.9
28	467	4	455	450	440	94.2
29	538	4	531	529	525	97.6
30	611	5	603	602	598	97.9
31	789	6	783	780	778	98.6
32	689	7	681	675	671	97.4
33	522	9	511	506	504	96.6
34	546	8	535	528	522	95.6
35	439	9	432	429	422	96.1
36	316	11	307	301	293	92.7
37	316	6	309	306	297	94.0
38	395	12	374	365	359	90.9
39	323	10	303	299	297	92.0
40	324	7	306	302	299	92.3
41	222	2	211	208	207	93.2
42	33	0	30	30	30	90.9
43	2	0	2	2	2	100.0
<b>All babies</b>	<b>7591</b>	<b>113</b>	<b>7325</b>	<b>7206</b>	<b>7077</b>	<b>93.2</b>

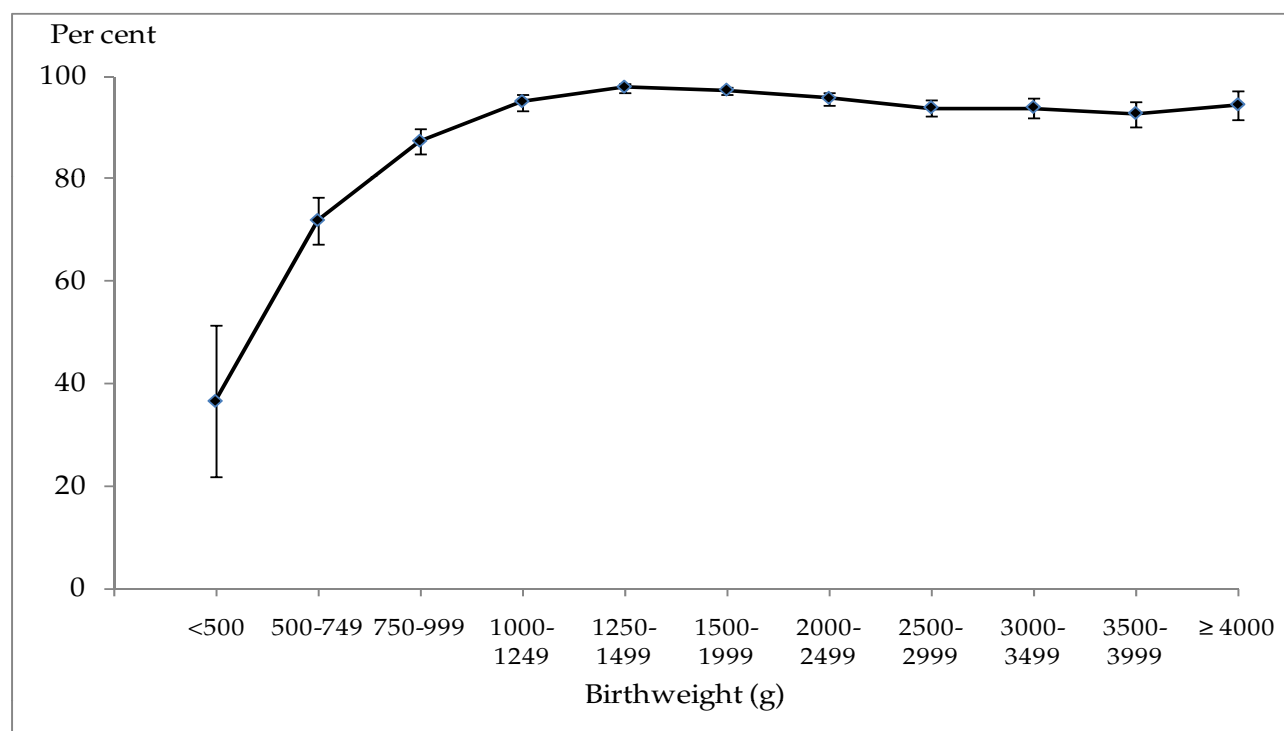
**Note:** No gestation recorded for one baby. Percentages are calculated using all babies for the denominator. 7 Babies transferred to a peripheral hospital whose discharge date is not available are assumed to have survived to discharge home.

In 2006, 514 ANZNN registrants died before discharge home. Mortality was higher in babies born before 28 weeks with a survival rate of 78.7% (Figure 26) and among babies weighing less than 1000 g at birth (Figure 27). During 2006, there were 385 neonatal deaths with 266 occurring in the early neonatal period. Another 129 babies died before discharge home. Lethal congenital anomaly was the cause of death for 22% (113) of these babies, with most occurring in babies born between 32–36 weeks gestation.

**FIGURE 26: Survival to discharge home (with 95% CIs) by gestational age 2006**



**FIGURE 27: Survival to discharge home by birth weight group (with 95% CIs) 2006**



### 3. Babies registered to level II nurseries

#### Overview

Nurseries with facilities to manage mild or moderately ill babies are known as level II units or special care nurseries. Individual nurseries may have varying levels of resources for giving special care. The ANZNN registration criteria for level II and level III units are the same. Babies born in a level II unit and transferred to a level III unit within 28 days of birth are registered to that level III unit. Babies are registered to a level II unit if their hospital stay was entirely within non-tertiary nurseries, or if they were transferred to a level III NICU after 28 days, or they were transferred to a children's hospital without being admitted to a level III unit. There are 16 level II units in New Zealand and one in Australia that are members of the ANZNN.

In 2006, 441 babies fulfilled the ANZNN audit criteria and were registered to one of the 17 level II nurseries. Of those babies, 17.7% were born at less than 32 weeks gestation and 14.5% weighed less than 1,500 grams at birth (Table 28). Assisted ventilation was given for 337 babies (76.4%) while 8 babies had major surgery (Figure 28). In 2006, three hospitals did not have eligible babies for inclusion in the audit. The highest number of babies registered to a level II unit was 54 (Figure 29). Previous preterm births were reported by 54 (12.2%) of the mothers of registrants and 21 had had previous perinatal death(s).

**TABLE 28: Level II registrants by gestational age group 2006**

<b>Gestational age age in weeks</b>	<b>Number of babies</b>	<b>Per cent</b>	<b>Cumulative per cent</b>
24-25	1	0.5	0.5
26-27	5	1.1	1.6
28-29	19	4.3	5.9
30-31	52	11.8	17.7
<b>Babies &lt; 32 wks</b>	<b>77</b>		
32-33	65	14.7	32.4
34-36	115	26.1	58.5
37-43	183	41.5	100.0
<b>All babies</b>	<b>441</b>		<b>100.0</b>

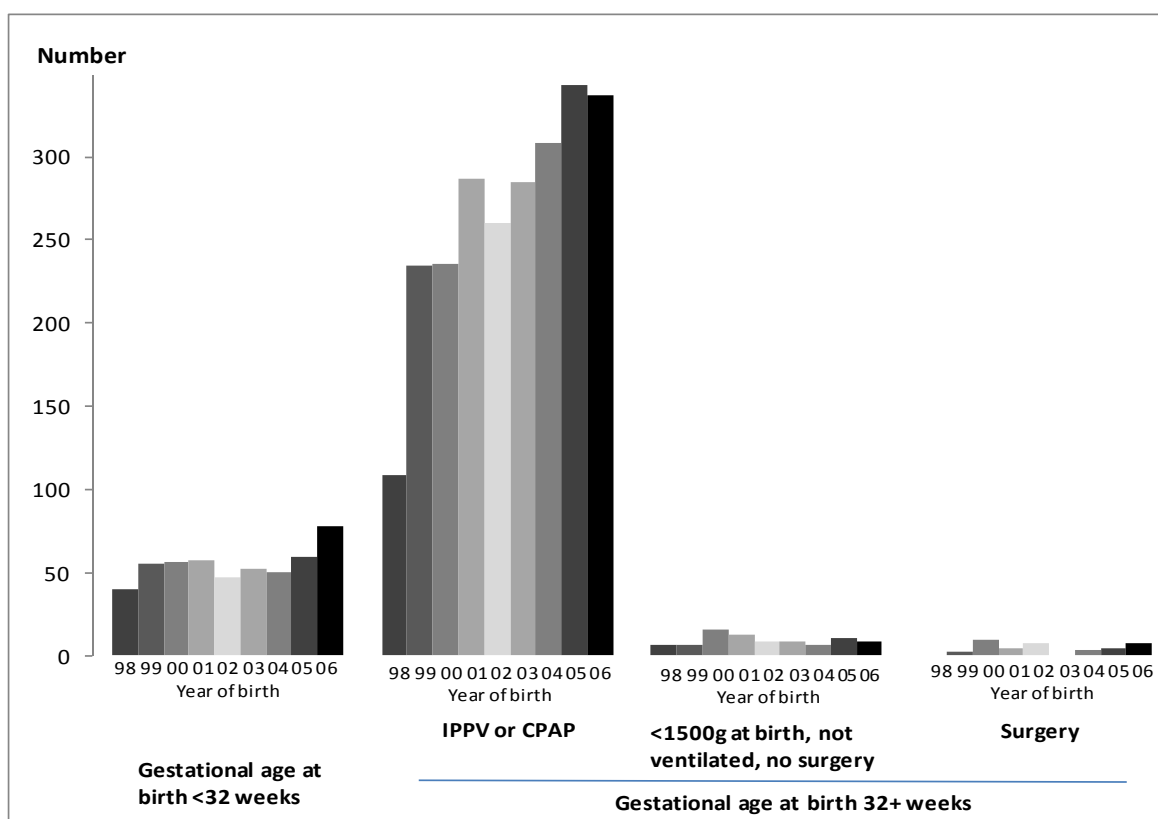
There were 250 male (56.7%) and 165 (37.4%) female babies admitted to level II units (no gender was recorded for 26 babies (5.9%)). More than half of the level II registrants, 234 babies (55.6%) were born to Caucasian mothers of those, 76.7% were born preterm. The number of registrants born to Maori mothers was 116 (26.3%) and 99 (85.3%) were born preterm. There were 13 babies (2.9%) born to Pacific Islander mothers.

**TABLE 29: Level II registrants by birth weight group 2006**

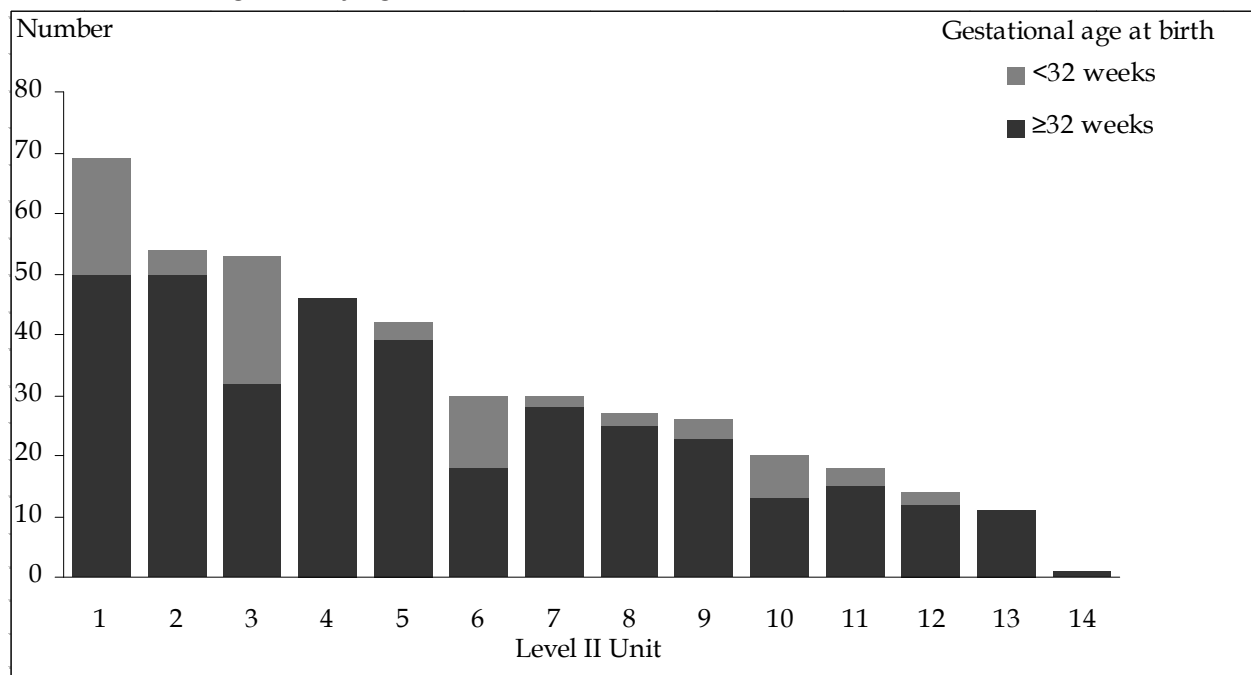
Gestational age age in weeks	Number of babies	Per cent	Cumulative per cent
500-749	2	0.5	0.5
750-999	4	0.9	1.4
1000-1249	19	4.3	5.7
1250-1499	37	8.4	14.1
<b>Babies &lt; 32 wks</b>	<b>62</b>		
1500-1999	67	15.3	29.4
2000-2499	88	49.4	49.4
2500-2999	59	33.5	62.9
3000-3499	80	31.7	81.1
3500-3999	50	29.6	92.5
>4000	33	18.9	100.0
<b>All babies</b>	<b>439</b>		<b>100.0</b>

There were 58 babies from multiple births – all twins, 35 males (60.3%), 21 females (32.6%) and one baby whose gender was not recorded.

**FIGURE 28: Level II registrants by registration criteria and year of birth 2006**

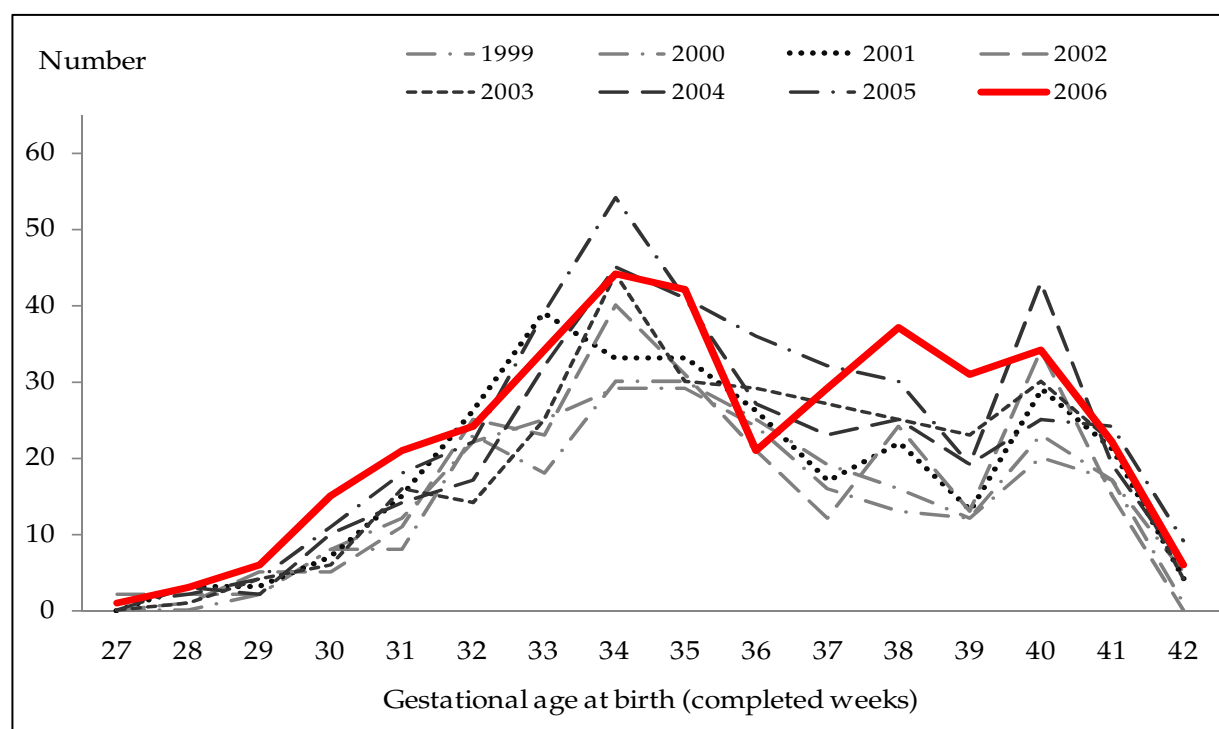


**FIGURE 29: Level II registrants by registration unit 2006**



Most mothers (90.5%) of level II registrants had booked into a level II hospital for delivery (Table 30). Of the level II registrants born before 34 weeks gestation, 92.5% were born at a level II hospital and 104 of those mothers were given antenatal corticosteroids (Table 31).

**FIGURE 30: Level II registrants with CPAP as their only form of assisted ventilation 2006**



**TABLE 30: Referral source to level II unit by gestational age group for level II registrants 2006**

Referral source to level II unit	Gestational age group						All
	<28	28–29	30–31	32–33	34–36	37–43	
Number							
Booked level II hospital	7	16	46	53	104	157	383
In utero transfer	0	2	5	6	8	5	26
Ex utero retrieval	0	0	0	2	0	5	7
Ex utero tranfer	0	0	0	0	0	7	7
Not stated	0	1	1	4	3	9	18
All babies	7	19	52	65	115	183	441
Per cent							
Booked level II hospital	100	88.9	90.2	86.9	92.9	90.2	90.5
In utero transfer	0	11.1	9.8	9.8	7.1	2.9	6.1
Ex utero retrieval	0	0	0	3.3	0	2.9	1.7
Ex utero tranfer	0	0	0	0	0	4.0	1.7
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**TABLE 31: Antenatal corticosteroid use by gestational age group for level II registrants 2006**

Antenatal corticosteroids	Gestational age group							All
	20–23	24–25	26–27	28–29	30–31	32–33	≥ 34	
Number								
None	1	1	0	7	11	18	250	288
Incomplete course	0	0	4	7	15	22	3	51
Course completed	0	0	0	2	14	14	12	42
Completed > 7 days	0	0	0	1	5	5	0	11
Not stated	0	0	1	2	7	6	33	49
All babies	1	1	5	19	52	65	298	441
Per cent								
None	100.0	100.0	0.0	41.2	24.4	30.5	94.3	73.5
Incomplete course	0.0	0.0	100.0	41.2	33.3	37.3	1.1	13.0
Course completed	0.0	0.0	0.0	11.8	31.1	23.7	4.5	10.7
Completed > 7 days	0.0	0.0	0.0	5.9	11.1	8.5	0.0	2.8
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**Note:** 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 is given and the first dose was given more than 24 hours and less than 8 days before baby's birth.

There were 128 mothers (28.3%) of term level II registrants who did not present with any maternal complications. Among babies born before 37 weeks, 105 mothers had presented with preterm labour (23.8%), (Table 32). Caesarean section was the predominant method of birth accounting for 48.3%, with more than half occurring before the onset of labour (Table 33). A low Apgar score of less than 4 at 1 minute was recorded for 11.6% of babies and 6.8% of them required endotracheal intubation in the labour ward to assist in their adaptation to extrauterine life.



**TABLE 32: Mother's presenting antenatal problem by gestational age group for level II registrants 2006**

Presenting antenatal problem	Gestational age group						All
	<28	28-29	30-31	32-33	34-36	37-43	
PPROM	0	4	9	12	29	4	58
Preterm labour	4	9	22	26	44	0	105
Hypertension in pregnancy	0	1	1	8	7	3	20
Antepartum haemorrhage	3	4	7	5	8	3	30
IUGR	0	0	1	6	6	4	17
Fetal distress	0	0	5	3	5	20	33
Other problem	0	0	4	3	8	11	26
No antenatal problems	0	0	0	0	2	123	125
Congenital anomalies	0	1	1	0	0	0	2
Not stated	0	0	2	2	6	15	25
<b>All babies</b>	<b>7</b>	<b>19</b>	<b>52</b>	<b>65</b>	<b>115</b>	<b>183</b>	<b>441</b>

*Notes: Reports of babies born at term with PPRM will be queried.*

**TABLE 33: Method of delivery by gestational age group for level II registrants 2006**

Method of delivery	Gestational age group						All
	<28	28-29	30-31	32-33	34-36	37-43	
Number							
Vaginal	3	8	18	28	47	97	201
Vaginal instrumental	0	0	2	0	6	10	18
Caesarean in labour	2	5	13	9	29	38	96
Caesarean no labour	2	5	18	27	32	33	117
Not stated	0	1	1	1	1	5	9
All babies	7	19	52	65	115	183	441
Per cent							
Vaginal	42.9	44.4	35.3	43.8	41.2	54.5	46.5
Vaginal instrumental	0.0	0	3.9	0	5.3	5.6	4.2
Caesarean in labour	28.5	27.8	25.5	14.1	25.4	21.3	22.2
Caesarean no labour	28.5	27.8	35.3	42.2	28.1	18.5	27.1
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**TABLE 34: Indication for respiratory support by gestational age group for level II registrants 2006**

Indication for respiratory support	Gestational age group					All
	20–28	28–31	32–33	34–36	37–43	
Number						
No respiratory support	0	10	2	3	4	19
Non-specific respiratory distress	0	16	29	71	80	196
Hyaline membrane disease	7	42	29	23	13	114
Meconium aspiration syndrome	0	0	0	0	24	24
Pneumonia	0	0	0	5	19	24
Newborn encephalopathy	0	0	0	0	8	8
Other specified	0	1	3	2	11	17
Other not specified	0	0	1	3	15	19
Not stated	0	2	1	8	9	20
All babies	7	71	65	115	183	441
Per cent						
No respiratory support	0	14.5	3.1	2.8	2.3	4.5
Non-specific respiratory distress	0	23.2	45.3	66.4	46.0	46.6
Hyaline membrane disease	100	60.9	45.3	21.5	7.5	27.1
Meconium aspiration syndrome	0	0	0	0	13.8	5.7
Pneumonia	0	0	0	4.7	10.9	5.7
Newborn encephalopathy	0	0	0	0	4.6	1.9
Other specified	0.0	1.4	4.7	1.9	6.3	4.0
Other	0	0	1.6	2.8	8.6	4.5
All babies	100.0	100.0	100.0	100.0	100.0	100.0

**Notes:** 'Other specified' includes 5 babies ventilated for persistent pulmonary hypertension, 4 for apnoea, 7 for congenital anomaly and one for perinatal surgery

Among the 441 babies registered to a level II unit in 2006, all but 19 received some form of respiratory support (Table 34). CPAP was given to 391 (89%) and IPPV to 34 (8%) babies in 2006 (Table 35).

**TABLE 35: Duration of assisted ventilation in hours, by gestational age group 2006**

Ventilation		Gestational age at birth						All
		<28	28-29	30-31	32-33	34-36	≥37	
Surfactant given		6	6	3	4	0	3	22
Intubated at resuscitation		5	4	2	2	5	12	30
IPPV used		4	8	4	2	3	13	34
CPAP used		3	15	40	60	109	164	391
O2 used		0	3	15	18	19	47	102
Home on O2		0	0	1	0	1	1	3
Duration of ventilation								
IPPV	Median	11	12.5	34	29	2	4	6.5
(hours)	IQR	4–46	4–37	18–61	23–35	1–74	2–6	4–31
CPAP	Median		86	40	20.5	16	12	16
(hours)	IQR		13–180	25–79	10–47	8–51	7–25	8–48
Oxygen	Median		2	1	1	1	2	2
(days)	IQR		2–45	1–2	1–3	1–2	1–3	1–3

## Cerebral ultrasound

Of 78 babies born at less than 32 weeks, 62 (79.5%) had a head ultrasound and none were diagnosed with an intraventricular haemorrhage (IVH). Most babies who did not have an early head ultrasound report were born at 30 or 31 weeks gestation. A late head ultrasound was reported for 28 babies the majority of whom had normal reports, four babies had abnormal reports three were recorded as having a grade I IVH and one as having a grade II IVH.

## Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 47 eligible babies. All were reported as normal except for one grade I ROP.

## Other morbidities

Sepsis was proven in 18 babies, including 12 before day two. One baby died following sepsis. There were five cases of necrotising enterocolitis; one baby required surgery. Major congenital anomalies were reported for 19 babies and 5 of them had surgery before discharging home. Four registrants died due to congenital anomalies.

## Level II transfers

Of 59 level II registrants transferred to level III units, five were transferred to a children's hospital. Twelve babies were transferred to other level II units.

## Survival

There were 401 level II registrants (90.9%) who survived to discharge home (Table 36). Eight babies died within the first 7 days of birth, one baby died before 28 days of age and a further 31 babies died before discharge home. Four babies had lethal congenital anomalies.

**TABLE 36: Survival to discharge home at each week of gestation level II registrants, 2006**

<b>Gestational age in completed weeks</b>	<b>All babies</b>	<b>Babies with lethal congenital anomaly</b>	<b>Babies alive at 7 days</b>	<b>Babies alive at 28 days</b>	<b>Babies alive at discharge home</b>	<b>Per cent survival to discharge home</b>
<28	7	0	4	4	3	42.9
28-29	19	1	19	19	17	89.5
30-31	52	0	52	52	49	94.2
32-33	65	0	65	65	65	100
34-36	115	0	115	115	110	95.7
37-43	183	3	178	177	157	85.8
<b>All babies</b>	<b>441</b>	<b>4</b>	<b>433</b>	<b>432</b>	<b>401</b>	<b>90.93</b>

# Appendix 1: Data tables by birth weight

TABLE 37: Antenatal corticosteroid use by birth weight group 2006

Antenatal corticosteroids	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
None	4	46	78	98	136	281	442	595	568	411	215	2874
Incomplete course	4	91	159	215	242	353	173	33	5	2	1	1278
Course completed	25	189	303	343	440	508	178	53	18	5	1	2063
Completed > 7 days	5	35	105	149	173	257	126	56	14	5	4	929
Not stated	1	15	21	26	41	63	60	65	75	53	26	446
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
None	10.5	12.7	12.1	12.2	13.7	20.1	48.1	80.7	93.9	97.2	97.3	40.2
Incomplete course	10.5	25.2	24.7	26.7	24.4	25.2	18.8	4.5	0.8	0.5	0.5	17.9
Course completed	65.8	52.4	47.0	42.6	44.4	36.3	19.4	7.2	3.0	1.2	0.5	28.9
Completed > 7 days	13.2	9.7	16.3	18.5	17.5	18.4	13.7	7.6	2.3	1.2	1.8	13.0
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Birth weight was missing for two babies.

TABLE 38: Method of delivery by birth weight group 2006

Method of birth	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
Vaginal	10	138	175	208	274	480	350	293	271	204	107	2510
Vaginal instrumental	0	20	30	30	47	66	47	56	57	46	20	419
Caesarean in labour	0	71	170	197	231	370	227	191	138	91	70	1758
Caesarean no labour	29	147	291	395	474	545	351	262	212	133	50	2889
Not stated	0	0	0	1	6	1	4	0	2	2	0	16
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
Vaginal	25.6	36.7	26.3	25.1	26.7	32.9	35.9	36.5	40.0	43.0	43.3	33.1
Vaginal instrumental birth	0.0	5.3	4.5	3.6	4.6	4.5	4.8	7.0	8.4	9.7	8.1	5.5
Caesarean in labour	0.0	18.9	25.5	23.7	22.5	25.3	23.3	23.8	20.4	19.2	28.3	23.2
Caesarean no labour	74.4	39.1	43.7	47.6	46.2	37.3	36.0	32.7	31.3	28.1	20.2	38.1
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Birth weight was missing for two babies.

**TABLE 39: Level of hospital of birth by birth weight group 2006**

Level of hospital	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
Non-tertiary hospital	1	34	70	106	115	190	216	240	254	174	91	1491
Hospital with level III unit	38	329	572	696	863	1209	723	516	398	275	144	5763
Not born in a hospital	0	2	6	8	12	9	11	8	8	5	3	74
Not stated	0	11	18	21	42	54	29	38	20	22	9	264
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
Non-tertiary hospital	2.6	9.3	10.8	13.1	11.6	13.5	22.7	31.4	38.5	38.3	38.2	20.3
Hospital with level III unit	97.4	90.1	88.3	85.9	87.2	85.9	76.1	67.5	60.3	60.6	60.5	78.6
Not born in a hospital	0.0	0.5	0.9	1.0	1.2	0.6	1.2	1.0	1.2	1.1	1.3	1.0
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Birth weight was missing for two babies.*

**TABLE 40: Mode of transfer to a level III unit after birth by birth weight group 2006**

Mode of transport	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
Not transported	35	335	568	700	879	1207	726	500	384	266	144	5744
Specialist retrieval team	3	33	76	101	106	191	199	235	228	158	79	1409
Non-specialist retrieval team	1	7	19	28	31	53	48	63	68	52	24	394
Not stated	0	1	3	2	16	11	6	4	0	0	0	43
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
Not transported	89.7	89.3	85.7	84.4	86.5	83.2	74.6	62.7	56.5	55.9	58.3	76.1
Specialist retrieval team	7.7	8.8	11.5	12.2	10.4	13.2	20.5	29.4	33.5	33.2	32.0	18.7
Non-specialist retrieval team	2.6	1.9	2.9	3.4	3.1	3.7	4.9	7.9	10.0	10.9	9.7	5.2
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Birth weight was missing for two babies.*

TABLE 41: Plurality by birth weight group, 2006

Plurality	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
Singleton	31	281	468	563	703	933	754	708	665	475	247	5828
Twins	8	85	163	234	295	475	207	89	15	1	0	1572
Triplets and higher orders	0	10	35	34	34	54	18	5	0	0	0	190
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
Singleton	79.5	74.7	70.3	67.7	68.1	63.8	77.0	88.3	97.8	99.8	100.0	76.8
Twins	20.5	22.6	24.5	28.2	28.6	32.5	21.1	11.1	2.2	0.2	0.0	20.7
Triplets and higher orders	0.0	2.7	5.3	4.1	3.3	3.7	1.8	0.6	0.0	0.0	0.0	2.5
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Birth weight was missing for two babies.*

TABLE 42: Exogenous surfactant use by birth weight group, 2006

Exogenous surfactant	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
	Number											
None	4	50	185	394	649	1032	728	626	551	403	207	4829
Survanta	18	137	193	200	172	187	137	86	56	29	16	1231
Curosurf and Survanta	1	35	28	19	13	21	5	6	1	0	1	130
Curosurf	16	149	248	187	140	136	64	35	37	20	10	1042
Other	0	1	6	9	7	7	3	3	2	0	1	39
Not stated	0	4	6	22	51	79	42	46	33	24	12	319
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
None	10.3	13.4	28.0	48.7	66.2	74.6	77.7	82.8	85.2	89.2	88.1	66.4
Survanta	46.2	36.8	29.2	24.7	17.5	13.5	14.6	11.4	8.7	6.4	6.8	17.0
Curosurf and Survanta	2.6	9.4	4.2	2.3	1.3	1.5	0.5	0.8	0.2	0.0	0.4	1.8
Curosurf	41.0	40.1	37.6	23.1	14.3	9.8	6.8	4.6	5.7	4.4	4.3	14.3
Other	0.0	0.3	0.9	1.1	0.7	0.5	0.3	0.4	0.3	0.0	0.4	0.5
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Birth weight was missing for two babies. The 'Other' category combines results for 2 babies given Exosurf, 1 baby given an unspecified surfactant, and 36 babies given a combination of Curosurf and Survanta*

**TABLE 43: Number of babies given assisted ventilation by birth weight group 2006**

Assisted ventilation	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
IPPV	34	350	533	465	365	441	372	345	359	235	114	3614
CPAP	18	312	582	718	737	1176	785	589	441	303	160	5823
O2	21	232	371	414	398	575	425	383	337	235	125	3516
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
IPPV	87.2	93.1	80.0	56.0	35.4	30.2	38.0	43.0	52.8	49.4	46.2	47.6
CPAP	46.2	83.0	87.4	86.4	71.4	80.4	80.2	73.4	64.9	63.7	64.8	76.7
O2	53.8	61.7	55.7	49.8	38.6	39.3	43.4	47.8	49.6	49.4	50.6	46.3

*Note: Birth weight was missing for two babies.*

**TABLE 44: Duration of assisted ventilation in hours by birth weight group 2006**

Birth weight	IPPV (hours)		CPAP (hours)		Oxygen (days)	
	Median	IQR	Median	IQR	Median	IQR
<500	274	75-816	687	282-1294	17.5	6-110
500-749	324.5	66-761	821	419-1186	63.5	17-104
750-999	97	31-347	582	268-946	36	8-70
1000-1249	40	18-128	192	46-590	11	2-39
1250-1499	28.5	14-68	77	25-178	3	1-10
1500-1999	32	16-68	34	14-75	2	1-4
2000-2499	42	20-75	33	14-71	3	1-5
2500-2999	45	23-92	22	10-59	3	1-6
3000-3499	50	21-83	24	10-58	3	1-7
3500-3999	47	24-96	18	9-42	3	1-7
≥4000	55	32-120	15	7-27	3	1-7
<b>All babies</b>	<b>49</b>	<b>21-37</b>	<b>49</b>	<b>16-170</b>	<b>4</b>	<b>1-15</b>

*Notes: Birth weight was missing for two babies. Non-missing values only were used in calculations.*



TABLE 45: Chronic lung disease by birth weight group 2006

		Birth weight group						
Chronic lung disease	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	≥2000	All
Number								
Chronic lung disease								
survived	8	150	170	89	44	16	15	492
died	3	12	6	2	1	1	2	27
No chronic lung disease	28	214	490	740	987	1445	3167	7071
All babies	39	376	666	831	1032	1462	3184	7590
Per cent								
Chronic lung disease	28.2	43.1	26.4	11.0	4.4	1.2		

*Notes: Birth weight was missing for two babies.*

TABLE 46: Supplemental oxygen therapy by birth weight group 2006

Supplemental oxygen therapy	Birth weight group											All
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
	Number											
Babies in oxygen on day 28												
survived to go home	9	193	283	191	83	34	27	13	17	9	7	866
died before discharge	3	30	15	8	4	5	4	6	1	6	1	83
No oxygen on day 28	27	153	368	632	945	1423	948	783	662	461	239	6641
<b>All babies</b>	<b>39</b>	<b>376</b>	<b>666</b>	<b>831</b>	<b>1032</b>	<b>1462</b>	<b>979</b>	<b>802</b>	<b>680</b>	<b>476</b>	<b>247</b>	<b>7590</b>
Babies given home oxygen	4	55	55	26	15	12	4	1	1	0	0	173
Per cent of babies using oxygen on day 28												
Survived to go home	75.0	86.5	95.0	96.0	95.4	87.2	87.1	68.4	94.4	60.0	87.5	91.3

*Note: Birth weight was missing for two babies.*

TABLE 47: Retinopathy of prematurity by birth weight group 2006

Retinopathy of prematurity. Babies < 31 weeks or < 1250 g	Birth weight group						All
	<500	500-749	750-999	1000-1249	1250-1499	1500+	
Number							
No retinopathy of prematurity	3	93	308	536	467	395	1802
Stage 1 retinopathy	2	64	134	105	54	19	378
Stage 2 retinopathy	5	78	106	44	26	5	264
Stage 3 retinopathy	6	51	25	10	3	3	98
Stage 4 retinopathy	0	3	4	1	0	0	8
Not examined	23	87	89	133	191	424	947
Not stated	0	0	0	2	22	49	72
Babies >31 weeks	0	0	0	0	269	3751	4021
<b>All babies</b>	<b>39</b>	<b>376</b>	<b>666</b>	<b>831</b>	<b>1032</b>	<b>4646</b>	<b>7590</b>
Treatment for ROP	6	47	19	5	3	1	81
Per cent							
No retinopathy of prematurity	18.8	32.2	53.4	77.0	84.9	93.6	70.7
Stage 1 retinopathy	12.5	22.1	23.2	15.1	9.8	4.5	14.8
Stage 2 retinopathy	31.3	27.0	18.4	6.3	4.7	1.2	10.4
Stage 3 retinopathy	37.5	17.6	4.3	1.4	0.5	0.7	3.8
Stage 4 retinopathy	0.0	1.0	0.7	0.1	0.0	0.0	0.3
<b>All babies</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>
Treatment for ROP	37.5	15.9	3.1	0.6	0.5	0.2	3.1

**Notes:** Birth weight was missing for two babies.

**TABLE 48: Intraventricular haemorrhage by birth weight group babies born less than 1500 grams and alive on day 3, 2006**

Intraventricular haemorrhage status	Birth weight groups						All
	<500	500-749	750-999	1000-1249	1250-1499	1500+	
	Number						
No IVH	20	207	454	645	738		2064
Grade 1 IVH	6	52	75	61	95		289
Grade 2 IVH	1	38	45	32	25		141
Grade 3 IVH	1	15	21	14	11		62
Grade 4 IVH	2	31	29	18	6		86
Not examined	1	6	10	49	148		214
Not stated	0	0	0	0	1		1
≥1500g or not alive on day 3	8	27	32	12	8	4646	4733
<b>All babies</b>	<b>39</b>	<b>376</b>	<b>666</b>	<b>831</b>	<b>1032</b>	<b>4646</b>	<b>7590</b>
Per cent							
No IVH	66.7	60.3	72.8	83.8	84.3		
Grade 1 IVH	20.0	15.2	12.0	7.9	10.9		
Grade 2 IVH	3.3	11.1	7.2	4.2	2.9		
Grade 3 IVH	3.3	4.4	3.4	1.8	1.3		
Grade 4 IVH	6.7	9.0	4.6	2.3	0.7		
<b>All babies</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>		

*Notes: Birth weight was missing for two babies.*

TABLE 49: Neonatal sepsis by birthweight group 2006

Septicaemia	Birthweight group											All
	< 500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
No Infection	25	235	511	712	958	1405	939	779	665	464	238	6931
Early sepsis (<48 hrs)	0	6	11	12	13	16	14	4	6	5	3	90
Late sepsis (48+hrs)	14	135	144	107	61	41	26	19	9	7	6	569
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Babies alive on day 2	33	349	634	819	1024	1447	960	788	663	457	243	7417
Per cent												
No infection	64.1	62.5	76.7	85.7	92.8	97.1	95.9	97.1	97.8	97.5	96.4	91.3
Early sepsis (<48 hrs)	0.0	1.6	1.7	1.4	1.3	1.1	1.4	0.5	0.9	1.1	1.2	1.2
Per cent of babies alive on day 2												
Late sepsis (>48 hrs)	42.4	38.7	22.7	13.1	6.0	2.8	2.7	2.4	1.4	1.5	2.5	7.7

Notes: Birth weight was missing for two babies.

TABLE 50: Transfer status and level of hospital by birthweight group 2006

Transfer status	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+	All
Number												
Not transferred	32	235	347	342	410	560	493	473	417	314	165	3788
Level I or II	6	94	248	419	569	817	421	256	177	106	52	3167
Level III	1	25	50	50	40	67	41	45	47	32	18	416
Children's hospitals NICU	0	22	21	20	13	18	23	28	39	24	12	220
All babies	39	376	666	831	1032	1462	979	802	680	476	247	7590
Per cent												
Not transferred	82.1	62.5	52.1	41.2	39.7	38.3	50.4	59.0	61.3	66.0	66.8	49.9
Level I or II	15.4	25.0	37.2	50.4	55.1	55.9	43.0	31.9	26.0	22.3	21.1	41.7
Level III	2.6	6.6	7.5	6.0	3.9	4.6	4.2	5.6	6.9	6.7	7.3	5.5
Children's hospitals NICU	0.0	5.9	3.2	2.4	1.3	1.2	2.4	3.5	5.7	5.0	4.9	2.9
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: Birth weight was missing for two babies.

**TABLE 51: Median length of stay by birth weight group 2006**

Birth weight	Days to discharge	
	Median	IQR
<500	123	102 – 159
500-749	106	92 – 129
750-999	82	70 – 98
1000-1249	63	49 – 76
1250-1499	48	37 – 59
1500-1999	35	27 – 43
2000-2499	21	15 – 29
2500-2999	13	8 – 21
3000-3499	9	6 – 18
3500-3999	8	5 – 16
4000+	7	5 – 16
<b>All babies</b>	<b>34</b>	<b>16 – 58</b>

*Notes: Birth weight was missing for two babies.*

**TABLE 52: Survival to discharge home by birthweight group 2006**

Birth weight in grams	All babies admitted	Number of babies with lethal congenital anomaly	Number of babies alive at 7 days	Number of babies alive at 28 days	Number of babies alive at discharge home	Per cent survival at discharge home
< 500	39	0	28	19	15	38.5
500-749	376	3	328	302	270	71.8
750-999	666	11	623	604	581	87.2
1000-1249	831	7	815	802	789	94.9
1250-1499	1032	6	1021	1017	1009	97.8
1500-1999	1462	20	1435	1429	1420	97.1
2000-2499	979	13	955	947	933	95.3
2500-2999	802	23	776	761	750	93.5
3000-3499	680	16	653	641	637	93.7
3500-3999	476	12	453	449	441	92.6
4000+	247	2	239	236	233	94.3
<b>All babies</b>	<b>7590</b>	<b>113</b>	<b>7326</b>	<b>7207</b>	<b>7078</b>	<b>93.2</b>

*Notes: Birth weight was missing for two babies.*

## Appendix 2: Methods for this report

The ANZNN data collection was moved to the Perinatal and Reproductive Epidemiology Research Unit, School of Women's & Children's Health, University of New South Wales in June 2008.

The historical ANZNN data was received as a Microsoft Access database. Updating data for the ANZNN audit of babies born in 2006 who qualify as high risk neonates were requested in June 2008 from each participating unit by September 2008. The data submitted were checked for consistency and completeness using the existing set of 36 queries, run sequentially on each batch of data entered. Exception reports were returned to units with details of the missing and inconsistent data values in records identified as problematic. Most, but not all, units returned corrected records in time for the production of this report.

The updating data submitted included 21 additional records for babies born in 2005. These have been added to the historical data and explain the slightly higher number of records for babies born in 2005 in this report compared with the previous report.

An extract from the database was made in March 2009. A small number of additional data anomalies detected during the analysis that could not be resolved have been flagged to be included with future exception reports. Apart from grouping, the data presented in the report reflect the database at that time with three exceptions: (1) data for infections for records that had not yet been entered were linked to the 2006 report data extract; (2) data value transformations were applied to information about multiple births from two units judged to have miscoded plurality on the basis that no singletons were reported; and (3) two derived data items were generated. These are detailed below.

Derived data items:

Survival to day n	The number of days between the date of birth and the date of death was calculated and records flagged if this was less than n days
Survival to 36 weeks postmenstrual age	Babies born before 36 weeks gestational age who survived to discharge or whose age in days at death was greater than or equal to the difference between 36 and the number of completed weeks of gestational age multiplied by seven. Not applicable to babies born at 36 or more weeks gestational age.

All data manipulations and analysis for the 2006 report was carried out using Statistical Analysis Systems (SAS) software and tabulations and figures produced using Microsoft Excel.

## Appendix 3: Minimum Data Set variables

**The following data variables are no longer part of the Minimum Data Set and have been removed; Highest appropriate inspired oxygen and Lowest appropriate inspired oxygen**

### Registration hospital

*Definition:* The hospital of registration is the first level III NICU that the baby remained in for four or more hours during the first 28 days of life. Babies who received their entire care in a level II hospital, or who were not transferred to a level III NICU during the first 28 days are registered to the first level II centre that they remain in for four or more hours.

*Coding:* numeric code representing registration hospital

*Guide for use:* If a baby dies within four hours, they are registered to the unit where they died.

### Maternal age

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

*Coding:* 2-digit number representing maternal age in completed years

### Previous preterm birth

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

*Coding:* 99: unknown

0: no previous preterm birth

-1: yes, there was a previous preterm birth

### Previous perinatal death

*Definition:* Mother has had a previous perinatal loss.

*Coding:* 99: unknown

0: no previous perinatal death

-1: yes, has had a previous perinatal death

*Guide for use:* A perinatal loss is when a baby with a birth weight of more than 400 grams or a gestational age of more than 20 completed weeks died during the first 28 days of life.

### Assisted conception in this pregnancy

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

*Coding:* 0: unknown

1: none – used for this pregnancy.

2: hyperovulation – any hormone therapy used to stimulate ovulation.

3: IVF / GIFT etc. – any method of in-vitro fertilisation. Including, in-vitro fertilisation, gamete intra-fallopian transfer, zygote intra-fallopian transfer, and IC sperm injection. 4: other – infertility treatment used that is not mentioned above, including artificial insemination.

*Guide for use:* Disregard any treatment for any previous pregnancies.

### Ethnicity of mother

*Definition:* Ethnic origin of the mother of baby, as identified by the mother.

*Coding:* 0: unknown

- 1: Aboriginal or Torres Strait Islander (TI) – by descent who identifies as an Aboriginal or TI and is accepted as such by the community with which she is associated.
- 2: Asian – from countries of Asia, including Fijian Indian.
- 3: Caucasian – of Caucasoid heritage, includes Arabic, European, Russian, Middle Eastern.
- 4: Other – includes African Negroes, Inuit, American Blacks and Indians, Melanesian.
- 5: Pacific Islander.
- 6: Maori – maternal self-identification.

## Source of referral

*Definition:* Source of referral to registration unit.

*Coding:* 0: unknown

- 1: booked at tertiary obstetric hospital – mother booked at a hospital with a NICU and not transferred during the most recent admission.
- 2: in-utero transfer from obstetric hospital – mum transferred during admission.
- 3: ex-utero retrieval – baby transferred from any hospital by a specialist retrieval team.
- 4: ex-utero transfer – baby transferred from any hospital by non-specialist team, includes transport by ambulance.
- 5: other– born in transit or not booked.
- 6: booked at this level II unit – mother booked into this hospital, no NICU.
- 7: in-utero transfer to this level II unit – mother transferred, baby in utero.
- 8: ex-utero retrieval to this level II unit – baby ‘retrieved’ from any other hospital.
- 9: ex-utero transfer to this level II unit.

*Guide for use:* Use most recent referral.

## Presenting antenatal problem

*Definition:* The antenatal complication that the mother presented with in this pregnancy.

*Coding:* 0: unknown or information not available.

- 1: preterm pre-labour rupture of membranes confirmed, spontaneous rupture of membranes occurring prior to the onset of labour and before 37 weeks’ gestation.
- 2: preterm labour.
- 3: hypertension in pregnancy.
- 4: antepartum haemorrhage.
- 5: suspected intrauterine growth restriction.
- 6: fetal distress.
- 7: other.
- 8: none – no presenting problem. Baby born at term.
- 9: antenatal diagnosis of fetal malformation.

## Other antenatal complications

*Definition:* Any other antenatal complication.

*Coding:* 99: unknown

- 0: no other antenatal complication present
- 1: yes other antenatal complications present



## **Prolonged rupture of membranes (ROM)**

*Definition:* Confirmed spontaneous ROM.

An obvious gush of clear amniotic fluid from vagina, or if fluid available, by differentiation with urine or vaginal secretions, for more than 24 hours before birth.

*Coding:* 99: unknown

0: no, membranes intact/ruptured for < 24 hrs

-1: yes, membranes ruptured for > 24 hours

## **Preterm labour**

*Definition:* Regular painful contractions, leading to progressive effacement and dilatation of the cervix, eventually leading to the birth of the baby, and commencing before 37 weeks gestation.

*Coding:* 99: unknown

0: no, labour did not commence before term

-1: yes, labour commenced in preterm period

## **Hypertension in pregnancy**

*Definition:* A systolic blood pressure (BP) > 140 mmHg and/or diastolic BP > 90 mmHg, or a rise in systolic BP > 25 mmHg and/or a rise in diastolic BP > 15 mmHg from a reading before conception or in 1<sup>st</sup> trimester; confirmed by 2 readings 6 hours apart.

*Coding:* 99: unknown

0: no hypertension in pregnancy detected

-1: yes, hypertension in pregnancy diagnosed

## **Antepartum haemorrhage**

*Definition:* Significant haemorrhage in the time from 20 weeks gestation to the end of second stage of labour (it excludes a 'show').

*Coding:* 99: unknown

0: no antepartum haemorrhage noted

-1: yes, antepartum haemorrhage

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

*Definition:* A condition of the fetus in which it fails to reach its genetically predetermined full growth potential due to intrinsic or extrinsic factors based on more than one obstetric ultrasound.

*Coding:* 99: unknown

0: no intrauterine growth restriction

-1: yes, IUGR suspected

## **Fetal distress**

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

*Coding:* 99: unknown

0: no intervention necessary

-1: yes, obstetric intervention required

## Antenatal diagnosis of fetal malformation

*Definition:* A fetal malformation is diagnosed prior to the baby's birth, by any method.

*Coding:* 99: unknown

0: no

-1: yes, malformation detected prior to birth

*Guide for use:* The diagnosis of the malformation may or may not be confirmed after birth.

## Other antenatal complication

*Definition:* Complication not specified.

*Coding:* 99: unknown

0: no other significant antenatal complication

-1: yes, other antenatal complication present

## Sex

*Definition:* The sex of the patient.

*Coding:* 0: unknown

1: male

2: female

3: ambiguous – or indeterminate.

## Infant weight

*Definition:* The first weight of the baby after birth.

*Coding:* A 4-digit number representing birth weight in grams.

*Guide for use:* The weight is usually measured to the nearest five grams and is obtained within one hour of birth, or shortly after the infant has been admitted.

## Gestational age

*Definition:* The estimated gestational age of the baby in completed weeks.

*Coding:* A 2-digit number representing the number of completed weeks of gestation.

*Guide for use:* Derived from a clinical assessment of the baby when accurate information is not stated.

## Place of birth

*Definition:* Place of baby's birth

*Coding:* 0: unknown

1: non-tertiary hospital – born in a hospital with no level III NICU.

2: born in a hospital with a level III NICU.

3: homebirth – planned.

4: born before arrival – unplanned birth at home, or in an ambulance, a car etc.

## Presentation at birth

*Definition:* Presenting part of the fetus (at lower segment of the uterus) at birth.

*Coding:* 0: unknown

- 1: cephalic – including face and brow
- 2: breech – legs or feet were facing the cervix
- 3: other – includes transverse.

## Mode of birth

*Definition:* The method of complete expulsion or extraction from its mother of a product of conception.

*Coding:* 0: unknown

- 1: vaginal – vaginal birth includes breech.
- 2: instrument – vaginal birth using an instrument – forceps, rotations, vacuum extraction.
- 3: Caesarean section in labour – caesarean performed after the commencement of labour.
- 4: Caesarean section, no labour – caesarean section performed prior to labour commencing.

## Antenatal corticosteroids

*Definition:* Corticosteroids given during the antenatal period via any route to the mother at a time likely to enhance fetal lung maturation.

*Coding:* 0: unknown

- 1: none – steroids not given
- 2: less than 24 hours – first dose given less than 24 hours prior to this baby's birth.
- 3: complete – more than 1 dose of steroids given, and 1<sup>st</sup> dose at more than 24 hours and less than 8 days before birth.
- 4: given at more than 7 days before baby's birth.

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

## Plurality

*Definition:* The total number of births resulting from this pregnancy.

*Coding:* 0: singleton – only one baby born.

- 1: twins – two babies
- 2: triplets – three babies
- 3: quads – four babies
- 4: more! – quintuplets, sextuplets etc.

*Guide for use:* Determined by the number of live births or by the number of fetuses that remain in utero at 20 weeks gestation. If gestational age is unknown, only live births of any birth weight or gestation, or fetuses weighing  $\geq 400$  grams are taken into account. Fetuses aborted at  $< 20$  weeks or fetuses compressed in the placenta at or more than 20 weeks are excluded.

## Birth order

*Definition:* Order of each baby of a multiple birth.

*Coding:* A single-digit number representing birth order.

- 0: singleton.
- 1: first of a multiple birth
- 2: second of a multiple birth
- 3: third of a multiple birth etc.
- 4: other.

## **Date of birth**

*Definition:* Date of birth of the patient.

*Coding:* DD / MM / YYYY

## **Admission date**

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

*Coding:* DD / MM / YYYY

## **Apgar score (1 minute)**

*Definition:* Numerical score to evaluate the baby's condition at one minute after birth.

*Coding:* 2-digit number representing the Apgar score.

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

## **Apgar score (5 minute)**

*Definition:* Numerical score to evaluate the baby's condition at five minutes after birth.

*Coding:* 2-digit number

*Guide for use:* As for Apgar score (1 minute).

## **Intubated at resuscitation**

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

*Coding:* 99: unknown

0: no, intubation was not necessary in labour ward

-1: yes, intubation necessary in labour ward

*Guide for use:* Does not include intubation for tracheal aspiration or intubation in the NICU after resuscitation is complete.

## **Congenital anomalies**

*Definition:* Structural abnormalities (including deformations) present at birth and diagnosed prior to separation from care (discharge home).

*Coding:* 99: unknown

0: no major congenital malformations noted

-1: yes, major congenital malformation noted

## **Specified congenital anomalies**

*Definition:* Detail of the major congenital anomalies.

*Coding:* Free text field representing congenital anomalies coded by ICD-10-AM.

## **Temperature on admission**

*Definition:* Temperature on admission to NICU or closest to admission to registration unit. Use rectal temperature or, if not available, per axilla.

*Coding:* A 4-digit number representing temperature measured in degrees Celsius to 1 decimal place.

*Guide for use:* If the baby is transported by a specialist neonatal retrieval team, admission is considered to commence when the team arrive at the baby's bedside. If the baby is more than 12 hours when NICU care started, or if an admission temperature is not recorded, use '0' to denote missing.

## Worst base excess

*Definition:* Worst base deficit recorded between admission to NICU and 12 hours after birth.

*Coding:* 3 digit numbered field representing base excess measured in mmol/l. May be negative.

*Guide for use:* Use '99' to denote missing.

## Main respiratory diagnosis

*Definition:* Main indication for respiratory support.

*Coding:* 0: unknown

1: normal – no respiratory support.

2: non specific – any non-specific respiratory distress (RD) in an infant requiring respiratory support (combines previous items transient tachypnoea of newborn and immature lung).

3: hyaline membrane disease – increasing RD or oxygen (O<sub>2</sub>) requirements, or the need for ventilator support from the first six hours of life with a chest x-ray showing generalised reticulogranular pattern, plus or minus air bronchogram.

4: meconium aspiration – RD presenting from immediately after birth to 12 hours of age. Hypoxia, tachypnoea and gasping respirations are often signs of underlying asphyxia. Chest x-ray shows over-expansion of lungs with wide spread coarse, fluffy infiltrates.

5: pneumonia – RD with proven or suspected infection (toxic blood count), and chest x-ray showing persisting opacities.

6: persistent pulmonary hypertension – echocardiatic (shunting or clinical evidence – O<sub>2</sub> need unexplained by chest x-ray or loud P<sub>2</sub>, or differential pre /post ductal TCPO<sub>2</sub>).

8: apnoea – recurrent pauses in breathing for more than 20 seconds, or for less than 20 seconds associated with bradycardia or any desaturation requiring intervention.

9: congenital anomaly – anomaly is the primary reason for RD, e.g. diaphragmatic hernia (list anomaly in appropriate field).

10: other – unspecified other RD.

11: peri surgical – no RD, support given for surgical intervention.

12: newborn encephalopathy – a syndrome of disturbed neurological function in an infant with difficulties initiating or maintaining respiration, depression of tone reflexes or consciousness and often with seizures.

*Guide for use:* For a diagnosis other than 'normal' the baby must receive respiratory support. If more than one diagnosis is possible, use the most serious condition.

## Exogenous surfactant

*Definition:* Any treatment with exogenous surfactant.

*Coding:* 0: unknown

1: none – no exogenous surfactant ever given.

2: Exosurf – any treatment using 'Exosurf'.

3: Survant – any treatment using 'Survanta'.

4: both – any combination of surfactant.

5: Curosurf- any treatment using 'Curosurf'.

6: Curosurf and Survanta.

*Guide for use:* Includes incomplete use.

## **Air leak requiring drainage**

*Definition:* Any form of pulmonary air leak requiring drainage (transient or continuous).

*Coding:* 99: unknown

0: no air leak requiring drainage present

-1: yes, air leak requiring drainage

## **Hours of intermittent positive pressure ventilation (IPPV)**

*Definition:* Total number of hours of IPPV given via an endotracheal tube, at any rate.

*Coding:* 4 – digit number – IPPV hours.

*Guide for use:* The hours of all forms of assisted ventilation via an endotracheal tube are summed. The usual rounding up applies.

## **Hours of continuous positive airways pressure (CPAP)**

*Definition:* Total number of hours of CPAP via any route, and nasopharyngeal ventilation.

*Coding:* 4 – digit number – CPAP hours

*Guide for use:* As for hours of IPPV.

## **High frequency ventilation (HFV)**

*Definition:* Mechanical ventilation presented at high frequencies (small tidal volumes with frequencies > 4Hz) initiated for this baby.

*Coding:* 99: unknown

0: high frequency ventilation not initiated

-1: yes, HFV was initiated

## **Nitric oxide**

*Definition:* Nitric oxide was used in any form or dose for respiratory support of the baby.

*Coding:* 99: unknown

0: no, nitric oxide therapy never used

-1: yes, nitric oxide therapy used

## **Extracorporeal membrane oxygenation**

*Definition:* An extracorporeal circuit was established to divert baby's blood to a membrane lung for oxygenation for this baby.

*Coding:* 99: unknown

0: no ECMO initiated

-1: yes, ECMO initiated

## **Date of final added oxygen therapy**

*Definition:* Date supplemental oxygen (O<sub>2</sub>) ceased appropriately.

*Coding:* DD / MM / YYYY

*Guide for use:* Four consecutive hours in any 24-hour period constitutes a 'day'.

## Chronic lung disease

*Definition:* The baby received respiratory support (supplemental O<sub>2</sub> or any form of assisted ventilation) for a chronic pulmonary disorder at 36 weeks post menstrual age.

*Coding:* 99: unknown

0: no chronic lung disease

-1: yes, chronic lung disease

*Guide for use:* Four consecutive hours in any one 24-hour period constitutes respiratory support on that day.

## Home oxygen therapy

*Definition:* Supplemental oxygen therapy was used at home after discharge from hospital.

*Coding:* 99: unknown

0: no supplemental oxygen used at home

-1: yes, home oxygen therapy given

*Guide for use:* Must have required supplemental oxygen in hospital.

## Neonatal surgery

*Definition:* Did this baby have major surgery that involved opening a body cavity?

*Coding:* 99: unknown

0: no

-1: yes

## Proven necrotising enterocolitis

*Definition:* Diagnosis of proven necrotising enterocolitis (NEC) is definite.

*Coding:* 99: unknown

0: no necrotising enterocolitis proven

-1: yes, NEC proven

*Guide for use:* Has at least four of the following symptoms:

1. At least one systemic sign: temperature instability, apnoea, bradycardia or lethargy; and one intestinal sign: a residual of more than 25% of the previous feed on 2 consecutive occasions, abdominal distension, vomiting or faecal blood.

2. Has profile consistent with definite NEC including 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 x-rays, or a surgical or post mortem diagnosis.

3. Plus the baby warranted treatment for NEC, which included nil by mouth and antibiotics.

## Early infection

*Definition:* An episode of systemic sepsis with initial symptoms occurring before 48 hours after birth.

*Coding:* 99: Unknown

0: No early infection noted.

-1: Yes, early infection noted.

*Guide for use:* These conditions must apply:

Isolation of an organism from at least one blood culture and, after consideration of the clinical and laboratory evidence, a decision is made to give antibiotics with therapeutic intent against this organism. Mixed coagulase negative staphylococci or other skin flora – contaminant are not included.

## Episodes of late-onset sepsis

*Definition:* At least one episode of systemic sepsis with initial symptoms occurring from 48 hours after birth.

*Coding:* 2 – digit field representing, the total number of episodes of late onset sepsis.

*Guide for use:* Isolation of organisms from one blood culture and, after considering clinical / laboratory evidence, decision made to give antibiotics with therapeutic intent against this organism. The following must not apply: mixed CNS or other skin flora contaminant. Same blood organism isolated from blood during previous 14 days – repeat isolate.

## Maximum grade of intraventricular haemorrhage (IVH)

*Definition:* Worst level of IVH seen on either side by ultrasound or post mortem examination.

*Coding:* 0: none – no IVH.

- 1: -subependymal germinal matrix IVH.
- 2: -IVH with no ventricular distension.
- 3: -the ventricle is distended with blood.
- 4: -intraparenchymal haemorrhage.
- 5: -Not examined.

## Date of late head ultrasound

*Definition:* Date of the cerebral ultrasound scan nearest to six weeks of age.

*Coding:* DD / MM / YYYY

## Ventricle size

*Definition:* Size of ventricle at the ultrasound closest to six weeks of age (date above). Ventricular index (VI) is measured as the furthest lateral extent of each ventricle from the midline measured at the level of Foramen of Monro.

*Coding:* 0: unknown

- 1: No dilatation – VI less than 97<sup>th</sup> centile.
- 2: dilatation – VI equal to 97<sup>th</sup> centile / 97<sup>th</sup> cent+ 4mm
- 3: hydrocephalus – VI greater than 97<sup>th</sup> centile + 4mm or hydrocephalus present requiring a shunt or drainage (permanent or transient).

## Ventricular Index (VI)

*Definition:* Size of ventricle at the ultrasound closest to six weeks of age (date above).

*Coding:* 4-digit number representing VI in mm correct to one decimal place

*Guide for use:* Record if ventricular dilatation is present, i.e. 'dilatation' or hydrocephalus'.

## Cerebral cystic formations

*Definition:* Changes in brain parenchyma seen at the scan closest to six weeks of age.

*Coding:* 0: unknown

- 1: no cysts – none seen on ultrasound
- 2: porencephalic cyst(s) – parenchymal lesion(s) corresponding to grade IV IVH.
- 3: periventricular leukomalacia – ischaemic brain injury affecting periventricular white matter in the boundary zones supplied by terminal branches of both centripetal and centrifugal arteries<sup>8</sup>.
- 4: encephaloclastic porencephaly – relatively late development on cerebral scan of extensive dense, cystic lesions involving the periphery of the brain<sup>4</sup>.



## **Baby meets local criteria for ROP exam**

*Definition:* The baby meets the criteria for eye examination for ROP.

*Coding:* 99: unknown

0: no

-1: yes, did meet local criteria.

## **Retinopathy of prematurity (ROP)**

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

*Coding:* 0: none seen – no changes seen

1: stage I – demarcation line.

2: stage II – ridge.

3: stage III – ridge with extraretinal fibro-vascular proliferation.

4: stage IV – retinal detachment<sup>9</sup>.

5: not examined – no eye examination

## **Therapy for retinopathy of prematurity**

*Definition:* Any therapy used to treat retinopathy of prematurity (ROP), i.e. laser or cryotherapy.

*Coding:* 99: unknown

0: no therapy for ROP received

-1: yes, therapy given for ROP.

## **Died**

*Definition:* The death of this baby occurred prior to discharge from hospital.

*Coding:* 99: unknown

0: no, survived to discharge to home

-1: yes, died

## **Date of death**

*Definition:* Date of death of the baby.

*Coding:* DD / MM / YYYY

*Guide for use:* If baby is known to have died after discharge, record date here and 'no' to died.

## **Post mortem**

*Definition:* Post mortem examination performed

*Coding:* 99: unknown

0: no post mortem performed

-1: yes, a post mortem was performed

## **Immediate cause of death**

*Definition:* The cause of death as stated on the death certificate.

*Coding:* unspecified free text field

*Guide for use:* To be described in morbid anatomical terms.

## **Death due to congenital anomaly**

*Definition:* The death of the infant directly attributed to the congenital anomaly.

*Coding:* 99: unknown

0: no

-1: yes

*Guide for use:* Must be coded as 'yes' for major congenital anomaly and 'yes' for died.

## **Transferred to another hospital**

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

*Coding:* 99: unknown

0: no, never transferred

-1: yes, transferred

## **Date of transfer**

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

*Coding:* DD / MM / YYYY

*Guide for use:* Use the most significant date.

## **Discharge date**

*Definition:* Date on which a patient completes an episode of care.

*Coding:* DD / MM / YYYY

*Comment:* All data collection ceases on this date.

# Glossary

**Antepartum fetal death:** fetal death occurring before the onset of labour.

**Apgar score:** numerical score used to indicate the baby's condition at 1 minute and 5 minutes after birth. Between 0 and 2 points are given for each of five characteristics: heart rate, breathing, colour, muscle tone and reflex irritability, and the total score is between 0 and 10.

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

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

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

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

**Early neonatal death:** death of a live born baby within seven days of birth.

**Extremely low birth weight:** birth weight of less than 1,000 grams.

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

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

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

**Instrumental delivery:** vaginal delivery using forceps or vacuum extraction.

**Intrapartum fetal death:** fetal death occurring during labour.

**Intrauterine growth restriction:** a fetus whose estimated weight is below the 10th percentile for its gestational age.

**Late neonatal death:** death of a live born baby after seven completed days and before 28 completed days.

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

**Low birth weight:** birth weight of less than 2,500 grams.

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

**Mode of separation:** status at separation of patient (discharge/transfer/death) and place to which patient is released (where applicable).

**Neonatal care levels:** Level I care is for normal healthy term babies, some of whom may need short-term observation during the first few hours of life.

Level II refers to a nursery that generally has babies born at 32–36 weeks gestation weighing around 1,500 to 2,500 grams at birth. It includes care for babies who require intravenous therapy or antibiotics, and/or those who are convalescing after intensive care, and/or those who need their heart rate or breathing monitored, and/or those who need short-term oxygen therapy.

Level III or intensive care refers to the care of newborn infants who require more specialised care and treatment. It includes most babies born at less than 32 weeks gestation or less than 1,500 grams birth weight, and others who may require such interventions as intravenous feeding, and/or surgery, and/or cardiorespiratory monitoring for management of apnoea or seizures, and/or require assisted ventilation, and/or supplemental oxygen over 40% or long-term oxygen (Abeywardana 2006).

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

**Neonatal morbidity:** any condition or disease of the baby diagnosed after birth and before separation from care.

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

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

**Post menstrual age** is the gestational age plus age after birth, in weeks. (PMA)

**Post neonatal death:** death of a live born baby after 28 days and within one year of birth.

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

**Presentation at birth:** presenting part of the fetus at birth.

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

**Resuscitation of baby:** active measures taken shortly after birth to assist the baby's ventilation and heartbeat, or to treat depressed respiratory effort and to correct metabolic disturbances.

**Sex ratio:** number of male live born babies per 100 female live born babies.

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

**Stillbirth:** see Fetal death (stillbirth).

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

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

**Vaginal breech:** vaginal birth in which the baby's buttocks is the presenting part.

**Very low birth weight:** birth weight of less than 1,500 grams

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