

# 2007

REPORT OF THE  
**AUSTRALIAN AND  
NEW ZEALAND  
NEONATAL NETWORK**



**UNSW**  
THE UNIVERSITY OF NEW SOUTH WALES

**ANZNN**

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

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# Acknowledgements

This is the thirteenth report of the Australian and New Zealand Neonatal Network (ANZNN), and the first in the new format. ANZNN has endeavoured to retain the information provided in previous reports to allow comparative reporting over time. Details of the new format can be found under ‘Structure of this report’.

Up until 2006, one level II unit in Australia contributed data. We are pleased to advise that this has increased to six units, with five additional Australian special care baby units contributing data for 2007. A further two units have contributed data for the 2008 report and more units are planning to join ANZNN in 2010 and 2011.

We would like to acknowledge all the units involved in the provision of data for this report. ANZNN appreciates the contribution of all participating units and we thank them for their ongoing support together with our data managers for their hard work and attention to detail.

The ANZNN greatly values the time, effort and expertise of the members of the ANZNN Advisory Committee and their conceptual, intellectual and financial contributions, all of which have helped make this network a respected and world-recognised organisation.

We thank the following members of the ANZNN Executive: Brian Darlow (Chairperson), Kaye Bawden, David Cartwright, Jenny Corban, Nick Evans, Ross Haslam, Kei Lui, William Tarnow-Mordi, Elizabeth Sullivan and Kenneth Tan for their commitment and guidance for all the activities of the ANZNN.

The ANZNN especially thanks David Henderson-Smart who has recently stepped down from the Executive Committee. David has been associated with the ANZNN since its inception in 1994. In addition to being a leading force in neonatology, David has given freely of his time and expertise to both the ANZNN and its staff. The ANZNN wishes him well in his retirement.

We thank Q Healthcare Pty Ltd for their ongoing support and for helping us to achieve our aims. We also thank Margaret Karr for her assistance with the tables for level III registrants and for reviewing this report. We acknowledge our colleagues from the Perinatal & Reproductive Epidemiology Research Unit for their continued technical support and encouragement.

# Structure of this report

- Chapter 1:** This chapter presents the structure and organisation of ANZNN together with some historical information related to its establishment. Also included is information on funding, selection criteria as well as a brief synopsis of level III registrants in Australia and New Zealand for 2007.
- Chapter 2:** ‘Babies registered to level III nurseries’ provides information and characteristics on the ANZNN registrants who are either born in a hospital with a level III unit or who are born elsewhere and then transferred to a level III unit within the first 28 days of life.
- Chapter 3:** ‘Mothers of level III registrants’ provides information on the mothers of level III registrants registered to ANZNN in 2007.
- Chapter 4:** ‘Level III baby characteristics’ provides information about the babies admitted to a level III neonatal unit during 2007.
- Chapter 5:** ‘Babies registered to level II nurseries’ provides information about babies registered to the level II special care baby units.
- Appendices:** Appendix 1 presents 10-year trends  
Appendix 2 presents data tables by birthweight  
Appendix 3 presents the methods employed for this report  
Appendix 4 contains confidentiality guidelines, and conditions for data collection, use and security.  
Appendix 5 presents the Minimum Data Set for ANZNN.

# Abbreviations

ABS	Australian Bureau of Statistics
ANZNN	Australian and New Zealand Neonatal Network
APH	antepartum haemorrhage
CI	confidence interval
CLD	chronic lung disease
CPAP	continuous positive airways pressure
CRIB	Clinical Risk Index for Babies
ECMO	extracorporeal membrane oxygenation
g	gram
HFOV	high frequency oscillatory ventilation
HFV	high frequency ventilation
HMD	hyaline membrane disease
ICD-10-AM	The International Statistics Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
IPPV	intermittent positive pressure ventilation
IQR	interquartile range
IUGR	intrauterine growth restriction
IVF	in vitro fertilisation
IVH	intraventricular haemorrhage
LOS	length of stay
NEC	necrotising enterocolitis
NHMRC	National Health and Medical Research Council
NICU	neonatal intensive care unit
NO	nitric oxide
O <sub>2</sub>	oxygen – normal air is 21% oxygen
PMA	post menstrual age (completed weeks)
PPROM	preterm pre-labour rupture of membranes
PRERU	Perinatal & Reproductive Epidemiology Research Unit
PVL	periventricular leukomalacia
RD	respiratory distress
RDS	respiratory distress syndrome
ROM	rupture of membranes
ROP	retinopathy of prematurity
UNSW	University of New South Wales
WHO	World Health Organization



# Participating units and supporting staff

## Level III nurseries:

### Australia

#### New South Wales

##### Children's Hospital at Westmead

*(Nursery beds: 23)*

Nadia Badawi (Director), Karen Walker,  
Caroline Karskens

##### John Hunter Hospital

*(Nursery beds: 41)*

Dr 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)*

Lyn Downe (Director), Mee Fong Chin

##### Royal Hospital for Women

*(Nursery beds: 44)*

Kei Lui (Director), Diane Cameron

##### Royal North Shore Hospital

*(Nursery beds: 25)*

Mary Paradisis (Director), Jennifer Bowen,  
Sara Sedgley, Martin Kluckow

##### RPA 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)*

Mark Tracy (Director), Jane Baird

## Australian Capital Territory

### The Canberra Hospital

*(Nursery beds: 24)*

Zsuzsoka Kecskes (Director), Lyn Barnes

## Victoria

### Mercy Hospital for Women

*(Nursery beds: 58)*

Andrew Watkins (Director), Julie Keng,  
Jim Holberton

### Monash Medical Centre

*(Nursery beds: 52)*

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

### Royal Children's Hospital

*(Nursery beds: 24)*

Rod Hunt (Director), Jo Brooks

### 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,  
Chrissy Harbridge

### Royal Brisbane and Women's Hospital

*(Nursery beds: 71)*

David Cartwright (Director), Paul Colditz  
(Professor of Perinatal Medicine), Tim Donovan

### The Townsville Hospital

*(Nursery beds: 32)*

Guan Koh (Acting Director), Gary Alcock,  
Jenny Binney, Cheri Boniface

## **South Australia**

### **Flinders Medical Centre**

*(Nursery beds: 35)*

Peter Marshall (Director), Rebecca Davis

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

*(Nursery beds: 49)*

Chad Anderson (Director), Ross Haslam, Elizabeth Gent, 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, Rolland Kohan, Shripada Rao, Andy Gill, Jane Pillow

## **Northern Territory**

### **Royal Darwin Hospital**

*(Nursery beds: 18)*

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

## **Newborn emergency transport services**

### **NSW Newborn & Paediatric Emergency Transport Service**

Andrew Berry (Director)

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

Michael Stewart (Director)

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

Steven Resnick

## **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 Bourchier (Director), Phil Weston, Deborah Harris

### **Wellington Women's Hospital**

*(Nursery beds: 40)*

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

## **Level II nurseries:**

## **Australia**

## **New South Wales**

### **Blacktown Hospital**

*(Nursery beds: 24)*

Maria Murray (Director), Debbie Green

### **Campbelltown Hospital**

*(Nursery beds: 15)*

Raymond Chin (Director), Maria Delpino

### **Gosford District Hospital**

*(Nursery beds: 25)*

John Erickson (Director), Kerry Field

### **St George Hospital**

*(Nursery beds: 8)*

Bob Fonseca (Director), Helen Giles

### **Wollongong Hospital**

*(Nursery beds: 20)*

Allan James (Director), Sylvia Lees

## **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)

### **ANZNN Program and Secretariat**

Perinatal & Reproductive Epidemiology Research Unit (PRERU)

Elizabeth Sullivan (Director), Vicki Gallimore, Sadia Hossain, Lisa Hilder

# 1. Organisation of the ANZNN

## History

A prospective audit commenced in 1994 with all level III units in Australia and New Zealand contributing data on babies from 1 January 1995. Level II units in New Zealand joined in 1998, followed by one level II unit in Tasmania, Australia in 1999. Level II units within Australia continue to join; there were a total of six units in 2007.

## Purpose of this report

The purpose of the *Report of the Australian and New Zealand Neonatal Network* is 'to improve the care of high-risk newborn infants and their families in Australia and New Zealand through collaborative audit and research'.

This is achieved through:

- providing 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
  - assist with the identification of areas of priority for research
  - enhance the ability to carry out multicentre studies and randomised controlled trials through collaboration
- monitoring the clinical indicators for perinatal care and improving clinical practice while maintaining national standards of evidence-based care
- monitoring the use of new technologies, e.g. surfactant usage by patient type and outcome
- consistency in national data collections.

## Structure of ANZNN

ANZNN is located in the Perinatal & Reproductive Epidemiology Research Unit (PRERU) within the University of New South Wales (UNSW). The arrangement is outlined in the memorandum of understanding (MOU) between ANZNN and UNSW.

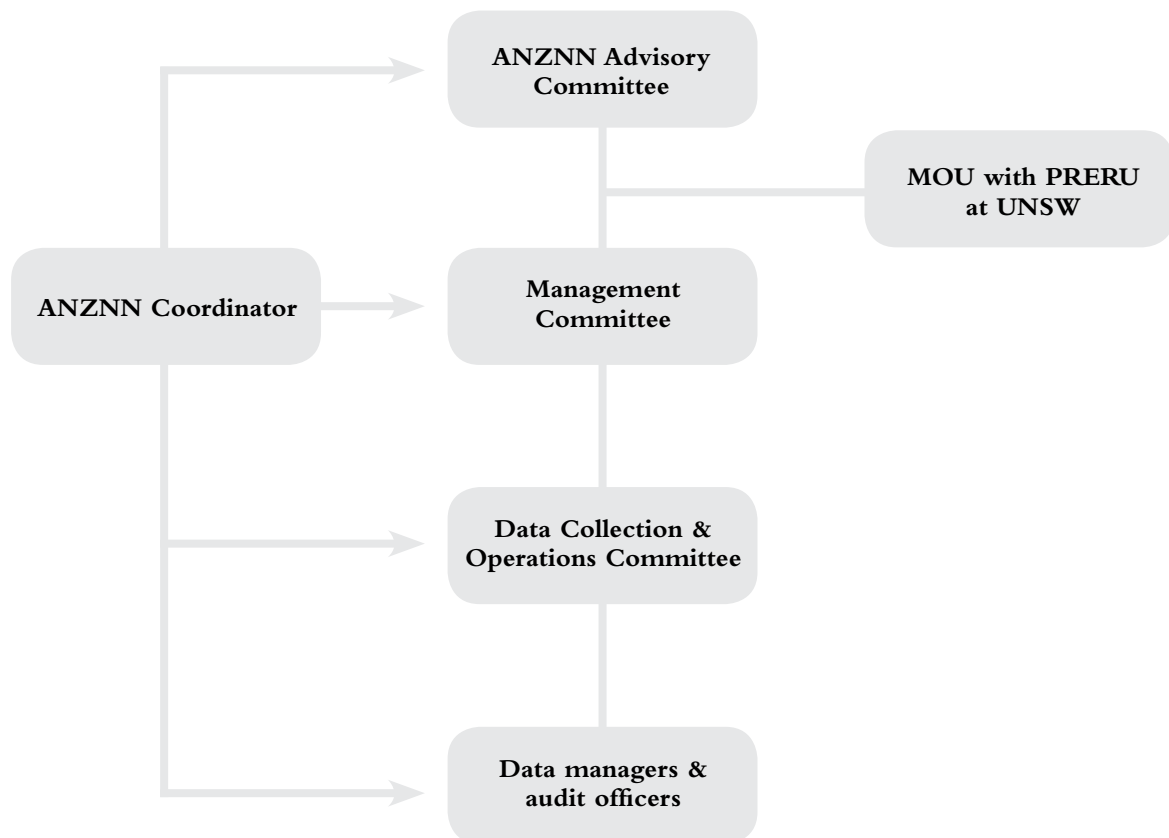
The governance structure of the ANZNN (refer to Figure 1) consists of the Advisory Committee, the Data Collection and Operations Committee and the Management Committee. The Advisory Committee is the governing body of ANZNN and includes the directors (or their nominee) of each participating unit, the academic neonatologists and neonatal nurses in the region. The Director of PRERU, who is the data custodian for ANZNN, is also a member of the Advisory Committee. The purpose of the Advisory Committee is to monitor the progress of ANZNN, discuss current issues and agree on new variables for inclusion in the minimum data set and to approve the use of the data for research.

The Data Collection and Operations Committee coordinates the operations of the ANZNN data collection, monitors the workload and progress of the annual report and reports to both 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, finance and decision-making.

The data managers and audit officers are responsible for the collection and submission of data for ANZNN. The ANZNN coordinator is the point of contact for ANZNN and liaises with ANZNN committees, PRERU, data managers and audit officers.

**FIGURE 1: Schematic flow chart of ANZNN**



## Registration criteria

Babies who meet one or more of the following criteria are eligible for registration with the audit:

- 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), or
- received therapeutic hypothermia.

Therapeutic hypothermia has been added to the registration criteria for ANZNN's audit of high-risk neonates for babies born in 2007. Babies who were discharged home and readmitted to a neonatal intensive care unit (NICU) during their neonatal period were not eligible for registration in the ANZNN audit. The hospital of registration was the first level III NICU in which the baby, aged less than 28 days, stayed for four or more hours. 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.

## **Funding support**

Currently the major share of funding is from annual contributions received from level III units. The contribution was a voluntary and unanimous decision made by the unit directors. In return individual units receive a feedback report that enables them to benchmark their unit against the combined ANZNN data set.

Q Healthcare makes an annual contribution and ANZNN thanks them for their generosity and support.

## **Data set variables**

The variables used for the 2007 audit are listed in Appendix 5 and are also available on the website <[www.preru.unsw.edu.au/ANZNN](http://www.preru.unsw.edu.au/ANZNN)>.

## **Babies born in Australia**

There were 6,358 babies registered to ANZNN from 22 level III NICUs in Australia, representing 2.2% of notified live births in 2007 (Laws & Sullivan 2009). Of these registrants, 73.8% were born in a hospital with tertiary care facilities. There were 2,819 babies born before 32 weeks gestation representing 44.5% of Australian registrants.

Maternal ethnicity was provided for more than 95.0% of mothers: 86.0% of the mothers of these babies identified as Caucasian and 6.5% as Asian. Almost one in twenty mothers (4.7%) identified as Aboriginal or Torres Strait Islander compared to 3.8% of all births in Australia in 2007 (Laws & Sullivan 2009).

Among Australian NICU admissions registered to ANZNN, 1,329 were from multiple births representing 21.0% of ANZNN admissions in Australia in 2007. Male babies were over-represented among NICU admissions – 57.5% of the Australian ANZNN registrants, compared with 51.4% among live births in Australia (Laws & Sullivan 2009).

Assisted ventilation was provided for 5,756 babies (2.0% of live births) and continuous positive airways pressure (CPAP) was the only form of respiratory assistance for 2,463 babies.

## **Babies born in New Zealand**

There were 1,644 babies who met ANZNN registration criteria from six level III NICUs in New Zealand representing 2.6% of the 64,044 live births registered in New Zealand in 2007 (Statistics New Zealand 2007). Of these registrants, 89.8% were born in a hospital with tertiary care facilities. There were 620 babies born before 32 weeks gestation representing 37.3% of New Zealand registrants.

The ethnicity of the mother was reported for 97.9% of the New Zealand registrants. The percentage of Caucasian mothers in the ANZNN cohort was 56.5%. A higher proportion of mothers identified themselves as Maori (19.9%) compared to 12.5% of mothers identified as Pacific Islander and 8.7% as Asian.

Among New Zealand NICU admissions registered to ANZNN, 292 were from multiple births representing 17.5% of ANZNN admissions in New Zealand in 2007.

Male babies were also over-represented among NICU admissions in New Zealand – 58.3% of the New Zealand registrants compared to 51.5% of total live births in New Zealand (Statistics New Zealand 2007).

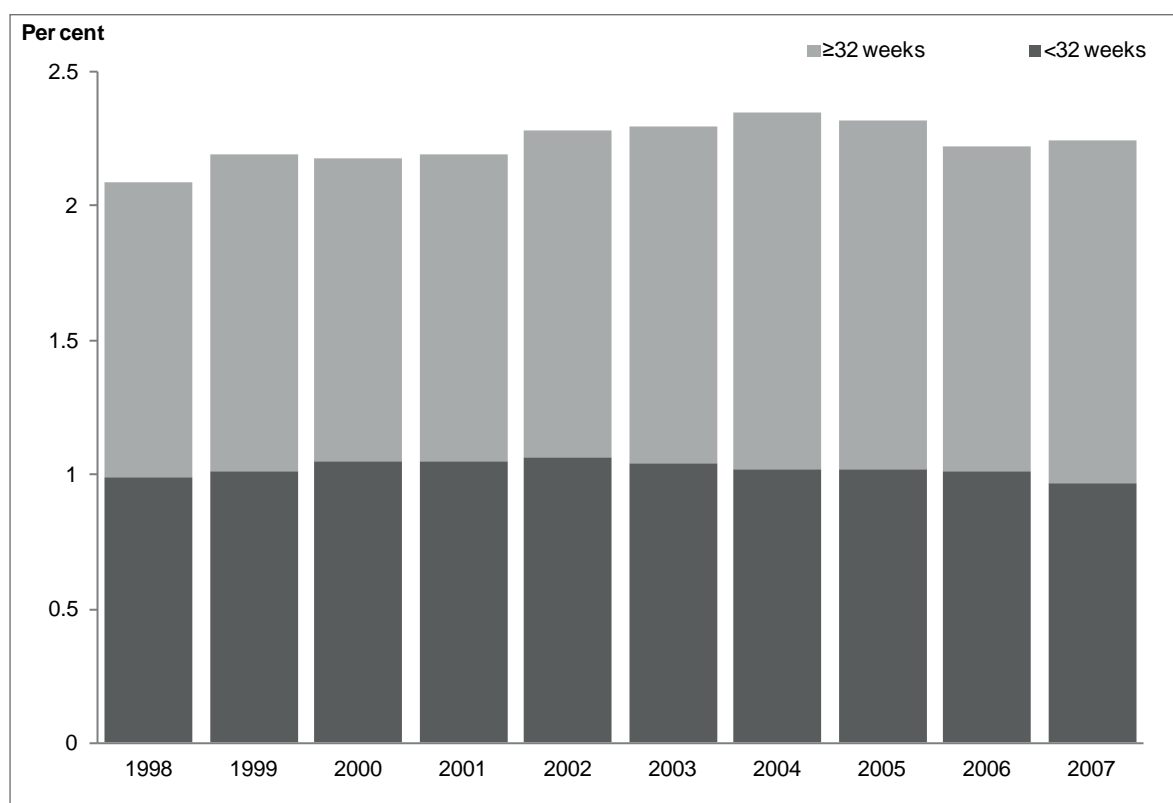
Assisted ventilation was given to 1,577 babies representing 2.5% of all live births with 1,024 babies receiving CPAP only (1.6% of all live births).

## 2. Babies registered to level III units

This section includes data on the ANZNN registrants from each of the 28 level III NICUs in 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.

Of the babies admitted to an NICU in Australia and New Zealand in 2007, 8,002 fulfilled the registration criteria for inclusion in the ANZNN audit. The population represents 2.4% of the 356,071 live births in the two countries in 2007 (Laws & Sullivan 2009; Statistics New Zealand 2007) (Figure 2) illustrating a slight increase of 406 registrants (2.2% of all live births) from 2006.

**FIGURE 2: Babies registered to ANZNN audit of level III units each year as a percentage of liveborn babies in Australia and New Zealand 1998-2007**

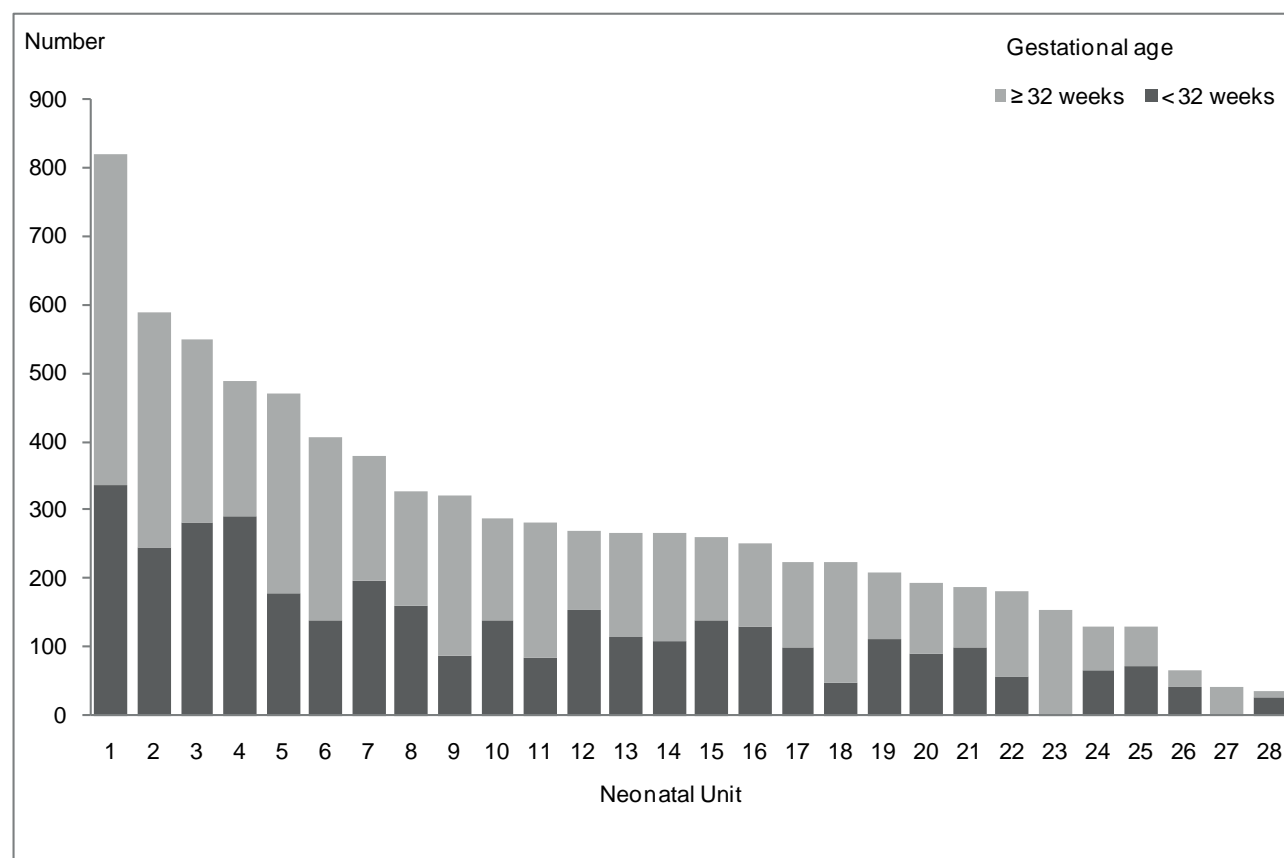


There were 3,439 (43.0%) babies born before 32 weeks gestation and 4,563 babies born at 32 weeks or more (57.0%). Of the registrants born before 32 weeks gestation 90.2% received assisted ventilation. The major indication for assisted ventilation in this age group was hyaline membrane disease.

The largest level III NICUs in Australia and New Zealand registered more than 550 babies in 2007, the smallest less than 50 (Figure 3). The median number of babies registered to an ANZNN unit was 256.

The gestational age group at birth and birthweight for babies qualifying for inclusion in the ANZNN 2007 level III audit is set out in Tables 1 and 2 respectively. The 10-year trend (1998–2007) in gestational age at birth is presented in Figure 10 in Appendix 1.

**FIGURE 3: Number of Level III registrants born at each neonatal intensive care unit, 2007**



**TABLE 1: Level III registrants born at each completed week of gestation, 2007**

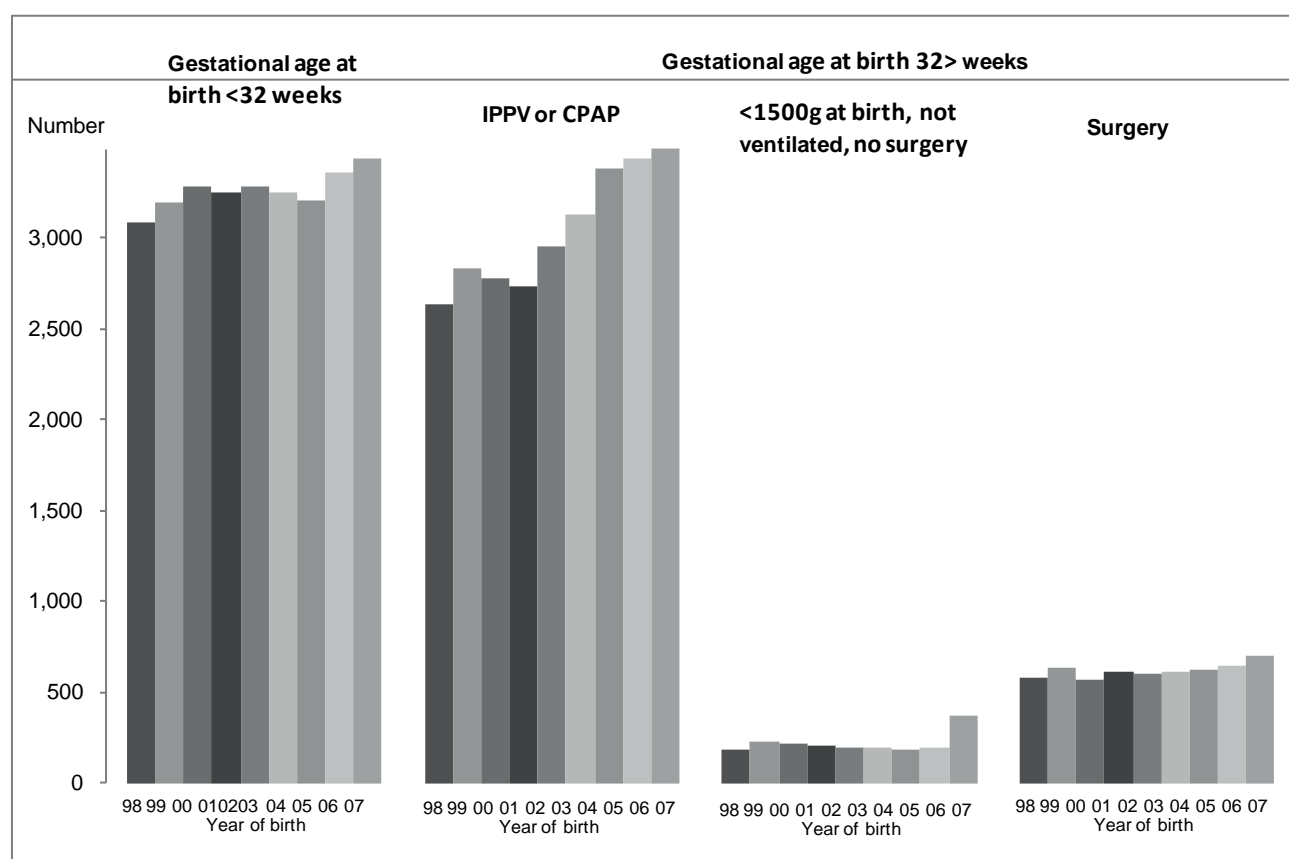
Gestational age (in weeks)	Number of babies	Per cent	Cumulative per cent
<24	61	0.8	0.8
24	181	2.3	3.1
25	212	2.6	5.7
26	296	3.7	9.4
27	359	4.5	13.9
28	455	5.7	19.6
29	490	6.1	25.7
30	607	7.6	33.3
31	778	9.7	43.0
<b>Babies &lt;32 weeks</b>	<b>3,439</b>	<b>43.0</b>	
32	697	8.7	51.7
33	549	6.9	58.6
34	578	7.2	65.8
35	389	4.9	70.7
36	372	4.6	75.3
37	382	4.8	80.1
38	498	6.2	86.3
39	360	4.5	90.8
40	432	5.4	96.2
41	258	3.2	99.4
42	45	0.6	100.0
43	3	0.0	100.0
<b>Total</b>	<b>8,002</b>	<b>100.0</b>	



**TABLE 2: Level III registrants in each birthweight group, 2007**

Birthweight group (grams)	Number of babies	Per cent	Cumulative percent
<500	37	0.5	0.5
500-599	90	1.1	1.6
600-699	189	2.4	4.0
700-799	239	3.0	7.0
800-899	259	3.3	10.3
900-999	279	3.5	13.8
1000-1099	296	3.7	17.5
1100-1199	353	4.4	21.9
1200-1299	369	4.6	26.5
1300-1399	392	4.9	31.4
1400-1499	416	5.2	36.6
<b>Babies &lt;1500g birthweight</b>	<b>2,920</b>	<b>36.6</b>	
1500-1999	1,519	19.0	55.6
2000-2499	1,025	12.8	68.4
2500-2999	839	10.5	78.9
3000-3499	848	10.6	89.5
3500-3999	549	6.9	96.4
4000+	303	3.8	100.1
<b>Total</b>	<b>8,002</b>	<b>100.0</b>	

**FIGURE 4: Level III registrants by registration criteria, 1998–2007**



### 3. Mothers of level III registrants

#### Maternal age

While there are many determinants of perinatal outcome, an important one is maternal age. In 2007, the age of mothers of neonates registered as high-risk ranged from less than 15 years to just over 50 years. The highest proportion of registrant mothers was aged 30–34 years (29.5%) followed by mothers aged 25–29 years (25.0%). Together they accounted for more than half of the mothers (54.5%) of ANZNN registrants in 2007 (Table 3). In 2007, the proportion of teenage mothers increased slightly (0.3%) from 2006, while mothers in the 35–39 age group decreased by 0.1%, from 19.2% in 2006 to 19.1%.

Almost half of the babies born to teenage mothers (48.9%) were born at less than 32 weeks completed gestation, while only 42.2% of babies born to mothers 30–34 years were less than 32 weeks gestation at birth (Table 3).

**TABLE 3: Age group of mothers of level III registrants by gestational age group, 2007**

Maternal age (years)	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
Less than 20	6	38	54	55	77	60	69	111	470
20–24	17	56	110	180	196	165	187	319	1,230
25–29	6	108	150	207	363	289	329	518	1,970
30–34	14	104	171	272	420	389	396	560	2,326
35–39	9	67	119	181	251	272	277	335	1,511
40 and over	5	13	44	37	64	62	62	101	388
Not stated	4	7	7	13	14	9	19	34	107
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
Less than 20	10.5	9.8	8.3	5.9	5.6	4.9	5.2	5.7	6.0
20–24	29.8	14.5	17.0	19.3	14.3	13.3	14.2	16.4	15.6
25–29	10.5	28.0	23.1	22.2	26.5	23.4	24.9	26.6	25.0
30–34	24.6	26.9	26.4	29.2	30.6	31.4	30.0	28.8	29.5
35–39	15.8	17.4	18.4	19.4	18.3	22.0	21.0	17.2	19.1
40 and over	8.8	3.4	6.8	4.0	4.7	5.0	4.7	5.2	4.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Not stated data are excluded from per cent calculations.*

#### Previous antenatal history

In 2007, a previous preterm delivery was reported by 1,001 mothers (12.5%) of babies registered to ANZNN while 273 mothers (3.4%) reported a previous perinatal loss.

#### Assisted conception

Assisted conception refers to any infertility treatment used in this pregnancy. Types of infertility treatment include ovulation induction, in vitro fertilisation (IVF), intrauterine insemination and other infertility treatments not already mentioned.

There were 615 (7.7%) pregnancies resulting from assisted conception in the ANZNN 2007 cohort with most (82.0%) the result of IVF treatment. Of the pregnancies resulting from assisted conception, 41.6% of the mothers were more than 34 years of age at the time of giving birth.

## Presenting antenatal problem

Many mothers of ANZNN registrants were admitted to hospital with complications prior to the baby's birth. The presenting antenatal problem refers to the antenatal complication that led to the baby's birth and subsequent admission to an NICU. There may be other complications related to this pregnancy but they are not reported here. Information about the presenting antenatal problem was available for 97.9% of 2007 ANZNN registrants. More than one-quarter of mothers (26.0%) presented with preterm labour while pre-labour rupture of membranes was the second highest (15.3%) presenting antenatal problem (Table 4). Overall seven out of eight mothers of registrants had a pregnancy complication recorded.

The maternal antenatal complications for registrants born at 37–43 weeks, 32–36 weeks and less than 32 weeks gestational age are set out in Figure 5. For women who gave birth before 32 weeks gestation and women who gave birth at 34–36 weeks gestation, the most common presenting antenatal problem was preterm labour (36.7% and 30.7% respectively) followed by pre-labour rupture of membranes (22.7% and 15.8% respectively).

Among women who gave birth at term, almost half (47.4%) were recorded as having no maternal presenting antenatal problem.

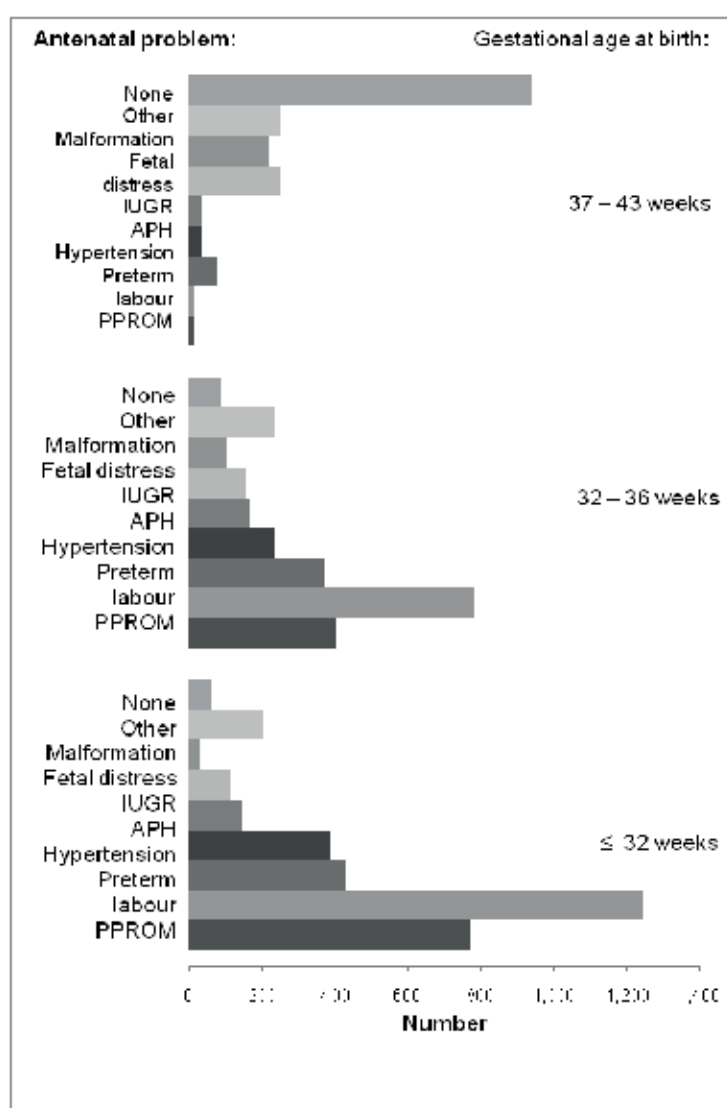
**TABLE 4: Mother's presenting antenatal problem by gestational age group, 2007**

Presenting antenatal problem	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
No antenatal problems	0	7	9	22	26	23	62	938	1,087
Preterm pre-labour rupture of membranes (PPROM)	15	100	132	203	322	219	184	23	1,198
Preterm labour	29	195	255	326	439	351	431	13 <sup>(a)</sup>	2,039
Hypertension in pregnancy	1	19	92	130	186	221	153	77	879
Antepartum haemorrhage (APH)	8	47	85	97	152	131	107	35	662
Intrauterine growth restriction (IUGR)	0	5	16	50	77	92	74	36	350
Fetal distress	1	7	19	36	52	70	90	306	581
Other problem	2	10	36	55	103	103	135	248	692
Congenital anomalies	1	1	4	11	11	26	79	220	353
Not stated	4	2	7	15	17	10	24	82	161
<b>Total</b>	<b>61</b>	<b>393</b>	<b>655</b>	<b>945</b>	<b>1,385</b>	<b>1,246</b>	<b>1,339</b>	<b>1,978</b>	<b>8,002</b>
Per cent									
No antenatal problems	0.0	1.8	1.4	2.4	1.9	1.9	4.7	49.5	13.9
Preterm pre-labour rupture of membranes (PPROM)	26.3	25.6	20.4	21.8	23.5	17.7	14.0	1.2	15.3
Preterm labour	50.9	49.9	39.4	35.1	32.1	28.4	32.8	0.7	26.0
Hypertension in pregnancy	1.8	4.9	14.2	14.0	13.6	17.9	11.6	4.1	11.2
Antepartum haemorrhage (APH)	14.0	12.0	13.1	10.4	11.1	10.6	8.1	1.8	8.4
Intrauterine growth restriction (IUGR)	0.0	1.3	2.5	5.4	5.6	7.4	5.6	1.9	4.5
Fetal distress	1.8	1.8	2.9	3.9	3.8	5.7	6.8	16.1	7.4
Other problem	3.5	2.6	5.6	5.9	7.5	8.3	10.3	13.1	8.8
Congenital anomalies	1.8	0.3	0.6	1.2	0.8	2.1	6.0	11.6	4.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

(a) These mothers presented with preterm labour, then went on to deliver at term.

**Note:** Not stated data are excluded from per cent calculations.

**FIGURE 5: Presenting antenatal problem for mothers of level III registrants by gestational age group, 2007**



## Antenatal corticosteroid use

Corticosteroids given to the mother during the antenatal period, via any route at a time likely to enhance fetal maturation, are recorded for ANZNN registrants.

Since 1997, consideration has been given to administering maternal antenatal corticosteroids before the 34th completed week of gestation with the aim of improving neonatal outcomes by enhancing newborns' maturation. The preferred regimen is more than one dose of antenatal corticosteroids, with the first dose given more than 24 hours and less than eight days before the baby's birth (Crowley 1995).

Table 5 presents antenatal corticosteroids use for mothers of ANZNN registrants in each gestational age group. In 2007, 97.5% of mothers of ANZNN registrants born before 34 completed weeks of gestation received one or more doses of antenatal corticosteroids leaving 2.5% of mothers of registrants in this group who did not receive any antenatal corticosteroids. Of the mothers who received antenatal corticosteroids, 16.0% received them more than seven days prior to giving birth.

For mothers of ANZNN registrants born before 32 completed weeks of gestation, 97.7% received one or more doses of antenatal corticosteroids and 2.3% of mothers of registrants in this group did not receive any antenatal corticosteroids. Of the mothers who received antenatal corticosteroids, 17.3% received them more than seven days prior to giving birth (Table 5). The 10-year trend (1998–2007) for maternal corticosteroids is represented by Figure 11 in Appendix 1.

**TABLE 5: Antenatal corticosteroid use for mothers of level III registrants by gestational age group, 2007**

Antenatal corticosteroids	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
None	13	31	70	93	141	179	811	1,652	2,990
Incomplete course	24	131	182	250	378	322	82	2	1,371
Course completed	19	188	276	430	611	499	162	19	2,204
Completed >7 days	1	34	104	151	232	208	141	18	889
Not stated	4	9	23	21	23	38	143	287	548
<b>Total</b>	<b>61</b>	<b>393</b>	<b>655</b>	<b>945</b>	<b>1,385</b>	<b>1,246</b>	<b>1,339</b>	<b>1,978</b>	<b>8,002</b>
Per cent									
None	22.8	8.1	11.1	10.1	10.4	14.8	67.8	97.7	40.1
Incomplete course	42.1	34.1	28.8	27.1	27.8	26.7	6.9	0.1	18.4
Course completed	33.3	49.0	43.7	46.5	44.9	41.3	13.5	1.1	29.6
Completed >7 days	1.8	8.9	16.5	16.3	17.0	17.2	11.8	1.1	11.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note: Not stated data are excluded from per cent calculations.*

## Multiple births

Multiple birth pregnancies are often associated with labour and delivery complications, an increased risk of premature birth, low birthweight infants as well as an increased risk of perinatal mortality and morbidity. In 2007, 20.1% of ANZNN registrants were reported as being from a multiple pregnancy with the greatest percentage of multiple births being twins (18.6%). Of the 2007 ANZNN registrants from multiple births, 59.4% were born before 32 weeks gestation and 96.2% were born before 37 weeks gestation (Table 6). The 10-year trend (1998–2007) for multiple births is represented by Figure 12 in Appendix 1.

**TABLE 6: Plurality of level III registrants by gestational age group, 2007**

Plurality	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Singleton	48	310	506	662	953	864	1,126	1,917	6,386
Twins	13	81	141	261	384	342	209	61	1,492
Triplet+	0	2	8	22	48	40	4	0	124
<b>Total</b>	<b>61</b>	<b>393</b>	<b>655</b>	<b>945</b>	<b>1,385</b>	<b>1,246</b>	<b>1,339</b>	<b>1,978</b>	<b>8,002</b>
Per cent									
Singleton	78.7	78.9	77.3	70.1	68.8	69.3	84.1	96.9	79.8
Twins	21.3	20.6	21.5	27.6	27.7	27.4	15.6	3.1	18.6
Triplet+	0.0	0.5	1.2	2.3	3.5	3.2	0.3	0.0	1.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note: Not stated data are excluded from per cent calculations.*

## Method of birth

Data on method of birth are presented for each baby. Method of birth can be dependent upon gestational age, presenting part of the baby and maternal factors. For more than half of the 2007 registrants (59.1%) the method of birth was caesarean section with 60.4% of caesarean sections occurring before the onset of labour. Just over one-third of registrants (36.0%) were non-instrumental vaginal births (Table 7). The rate of birth by caesarean section has gradually increased from 49.8%, since the first data collection in 1995, to 61.0% in 2006. The 2007 data show a decrease of 1.9% from 2006.

The most common method of birth for registrants born before 24 weeks was vaginal birth (78.7%) with less than five per cent (4.9%) requiring assistance with instruments (Table 7). The 10-year trend (1998–2007) for method of birth is represented by Figure 13 in Appendix 1.

**TABLE 7: Method of birth for level III registrants by gestational age group, 2007**

Method of birth	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Vaginal	48	245	231	304	456	303	459	807	2,853
Vaginal instrumental birth	3	9	11	23	53	30	60	196	385
Caesarean section in labour	5	71	172	243	329	312	296	424	1,852
Caesarean section no labour	5	67	238	373	544	596	504	501	2,828
Not stated	0	1	3	2	3	5	20	50	84
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
Vaginal	78.7	62.5	35.4	32.2	33.0	24.4	34.8	41.9	36.0
Vaginal instrumental birth	4.9	2.3	1.7	2.4	3.8	2.4	4.5	10.2	4.9
Caesarean section in labour	8.2	18.1	26.4	25.8	23.8	25.1	22.4	22.0	23.4
Caesarean section no labour	8.2	17.1	36.5	39.6	39.4	48.0	38.2	26.0	35.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Not stated data are excluded from per cent calculations.*

## Place of birth

In line with standard clinical practice guidelines, clinicians endeavour to have all births at less than 33 weeks gestation occur in a perinatal centre equipped with an NICU. In 2007, 77.2% of all babies and 86.2% of babies less than 32 weeks gestation at birth were born in a tertiary centre equipped with an NICU; 21.1% of all ANZNN registrants were born in a non-tertiary hospital; while 1.7% of registrants were not born in a hospital (Table 8).

**TABLE 8: Level of hospital of birth for level III registrants by gestational age group, 2007**

Level of birth hospital	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
Tertiary hospital	52	342	554	825	1,190	1,066	940	1,200	6,169
Non-tertiary hospital	7	41	89	102	175	168	375	732	1,689
Not born in a hospital	2	10	12	18	19	11	22	44 <sup>(a)</sup>	138
Not stated	0	0	0	0	1	1	2	2	6
<b>Total</b>	<b>61</b>	<b>393</b>	<b>655</b>	<b>945</b>	<b>1,385</b>	<b>1,246</b>	<b>1,339</b>	<b>1,978</b>	<b>8,002</b>
	Per cent								
Tertiary hospital	85.2	87.0	84.6	87.3	86.0	85.6	70.3	60.7	77.2
Non-tertiary hospital	11.5	10.4	13.6	10.8	12.6	13.5	28.0	37.0	21.1
Not born in a hospital	3.3	2.5	1.8	1.9	1.4	0.9	1.6	2.2	1.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

(a) These babies were either born before arrival to hospital or born at home.

**Note:** Not stated data are excluded from per cent calculations.

## Transport after birth to a level III NICU

Transport after birth to a level III NICU is required if there is insufficient time before birth to allow the mother to be transferred to a tertiary centre; if a cot is not available in the hospital of birth; if a term baby born in a non-tertiary centre has an unexpected need for NICU care; or the baby requires specialised care in a children's hospital.

In 2007, 25.4% of ANZNN registrants were transferred to an NICU after birth. Of these the greatest percentage (80.3%) were transported by a specialist team with 16.8% transported by a non-specialist team (Table 9). The 10-year trend (1998–2007) for mode of transport to level III unit is represented by Figure 15 in Appendix 1.

**TABLE 9: Mode of transport to level III NICU after birth for level III registrants by gestational age, 2007**

Mode of transport	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Not transported	50	337	541	811	1,191	1,058	908	1,049	5,945
Specialist retrieval team	11	42	89	112	139	149	367	718	1,627
Non-specialist team	0	11	18	9	36	31	49	186	340
Other	0	1	6	8	6	6	14	18	59
Not stated	0	2	1	5	13	2	1	7	31
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
Not transported	82.0	86.2	82.7	86.3	86.8	85.0	67.9	53.2	74.6
Specialist transport team	18.0	10.7	13.6	11.9	10.1	12.0	27.4	36.4	20.4
Non-specialist team	0.0	2.8	2.8	1.0	2.6	2.5	3.7	9.4	4.3
Other	0.0	0.3	0.9	0.9	0.4	0.5	1.0	0.9	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**Note:** Not stated data are excluded from per cent calculations.

## **Breastfeeding at discharge**

Data on breastfeeding at discharge were available for 4,118 babies (51.5% of the babies who survived to go home). Among registrants who provided data on breastfeeding, 69.5% were breastfed at discharge.

The rate of breastfeeding among surviving very preterm babies at discharge was 42.8% compared to 34.8% for surviving preterm and term babies. Care should be taken with interpretation of this data as data were not available for breastfeeding status on discharge for almost half (48.5%) of surviving ANZNN registrants.



## 4. Characteristics of level III babies

### Baby gender

Male births exceeded female births in both Australia and New Zealand and accounted for 51.3% of combined live births in both countries in 2007 (Laws & Sullivan 2009; Statistics New Zealand 2007). The percentage was higher among ANZNN registrants with male births representing 57.6%. Gender was not able to be determined for one baby. For births at less than 32 weeks gestation, 51.2% were male; of births at term 60.1% were male.

### Resuscitation in delivery suite

The types of resuscitation given to babies immediately after birth range from the least severe, suction, to the most severe, external cardiac massage and ventilator support. For the purpose of this audit ANZNN only collected data on babies on whom endotracheal intubation was performed; 23.9% of registrants were intubated in the delivery suite to establish independent respiration and heart rate. For babies born before 32 weeks the percentage was 37.5% and for babies born at term the percentage was 18.3%.

### Apgar score at birth

The Apgar score gives a clinical indication of a baby's condition immediately after birth. It is a numerical score based on five characteristics: heart rate, respiratory condition, muscle tone, reflexes and colour with a maximum possible score of 10. A low score (less than 4) at one minute of age indicates a baby requires specialised resuscitation.

An Apgar score of less than 4 at one minute of age was recorded for 17.0% of ANZNN registrants, with 4.1% of registrants recording an Apgar score of less than 4 at five minutes of age. Among the babies who had low Apgar scores at one minute, 48.0% of babies were born at less than 32 weeks and 29.8% were born at term (Table 10).

**TABLE 10: Apgar scores at birth for level III registrants by gestational age group, 2007**

Apgar score	Gestational age group							Total	
	<24	24–25	26–27	28–29	30–31	32–33	34–36		37–43
Number									
Apgar at 1 minute									
Apgar less than 4	33	151	171	147	150	143	159	405	1,359
Apgar between 4 and 7	24	196	365	468	653	543	468	683	3,400
Apgar greater than 8	4	44	116	328	582	559	710	889	3,232
Not stated	0	2	3	2	0	1	2	1	11
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Number									
Apgar at 5 minutes									
Apgar less than 4	7	31	30	25	22	29	35	146	325
Apgar between 4 and 7	37	201	240	212	269	231	235	530	1,955
Apgar greater than 8	17	159	383	706	1,092	985	1,067	1,301	5,710
Not stated	0	2	2	2	2	1	2	1	12
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002

## Admission temperature

The temperature at admission to the NICU, or temperature nearest to admission to the registration unit, was reported for all ANZNN registrants in 2007. The rectal temperature is preferred; however, if it is not available the axilla temperature is recorded.

For babies born before 32 weeks gestation the admission temperature together with the base excess is used to calculate the Clinical Risk Index for Babies (CRIB) II score. CRIB II score is a risk-adjustment instrument widely used in NICUs to measure initial illness severity and is a predictor of survival until discharge.

The median temperature at admission to the NICU was 36.2° C; the median temperature increased slightly with increasing gestational age at birth. The lowest median temperature recorded was 35.3° C by the youngest babies, i.e. those born at less than 24 weeks gestation (Table 11).

**TABLE 11: Median admission temperature and interquartile ranges for level III registrants by gestational age group, 2007**

Gestational age group	Number of babies	Temperature	
		Median	Inter quartile ranges
<24	61	35.3	34.5–36.1
24–25	393	36.1	35.3–36.7
26–27	655	36.4	35.9–36.8
28–29	945	36.4	36.0–36.9
30–31	1,385	36.5	36.0–36.8
32–33	1,246	36.3	35.8–36.7
34–36	1,339	36.4	35.8–36.8
37–43	1,978	36.4	33.7–36.9
<b>Total</b>	<b>8,002</b>	<b>36.2</b>	<b>36.2–36.4</b>

## Indication for respiratory support

In 2007, only 7.2% of all ANZNN registrants did not receive any form of respiratory support. For the remaining registrants, hyaline membrane disease (HMD) remained the most common indication for respiratory support at 49.7%. Non-specific respiratory distress accounted for 21.3% of babies while congenital anomaly, encephalopathy and meconium aspiration each accounted for approximately 3.0% (Table 12).

For babies born before 37 weeks gestation, HMD (59.9%) remained the most common indication for respiratory support. For babies born at term, non-specific respiratory distress (24.5%) was the most common indication followed by HMD (13.2%), surgery (12.8%) and meconium aspiration (12.0%) (Table 12). The 10-year trend (1998–2007) for mode of assisted ventilation is represented by Figure 16 in Appendix 1.

**TABLE 12: Indication for respiratory support for level III registrants by gestational age, 2007**

Indication for respiratory support	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
No respiratory support	0	3	0	23	230	128	82	97	563
Non-specific respiratory distress	6	19	37	106	257	356	404	471	1,656
Hyaline membrane disease	50	356	573	733	762	589	545	253	3,861
Meconium aspiration syndrome	0	0	0	0	0	1	2	230	233
Pneumonia	0	0	1	1	1	0	8	42	53
Persistent pulmonary hypertension	0	3	7	6	2	2	13	73	106
Apnoea	1	1	6	37	49	23	20	18	155
Congenital anomaly	0	2	2	5	6	13	46	183	257
Other	2	3	10	12	17	65	62	121	292
Peri-surgery	0	2	3	2	7	13	83	245	355
Newborn encephalopathy	0	1	0	3	9	15	29	186	243
Not stated	2	3	16	17	45	41	45	59	228
<b>Total</b>	<b>61</b>	<b>393</b>	<b>655</b>	<b>945</b>	<b>1,385</b>	<b>1,246</b>	<b>1,339</b>	<b>1,978</b>	<b>8,002</b>
	Per cent								
No respiratory support	0.0	0.8	0.0	2.4	16.6	10.3	6.1	4.9	7.2
Non-specific respiratory distress	10.2	4.9	5.8	11.4	19.2	29.5	31.2	24.5	21.3
Hyaline membrane disease	84.7	91.3	89.7	79.0	56.9	48.9	42.1	13.2	49.7
Meconium aspiration syndrome	0.0	0.0	0.0	0.0	0.0	0.1	0.2	12.0	3.0
Pneumonia	0.0	0.0	0.2	0.1	0.1	0.0	0.6	2.2	0.7
Persistent pulmonary hypertension	0.0	0.8	1.1	0.6	0.1	0.2	1.0	3.8	1.4
Apnoea	1.7	0.3	0.9	4.0	3.7	1.9	1.5	0.9	2.0
Congenital anomaly	0.0	0.5	0.3	0.5	0.4	1.1	3.6	9.5	3.3
Other	3.4	0.8	1.6	1.3	1.3	5.4	4.8	6.3	3.8
Peri-surgery	0.0	0.5	0.5	0.2	0.5	1.1	6.4	12.8	4.6
Newborn encephalopathy	0.0	0.3	0.0	0.3	0.7	1.2	2.2	9.7	3.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note: Not stated data are excluded from per cent calculations.*

## Exogenous surfactant

Exogenous surfactant administered to babies with moderate to severe HMD has been shown to reduce the severity of the disease, the ventilation requirements and the risk of air leaks. Exogenous surfactant can be administered for both prevention and cure. For babies born at less than 31 weeks gestation most benefit is gained by early administration of exogenous surfactant (within two hours of birth). For babies born at 31 or more weeks gestation exogenous surfactant is usually only administered to those with a confirmed diagnosis

of HMD. There is some evidence that a bolus dose of exogenous surfactant given to babies with meconium aspiration syndrome can reduce ventilation requirements.

In 2007, one-third of ANZNN registrants (33.0%) were administered exogenous surfactant (Table 13).

There were 2,369 babies who received IPPV for HMD in 2007. Exogenous surfactant was given to 2,132 of these babies (90.0%). There were 237 babies diagnosed with HMD who were not given exogenous surfactant.

**TABLE 13: Exogenous surfactant use for level III registrants by gestational age group, 2007**

Exogenous surfactant	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
None	8	39	127	444	947	928	1,027	1,655	5,175
Curosurf	38	270	381	316	247	160	143	150	1,705
Survanta	10	64	100	138	141	93	104	71	721
SurvCuro	0	2	3	2	1	5	4	6	23
Any combination	5	15	30	24	14	10	7	6	111
Not stated	0	3	14	21	35	50	54	90	267
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
None	13.1	10.0	19.8	48.1	70.1	77.6	79.9	87.7	66.9
Curosurf	62.3	69.2	59.4	34.2	18.3	13.4	11.1	7.9	22.0
Survanta	16.4	16.4	15.6	14.9	10.4	7.8	8.1	3.8	9.3
SurvCuro	0.0	0.5	0.5	0.2	0.1	0.4	0.3	0.3	0.3
Any combination	8.2	3.8	4.7	2.6	1.0	0.8	0.5	0.3	1.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Not stated data are excluded from per cent calculations.*

## Type of assisted ventilation

Assisted ventilation requires specialised nursing, medical and paramedical care and utilises a large component of the available resources. Of the babies registered to the ANZNN in 2007, 92.8% required assisted ventilation for four or more hours.

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. The 10-year trend (1998–2007) for assisted ventilation is represented in Figures 17 and 18 in Appendix 1.

In 2007, IPPV was given for a total of 595,203 hours to ANZNN registrants and CPAP was given for 1,497,277 hours. The total number of hours of ventilation equates to each baby receiving 11.8 days of assisted ventilation. The median number of days of assisted ventilation is inversely related to the gestational age at birth (Table 14).

The most common form of ventilation given to ANZNN registrants in 2007 remains CPAP with 43.5% of registrants receiving CPAP only, 14.3% receiving IPPV only and 33.8% receiving both CPAP and IPPV.

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 percentage of the babies who received IPPV. The use of HFOV had been relatively stable at 12–14% since 1999, but decreased slightly in 2007 with 11.2% of registrants who received IPPV also receiving HFOV. The use of HFOV among individual units can vary between 0.4% and 18.0% with the highest percentage of babies receiving HFOV born at 24–25 weeks gestation (32.5%) followed by babies less than 24 weeks (30.0%). The 10-year trend (1998–2007) for HFOV is represented in Figure 19 in Appendix 1.

**TABLE 14: Duration of assisted ventilation and oxygen use by level III registrants by gestational age group, 2007**

	Gestational age group							
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43
<b>IPPV (hours)</b>								
<b>Median</b>	407	342	72	36.5	26	31	42	51
<b>IQR</b>	55–836	87–726	21–282	17–92	13–64	15–73	19–79	23–99
<b>CPAP (hours)</b>								
<b>Median</b>	832	1076	816	191	55	28	24	18
<b>IQR</b>	245–1,420	678–1,362	405–1,137	66–503	20–219	3–167	11–61	8–44
<b>Oxygen (days)</b>								
<b>Median</b>	33	73	35	2	0	1	1	1
<b>IQR</b>	2–108	8–116	04–65	0–22	0–3	0–3	0–3	0–4

*Note: IQR= Interquartile range*

The percentage of ANZNN registrants who received nitric oxide (NO) was 4.6%. The use of NO continues to have a U-shaped distribution with the highest percentage of babies to receive NO born at term (16.5%) (Table 15). The 10-year trend (1998–2007) for NO is represented in Figure 20 in Appendix 1.

**TABLE 15: Assisted ventilation for level III registrants by gestational age group, 2007**

Ventilation type	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
CPAP	29	327	622	884	1,040	1,020	1,059	1,207	6,188
IPPV	60	369	548	524	442	341	487	1,077	3,848
Oxygen	24	144	214	226	232	209	286	485	1,820
HFOV	18	120	91	42	26	13	29	92	431
NO	7	47	37	29	16	18	34	178	366
ECMO	0	0	0	0	0	1	0	5	6
Total in each age group	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
CPAP	47.5	83.2	95.0	93.5	75.1	81.9	79.1	61.0	77.3
IPPV	98.4	93.9	83.7	55.4	31.9	27.4	36.4	54.4	48.1
Oxygen	39.3	36.6	32.7	23.9	16.8	16.8	21.4	24.5	22.7
Per cent of babies given IPPV									
HFOV	30.0	32.5	16.6	8.0	5.9	3.8	6.0	8.5	11.2
NO	11.7	12.7	6.8	5.5	3.6	5.3	7.0	16.5	9.5
ECMO	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.5	0.2

*Note: Groups are not mutually exclusive. Percentage of babies given HFOV and NO are given as a percentage of babies given IPPV.*

## 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. Among the 3,439 babies born before 32 weeks gestation, 90.2% were given assisted ventilation in the form of IPPV or CPAP. For registrants in this age group CPAP was the only form of ventilation for 37.3% and IPPV was the only form of ventilation for 6.4% of registrants. Both IPPV and CPAP were given to 56.2% of registrants.

The total duration of IPPV for these very preterm babies was 397,095 hours or 16,546 days, and the duration of CPAP was 1,310,395 hours or 54,599 days.

Of the babies born before 32 weeks gestational age and given IPPV in 2007, 15.3% were given high frequency ventilation while 6.8 % of these babies were given NO. (Table 15)

Among 2007 ANZNN registrants born at less than 32 weeks gestation 36.1% of registrants received supplemental oxygen at 28 days of age, with 13.4% of them discharged on home oxygen (Table 16).

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

Among the babies born at 32–36 weeks gestation, 77.7% received assisted ventilation (Table 15). Hyaline membrane disease was the main reason for ventilation. Total duration of CPAP use by registrants in this gestational age group was 125,916 hours (5,247 days) and IPPV use was 70,816 hours (2,951 days).

Of the babies born at 32–36 weeks gestation and given IPPV in 2007, 5.1% were given high frequency ventilation while 4.1 % of these babies were given NO. Supplementary oxygen was given to 21.9% of registrants (Table 15).

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

The main indication for respiratory support in term babies was non-specific respiratory distress (23.8%). This group required 127,292 hours of IPPV (5,304 days) and 50,275 hours (2,095 days) of CPAP.

Of the babies born at term and given IPPV in 2007, 8.5% were given high frequency ventilation while 16.5 % of these babies were given NO. There were five babies born at term who received extracorporeal membrane oxygenation (ECMO) (Table 15).

## **Supplemental oxygen (O<sub>2</sub>) therapy**

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 commonly require long-term oxygen administration as part of their specialised care. The duration of supplemental oxygen use may vary between babies, from as little as a few hours to several weeks or months. For the ANZNN audit, four consecutive hours in any single 24-hour period constitutes the use of supplemental oxygen on that day. The continued use of oxygen at 28 days of age is a predictor of postneonatal mortality and the need for continued oxygen therapy after discharge.

Among 2007 ANZNN registrants, 20.1% received supplemental oxygen on day 28, a higher percentage than in 2006 (12.6%), and 17.7% of registrants given oxygen on day 28 were discharged on home oxygen (Table 16).

**TABLE 16: Supplemental oxygen therapy for level III registrants by gestational age group, 2007**

Oxygen therapy	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
No oxygen on day 28	5	51	218	661	1,250	1,178	1,254	1,763	6,380
Oxygen on day 28	56	339	434	281	131	67	83	210	1,601
▪ survived to discharge home	20	246	378	237	102	38	37	60	1,118
▪ died before discharge	36	93	56	44	29	29	46	150	483
Not stated	0	3	3	3	4	1	2	5	21
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Number									
Babies given home oxygen	11	62	57	25	11	8	9	15	198
Per cent									
No oxygen on day 28	8.2	13.1	33.4	70.2	90.5	94.6	93.8	89.4	79.9
Oxygen on day 28	91.8	86.9	66.6	29.8	9.5	5.4	6.2	10.6	20.1
▪ survived to discharge home	35.7	72.6	87.1	84.3	77.9	56.7	44.6	28.6	69.8
▪ died before discharge	64.3	27.4	12.9	15.7	22.1	43.3	55.4	71.4	30.2
Per cent									
Babies given home oxygen	55.0	25.2	15.1	10.5	10.8	21.1	24.3	25.0	17.7

**Note:** Not stated data are excluded from per cent calculations.

## 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 (PMA). (Post menstrual age is calculated by adding the baby's age in weeks to the gestational age at birth in weeks.) For ANZNN registrants 7.3% of babies in 2007 were reported to have had respiratory support at 36 weeks PMA, indicating the presence of CLD. The highest percentage of chronic lung disease was in the 24–25 weeks gestation group with almost half (46.6%) reported as having CLD (Table 17). Not all the babies born at earlier gestations survived to 36 weeks PMA. CLD by gestational age is represented by Figure 21 in Appendix 1.

**TABLE 17: Chronic lung disease for level III registrants by gestational age group, 2007**

Chronic lung disease (CLD)	Gestational age group										Total
	<24	24	25	26	27	28	29	30	31	≥32	
	Number										
No CLD	44	89	121	185	265	381	445	572	752	4,563	7,417
CLD	17	92	91	111	94	74	45	35	26	0	585
▪ CLD and survived	17	82	88	106	86	68	43	34	25	0	549
▪ CLD and died	0	10	3	5	8	6	2	1	1	0	36
Total	61	181	212	296	359	455	490	607	778	4,563	8,002
Per cent											
No CLD	72.1	49.2	57.1	62.5	73.8	83.7	90.8	94.2	96.7	100.0	92.7
CLD	27.9	50.8	42.9	37.5	26.2	16.3	9.2	5.8	3.3	0.0	7.3
▪ CLD and survived	100.0	89.1	96.7	95.5	91.5	91.9	95.6	97.1	96.2	0.0	93.8
▪ CLD and died	0.0	10.9	3.3	4.5	8.5	8.1	4.4	2.9	3.8	0.0	6.2

*Note: Not stated data are excluded from per cent calculations. Survival is assessed to discharge from hospital.*

## Pulmonary air leak

A pulmonary air leak is a collection of air in the space around the lungs which can cause difficulty in breathing. There are several types of pulmonary air leak and while some produce only minor symptoms a number of them require treatment by the insertion of a drainage tube. For the purposes of this report the presence of any form of air leak that required drainage (either transient or continuous drainage) is reported for ANZNN registrants (Table 18). Caution is advised when using these data as information about the presence of an air leak is missing for most registrants.

**TABLE 18: Pulmonary air leak for level III registrants by gestational age group, 2007**

	Gestational age group								
Air leak	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
Air leak	9	24	28	33	25	28	57	118	322
No air leak	6	55	108	168	304	255	267	169	1,332
Not stated	46	314	519	744	1,056	963	1,015	1,691	6,348
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
Air leak	60.0	30.4	20.6	16.4	7.6	9.9	17.6	41.1	19.5
No air leak	40.0	69.6	79.4	83.6	92.4	90.1	82.4	58.9	80.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Not stated data are excluded from per cent calculations.*



## 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 where the initial symptoms occurred within the first 48 hours after birth that is, in babies aged from 0 to 47 hours. Late onset sepsis is the presence of at least one episode of systemic sepsis with the initial symptoms occurring among babies aged 48 or more hours. Episodes of sepsis involving the same organism separated by at least 14 days are considered to be new episodes of infection. Symptomatic, blood culture positive septicaemia was reported in 8.7% of ANZNN registrants in 2007. Of these babies, 46.8% were born at less than 28 weeks gestation, 78.1% were born at less than 32 weeks gestation and 95.2% of registrants survived up to 2 days of life (Table 19).

The 5-year trends (2003–2007) for early and late sepsis are represented by Figures 24 and 25 respectively in Appendix 1.

**TABLE 19: Neonatal sepsis for level III registrants by gestational age group, 2007**

Neonatal Sepsis	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
No sepsis	44	246	491	810	1,301	1,207	1,297	1,906	7,302
Sepsis	17	147	164	135	84	39	42	72	700
▪ <48 hrs	2	8	7	14	13	7	4	17	72
▪ ≥48 hrs	14	135	153	120	71	30	35	50	608
▪ all sepsis	1	4	4	1	0	2	3	5	20
Babies alive on day 2	34	317	611	911	1,362	1,224	1,304	1,857	7,620
Babies who did not survive to day 2	27	76	44	34	23	22	35	121	382
<b>Total in each age group</b>	<b>61</b>	<b>393</b>	<b>655</b>	<b>945</b>	<b>1,385</b>	<b>1,246</b>	<b>1,339</b>	<b>1,978</b>	<b>8,002</b>
Per cent									
No sepsis <sup>(a)</sup>	72.1	62.6	75	85.7	93.9	96.9	96.9	96.4	91.3
Sepsis									
▪ <48 hrs <sup>(a)</sup>	4.9	3.1	1.7	1.6	0.9	0.7	0.5	1.1	1.1
▪ ≥48 hrs <sup>(b)</sup>	44.1	43.8	25.7	13.3	5.2	2.6	2.9	3.0	8.2
▪ all sepsis <sup>(a)</sup>	27.9	37.4	25.0	14.3	6.1	3.1	3.1	3.6	8.7

(a) Denominator is all registrants.

(b) Denominator is registrants alive at 48 hours.

**Note:** Denominator for these calculations are all ANZNN registrants.

## Retinopathy of prematurity

The classification of retinopathy of prematurity (ROP) for ANZNN registrants are those recommended by the Committee for the Classification of Retinopathy of Prematurity (1984). The examination criteria for ROP vary between units within ANZNN. As in previous reports, the prevalence of ROP screening in 2007 was assessed among registrants with a gestational age of less than 31 weeks and/or a birthweight of less than 1,250 grams. Among the 2007 registrants, 33.3% were eligible for ROP examination and of these eligible registrants, 80.9% were examined and had the results of their eye examination recorded.

Of those ANZNN registrants who were eligible for an eye examination, 179 died before their ROP status could be determined. Of those examined, 7.2% had stage 3 or 4 eye disease and of these babies 64.5% received treatment (Table 20). The 2007 data for stages 3 and 4 ROP and treatment are represented by Figure 22 in Appendix 1.

**TABLE 20: Retinopathy of prematurity for level III registrants by gestational age, 2007**

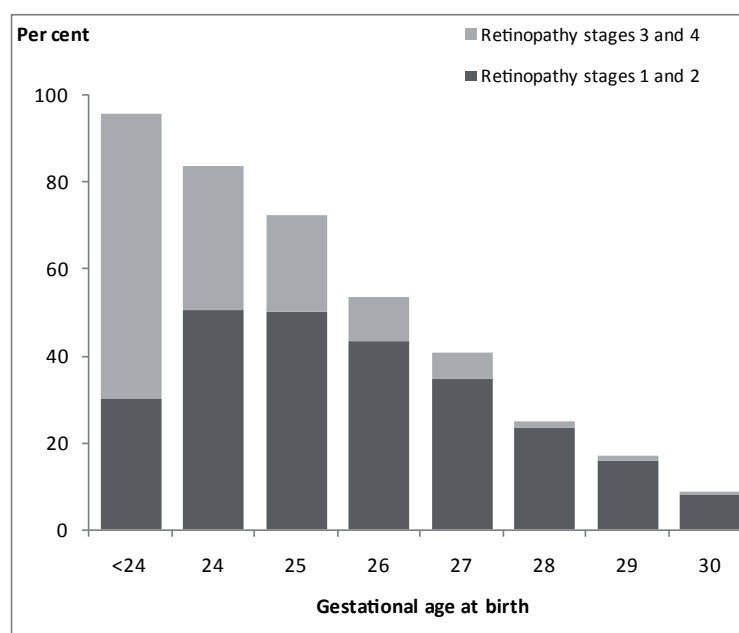
Retinopathy of prematurity (ROP)	Gestational age								Total
	<24	24	25	26	27	28	29	30	
	Number								
No ROP	3	22	48	121	194	303	357	366	1,414
▪ Stage 1 ROP	3	26	32	53	54	52	39	21	280
▪ Stage 2 ROP	4	41	55	60	58	42	29	12	301
▪ Stage 3 ROP	15	42	39	28	20	6	4	2	156
▪ Stage 4 ROP	0	0	0	0	0	0	1	0	1
Not examined	34	45	36	34	30	47	55	187	468
Not stated	2	5	2	0	3	5	5	19	41
<b>Total</b>	<b>61</b>	<b>181</b>	<b>212</b>	<b>296</b>	<b>359</b>	<b>455</b>	<b>490</b>	<b>607</b>	<b>2661</b>
Number									
Treatment for ROP <sup>(a)</sup>	5	18	21	13	6	10	2	3	78
Per cent									
No ROP	12.0	16.8	27.6	46.2	59.5	75.2	83.0	91.3	65.7
▪ Stage 1 ROP	12.0	19.8	18.4	20.2	16.6	12.9	9.1	5.2	13.0
▪ Stage 2 ROP	16.0	31.3	31.6	22.9	17.8	10.4	6.7	3.0	14.0
▪ Stage 3 ROP	60.0	32.1	22.4	10.7	6.1	1.5	0.9	0.5	7.2
▪ Stage 4 ROP	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Per cent									
Treatment for ROP	33.3	42.9	53.8	46.4	30.0	166.7 <sup>(b)</sup>	40.0	150.0 <sup>(b)</sup>	49.7

*(a) Percentages for babies with retinopathy of prematurity who received treatment have been calculated using as the denominator the total number in each age group who had stages 3 and 4 ROP.*

*(b) Some babies had more than one treatment for ROP.*

**Note:** Not stated data are excluded from per cent calculations.

**FIGURE 6: Retinopathy of prematurity for level III registrants by gestational age in 2007**



## Intraventricular haemorrhage

An initial head ultrasound is generally performed during the first week of life to detect signs of intraventricular haemorrhage (IVH) which is graded according to an internationally recognised method in which severity increases with higher grade (Papile et al. 1978).

There were 3,439 babies born at less than 32 weeks gestation who were eligible for a cerebral ultrasound with 92.4% having an examination recorded. A normal report was recorded for 77.0% of these 2007 ANZNN registrants.

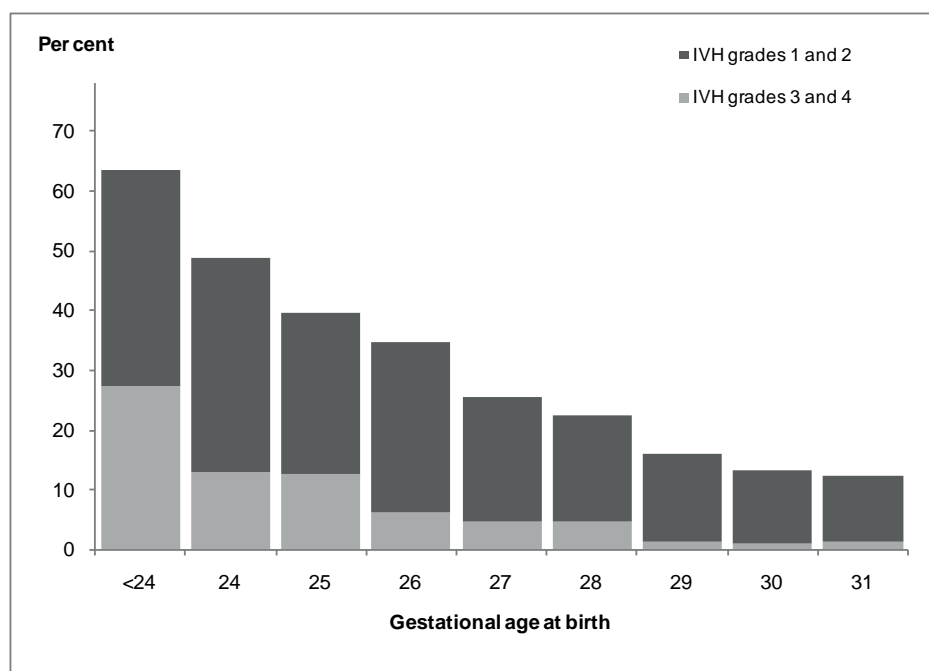
There were 158 babies reported to have grade 3 or 4 IVH representing 4.6% of the babies born before 32 weeks gestation. The percentage of babies with significant haemorrhage increases as gestational age decreases (Table 21, Figure 7). The highest percentage of babies who had severe IVH (grade 4) were born before 29 weeks gestational age, with the majority (50.5%) of the babies born between 24 and 26 weeks gestation. The 10-year trend (1998–2007) for registrants with grades 3 and 4 IVH who survived to day 3 is represented in Figure 23 in Appendix 1.

**TABLE 21: Intraventricular haemorrhage for level III registrants born before 32 weeks by gestational age, 2007**

Intraventricular Haemorrhage (IVH)	Gestational age									Total
	<24	24	25	26	27	28	29	30	31	
Number										
No IVH	17	86	122	185	258	342	397	476	557	2,440
▪ Grade 1 IVH	12	28	29	46	42	67	54	58	59	395
▪ Grade 2 IVH	5	31	25	36	32	11	15	9	10	174
▪ Grade 3 IVH	7	7	7	8	3	10	2	2	3	49
▪ Grade 4 IVH	13	21	22	12	14	12	5	4	6	109
Not examined	6	7	5	8	10	12	16	57	143	264
Not stated	1	1	2	1	0	1	1	1	0	8
Total	61	181	212	296	359	455	490	607	778	3,439
Per cent										
No IVH	31.5	49.7	59.5	64.5	73.9	77.4	83.9	86.7	87.7	77.0
▪ Grade 1 IVH	22.2	16.2	14.1	16.0	12.0	15.2	11.4	10.6	9.3	12.5
▪ Grade 2 IVH	9.3	17.9	12.2	12.5	9.2	2.5	3.2	1.6	1.6	5.5
▪ Grade 3 IVH	13.0	4.0	3.4	2.8	0.9	2.3	0.4	0.4	0.5	1.5
▪ Grade 4 IVH	24.1	12.1	10.7	4.2	4.0	2.7	1.1	0.7	0.9	3.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Not stated data are excluded from per cent calculations.*

**FIGURE 7: Intraventricular haemorrhage in level III registrants born at less than 32 weeks gestation and survived to day 3, by gestational age 2007**



## Late cerebral ultrasound

Late cerebral ultrasound data are based on changes seen in brain tissue at the cerebral ultrasound scan nearest to six weeks of age. As noted above there were 3,439 babies born at less than 32 weeks gestation eligible for a cerebral ultrasound, 3,351 survived until day 3 and late ultrasound results were available for 2,208 of these babies. A normal report of no cysts was recorded for 96.9% of these registrants, 0.9% reported porencephalic cysts, 2.0% reported periventricular leukomalacia (PVL) and 0.1% reported encephaloclastic porencephaly. Hydrocephalus was reported for 1.2% of these registrants in 2007 (Table 22).

**TABLE 22: Late cerebral ultrasound results for level III registrants born before 32 weeks by gestational age, 2007**

Cerebral ultrasound results	Gestational age									Total
	<24	24	25	26	27	28	29	30	31	
	Number									
No cysts	28	114	141	202	248	335	332	359	383	2,142
Porencephalic cysts	0	2	3	3	2	2	5	1	1	19
Periventricular leukomalacia	1	3	4	5	9	5	7	6	5	44
Encephaloclastic porencephaly	1	0	0	0	2	0	0	0	0	3
Not stated	31	62	64	86	98	113	146	241	389	1,229
<b>Total</b>	<b>61</b>	<b>181</b>	<b>212</b>	<b>296</b>	<b>359</b>	<b>455</b>	<b>490</b>	<b>607</b>	<b>778</b>	<b>3,439</b>
Hydrocephalus	1	2	3	4	3	6	2	3	2	26
	Per cent									
No cysts	93.3	95.8	95.3	96.2	95.0	98.0	96.5	98.1	98.5	96.9
Porencephalic cysts	0.0	1.7	2.0	1.4	0.8	0.6	1.5	0.3	0.3	0.9
Periventricular leukomalacia	3.3	2.5	2.7	2.4	3.4	1.5	2.0	1.6	1.3	2.0
Encephaloclastic porencephaly	3.3	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Hydrocephalus	3.3	1.7	2.0	1.9	1.1	1.8	0.6	0.8	0.5	1.2

*Note: Not stated data are excluded from per cent calculations.*

## Necrotising enterocolitis

Necrotising enterocolitis (NEC) is a gastrointestinal disease affecting premature infants that can be life threatening and is a leading cause of mortality and morbidity among infants in NICUs. There is no definitive cause identified for NEC although infection, empirical use of antibiotics for more than five days and enteral feeding are thought to be involved. With an early diagnosis, NEC can be treated medically through cessation of feeds, use of parental nutrition and antibiotic treatment. If medical treatment is unsuccessful surgery may be required to remove the affected bowel.

For ANZNN registrants in 2007 the percentage of babies with confirmed NEC was 1.6%. Of these babies, 61.5% were born before 28 weeks gestation with 58.8% of them undergoing surgery, and 38.5% were born after 27 weeks gestation; surgery was required for 26.9% of them. In total 39 registrants died from NEC. The number of registrants with confirmed NEC is less than in 2006 (Table 23).

**TABLE 23: Necrotising enterocolitis in level III registrants by year of birth, 1998–2007**

Gestational age group	Year of birth									
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number										
NEC at <28 weeks	74	56	68	78	75	78	85	85	95	80
▪ No NEC at <28 weeks	928	989	1,028	952	1,042	943	941	951	944	1,005
▪ Not stated	0	3	1	1	0	2	0	0	20	24
NEC at ≥28 weeks	72	55	57	57	65	77	63	50	72	50
▪ No NEC at ≥28 weeks	5,257	5,776	5,682	5,718	5,861	6,091	6,316	6,560	6,428	6,773
▪ Not stated	156	7	4	5	2	4	2	0	32	70
<b>Total</b>	<b>6,487</b>	<b>6,886</b>	<b>6,840</b>	<b>6,811</b>	<b>7,045</b>	<b>7,195</b>	<b>7,407</b>	<b>7,646</b>	<b>7,591</b>	<b>8,002</b>
Per cent										
NEC <28 weeks	7.4	5.4	6.2	7.6	6.7	7.6	8.3	8.2	9.1	7.4
NEC ≥28 weeks	1.4	0.9	1.0	1.0	1.1	1.2	1.0	0.8	1.1	0.7

*Note: Not stated data are excluded from per cent calculations.*

## Neonatal surgery

The information given in this report includes the registrant's first admission to an NICU before discharge home after birth. Babies who were discharged home and re-admitted for surgery during the neonatal period are not included in this audit.

In 2007, there were 838 ANZNN registrants who had major surgery, of whom more than half (52.4%) were born at term. Of registrants born in a hospital, 69.6% were born in a hospital with tertiary care facilities. Of registrants who had major surgery, 71.7% also had a congenital anomaly present with 45.9% of these diagnosed during the antenatal period. 8.8% had surgery for proven NEC. The median length of stay (LOS) for survivors was 32 days (Table 24).

**TABLE 24: Characteristics of level III registrants who underwent surgery by gestational age group, 2007**

Characteristics	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
Number									
Male	4	50	36	30	16	17	69	258	480
Female	5	24	19	18	20	24	67	181	358
Congenital anomaly present	0	10	10	19	16	30	116	400	601
Congenital anomaly diagnosed antenatally	0	1	3	3	8	13	73	175	276
Proven NEC	4	22	15	11	4	3	6	9	74
Hospital of birth									
▪ Tertiary	6	64	46	39	29	35	99	265	583
▪ Non-tertiary	3	10	9	9	7	6	37	174	255
Median LOS for survivors	118.5	119	104	91	64	48	32	21	32
Died before discharge home	1	15	10	8	4	3	8	23	72
<b>Total</b>	<b>9</b>	<b>74</b>	<b>55</b>	<b>48</b>	<b>36</b>	<b>41</b>	<b>136</b>	<b>439</b>	<b>838</b>
Per cent									
Male	44.4	67.6	65.5	62.5	44.4	41.5	50.7	58.8	57.3
Female	55.6	32.4	34.5	37.5	55.6	58.5	49.3	41.2	42.7
Congenital anomaly present	0.0	13.5	18.2	39.6	44.4	73.2	85.3	91.1	71.7
Congenital anomaly diagnosed antenatally	0.0	1.4	5.5	6.3	22.2	31.7	53.7	39.9	32.9
Hospital of birth									
▪ Tertiary	66.7	86.5	83.6	81.3	80.6	85.4	72.8	60.4	69.6
▪ Non-tertiary	33.3	13.5	16.4	18.8	19.4	14.6	27.2	39.6	30.4
Proven NEC	44.4	29.7	27.3	22.9	11.1	7.3	4.4	2.1	8.8
Died before discharge home	11.1	20.3	18.2	16.7	11.1	7.3	5.9	5.2	8.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note: Not stated data are excluded from per cent calculations.*

## Congenital anomalies

In 2007, 1,139 ANZNN registrants (14.2%) had one or more congenital anomalies. For registrants who had a congenital anomaly, 17.6% were born before 32 weeks gestation, 27.2% were born between 32 and 36 weeks gestation and more than half of registrants (54.8%) were born at term.

Almost half of ANZNN registrants (45.0%) with congenital anomalies were diagnosed during the antenatal period with 10.7% of congenital anomalies recorded as fatal. A higher percentage of babies with congenital anomalies were male (57.3%).

## Transfer from level III NICUs to other units

Once intensive care is no longer required babies are often transferred to a level II unit, sometimes referred to as a 'special care baby unit', either within the same hospital or to another hospital for convalescence before discharge home. In 2007, more than one-third of ANZNN registrants (38.9%) were transferred from a level III unit to a level II unit before discharge home. Half of the registrants (50.5%) transferred from level III to level II units were born at less than 32 weeks gestation compared to 13.8% born at term.

Some level III registrants required transfer to a specialist children's hospital and in 2007 these accounted for 2.6% of transfers from level III units. Overall 55.3% of level III registrants were not transferred after registration (Table 25).

**TABLE 25: Transfer after registration of level III registrants by level of destination hospital and gestational age group, 2007**

Transfer status	Gestational age group							Total	
	<24	24–25	26–27	28–29	30–31	32–33	34–36		37–43
Number									
Not transferred	50	233	333	434	574	593	776	1,416	4,408
Level 3 hospital	3	34	36	40	41	38	20	41	253
Level 2 hospital	4	101	268	450	741	597	507	428	3,096
Children's hospital	4	22	15	14	15	10	35	93	208
Not stated	0	3	3	7	14	8	1	0	36
Total	61	393	655	945	1,385	1,246	1,339	1,978	8,002
Per cent									
Not transferred	82.0	59.7	51.1	46.3	41.9	47.9	58.0	71.6	55.3
Level 3 hospital	4.9	8.7	5.5	4.3	3.0	3.1	1.5	2.1	3.2
Level 2 hospital	6.6	25.9	41.1	48.0	54.0	48.2	37.9	21.6	38.9
Children's hospital	6.6	5.6	2.3	1.5	1.1	0.8	2.6	4.7	2.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Note: Not stated data are excluded from per cent calculations.*

## Length of stay until discharge home

Factors that influence a baby's length of stay (LOS) in hospital are gestational age, birthweight and plurality. Preterm and low birthweight babies require more intensive care, lengthening their hospital stay. Extremely preterm babies are usually discharged home by the time they reach 40 weeks corrected age.

In ANZNN the LOS includes all the time the baby spends in hospital from the first day of their first admission up until and including the day of their discharge home. The LOS has added together the time spent in all hospitals. It does not include the time spent in hospital in any subsequent admissions from home, nor does it include periods spent in 'Hospital in the Home' programs. Discharge information was available for 96.2% of ANZNN registrants in 2007. The median length of stay was 32 days with an interquartile range of 15–57 days (Table 26). LOS is inversely related to gestational age with the very preterm and extremely preterm babies having a longer stay in hospital than those babies born at or near term.

Babies born at less than 32 weeks gestation spent approximately 217,389 days in hospital, babies born between 32 and 36 weeks spent 68,206 days and babies born at term spent 33,943 days in hospital.



**TABLE 26: Median length of stay for level III registrants who survived until discharge home by gestational age, 2007**

<b>Gestational age</b>	<b>Number of babies</b>	<b>Median LOS (in days)</b>	<b>Interquartile range (in days)</b>
<24	25	133	125–168
24	120	121	111–145
25	177	105	94–121
26	265	90	78–109
27	331	80	70–92
28	426	67	60–78
29	472	56	49–67
30	588	48	41–56
31	764	38	32–46
32	682	32	26–38
33	534	26	19–32
34	559	19	14–28
35	373	15	10–21
36	359	11	7–20
37	357	12	7–21
38	462	11	6–20
39	323	10	5–19
40	401	9	5–17
41	234	8	5–15
42	43	6	4–11
43	3	9	3–19
<b>Total</b>	<b>8,002</b>	<b>32</b>	<b>15–57</b>

## Survival of the ANZNN registrants

In 2007, 93.7% of ANZNN registrants survived to go home. These data include babies who were transferred to level I or level II units, those transferred to another level III unit and those babies transferred to a children's hospital. The survival rate to discharge home as shown 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 babies not transferred to an NICU or children's hospital.

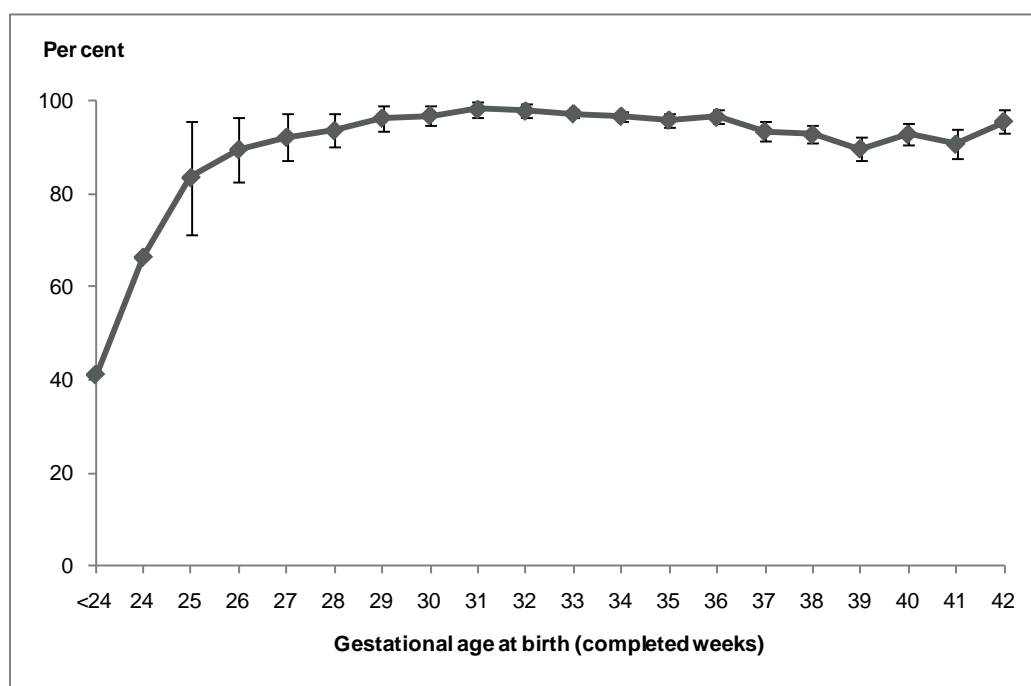
During 2007, there were 504 neonatal deaths, of which 240 occurred in the early neonatal period that is within seven days of birth (Table 27). Mortality was highest among babies born before 26 weeks gestation with a survival rate at discharge increasing week on week from 41% for babies born before 24 weeks to 92% for babies born at 27 weeks (Table 27 and Figure 8). A similar pattern of increasing survival with increasing birthweight is seen in Figure 9.

Lethal congenital anomaly was the cause of death for 1.5% of registrants, with most occurring in babies born between 37–39 weeks gestation (Table 27).

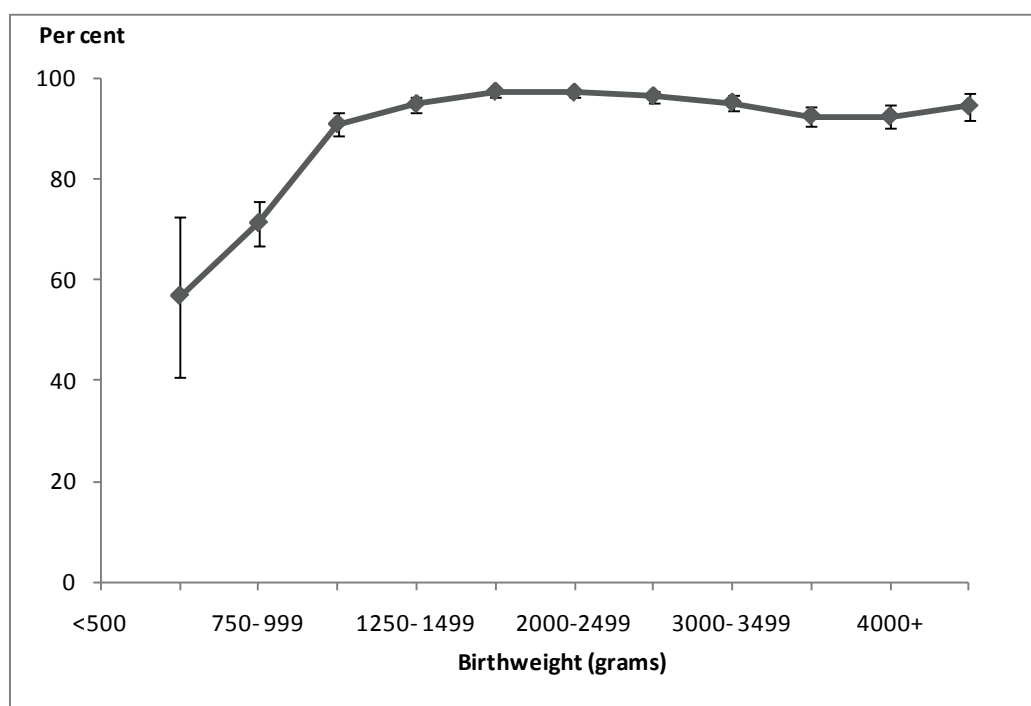
TABLE 27: Survival to discharge home for level III registrants by gestational age at birth, 2007

Gestational age (completed weeks)	Number of babies	Lethal congenital anomalies	Babies alive on day 7	Babies alive on day 28	Survived to go home	Per cent survival at discharge home
<24	61	0	39	32	25	41.0
24	181	1	156	140	120	66.3
25	212	1	191	181	177	83.5
26	296	4	278	273	265	89.5
27	359	3	351	343	331	92.2
28	455	1	443	439	426	93.6
29	490	4	483	476	472	96.3
30	607	4	599	594	588	96.7
31	778	4	773	769	764	98.2
32	697	4	691	686	682	97.8
33	549	5	541	540	534	97.3
34	578	11	569	564	559	96.7
35	389	8	382	377	373	92.3
36	372	8	366	361	359	96.5
37	382	15	370	362	357	93.5
38	498	16	487	474	462	92.8
39	360	21	344	330	323	89.7
40	432	7	408	403	401	92.8
41	258	5	243	239	234	90.7
42	45	1	45	43	43	95.6
43	3	0	3	3	3	100.0
<b>Total</b>	<b>8,002</b>	<b>123</b>	<b>7,762</b>	<b>7,212</b>	<b>7,498</b>	<b>93.7</b>

**FIGURE 8: Survival of level III registrants to discharge home (with 95% CI) by gestational age, 2007**



**FIGURE 9: Survival of level III registrants to discharge home (with 95% CI) by birthweight group , 2007**



## 5. Babies registered to level II units

### Overview

Nurseries with facilities to manage mild or moderately ill babies are known as 'level II units' or 'special care baby units'. 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 centre nurseries, or if they were transferred to a level III NICU after 28 days, or they were transferred to a level II nursery from a children's hospital without first having been admitted to a level III unit.

There are 14 level II units in New Zealand and 6 in Australia that are members of the ANZNN. Eighteen level II units contributed data for this report. The remaining two units had no eligible babies for inclusion in the 2007 audit.

In 2007, 464 babies fulfilled the ANZNN criteria and were registered to one of the 18 level II nurseries. Of those babies, 11.4% were born at less than 32 weeks gestation and 8.2% weighed less than 1,500 grams at birth (Tables 28 and 29). The highest number of babies registered to a level II unit in 2007 was 54.

**TABLE 28: Level II registrants born at each completed week of gestation, 2007**

Gestational age group	Number of babies	Per cent	Cumulative per cent
<29	18	3.9	3.9
30–31	35	7.5	11.4
<b>Babies &lt;32 weeks gestation</b>	<b>53</b>		
32–33	74	16.0	27.4
34–36	148	32.0	59.4
37–43	189	41.0	100.4
<b>Total</b>	<b>464</b>	<b>100.0</b>	

*Note: Gestational age groups below 29 weeks have been combined to maintain confidentiality of small numbers.*

**TABLE 29: Level II registrants by birthweight group, 2007**

Birthweight group (grams)	Number of babies	Per cent	Cumulative per cent
<1,250	16	3.5	3.5
1,250–1,499	22	4.7	8.2
<b>All babies &lt;1,500g birthweight</b>	<b>38</b>		
1,500–1,999	74	16.0	24.2
2,000–2,499	100	21.6	45.8
2,500–2,999	90	19.4	65.2
3,000–3,499	71	15.3	80.5
3,500–3,999	54	11.6	92.1
4,000+	37	8.0	100.1
<b>Total</b>	<b>464</b>	<b>100.0</b>	

*Note: Birthweight groups below 1,250g have been combined to maintain confidentiality of small numbers.*

More than half of the level II registrants, 289 babies (62.3%), were born to Caucasian mothers, 61.6% of which were born preterm. The number of registrants born to Maori mothers was 114 (24.6%), and 45 (39.5%) were born preterm. There were 16 babies (3.5%) born to Pacific Islander mothers.

There were 260 male (56.0%) and 185 female (39.9%) registrants in the audit. No gender was recorded for 19 registrants (4.1%). Non-specific respiratory distress was the major reason for assisted ventilation for level II registrants.

## Maternal, pregnancy and birth characteristics

Of the mothers of level II registrants, 31.1% did not present with any maternal complications. Among babies born before 37 weeks, 52.3% of mothers had presented with preterm labour (Table 30).

**TABLE 30: Mothers of level II registrants presenting antenatal problem by gestational age group, 2007**

Presenting antenatal problem	<29	30–31	32–33	34–36	37–43	Total
Number						
No antenatal problems	0	0	0	3	136	140
Pre-labour rupture of membranes	n.p.	11	5	21	n.p.	42
Preterm labour	12	18	38	76	4	148
Hypertension in pregnancy	n.p.	n.p.	9	14	n.p.	30
Antepartum haemorrhage	n.p.	2	8	6	n.p.	21
Intrauterine growth restriction	0	0	n.p.	9	n.p.	17
Fetal distress	0	n.p.	n.p.	6	22	32
Congenital anomalies & other problem	0	0	5	10	5	20
Not stated	1	0	2	3	8	14
<b>Total</b>	<b>18</b>	<b>35</b>	<b>74</b>	<b>148</b>	<b>188</b>	<b>464</b>
Per cent						
No antenatal problems	0.0	0.0	0.0	2.1	75.6	31.1
Pre-labour rupture of membranes	n.p.	31.4	6.9	14.5	n.p.	9.3
Preterm labour	70.6	51.4	52.8	52.4	2.2	32.9
Hypertension in pregnancy	n.p.	n.p.	12.5	9.7	n.p.	6.7
Antepartum haemorrhage	n.p.	5.7	11.1	4.1	n.p.	4.7
Intrauterine growth restriction	0.0	0.0	n.p.	6.2	n.p.	3.8
Fetal distress	0.0	n.p.	n.p.	4.1	12.2	7.1
Congenital anomalies & other problem	0.0	0.0	6.9	6.9	2.8	4.4
<b>Total</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>

*n.p.* Data not published to maintain confidentiality of small numbers.

**Note:** Not stated data are excluded from per cent calculations.

Previous preterm births were reported by 68 (14.7%) of the mothers of registrants and 13 mothers (2.8%) had had a previous perinatal death(s).

Most mothers (82.3%) of level II registrants had booked into a level II hospital for delivery. Of the level II registrants born before 34 weeks gestation, 102 were born at a level II hospital and 57.5% of these mothers were given antenatal corticosteroids within seven days of the birth (Table 31).

**TABLE 31: Antenatal corticosteroid use by mothers of level II registrants by gestational age group, 2007**

Antenatal corticosteroids	Gestational age group				Total
	<29	30–31	32–33	≥34	
	Number				
None	n.p.	n.p.	24	281	313
Incomplete course	10	15	18	8	51
Complete course	n.p.	13	16	n.p.	41
Completed >7days ago	n.p.	n.p.	9	n.p.	18
Not stated	3	2	7	29	41
<b>Total</b>	<b>18</b>	<b>35</b>	<b>74</b>	<b>336</b>	<b>464</b>
Per cent					
None	n.p.	n.p.	35.8	91.5	74
Incomplete course	66.7	45.5	26.9	n.p.	12.1
Complete course	n.p.	39.4	23.9	n.p.	9.7
Completed >7days ago	n.p.	n.p.	13.4	2.3	4.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*n.p.* Data not published to maintain confidentiality of small numbers.

**Note:** Not stated data are excluded from per cent calculations.

Vaginal delivery was the most common method of birth for 48.5% of level II registrants, followed by caesarean section (46.3%), with more than half of these occurring before the onset of labour (Table 32).

**TABLE 32: Method of delivery for level II registrants by gestational age group, 2007**

Method of delivery	<29	30–31	32–33	34–36	37–43	Total
	Number					Total
Vaginal <sup>(a)</sup>	11	17	32	73	112	245
Caesarean <sup>(b)</sup>	7	18	41	75	74	215
Not stated	0	0	1	0	4	5
<b>Total</b>	<b>18</b>	<b>35</b>	<b>74</b>	<b>148</b>	<b>189</b>	<b>464</b>
Per cent						Total
Vaginal	61.1	48.6	43.8	49.3	60.5	53.4
Caesarean	38.9	51.4	56.2	50.7	40.0	46.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*(a)* Vaginal and assisted births have been combined to maintain confidentiality of small numbers

*(b)* Caesarean section deliveries in labour and no labour have been combined to maintain confidentiality of small numbers

**Note:** Not stated data are excluded from per cent calculations.

## Characteristics of level II babies

Among the 464 babies registered to level II units, 54 were from multiple births (92.5%). There were 260 male births and 19 babies whose gender was not recorded.

A low Apgar score of less than 4 at one minute of age 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.

Non-specific respiratory distress (46.4%) was the major reason for assisted ventilation for level II registrants, followed by hyaline membrane disease (30.7%) (Table 33).

For level II registrants, the median duration of assisted ventilation by IPPV was 23 hours and 19 hours by CPAP. The median duration of oxygen was 2 days (Table 34).

**TABLE 33: Indication for respiratory support for level II registrants by gestational age group, 2007**

Indication for respiratory support	Gestational age group				Total
	<32	32–33	34–36	37–43	
	Number				
No support	12	n.p.	n.p.	n.p.	19
Non-specific distress	11	22	78	96	207
Hyaline membrane disease	26	46	53	12	137
Pneumonia	n.p.	n.p.	n.p.	10	15
Meconium aspiration	n.p.	n.p.	n.p.	29	31
Persistent pulmonary hypertension	0	0	0	8	8
Encephalopathy	0	0	0	12	12
Apnoea	0	n.p.	0	n.p.	2
Congenital malformation & other problems	n.p.	0	0	n.p.	13
Peri-surgery	0	0	0	0	0
Not stated	2	1	7	8	18
<b>Total</b>	<b>53</b>	<b>74</b>	<b>148</b>	<b>188</b>	<b>464</b>
Per cent					
No support	23.5	n.p.	n.p.	n.p.	4.3
Non-specific distress	21.6	30.1	55.3	53.3	46.4
Hyaline membrane disease	51.0	63.0	37.6	6.7	30.7
Pneumonia	n.p.	n.p.	n.p.	5.6	3.4
Meconium aspiration	n.p.	n.p.	n.p.	16.1	7.0
Persistent pulmonary hypertension	0.0	0.0	0.0	4.4	1.8
Encephalopathy	0.0	0.0	0.0	6.7	2.7
Apnoea	0.0	n.p.	0.0	n.p.	0.4
Congenital malformation & other problems	n.p.	0.0	0.0	n.p.	2.9
Peri-surgery	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*n.p.* Data not published to maintain confidentiality of small numbers.

**Note:** Not stated data are excluded from per cent calculations.

TABLE 34: Duration of assisted ventilation and oxygen use by level II registrants by gestational age group, 2007

Median & IQR	Gestational age group						Total
	<28	28–29	30–31	32–33	34–36	37–43	
IPPV (hours)							
Median	3	15	45	15	80	44	23
IQR	3–8	14–37	26–81	13–17	1–885	3–82	5–61
CPAP (hours)							
Median	29	68	22	34.5	22	13	19
IQR	29–29	32–194	10–67	15–68	10–67	8–27	9–51
Oxygen (days)							
Median	1	4	3	3	3	2	2
IQR	1–1	4–11	2–8	2–5	1–5	1–3	1–4

*Note: IQR = Interquartile range.*

## Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 47 of the 53 eligible babies born at less than 31 weeks gestational age and/or weighing less than 1,250 grams at birth. All were reported as normal except for one baby with a grade 1 ROP.

## Cerebral ultrasound

Of the 53 babies born at less than 32 weeks, 37 (69.8%) had a cerebral ultrasound in the first week after birth. Thirty-three of them were reported as normal, that is no intraventricular haemorrhage (IVH), three reported grade 1 IVH and one reported grade 2 IVH. Most babies who did not have an early cerebral ultrasound reported at this time were born at 30 or 31 weeks gestation. A late cerebral ultrasound was reported for 29 babies all of whom had normal reports.

## Other morbidities

Septicaemia was proven in 18 babies, including 12 before day two, that is less than 48 hours. 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 being discharged home. Three registrants died due to congenital anomalies.

## Level II transfers

In total 28 level II registrants were transferred to other units, 19 were transferred to a level I or II unit, 3 were transferred to a level III unit and the remaining 6 to a children's hospital.

## Survival

There were 447 level II registrants who survived to discharge home (96.3%). Five babies died within the first seven days of birth and a further 12 babies died before discharge home. Three babies were reported to have had lethal congenital anomalies (Table 35).



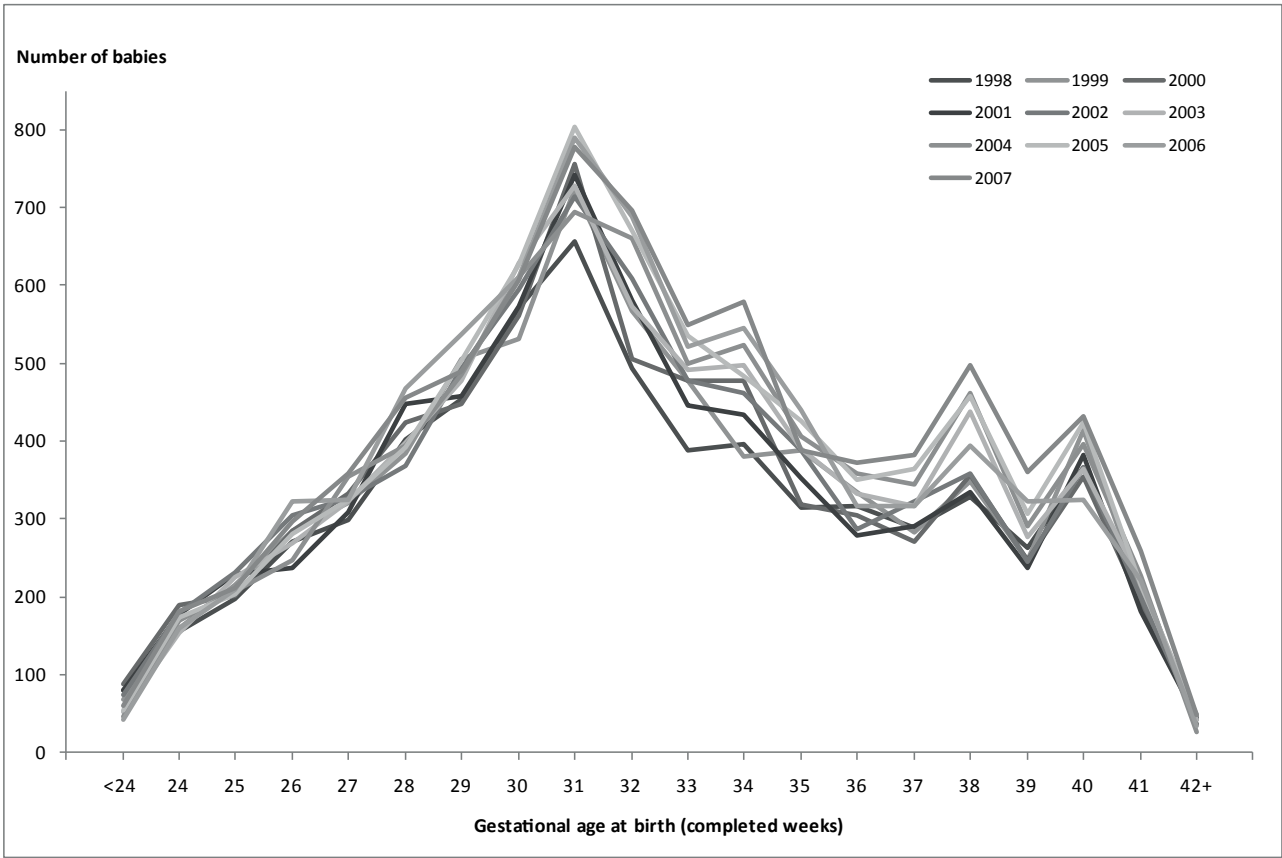
**TABLE 35: Survival to discharge home for level II registrants by gestational age group, 2007**

<b>Gestational age group</b>	<b>All babies</b>	<b>Lethal congenital anomalies</b>	<b>Babies alive on day 7</b>	<b>Babies alive on day 28</b>	<b>Survived to go home</b>	<b>Per cent</b>
<29	18	0	16	16	14	77.8
30-31	35	0	35	35	31	88.6
32-33	74	0	74	74	72	97.3
34-36	148	1	148	148	145	98.0
37-43	188	2	186	186	184	97.9
<b>All babies</b>	<b>464</b>	<b>3</b>	<b>459</b>	<b>459</b>	<b>447</b>	<b>96.3</b>

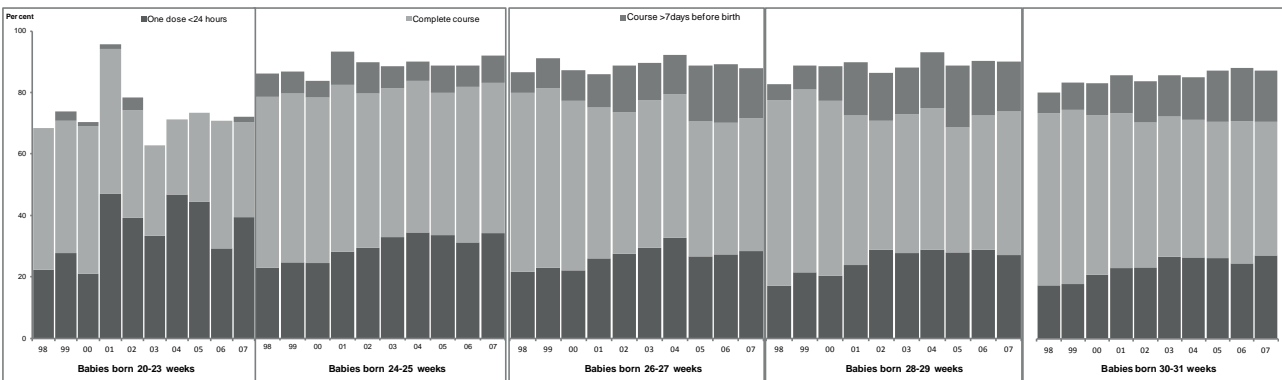
*Note: Gestational age groups below 29 weeks have been combined to maintain confidentiality of small numbers.*

# Appendix 1: Trends

**FIGURE 10: Trends in gestational age at birth of level III registrants, 1998–2007**

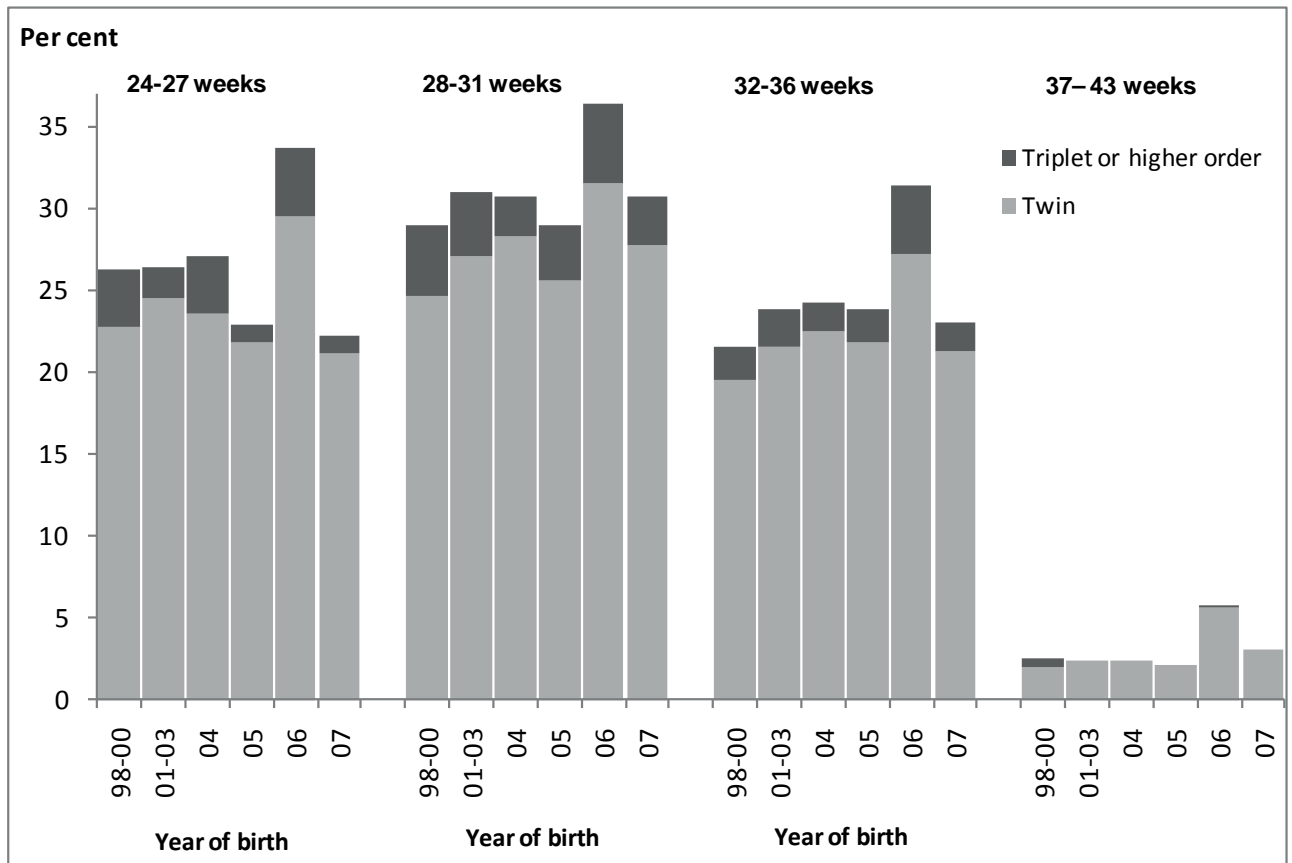


**FIGURE 11: Trends in the use of corticosteroids for mothers of babies less than 32 weeks gestation, 1998–2007**

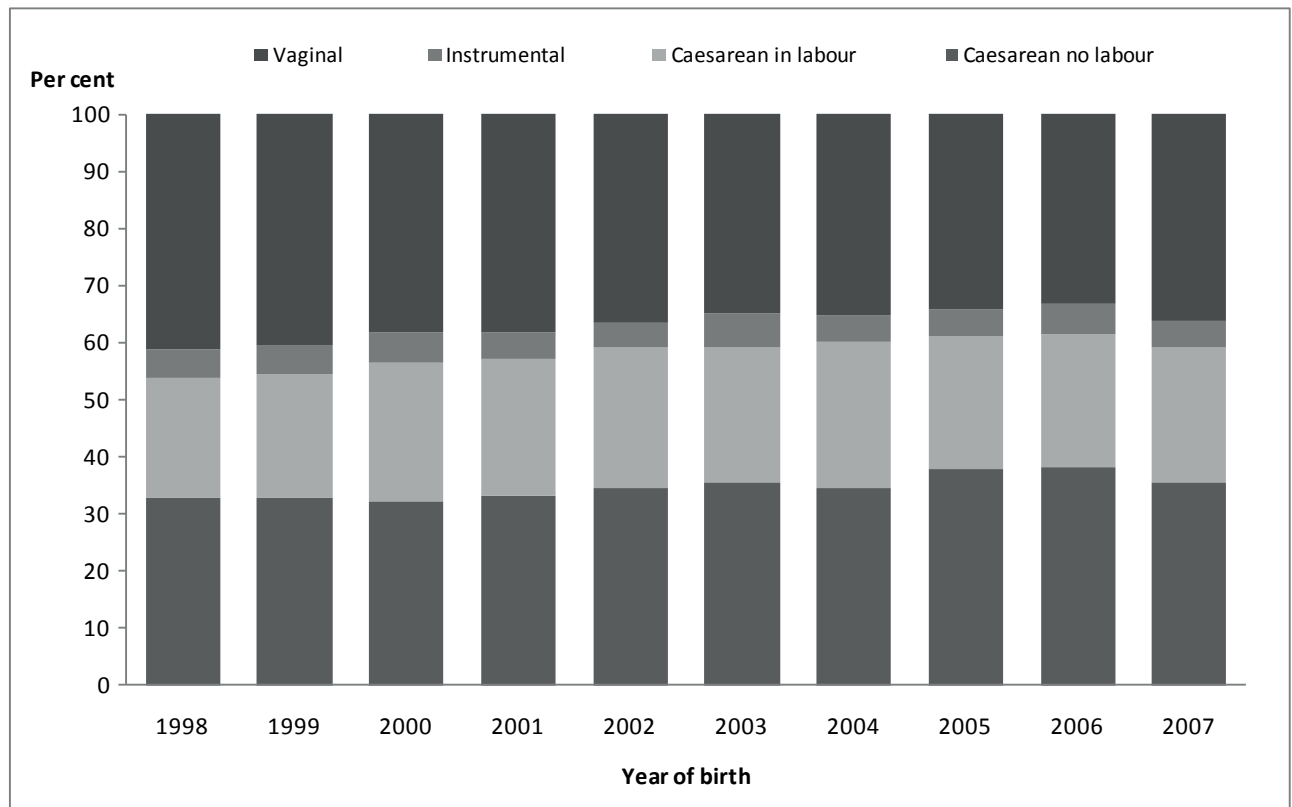


**Note:** Corticosteroid treatment to enhance fetal lung maturation is considered ‘complete’ when two doses are given, the first dose more than 24 hours and less than 8 days before the baby’s birth. Stacked bars represent annual cumulative percentages.

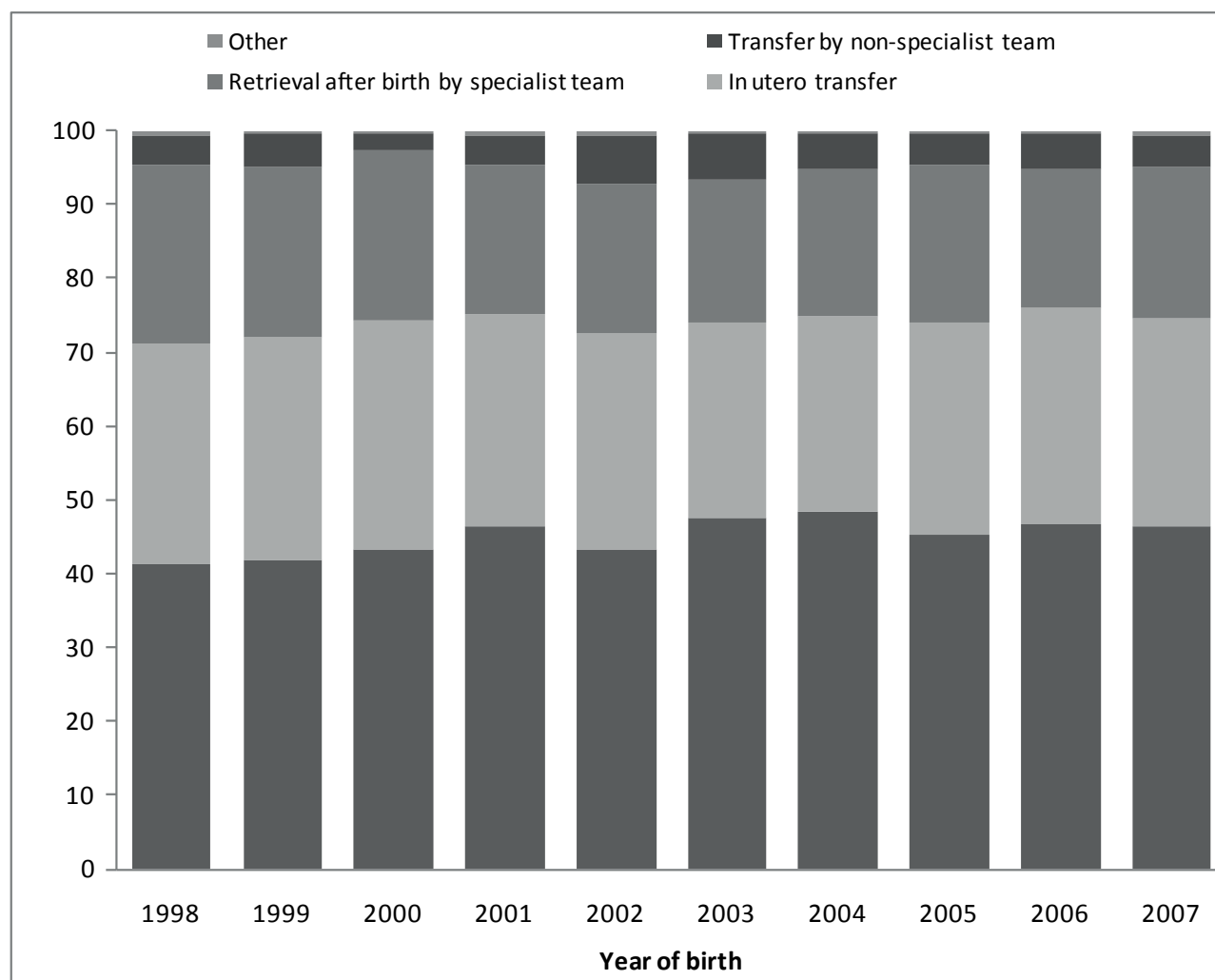
**FIGURE 12: Trends in multiple births of level III registrants by gestational age group, 1998–2007**



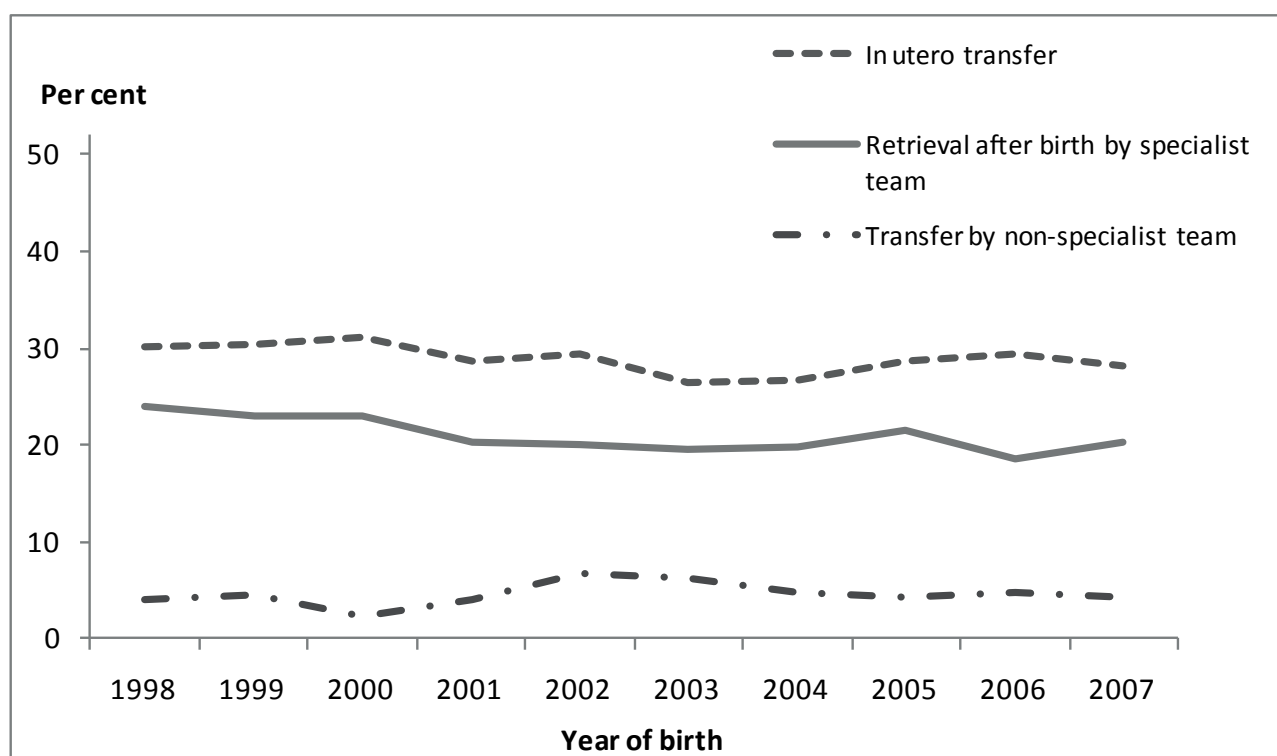
**FIGURE 13: Trends in method of birth for level III registrants by year of birth, 1998–2007**



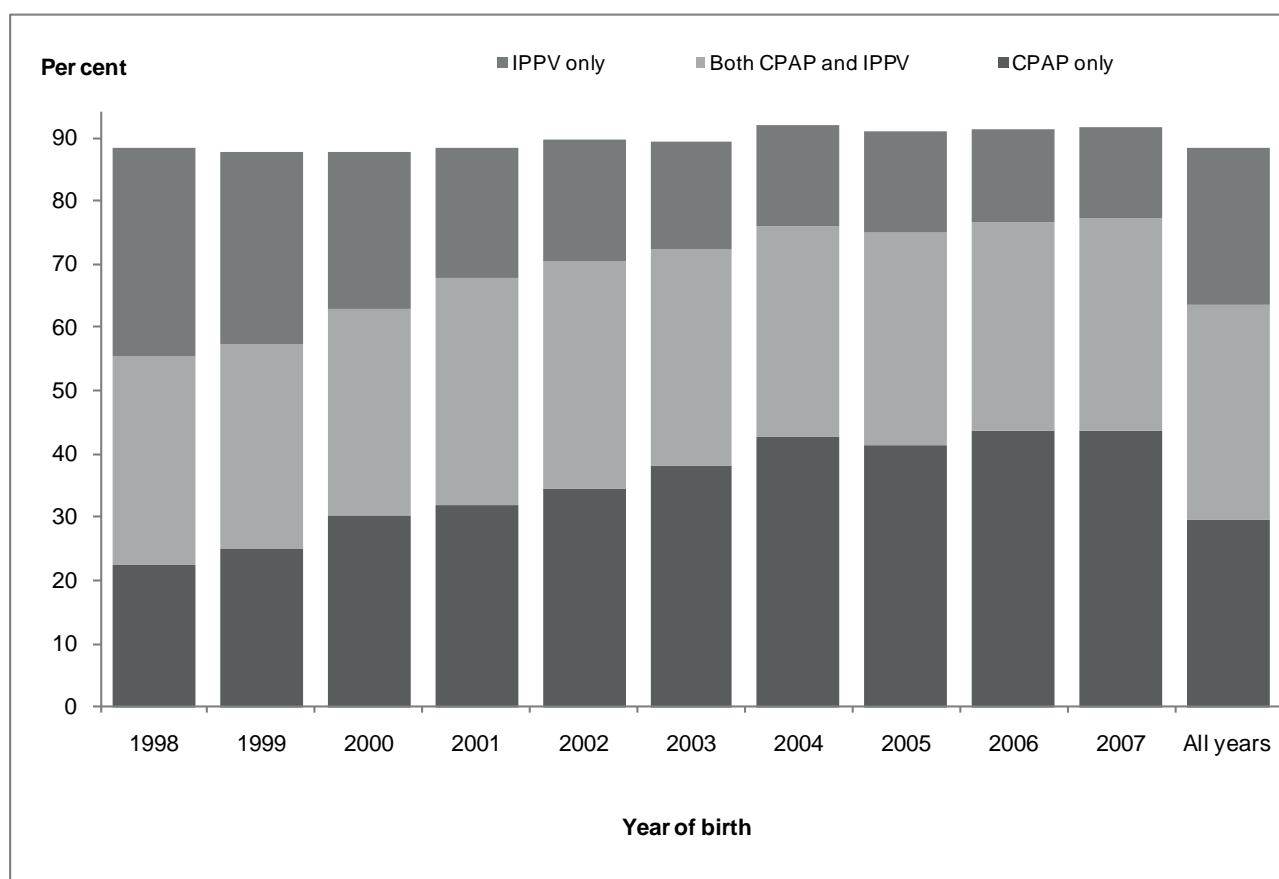
**FIGURE 14: Trends in referral source to level III NICU by year of birth, 1998–2007**



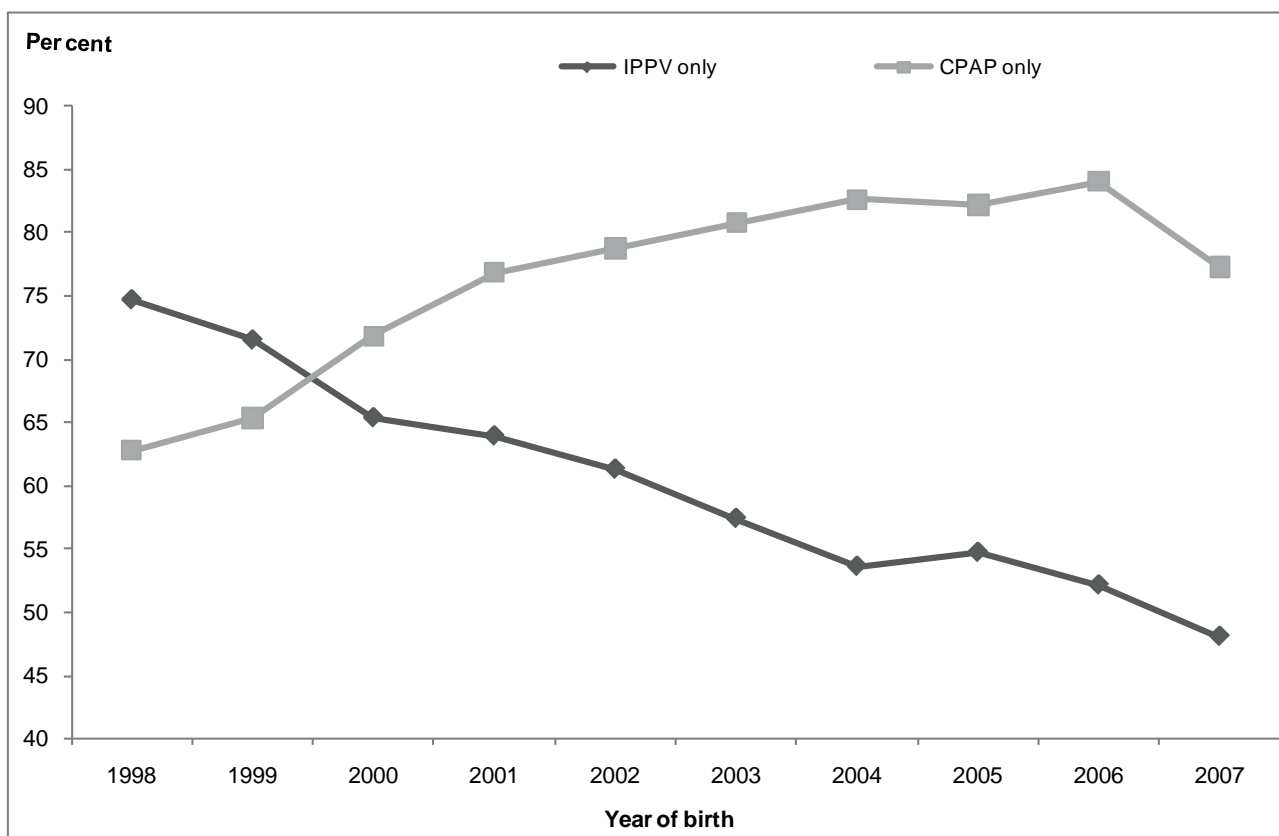
**FIGURE 15: Trends in mode of transport to level III NICU, 1998–2007**



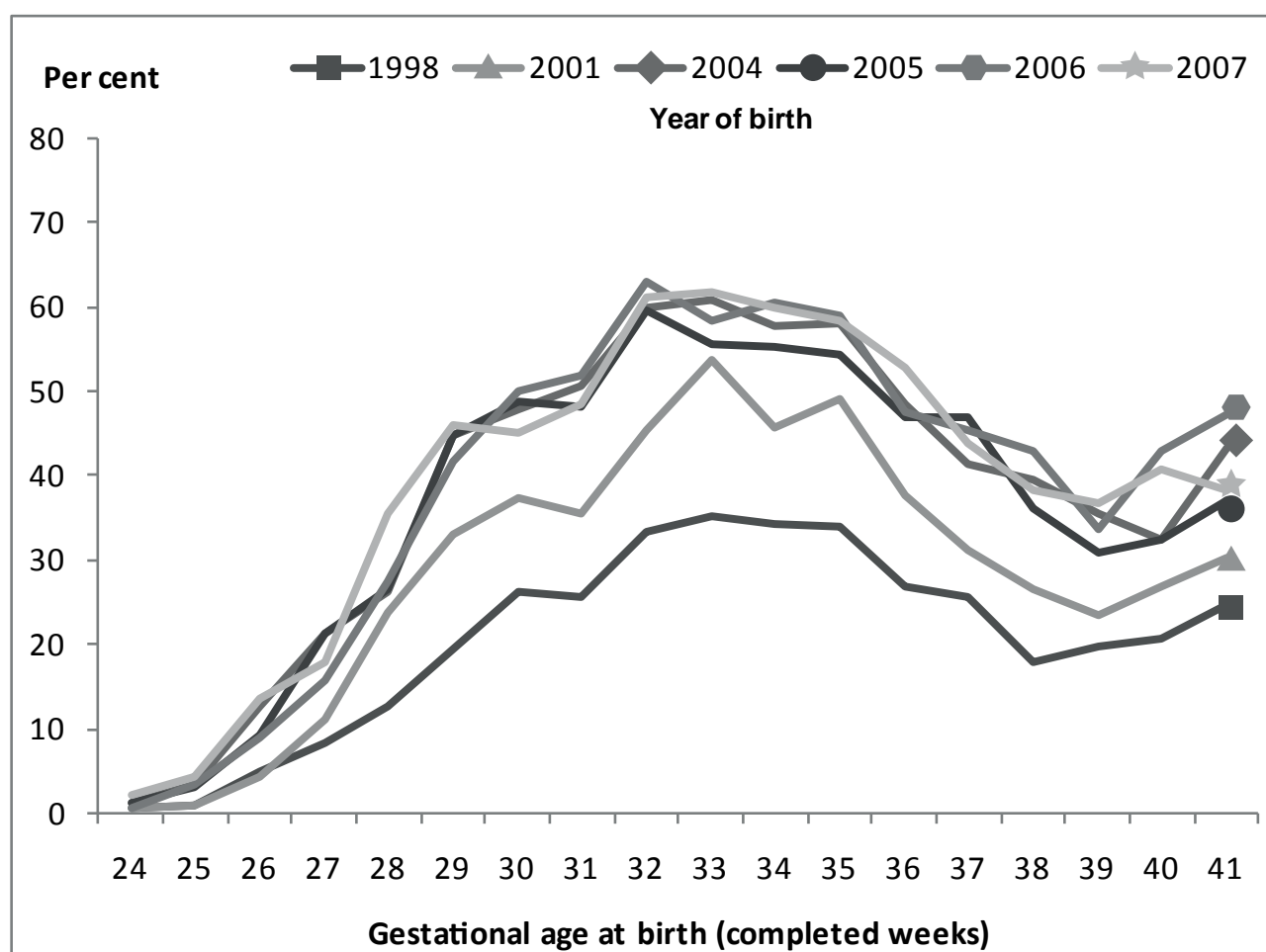
**FIGURE 16: Trends in mode of assisted ventilation for level III registrants, 1998–2007**



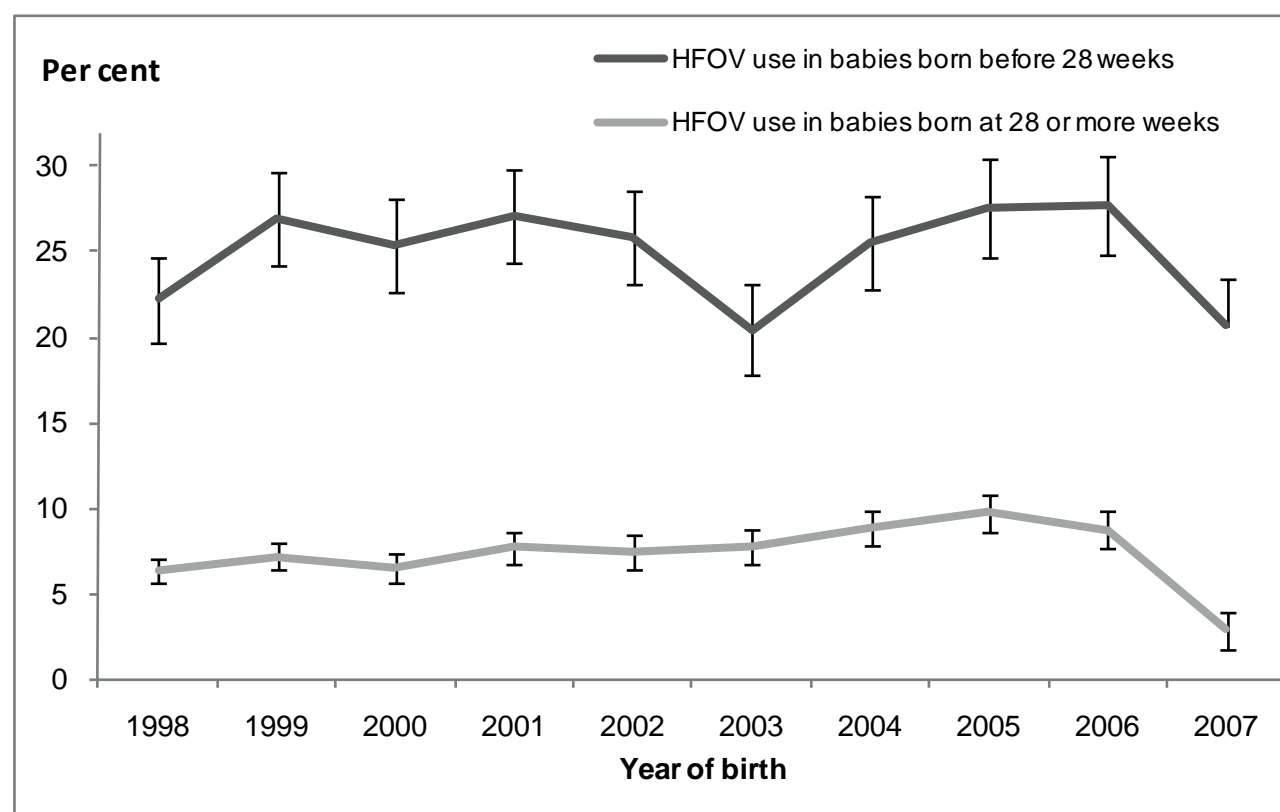
**FIGURE 17: Trends in provision of intermittent positive pressure ventilation and continuous positive pressure ventilation by year of birth for level III registrants ventilated, 1998–2007**



**FIGURE 18: Trends in the use of CPAP as the only form of ventilation by gestational age for level III registrants, 1998, 2001, 2004–2007**

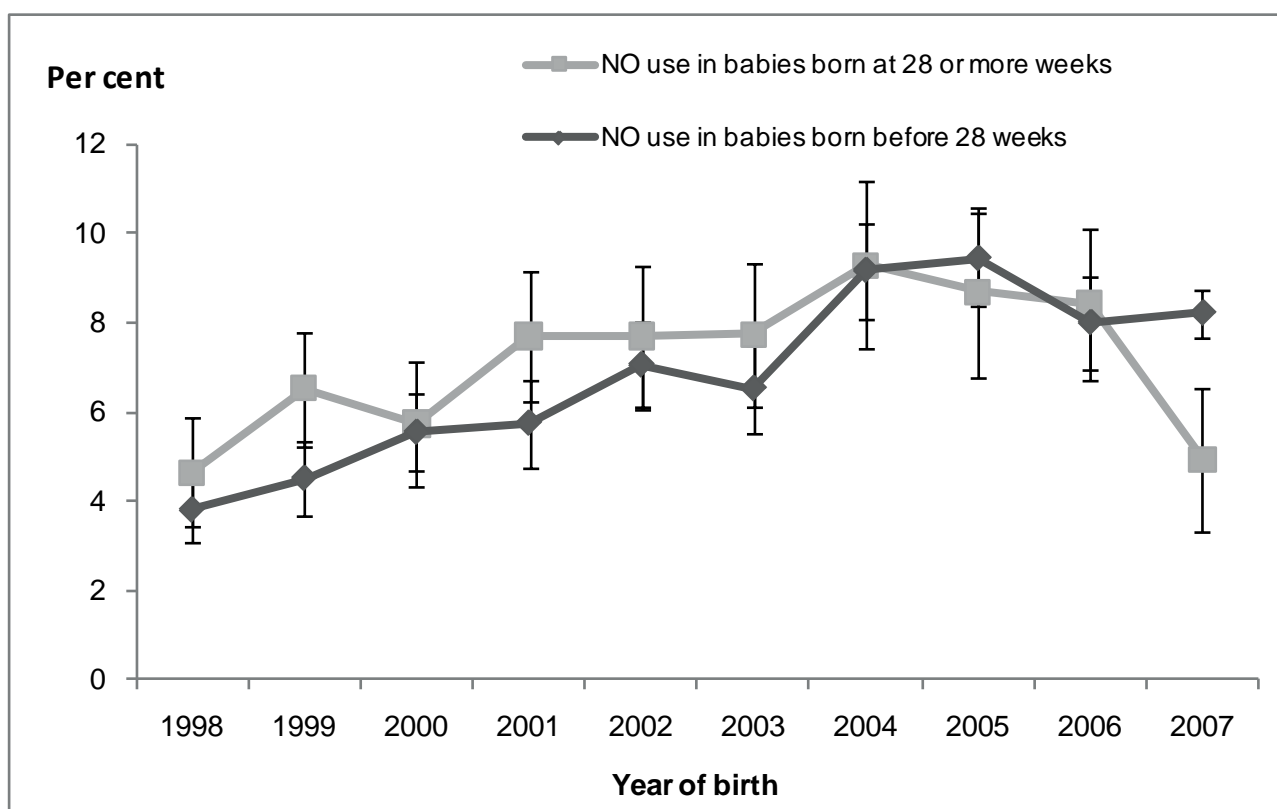


**FIGURE 19: Trends in provision of high frequency oscillatory ventilation (with 95% CI) for level III registrants, born before 28 weeks and at 28 or more weeks gestation, 1998–2007**



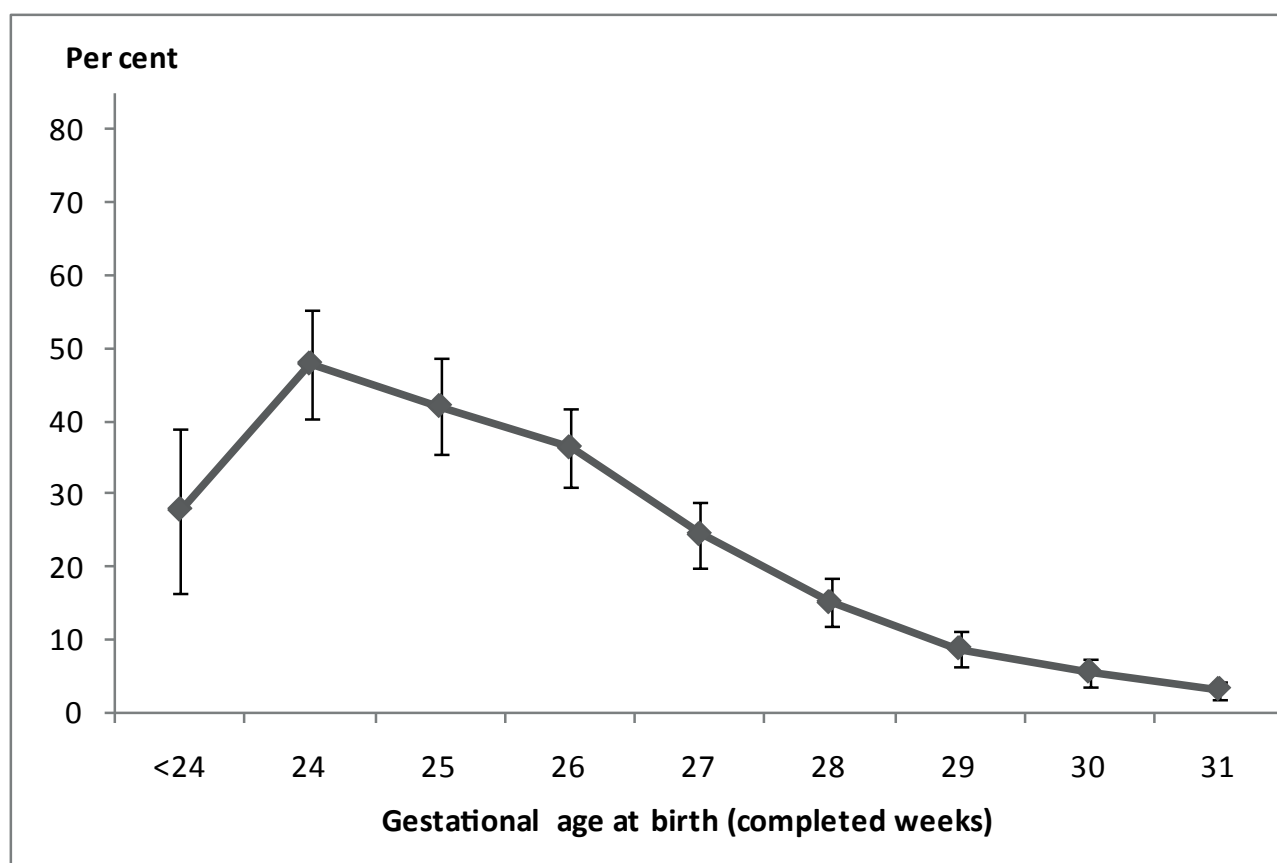
*Note: The results are given as the percentage of babies given IPPV.*

**FIGURE 20: Trends in nitric oxide (with 95% CI) provision for level III registrants born before 28 weeks and 28 or more weeks gestation, 1998–2007**

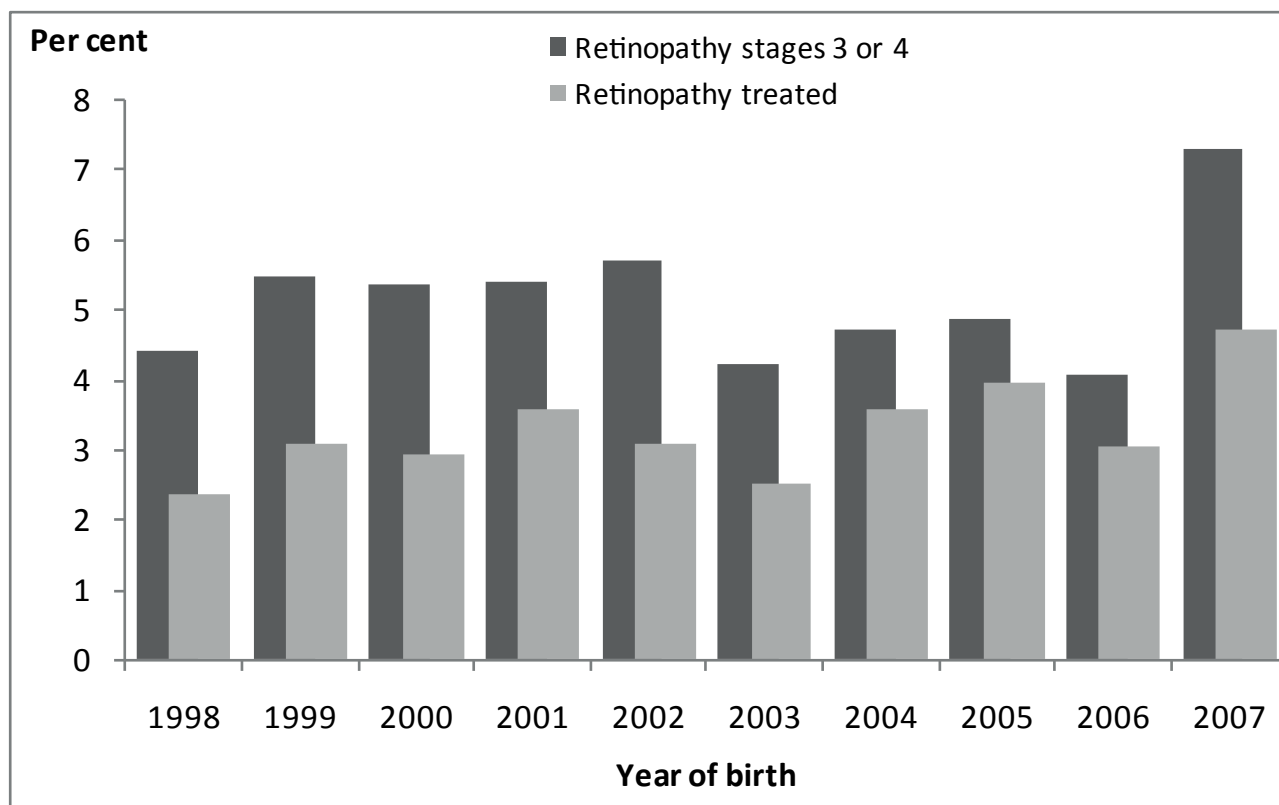


*Note: Results are given as the percentage of babies given IPPV.*

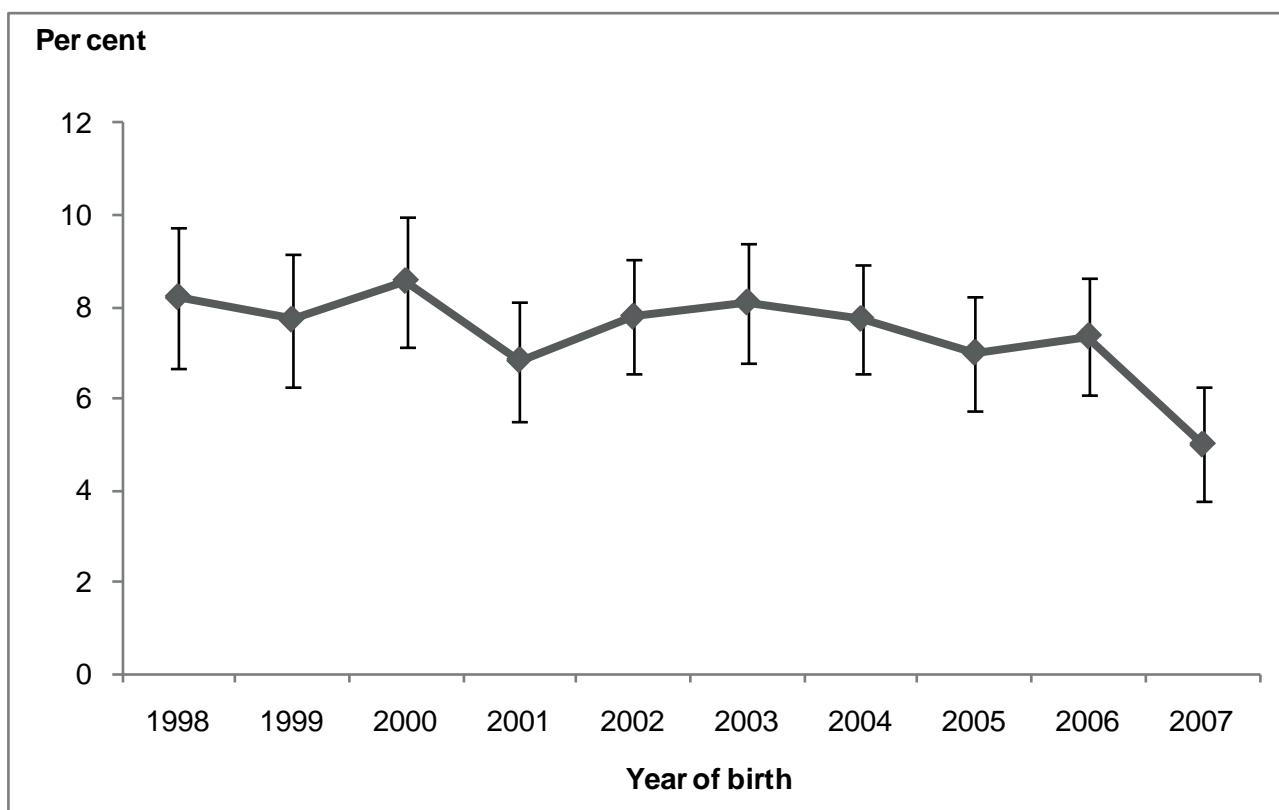
**FIGURE 21: Incidence of chronic lung disease (with 95% CI) for level III registrants by gestational age, 2007**



**FIGURE 22: Stage 3 or 4 retinopathy of prematurity and treated retinopathy among babies born before 32 weeks gestation who survived to 36 weeks corrected age for level III registrants, 1998–2007**

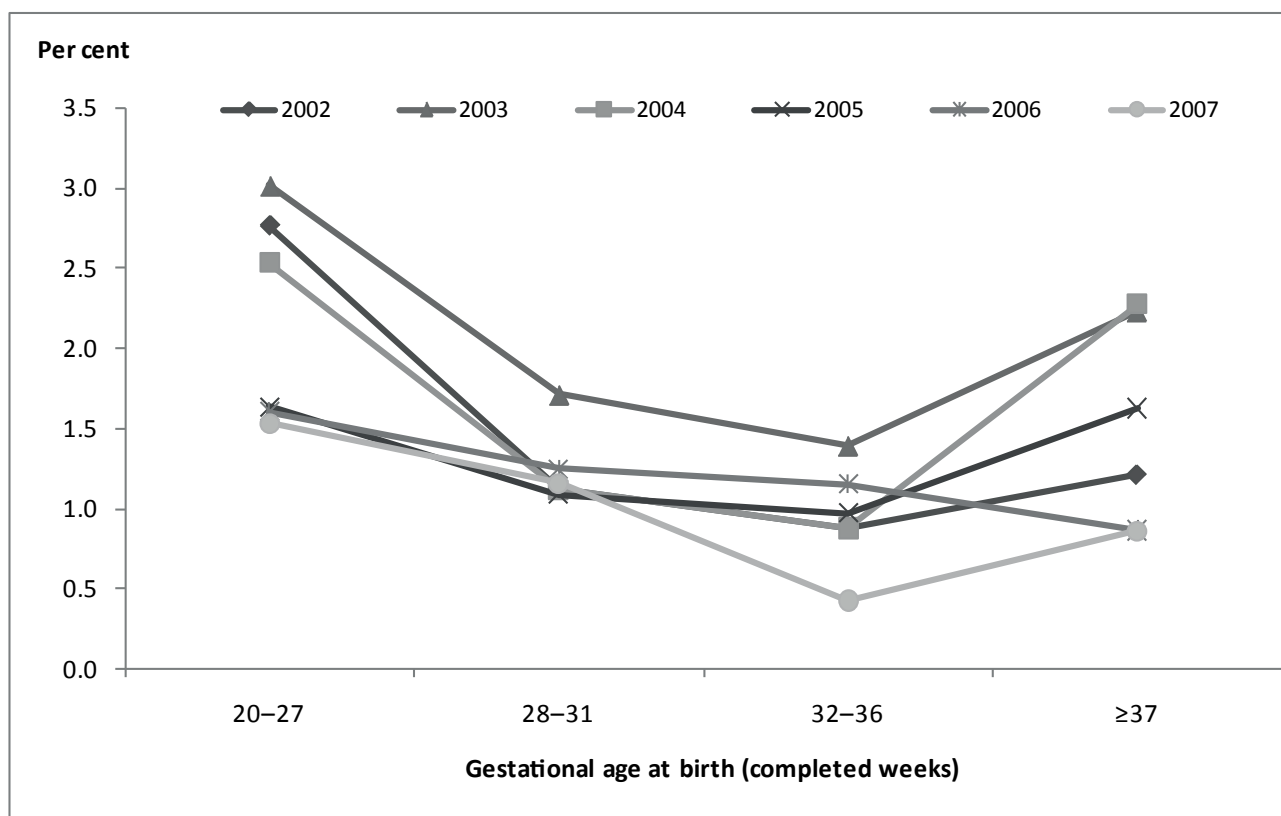


**FIGURE 23: Trends in grade 3 or 4 intraventricular haemorrhage (with 95% CI) in babies born at less than 32 weeks gestation who survived to day 3 for level III registrants, 1998–2007**





**FIGURE 24: Incidence of early sepsis for level III registrants by gestational age group, 2002–2007**



**FIGURE 25: Incidence of late sepsis for level III registrants by gestational age group, 2002–2007**

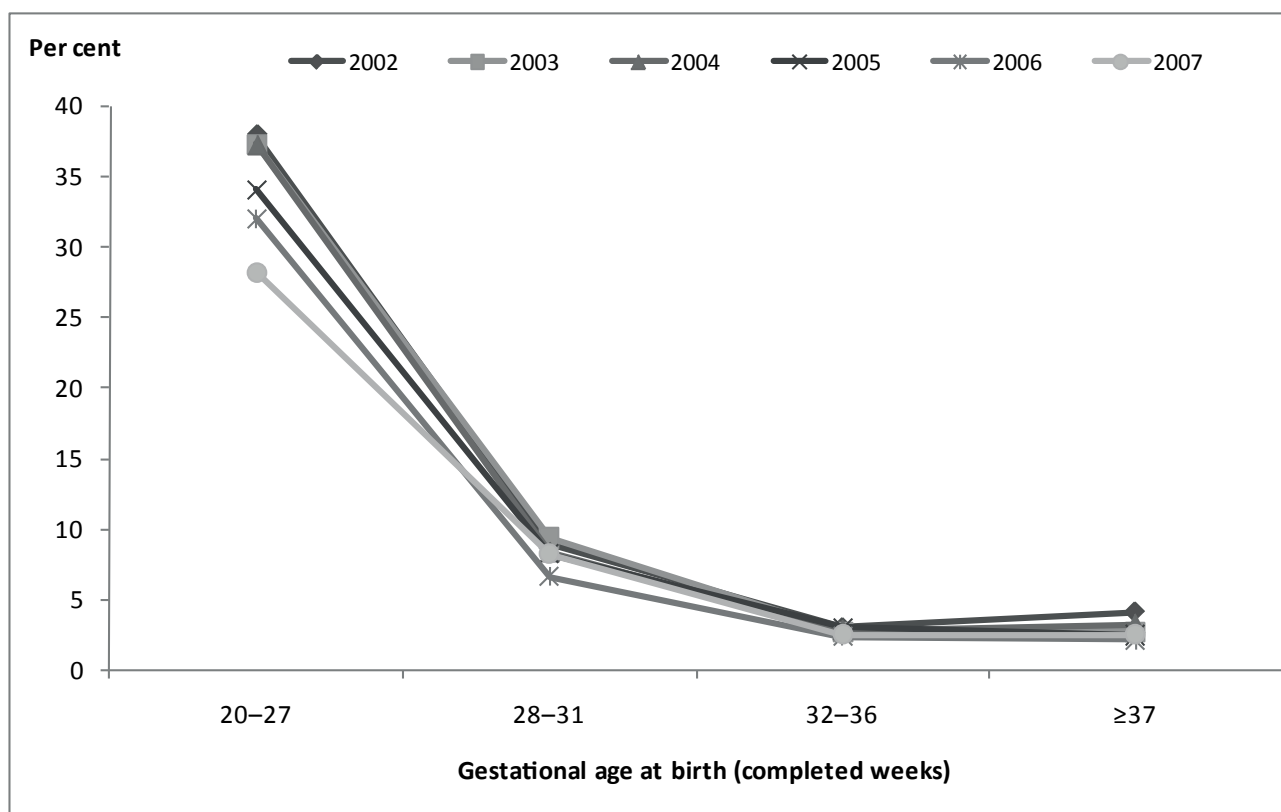
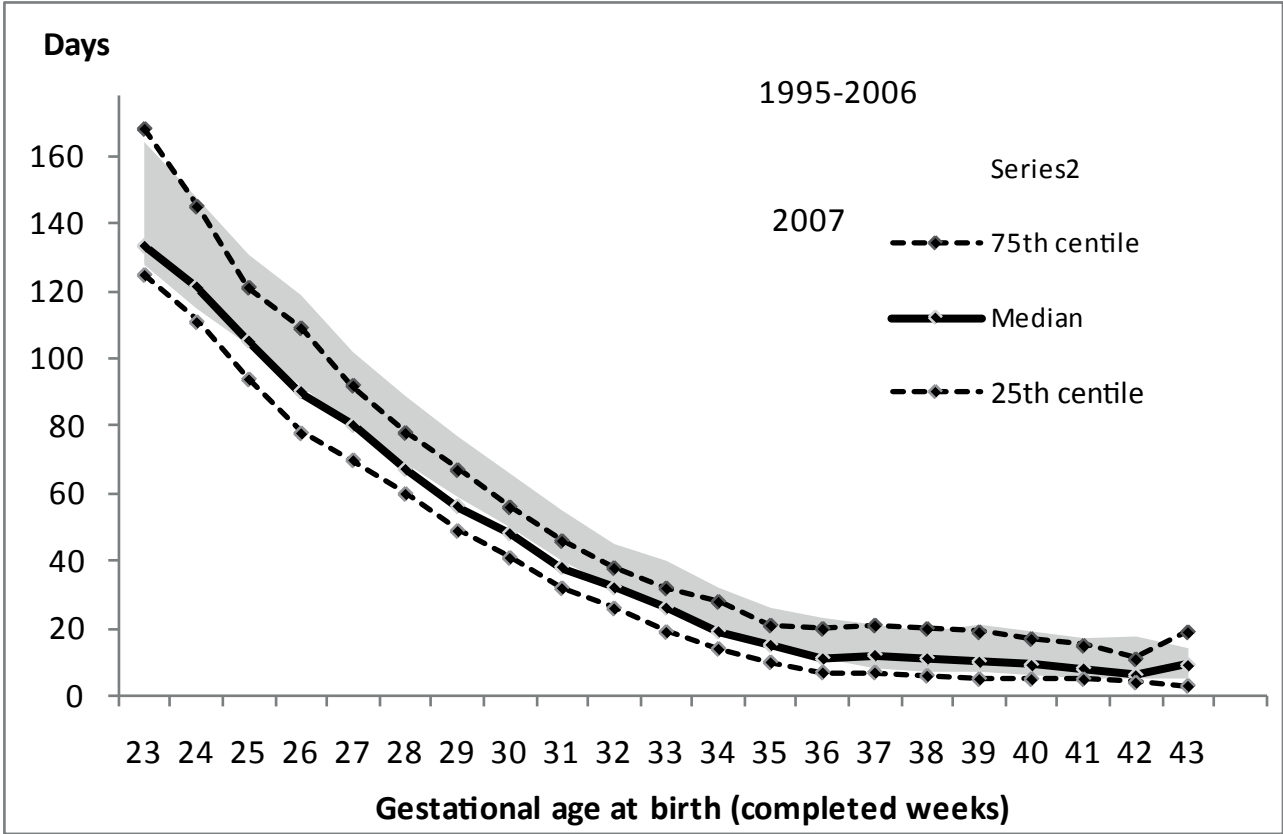


FIGURE 26: Median length of stay for level III registrants by gestational age, 1995–2006, 2007



## Appendix 2: Data tables by birthweight

TABLE 36: Antenatal corticosteroid use for level III registrants by birthweight group, 2007

Antenatal corticosteroids	Birthweight group (grams)											Total
	<500	500- 749	750- 999	1000- 1249	1250- 1499	1500- 1999	2000- 2499	2500- 2999	3000- 3499	3500- 3999	≥4000	
	Number											
None	1	38	59	92	124	249	449	590	679	459	250	2,990
Incomplete course	5	114	176	212	245	391	185	35	6	2	0	1,371
Course completed	25	184	320	370	433	587	199	55	17	11	3	2,204
Completed > 7 days	5	38	96	141	172	246	108	48	26	7	2	889
Not stated	1	15	16	16	21	46	84	111	120	70	48	548
<b>Total</b>	<b>37</b>	<b>389</b>	<b>667</b>	<b>831</b>	<b>995</b>	<b>1,519</b>	<b>1,025</b>	<b>839</b>	<b>848</b>	<b>549</b>	<b>303</b>	<b>8,002</b>
Per cent												
None	2.8	10.2	9.1	11.3	12.7	16.9	47.7	81.0	93.3	95.8	98.0	40.1
Incomplete course	13.9	30.5	27.0	26.0	25.2	26.5	19.7	4.8	0.8	0.4	0.0	18.4
Course completed	69.4	49.2	49.2	45.4	44.5	39.9	21.1	7.6	2.3	2.3	1.2	29.6
Completed > 7 days	13.9	10.2	14.7	17.3	17.7	16.7	11.5	6.6	3.6	1.5	0.8	11.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

TABLE 37: Plurality of level III registrants by birthweight group, 2007

Plurality	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
	Number											
Singleton	27	287	514	593	667	1,052	819	750	830	545	302	6,386
Twins	10	97	137	216	292	430	198	89	18	4	1	1,492
Triplets & higher orders	0	5	16	22	36	37	8	0	0	0	0	124
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
Singleton	73.0	73.8	77.1	71.4	67.0	69.3	79.9	89.4	97.9	99.3	99.7	79.8
Twins	27.0	24.9	20.5	26.0	29.3	28.3	19.3	10.6	2.1	0.7	0.3	18.6
Triplets and higher orders	0.0	1.3	2.4	2.6	3.6	2.4	0.8	0.0	0.0	0.0	0.0	1.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 38: Method of delivery by birthweight group, 2007

Method of Delivery	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
	Number											
Vaginal	8	183	231	245	288	522	393	308	341	218	116	2,853
Vaginal instrumental birth	0	7	11	10	35	61	34	64	73	61	29	385
Caesarean section in labour	0	45	132	214	245	393	265	193	179	115	71	1,852
Caesarean section no labour	29	153	293	358	424	540	321	263	232	138	77	2,828
Not stated	0	1	0	4	3	3	12	11	23	17	10	84
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
Vaginal	21.6	47.2	34.6	29.6	29.0	34.4	38.8	37.2	41.3	41.0	39.6	36.0
Vaginal instrumental birth	0.0	1.8	1.6	1.2	3.5	4.0	3.4	7.7	8.8	11.5	9.9	4.9
Caesarean in labour	0.0	11.6	19.8	25.9	24.7	25.9	26.2	23.3	21.7	21.6	24.2	23.4
Caesarean no labour	78.4	39.4	43.9	43.3	42.7	35.6	31.7	31.8	28.1	25.9	26.3	35.7
Total	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: Not stated data are excluded from per cent calculations.*

TABLE 39: Level of hospital of birth for level III registrants by birthweight group, 2007

Level of hospital of birth	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
	Number											
Tertiary	34	347	586	717	874	1,269	770	563	505	324	179	6,169
Non-tertiary	2	33	67	99	108	229	238	260	323	212	118	1,689
Born before arrival	0	9	14	15	13	19	15	16	20	12	5	138
Not stated	1	0	0	0	0	2	2	0	0	1	1	6
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
	Per cent											
Tertiary	94.4	89.2	87.9	86.3	87.8	83.7	75.3	67.1	59.6	59.1	59.3	77.2
Non-tertiary	5.6	8.5	10.0	11.9	10.9	15.1	23.3	31.0	38.1	38.7	39.1	21.1
Born before arrival	0.0	2.3	2.1	1.8	1.3	1.3	1.5	1.9	2.4	2.2	1.7	1.7
Total	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: Not stated data are excluded from per cent calculations.*

**TABLE 40: Mode of transport to level III unit after birth by birthweight group, 2007**

Mode of transport	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
Not transported	34	338	576	708	869	1,260	747	518	443	290	162	5,945
Specialist retrieval team	3	35	69	101	94	203	229	254	319	210	110	1,627
Non-specialist retrieval team	0	10	17	17	13	41	38	56	79	45	25	341
Not stated	0	6	5	5	19	15	11	11	7	4	6	89
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
Not transported	91.9	88.3	87.0	85.7	89.0	83.8	73.7	62.6	52.7	53.2	54.5	75.1
Specialist retrieval team	8.1	9.1	10.4	12.2	9.6	13.5	22.6	30.7	37.9	38.5	37.0	20.6
Non-specialist retrieval team	0.0	2.6	2.6	2.1	1.3	2.7	3.7	6.8	9.4	8.3	8.4	4.3
Total	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: Not stated data are excluded from per cent calculations.*

**TABLE 41: Exogenous surfactant use by level III registrants by birthweight group, 2007**

Exogenous surfactant	Birthweight group (grams)											Total
	<500	500- 749	750- 999	1000- 1249	1250- 1499	1500- 1999	2000- 2499	2500- 2999	3000- 3499	3500- 3999	≥4000	
	Number											
None	6	53	170	404	658	1,086	753	675	688	444	238	5,175
Curosurf	20	254	356	282	201	229	133	87	78	37	28	1,705
Survanta	8	63	97	104	97	142	79	38	41	33	19	721
SurvCuro	1	0	2	2	3	2	5	1	2	4	1	23
Any combination	2	16	27	19	13	16	9	3	2	2	2	111
Not stated	0	3	15	20	23	44	46	35	37	29	15	267
<b>Total</b>	<b>37</b>	<b>389</b>	<b>667</b>	<b>831</b>	<b>995</b>	<b>1,519</b>	<b>1,025</b>	<b>839</b>	<b>848</b>	<b>549</b>	<b>303</b>	<b>8,002</b>
Per cent												
None	16.2	13.7	26.1	49.8	67.7	73.6	76.9	84.0	84.8	85.4	82.6	66.9
Curosurf	54.1	65.8	54.6	34.8	20.7	15.5	13.6	10.8	9.6	7.1	9.7	22.0
Survanta	21.6	16.3	14.9	12.8	10.0	9.6	8.1	4.7	5.1	6.3	6.6	9.3
SurvCuro	2.7	0.0	0.3	0.2	0.3	0.1	0.5	0.1	0.2	0.8	0.3	0.3
Any combination	5.4	4.1	4.1	2.3	1.3	1.1	0.9	0.4	0.2	0.4	0.7	1.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

*Note: Not stated data are excluded from per cent calculations.*

TABLE 42: Assisted ventilation for level III registrants by birthweight group, 2007

Assisted ventilation	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
	Number											
CPAP	26	319	609	719	731	1,226	845	617	530	357	209	6,186
IPPV	36	359	525	444	353	476	375	383	464	283	150	3,848
Oxygen given	18	129	216	192	155	280	198	185	205	156	86	1,820
HFOV	17	113	91	40	22	25	18	24	42	27	12	431
NO	7	50	27	21	15	25	23	34	68	51	35	366
ECMO	0	0	0	0	1	0	0	0	5	0	0	6
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
CPAP	70.3	82.0	91.3	86.5	73.5	80.7	82.4	73.5	62.5	65.0	69.0	77.31
IPPV	97.3	92.3	78.7	53.4	35.5	31.3	36.6	45.6	54.7	51.5	49.5	48.09
Oxygen given	48.6	33.2	32.4	23.1	15.6	18.4	19.3	22.1	24.2	28.4	28.4	22.74
Per cent of babies given IPPV												
HFOV	47.2	31.5	17.3	9.0	6.2	5.3	4.8	6.3	9.1	9.5	8.0	11.2
NO	19.4	13.9	5.1	4.7	4.2	5.3	6.1	8.9	14.7	18.0	23.3	9.5
ECMO	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	1.1	0.0	0.0	0.2

TABLE 43: Medians and interquartile ranges of assisted ventilation for level III registrants by birthweight group, 2007

	Birthweight group (grams)										
Median and interquartile range (IQR)	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000
	IPPV (hours)										
Median	519	314	97	37	29	31	41	47	49.5	47	51.5
IQR	170–1030	64–738	25–318	16.5–118	13–62	15–65	17–89	22–92	23–100	21–92	20–91
	CPAP (hours)										
Median	983.5	966	802	252	81	39	25	23	20	19	18
IQR	533–1392	611–1364	329–1152	73–654	23–197	15–91	11–62	10–58	08–50	8–44	8–40
	Oxygen (days)										
Median	106	69	30	3	0	0.5	1	1	1	2	1
IQR	14–169	8–113	3–67	0–31	0–3	0–3	0–3	0–4	0–4	0–4	0–4

**TABLE 44: Chronic lung disease for level III registrants by birthweight group, 2007**

Chronic lung disease (CLD)	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
No CLD	15	201	462	724	957	1,495	1,024	839	848	549	303	7,417
CLD	22	188	205	107	38	24	1	0	0	0	0	585
▪ CLD & survived	19	163	202	105	37	22	1	0	0	0	0	549
▪ CLD and died	3	25	3	2	1	2	0	0	0	0	0	36
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
No CLD	40.5	51.7	69.3	87.1	96.2	98.4	99.9	100.0	100.0	100.0	100.0	92.7
CLD	59.5	48.3	30.7	12.9	3.8	1.6	0.1	0.0	0.0	0.0	0.0	7.3
▪ CLD & survived	86.4	86.7	98.5	98.1	97.4	0.0	0.0	0.0	0.0	0.0	0.0	93.8
▪ CLD and died	13.6	13.3	1.5	1.9	2.6	0.0	0.0	0.0	0.0	0.0	0.0	6.2

**TABLE 45: Supplemental oxygen therapy for level III registrants by gestational age group, 2007**

Birthweight group (grams)												
Oxygen therapy	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
Number												
No oxygen on day 28	1	62	236	551	872	1,404	953	764	763	493	281	6,380
Oxygen on day 28,	36	325	427	277	119	114	70	75	82	54	22	1,601
▪ survived to discharge home	20	215	370	237	96	71	35	34	21	14	5	1,118
▪ died before discharge	16	110	57	40	23	43	35	41	61	40	17	483
Not stated	0	2	4	3	4	1	2	0	3	2	0	21
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Number												
Babies given home oxygen	8	57	61	25	7	11	6	5	5	6	3	
Per cent												
No oxygen on day 28	2.7	16.0	35.6	66.5	88.0	92.5	93.2	91.1	90.3	90.1	92.7	79.9
Oxygen on day 28,	97.3	84.0	64.4	33.5	12.0	7.5	6.8	8.9	9.7	9.9	7.3	20.1
▪ survived to discharge home	55.6	66.2	86.7	85.6	80.7	62.3	50.0	45.3	25.6	25.9	22.7	69.8
▪ died before discharge	44.4	33.8	13.3	14.4	19.3	37.7	50.0	54.7	74.4	74.1	77.3	30.2
Per cent												
Babies given home oxygen	50.0	51.8	107.0	62.5	30.4	25.6	17.1	12.2	8.2	15.0	17.6	1.0

**Note:** Not stated data are excluded from per cent calculations.

**TABLE 46: Transfer after registration of level III registrants by level of destination hospital by birthweight group, 2007**

Transfer status	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
Not transferred	29	246	351	367	433	684	563	530	577	395	234	4,409
Level III hospital	1	25	45	37	26	52	22	11	20	8	6	253
Level II hospital	4	95	244	411	524	753	414	261	207	127	56	3,096
Children's hospital	3	17	26	9	5	19	22	37	44	19	7	208
Not stated	0	6	1	7	7	11	4	0	0	0	0	36
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
Not transferred	78.4	64.2	52.7	44.5	43.8	45.4	55.1	63.2	68.0	71.9	77.2	55.3
Level I or II	2.7	6.5	6.8	4.5	2.6	3.4	2.2	1.3	2.4	1.5	2.0	3.2
Level III	10.8	24.8	36.6	49.9	53.0	49.9	40.5	31.1	24.4	23.1	18.5	38.9
Children's hospital	8.1	4.4	3.9	1.1	0.5	1.3	2.2	4.4	5.2	3.5	2.3	2.6
Total	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: Not stated data are excluded from per cent calculations.*



**TABLE 47: Retinopathy of prematurity for level III registrants by birthweight group, 2007(a)**

Retinopathy of prematurity (ROP)	Birthweight group (grams)						Total
	<500	500-749	750-999	1000-1249	1250-1499	≥ 1500	
	Number						
No ROP	5	85	286	435	380	223	1,414
Total ROP present	19	210	284	151	57	17	738
▪ Stage 1 ROP	2	58	106	77	27	10	280
▪ Stage 2 ROP	6	80	122	64	25	4	301
▪ Stage 3 ROP	11	72	56	10	5	2	156
▪ Stage 4 ROP	0	0	0	0	0	1	1
Not examined	13	83	69	79	100	124	468
Not stated	0	11	28	166	458	4,719	5,382
<b>Total</b>	<b>37</b>	<b>389</b>	<b>667</b>	<b>831</b>	<b>995</b>	<b>5,083</b>	<b>8,002</b>
Number							
Treatment for ROP	9	48	29	10	5	0	101
Per cent							
No ROP	20.8	28.8	50.2	74.2	87.0	92.9	65.7
▪ Stage 1 ROP	8.3	19.7	18.6	13.1	6.2	4.2	13.0
▪ Stage 2 ROP	25.0	27.1	21.4	10.9	5.7	1.7	14.0
▪ Stage 3 ROP	45.8	24.4	9.8	1.7	1.1	0.8	6.0
▪ Stage 4 ROP	0.0	0.0	0.0	0.0	0.0	0.4	0.0
<b>Total</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>
Per cent							
<b>Treatment for ROP</b>	<b>81.8</b>	<b>66.7</b>	<b>51.8</b>	<b>100.0</b>	<b>100.0</b>	<b>0.0</b>	<b>64.3</b>

(a) Weight criterion less than 1250 grams for ANZNN but 1500 grams for some individual units.

(b) Percentages for babies with ROP who received treatment have been calculated using as the denominator the total number in each birthweight group who had stages 3-4.

(c) There were two babies who received more than one treatment for ROP.

**Note:** Not stated data are excluded from per cent calculations.

**TABLE 48: Intraventricular haemorrhage for level III registrants by birthweight group, 2007(a)**

Intraventricular haemorrhage (IVH)	Birthweight group (grams)						Total
	<500	500-749	750-999	1000-1249	1250-1499	≥ 1500	
	Number						
No IVH	22	224	439	555	554	627	2,421
IVH	12	118	192	151	109	114	696
▪ Grade 1 IVH	9	44	96	87	69	88	393
▪ Grade 2 IVH	2	39	55	34	19	20	169
▪ Grade 3 IVH	1	8	14	11	7	2	43
▪ Grade 4 IVH	0	27	27	19	14	4	91
Not examined	0	9	10	20	36	159	234
Not stated	0	5	7	91	290	4,107	4,500
<b>Total</b>	<b>34</b>	<b>356</b>	<b>648</b>	<b>817</b>	<b>989</b>	<b>4,981</b>	<b>7,851</b>
Per cent							
No IVH	64.7	65.5	69.6	78.6	83.6	87.7	77.7
IVH	35.3	34.5	30.4	21.4	16.4	12.3	22.3
▪ Grade 1 IVH	26.5	12.9	15.2	12.3	10.4	12.3	12.6
▪ Grade 2 IVH	5.9	11.4	8.7	4.8	2.9	2.8	5.4
▪ Grade 3 IVH	2.9	2.3	2.2	1.6	1.1	0.3	1.4
▪ Grade 4 IVH	0.0	7.9	4.3	2.7	2.1	0.6	2.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

(a) Weight criterion for IVH is a birthweight of less than 1500 grams.

**Note:** Not stated data are excluded from per cent calculations.

**TABLE 49: Neonatal sepsis for level III registrants by birthweight group, 2007**

Neonatal sepsis	Birthweight group (grams)											Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	
Number												
No sepsis	20	267	490	713	926	1,440	986	815	822	533	290	7,302
Sepsis	17	122	177	118	69	79	39	24	26	16	13	700
▪ <48 hours	1	7	8	10	8	17	2	4	6	7	2	72
▪ ≥48 hours	16	111	167	105	60	62	33	20	19	7	8	608
▪ Any sepsis	0	4	2	3	1	0	4	0	1	2	3	20
Total	37	389	667	831	995	1,519	1,025	839	848	549	303	8,002
Per cent												
No sepsis	54.1	68.6	73.5	85.8	93.1	94.8	96.2	97.1	96.9	97.1	95.7	91.3
Sepsis	45.9	31.4	26.5	14.2	6.9	5.2	3.8	2.9	3.1	2.9	4.3	8.7
▪ <48 hours	5.9	5.7	4.5	8.5	11.6	21.5	5.1	16.7	23.1	43.8	15.4	10.3
▪ ≥48 hours	94.1	91.0	94.4	89.0	87.0	78.5	84.6	83.3	73.1	43.8	61.5	86.9
▪ Any sepsis	0.0	57.1	25.0	30.0	12.5	0.0	200.0	0.0	16.7	28.6	150.0	27.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**TABLE 50: Median length of stay for level II registrants who survived until discharge home by birthweight group, 2007**

Birthweight group (g)	Number of babies	Median LOS (days)	Interquartile range (days)
<500	37	111.5	22.5–142.5
500–749	389	103	68–124
750–999	667	83	68–101
1,000–1,249	831	63	49–75
1,250–1,499	995	47	35–59
1,500–1,999	1,519	35	27–44
2,000–2,499	1,025	20	14–28
2,500–2,999	839	13	8–21
3,000–3,499	848	10	6–19
3,500–3,999	549	9	5–16
≥4,000	303	7	5–15
<b>Total</b>	<b>8,002</b>	<b>41</b>	<b>10.75–83.0</b>

**TABLE 51: Survival to discharge home Level II registrants by birthweight group, 2007**

Survival until discharge home	Birthweight group (grams)											Total
	<500	500- 749	750- 999	1000- 1249	1250- 1499	1500- 1999	2000- 2499	2500- 2999	3000- 3499	3500- 3999	≥4000	
Number												
Babies with a lethal congenital anomaly	0	5	2	5	6	17	20	23	29	13	3	123
Babies alive on day 7	33	340	635	808	986	1,499	1,007	822	815	525	292	7,762
Babies alive on day 28	25	317	619	797	977	1,490	997	807	797	514	289	7,629
Survived to go home	21	277	606	788	968	1,475	988	798	784	507	286	7,498
<b>Total</b>	<b>37</b>	<b>389</b>	<b>667</b>	<b>831</b>	<b>995</b>	<b>1,519</b>	<b>1,025</b>	<b>839</b>	<b>848</b>	<b>549</b>	<b>303</b>	<b>8,002</b>
Per cent												
Survived to go home	56.8	71.2	90.9	94.8	97.3	97.1	96.4	95.1	92.5	92.3	94.4	93.7

## Appendix 3: Methods used in this report

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

The historical ANZNN data were received as a Microsoft Access database. Updated data for the ANZNN audit of babies born in 2007 who qualified as high-risk neonates were requested from each participating unit in June 2008 with a deadline of 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 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.

An extract from the database was made in January 2011. Apart from grouping, the data presented in the report reflect the database at that time with two exceptions: (1) data value transformations were applied to information about air leaks, and (2) a series of derived data items were generated. These are listed below.

### Derived data items:

<b>Survival to day n</b>	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.
<b>Survival to 36 weeks post menstrual age</b>	This item is for babies born at less than 36 weeks gestation only. The day the baby reaches 36 weeks post menstrual age is considered to be the infant's gestational age (completed weeks) plus chronological age in days. For example, a baby born at '28 weeks and four days' gestation on 1 January is 36 weeks post menstrual age on 26 February.
<b>Chronic lung disease (CLD)</b>	This item is for babies born at less than 32 weeks gestation only. The baby received any respiratory support (supplemental oxygen or intermittent positive pressure ventilation (IPPV) or continuous positive airways pressure (CPAP)) for a chronic pulmonary disorder on the day the baby reached 36 weeks post menstrual age. Date of final added respiratory support must be: > Date of birth or $\{[(\text{Hours of IPPV} + \text{Hours of CPAP})/168] + \text{Gestational age}\} > 35.9$ weeks
<b>Length of stay</b>	The total number of days a baby spent in hospital during their first admission from birth. The total may include stays in more than one hospital.

All data manipulations and analysis for the 2007 report were carried out using Statistical Analysis Systems (SAS) software, and tabulations and figures were produced using Microsoft Excel.

## Appendix 4: Confidentiality guidelines

Confidentiality guidelines provide an unambiguous framework for the handling of data that met the strict criteria of governing bodies. Confidentiality guidelines for the collection, processing and analysis of data from the minimum data collection of ANZNN were devised and agreed to by the Advisory Committee at the ANZNN Advisory Committee Meeting, Auckland, New Zealand on 2 April 1995. The summary below incorporates modifications agreed in the Memorandum of Understanding (MOU) between ANZNN and the Perinatal & Reproductive Epidemiology Research Unit (PRERU), School of Women's and Children's Health, the University of New South Wales.

The purpose of these guidelines is to set out the principles under which the National Minimum Data Collection (NMDC) for neonatal intensive care units (NICUs) is formulated and the conditions that apply to the use of these data and release to parties internal and external to the ANZNN.

The essential purpose of the NMDC is to provide national unit record tabulations on babies meeting specified criteria who have been admitted to NICUs or affiliated nurseries in Australia and New Zealand. In general, this will be achieved through distribution of an annual report containing summary tables without identifying characteristics, either of a personal, institutional or state, territory or national nature. In certain other instances, data may be provided internally in the following manner:

- as de-identified summary tables not provided in the annual report, but available upon request
- as de-identified unit record data for analytical purposes as approved by the ANZNN
- as NICU identifiable summary and/or unit record data for clinical audit purposes by the respective NICU providing the data. These guidelines will cover the collection and provision of data retrospectively from 1 January 1994.

### Principles of ownership and maintenance of data

- The Perinatal & Reproductive Epidemiology Research Unit (PRERU) agrees to house and maintain the ANZNN Data Collection through electronic data submission from neonatal intensive care units and special care nurseries during the period 1 January 2008 to 31 December 2012.
- The ANZNN Data Collection will be housed at PRERU. It will be managed according to existing data security procedures as for other data collections at PRERU. The Data Custodian is the Director of PRERU.

The ANZNN Data Collection Operation Committee ("ANZNN DCOC") was established in June 2008 to make decisions concerning the management, operation, data provision and reporting of the ANZNN Data Collection. The ANZNN DCOC is comprised of: three members appointed by the ANZNN Management Committee and the ANZNN Advisory Committee; two members appointed by the PRERU; and the Chairperson appointed by the ANZNN Management Committee. The operations and progress of ANZNN Data Collection will be reported quarterly by ANZNN DCOC to the ANZNN Management Committee.

PRERU will ensure that the data structure of the ANZNN Data Collection will remain the same as the existing data collection. Any modification to the data structure will be a joint decision between ANZNN Management Committee and PRERU. Issues such as data entry, collation, retrieval and analysis will be considered.

The ANZNN will be responsible for collection and maintenance of the data set and decision-making with respect to its use.

All queries related to the NMDC should be referred to the Data Custodian at PRERU who will address them personally or refer them to the appropriate source person.

### Conditions for data collection

It is expected that all participating NICUs will collect the agreed-upon minimum set of data in a standardised format for eligible babies registered to the ANZNN audit in their unit. Data will be transferred securely to the ANZNN coordinator.

## **Conditions for data security**

The electronic version of this data is maintained in a secure partition at the University of New South Wales. Access to the server is limited to authorised named staff and further protected by the use of a high-level password. Attempted security breaches are monitored and investigated. Hard copy patient identifiable data and electronic backup files are kept in secured and locked safe cabinets. Master lists of code material and source record identifiers are kept away from the database in a separate locked area. All rooms and offices used by the ANZNN are locked when not in use. Filing cabinets containing data are locked when not in use. Computerised data on the server are protected by high-level passwords known only to each person who has access to computerised data. Potentially identifiable data will not leave the site of the ANZNN. Security disposal of data is available through use of designated bags or a shredding machine and must be witnessed by at least two staff members. A destruction certificate stating the name of the data and the date on which they are destroyed is to be issued and retained in the records.

## Appendix 5: Minimum Data Set variables

### 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 the 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 birthweight 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 – no infertility treatment used for this pregnancy.

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

3: IVF / GIFT etc. – any method of in vitro fertilisation. Including in vitro fertilisation, gamete intrafallopian transfer, zygote intrafallopian transfer and IC sperm injection.

4: other – infertility treatment used that is not mentioned above, incl. 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 – is a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community with which she is associated.



- 2: Asian – all whose ethnic background originates from countries of Asia, South East Asia and Indian subcontinent. For example Fijian Indian.
- 3: Caucasian – all of Caucasoid heritage, including, European, Russian, Middle Eastern and Arabic.
- 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 into a hospital with a NICU and was not transferred during the most recent admission.
- 2: in-utero transfer from obstetric hospital – mother transferred during most recent admission, baby in utero.
- 3: ex-utero retrieval – baby 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 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. 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 1st 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**

*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 birthweight 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 1st 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 birthweight 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:* 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 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 malformations

*Definition:* Detail of the major congenital malformation.

*Coding:* Free text field representing congenital malformation 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.

## Highest appropriate inspired oxygen

*Definition:* Highest appropriate inspired oxygen (FiO<sub>2</sub>), between admission to NICU and 12 hours after birth. Appropriate range is when: arterial PaO<sub>2</sub> or TcPO<sub>2</sub> is 50-80 mmHg, or if FiO<sub>2</sub> is > 25%, SaO<sub>2</sub> is 88-95%, or if FiO<sub>2</sub> is < 25%, SaO<sub>2</sub> is > 88%.

*Coding:* FiO<sub>2</sub> recorded as a percentage.

*Guide for use:* Use '0' to denote missing.

## Lowest appropriate inspired oxygen

*Definition:* Lowest appropriate FiO<sub>2</sub>, between admission to NICU and 12 hours after birth – as for highest appropriate inspired oxygen.

*Coding:* FiO<sub>2</sub> recorded as a percentage.

*Guide for use:* 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 malformation – malformation is the primary reason for RD, e.g. diaphragmatic hernia (list malformation 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: Survanta – 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: no 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, was initiated 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.



## Therapeutic hypothermia

*Definition:* Intentional cooling of an infant of any gestational age to a core temperature <35.0°C

*Coding:* 0: No

-1: Yes.

99: Unknown.

*Guide for use:* Record if therapeutic hypothermia has occurred.

## 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 from 48 hours after birth.

*Coding:* 2-digit field representing total episodes of late onset septicaemia.

*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 coagulase negative staphylococci or other skin flora contaminant. Same blood organism isolated from blood during previous 14 days – repeat isolate.

## Maximum grade of IVH

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

*Coding:* 0: none – ultrasound / post mortem shows no haemorrhage.

- 1: Grade 1-subependymal germinal matrix haemorrhage.
- 2: Grade 2-intraventricular haemorrhage with no ventricular distension.
- 3: Grade 3- intraventricular haemorrhage with ventricle distended with blood.
- 4: Grade 4-intraparenchymal haemorrhage.
- 5: Not examined- by ultrasound or by post mortem examination.

## 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 97th centile.

- 2: dilatation – VI equal to 97th centile / 97th centile + 4mm.
- 3: hydrocephalus – VI greater than 97th 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 lesions corresponding to grade 4 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.
- 4: encephaloclastic porencephaly – relatively late development on cerebral scan of extensive dense, cystic lesions involving the periphery of the brain (ANZNN 2009).

## 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.
- 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.

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

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

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

**Extremely low birthweight:** birthweight 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 birthweight. The death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles.

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

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

**Hyaline membrane disease:** a disorder of the respiratory system.

**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 liveborn 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 liveborn (WHO definition).

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

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

**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 birthweight, 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

**Neonatal death:** death of a liveborn 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 birthweight.

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

**Post menstrual age** (completed weeks). Is calculated by taking the 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).

**Post neonatal death:** death of a liveborn 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.

**Retinopathy of prematurity (ROP):** a disorder of the developing eye.

**Sex ratio:** number of male liveborn babies per 100 female liveborn 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 birthweight:** birthweight of less than 1,500 grams.

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