

# 2010

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



**UNSW**  
AUSTRALIA

**ANZNN**

# 2010

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## REPORT OF THE AUSTRALIAN AND NEW ZEALAND NEONATAL NETWORK

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

ISBN: 978-0-9807290-3-0

Suggested citation:

Chow, S.S.W. 2013. Report of the Australian and New Zealand Neonatal Network 2010. Sydney: ANZNN.

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Published by the Australian and New Zealand Neonatal Network 2013

Designed and printed by Print Post Plus (P3)

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 fifteenth report of the Australian and New Zealand Neonatal Network (ANZNN) and the third report in the new format. The ANZNN has endeavoured to retain the information provided in previous reports to allow comparative reporting over time. Details of the current format can be found under 'Structure of this report'.

The number of Australian level II units continues to increase with a total of eight units contributing data for this report, with more units joining ANZNN the number will continue to rise.

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: Ross Haslam (Chairperson), Kaye Bawden, Roland Broadbent, David Cartwright, Jenny Corban, Brian Darlow, Nick Evans, Kei Lui, Shelley Reid, Karen Simmer, Elizabeth Sullivan, Kenneth Tan and William Tarnow-Mordi for their commitment and guidance for all the activities of the ANZNN. Particular thanks to the ANZNN Data Collection Operation Committee, namely Kei Lui (Chairperson), Jo Brooks, Ian Callander, David Cartwright, Deborah Donoghue, Lex Doyle, Lisa Hilder, Peter Marshall and Elizabeth Sullivan.

We thank QHealth (Australia) and Douglas Pharmaceuticals (New Zealand) for their ongoing support and for helping us to achieve our aims. We also thank the Leslie Stevens Fund for Newborn Care, Sydney Children's Hospital Foundation for infrastructure support (2008 to 2010), as well as the Royal Hospital for Women Foundation for funding development of the data validation program. 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 2010.
- Chapter 2:** ‘Babies registered to level III units, 2010’ provides information and characteristics on the ANZNN registrants in 2010 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, 2010’ provides information on the mothers of level III registrants registered to the ANZNN in 2010.
- Chapter 4:** ‘Characteristics of level III registrants, 2010’ provides information about the babies admitted to a level III neonatal unit during 2010.
- Chapter 5:** ‘Babies registered to level II units, 2010’ provides information about babies registered to the level II special care baby units during 2010.
- Appendices:** Appendix 1 presents 10-year trends  
Appendix 2 presents data tables by birthweight for 2010  
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 the 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
GIFT	gamete intra-fallopian transfer
HFOV	high frequency oscillatory 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
NHFT	nasal high flow therapy
HFNC	high flow nasal cannulae
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)*

Chris Wake (Director), Lynne Cruden, Alissa Argomand

##### Liverpool Health Service

*(Nursery beds: 31)*

Jacqueline Stack (Director), Robert Guaran, Ian Callander, Kathryn Medlin, Sara Wilson, Kaye Marcin

##### Nepean Hospital

*(Nursery beds: 35)*

Lyn Downe (Director), Vijay Shingde (Acting Clinical 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, Martin Kluckow, Sara Sedgley, Claire Jacobs

##### RPA Women and Babies

*(Nursery beds: 34)*

Nick Evans (Director), Shelley Reid, David Osborn (Clinical Director)

##### Sydney Children's Hospital

*(Nursery beds: 4)*

Andrew Numa (Director), Janelle Young

##### Westmead Hospital

*(Nursery beds: 39)*

Mark Tracy (Director), Jane Baird

### Neonatal Intensive Care Units' (NICUS) Data Collection

*(New South Wales and Australian Capital Territory)*

Barbara Bajuk, Sara Segley, Mark Leckie

#### 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), Jim Holberton, Julie Keng

##### Monash Medical Centre

*(Nursery beds: 52)*

Andrew Ramsden (Director), Elizabeth Carse (Acting 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, Judith Zenchyson

### **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 (Director), Gary Alcock, Jenny Binney, Cherie Boniface

## **South Australia**

### **Flinders Medical Centre**

*(Nursery beds: 35)*

Peter Marshall (Director), Rebecca Davis

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

*(Nursery beds: 49)*

Chad Andersen (Director), Ross Haslam, Elizabeth Gent, Andy McPhee, Cindy Golding

## **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, John McTigue

## **Northern Territory**

### **Royal Darwin Hospital**

*(Nursery beds: 18)*

Charles Kilburn (Director), Alan Ruben, Gurmeet Singh, 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), Carole Chettleburgh, Frances McCaffrey

### **Middlemore Hospital**

*(Nursery beds: 30)*

Lindsay Mildenhall (Director), Maisie Wong

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

*(Nursery beds: 46)*

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

### **Waikato Hospital**

*(Nursery beds: 41)*

David Bouchier (Director), Phil Weston, Deborah Harris, Arun Nair

### **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), Heather Coughtrey,  
Debbie Green, Therese Freeman

##### Campbelltown Hospital

*(Nursery beds: 15)*

Raymond Chin (Director), Maria Delpino, Melissa  
Cooke

##### 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), Susie Piper, Sylvia Lees

### Queensland

#### Cairns Base Hospital

*(Nursery beds: 22)*

Ross Messer (Director), Sue McMahon

#### Mackay Base Hospital

*(Nursery beds: 4)*

Michael Williams (Director), Kerry Topping

### Tasmania

#### Launceston General Hospital

*(Nursery beds: 12)*

Chris Bailey (Director), Jennifer James, Robyn  
Morey, Frances McCarroll, Christine Coker

### Northern Territory

#### Alice Springs Hospital

*(Nursery beds: 8)*

Rose Fahy, Marion Bates

### New Zealand

#### Gisborne Hospital

*(Nursery beds: 6)*

Heinrich Stander (Director), Graeme Lear, Barbara  
Reid

#### Hawkes Bay Hospital

*(Nursery beds: 12)*

Jenny Corban (Director), Kay Hodson

#### Lower Hutt Hospital

*(Nursery beds: 8)*

Robyn Shaw (Director), Debbie Bashaw, Anne  
Mitchell

#### Nelson Hospital

*(Nursery beds: 10)*

Peter McIlroy (Director)

#### North Shore Hospital

*(Nursery beds: 12)*

Jutta van den Boom (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)*

Ian Shaw (Director), Paul Tomlinson

#### 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)*

David Montgomery (Director), Barbara Hammond

### **Whakatane Hospital**

*(Nursery beds: 5)*

Chris Moyes (Director), Margret Norris, Lee Willetts

### **Whangarei Area Hospital**

*(Nursery beds: 8)*

Janine Whale (Director), Lynne Clarke

### **Waitakere Hospital**

*(Nursery beds: 12)*

Jutta van den Boom (Director), Janis Stockman

## **ANZNN Program and Secretariat**

### **Perinatal & Reproductive Epidemiology Research Unit (PRERU)**

Elizabeth Sullivan (Director), Sharon Chow, 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 with a total of eight units contributing data in 2010.

## 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. high flow/oxygen air usage by patient type and outcome
  - consistency in national data collections.

## Structure of the ANZNN

The 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.

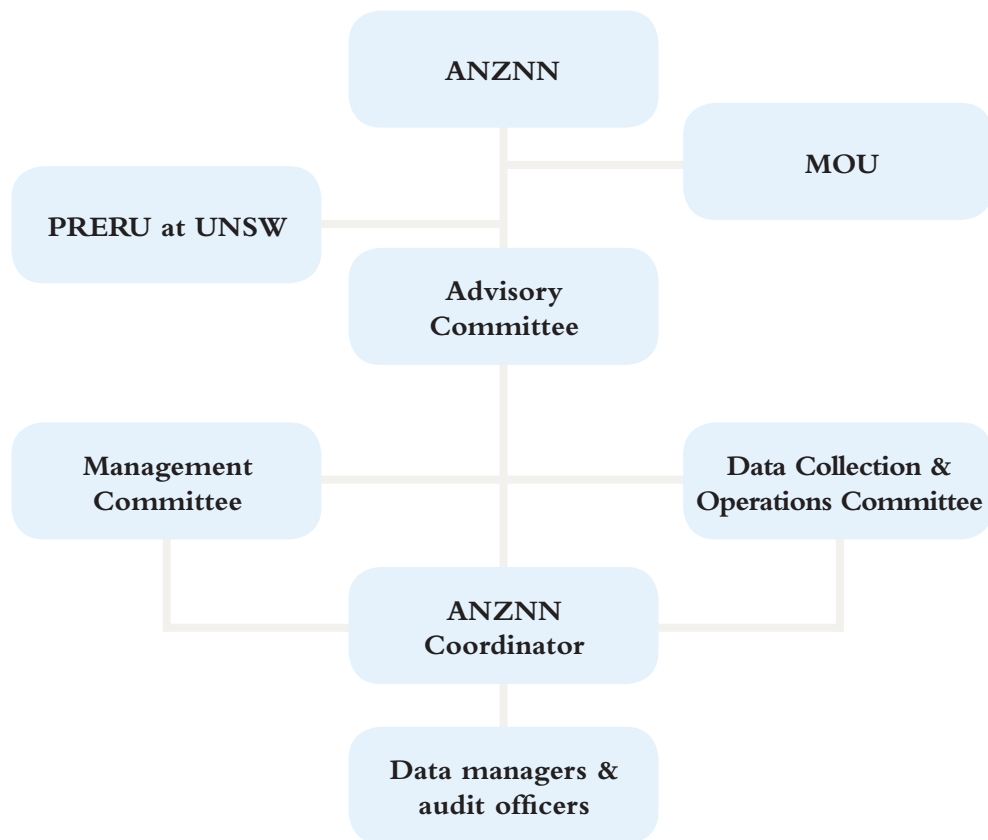
The governance structure of the ANZNN (refer to Figure 1) consists of the Advisory Committee, the Data Collection and Operations Committee and the Management Committee. The Advisory Committee is the governing body of ANZNN and includes the directors (or their nominee) of each participating unit, the 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 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) or high flow 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.

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.

QHealth (Australia) and Douglas Pharmaceuticals (New Zealand) make an annual contribution and the ANZNN thanks them for their generosity and support. The ANZNN also thanks the Leslie Stevens Fund for Newborn Care, Sydney Children's Hospital Foundation for infrastructure support (2008 to 2010), as well as the Royal Hospital for Women Foundation for funding development of the data validation program.

## Data set variables

The variables used for the 2010 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).



# 2010

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## Babies born in Australia, 2010

There were 6,350 babies registered to the ANZNN from 21 level III NICUs in Australia, representing 2.1% of notified live births in 2010 (Li et al. 2012). Of these registrants, 74.6% were born in a hospital with tertiary care facilities. There were 2,635 babies born before 32 weeks gestation representing 41.5% of Australian registrants.

Maternal ethnicity was provided for more than 92.1% of mothers: 79.8% of the mothers of these babies identified as Caucasian and 10.6% as Asian. One in twenty mothers (5.7%) identified as Aboriginal or Torres Strait Islander compared to 3.9% of all births in Australia in 2010 (Li et al. 2012).

Among Australian NICU admissions registered to the ANZNN, 1,309 were from multiple births representing 20.6% of ANZNN admissions in Australia in 2010.

Male babies were over-represented among NICU admissions – 56.9% of the Australian ANZNN registrants, compared with 51.1% among live births in Australia (Li et al. 2012).

Assisted ventilation was provided for 5,870 babies (2.0% of live births) and continuous positive airways pressure (CPAP) was the only form of respiratory assistance for 2,708 babies.

## Babies born in New Zealand, 2010

There were 1,886 babies who met ANZNN registration criteria from six level III NICUs in New Zealand representing 3.0% of the 63,897 live births registered in New Zealand in 2010 (Statistics New Zealand 2010). Of these registrants, 88.2% were born in a hospital with tertiary care facilities. There were 638 babies born before 32 weeks gestation representing 33.8% of New Zealand registrants.

The ethnicity of the mother was reported for 98.1% of the New Zealand registrants. The percentage of Caucasian mothers in the ANZNN cohort was 57.6%. A higher proportion of mothers identified themselves as Maori (19.7%) compared to 10.5% of mothers identified as Pacific Islander and 9.3% as Asian.

Among New Zealand NICU admissions registered to the ANZNN, 310 were from multiple births representing 16.4% of ANZNN admissions in New Zealand in 2010.

Male babies were also over-represented among NICU admissions in New Zealand – 59.1% of the New Zealand registrants compared to 51.5% of total live births in New Zealand (Statistics New Zealand 2010).

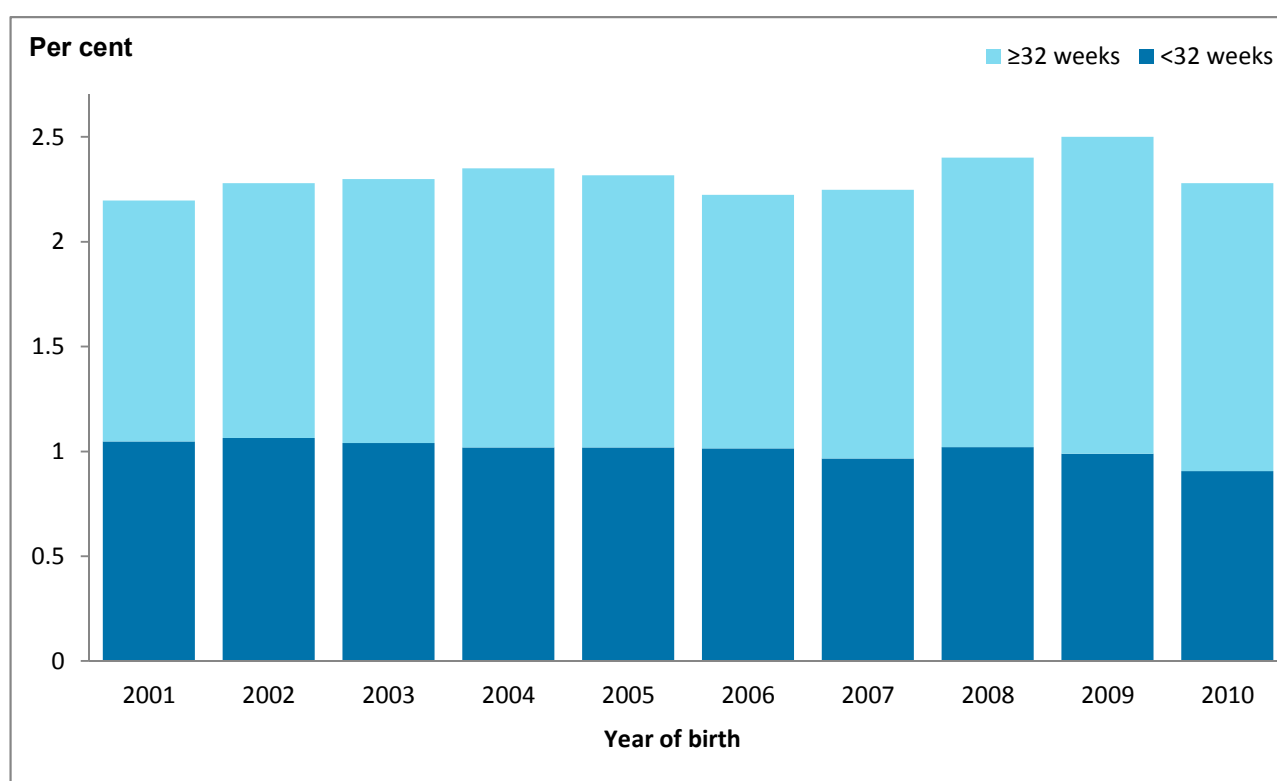
Assisted ventilation was given to 1,817 babies representing 2.8% of all live births with 1,153 babies receiving CPAP as the only form of respiratory assistance (1.8% of all live births).

## 2. Babies registered to level III units, 2010

This section includes data on the ANZNN registrants from 26 of the 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 2010, 8,236 fulfilled the registration criteria for inclusion in the ANZNN audit. The population represents 2.3% of the 361,254 live births in the two countries in 2010 (Li et al. 2012; Statistics New Zealand 2010) (Figure 2) illustrating a slight decrease of 750 registrants (2.5% of all live births) from 2009. It should be noted that data on the ANZNN registrants from two level III NICUs were unable to be included before the publication of this report. In 2009, these two NICUs registered 786 babies. When available, these data will be included into the data collection for future trend analyses.

**FIGURE 2: Babies registered to ANZNN audit of level III units each year as a percentage of liveborn babies in Australia and New Zealand 2001-2010**



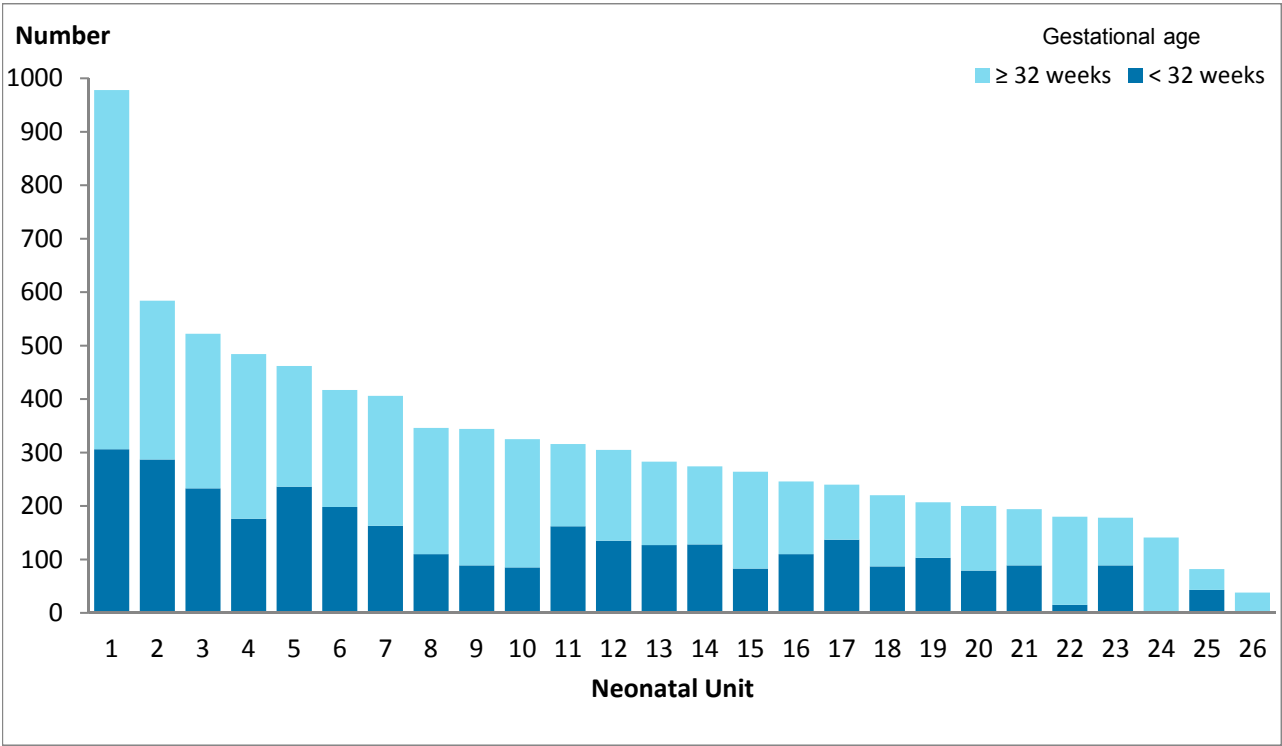
**Note:** Data on the ANZNN registrants from two level III NICUs were not included in 2010.

There were 3,273 (39.7%) babies born before 32 weeks gestation and 4,963 babies born at 32 weeks or more (60.3%). Of the registrants born before 32 weeks gestation 93.0% received assisted ventilation. The major indication for assisted ventilation in this age group was hyaline membrane disease.

The largest level III NICU in Australia and New Zealand registered just over 950 babies in 2010, the smallest less than 50 (Figure 3). The median number of babies registered to an ANZNN unit was 275.

The gestational age group at birth and birthweight for babies qualifying for inclusion in the ANZNN 2010 level III audit is set out in Tables 1 and 2 respectively. The 10-year trend (2001–2010) 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, 2010



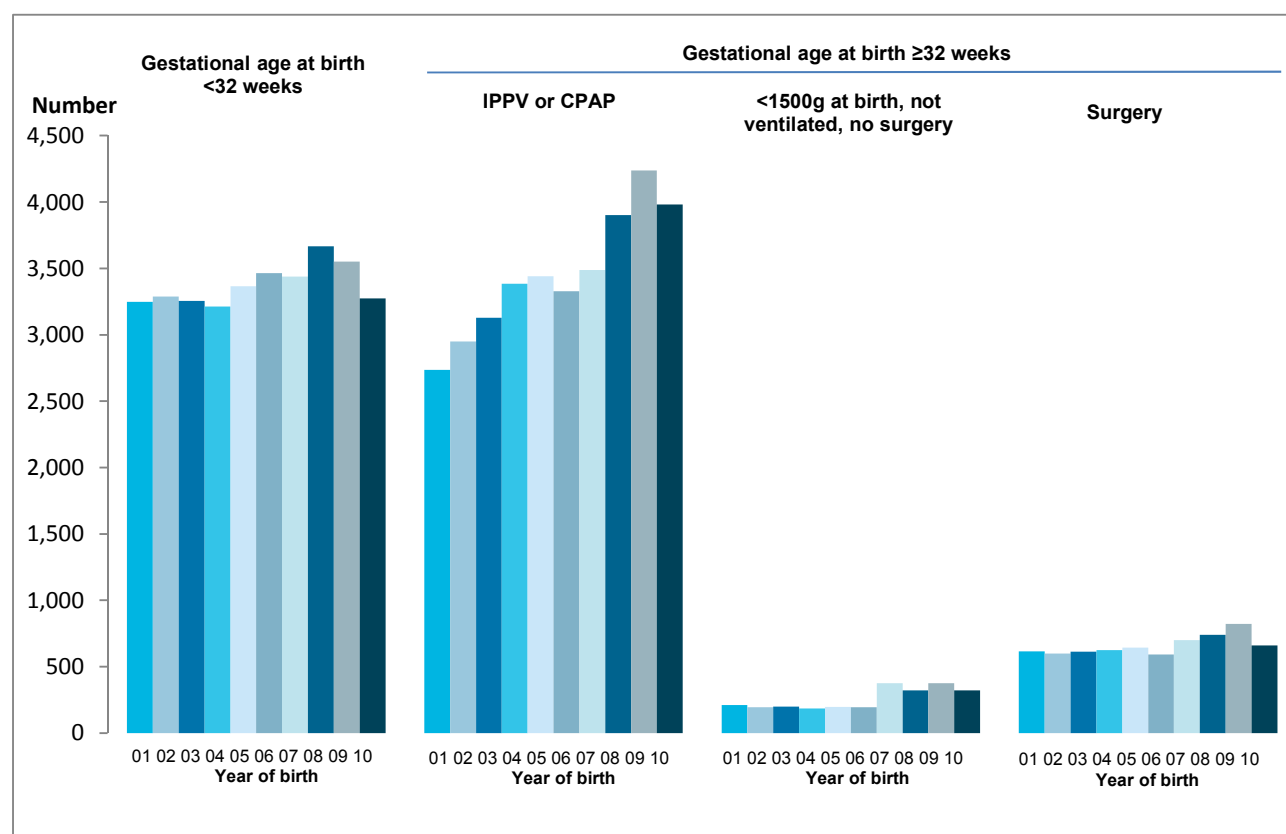
**TABLE 1: Level III registrants born at each completed week of gestation, 2010**

<b>Gestational age (completed weeks)</b>	<b>Number of babies</b>	<b>Percent</b>	<b>Cumulative percent</b>
<24	66	0.8	0.8
24	175	2.1	2.9
25	224	2.7	5.6
26	276	3.4	9.0
27	326	4.0	13.0
28	380	4.6	17.6
29	448	5.4	23.0
30	626	7.6	30.6
31	752	9.1	39.7
<b>All babies &lt;32 weeks</b>	<b>3,273</b>	<b>39.7</b>	
32	685	8.3	48.1
33	568	6.9	55.0
34	570	6.9	61.9
35	455	5.5	67.4
36	388	4.7	72.1
37	393	4.8	76.9
38	538	6.5	83.4
39	473	5.7	89.2
40	511	6.2	95.4
41	340	4.1	99.5
42	42	0.5	100.0
<b>Total</b>	<b>8,236</b>	<b>100.0</b>	

**TABLE 2: Level III registrants in each birthweight group, 2010**

Birth weight (grams)	Number of babies	Percent	Cumulative percent
<500	40	0.5	0.5
500-599	99	1.2	1.7
600-699	183	2.2	3.9
700-799	210	2.5	6.5
800-899	268	3.3	9.7
900-999	288	3.5	13.2
1000-1099	251	3.0	16.3
1100-1199	293	3.6	19.8
1200-1299	346	4.2	24.0
1300-1399	361	4.4	28.4
1400-1499	429	5.2	33.6
<b>All babies &lt;1,500g birthweight</b>	<b>2,768</b>	<b>33.6</b>	
1500-1999	1,470	17.8	51.5
2000-2499	1,057	12.8	64.3
2500-2999	948	11.5	75.8
3000-3499	988	12.0	87.8
3500-3999	674	8.2	96.0
≥4000	331	4.0	100.0
<b>Total</b>	<b>8,236</b>	<b>100.0</b>	

**FIGURE 4: Level III registrants by registration criteria, 2001-2010**



## 3. Mothers of level III registrants, 2010

### Maternal age

While there are many determinants of perinatal outcome, an important one is maternal age. In 2010, 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 (28.0%) followed by mothers aged 25–29 years (25.3%). Together they accounted for more than half of the mothers (53.3%) of ANZNN registrants in 2010 (Table 3). In 2010, the proportion of babies born to teenage mothers decreased slightly (0.5%) from 2009, while those born to mothers in the 35–39 age group decreased by 0.2%, from 20.2% in 2009 to 20.0%.

Almost half of the babies born to teenage mothers (47.3%) were born at less than 32 weeks completed gestation, while only 40.2% 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, 2010**

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	40	37	56	71	60	70	104	444
20–24	9	68	109	152	213	149	215	366	1,281
25–29	21	93	132	213	323	311	345	629	2,067
30–34	13	112	170	212	414	376	389	604	2,290
35–39	14	57	124	158	277	276	288	441	1,635
40 and over	1	28	29	34	72	76	93	114	447
Not stated	2	1	1	3	8	5	13	39	72
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
	Per cent								
Less than 20	9.4	10.1	6.2	6.8	5.2	4.8	5.0	4.6	5.4
20–24	14.1	17.1	18.1	18.4	15.5	11.9	15.4	16.2	15.7
25–29	32.8	23.4	22.0	25.8	23.6	24.9	24.6	27.9	25.3
30–34	20.3	28.1	28.3	25.7	30.2	30.1	27.8	26.7	28.0
35–39	21.9	14.3	20.6	19.2	20.2	22.1	20.6	19.5	20.0
40 and over	1.6	7.0	4.8	4.1	5.3	6.1	6.6	5.0	5.5
<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.

Maternal data for babies of a multiple birth are presented for each registrant.

### Previous antenatal history

In 2010, a previous preterm delivery was reported by 991 mothers (12.0%) of babies registered to ANZNN while 302 mothers (3.7%) 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 590 (7.2%) pregnancies resulting from assisted conception in the ANZNN 2010 cohort with most (86.6%) the result of IVF treatment. Of the pregnancies resulting from assisted conception, 44.4% 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 99.2% of 2010 ANZNN registrants. The mothers of one-quarter of registrants (24.9%) presented with preterm labour while preterm pre-labour rupture of membranes was the second highest (15.0%) presenting antenatal problem (Table 4). Overall 83.4% of 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 (38.2% and 31.2% respectively) followed by preterm pre-labour rupture of membranes (22.4% and 16.6% respectively).

Among women who gave birth at term, just over half (54.3%) were recorded as having no maternal presenting antenatal problem.

**TABLE 4: Mother's presenting antenatal problem for level III registrants by gestational age group, 2010**

	Gestational age group								
Presenting antenatal problem	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
	Number								
No antenatal problems	0	0	1	3	5	11	27	1,248	1,295
Preterm pre-labour rupture of membranes (PROM)	21	103	136	158	315	237	233	20	1,223
Preterm labour	36	180	251	313	470	343	439	5 <sup>(a)</sup>	2,037
Hypertension in pregnancy	1	32	71	106	214	199	145	81	849
Antepartum haemorrhage (APH)	7	59	45	101	130	118	108	49	617
Intrauterine growth restriction (IUGR)	0	5	27	46	77	94	101	48	398
Fetal distress	0	9	29	35	75	74	70	387	679
Other problem	1	9	40	54	71	135	188	205	703
Congenital anomalies	0	2	2	12	21	38	94	197	366
Not stated	0	0	0	0	0	4	8	57	69
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
	Per cent								
No antenatal problems	0.0	0.0	0.2	0.4	0.4	0.9	1.9	55.7	15.9
Preterm pre-labour rupture of membranes (PROM)	31.8	25.8	22.6	19.1	22.9	19.0	16.6	0.9	15.0
Preterm labour	54.5	45.1	41.7	37.8	34.1	27.5	31.2	0.2	24.9
Hypertension in pregnancy	1.5	8.0	11.8	12.8	15.5	15.9	10.3	3.6	10.4
Antepartum haemorrhage (APH)	10.6	14.8	7.5	12.2	9.4	9.4	7.7	2.2	7.6
Intrauterine growth restriction (IUGR)	0.0	1.3	4.5	5.6	5.6	7.5	7.2	2.1	4.9
Fetal distress	0.0	2.3	4.8	4.2	5.4	5.9	5.0	17.3	8.3
Other problem	1.5	2.3	6.6	6.5	5.2	10.8	13.4	9.2	8.6
Congenital anomalies	0.0	0.5	0.3	1.4	1.5	3.0	6.7	8.8	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>

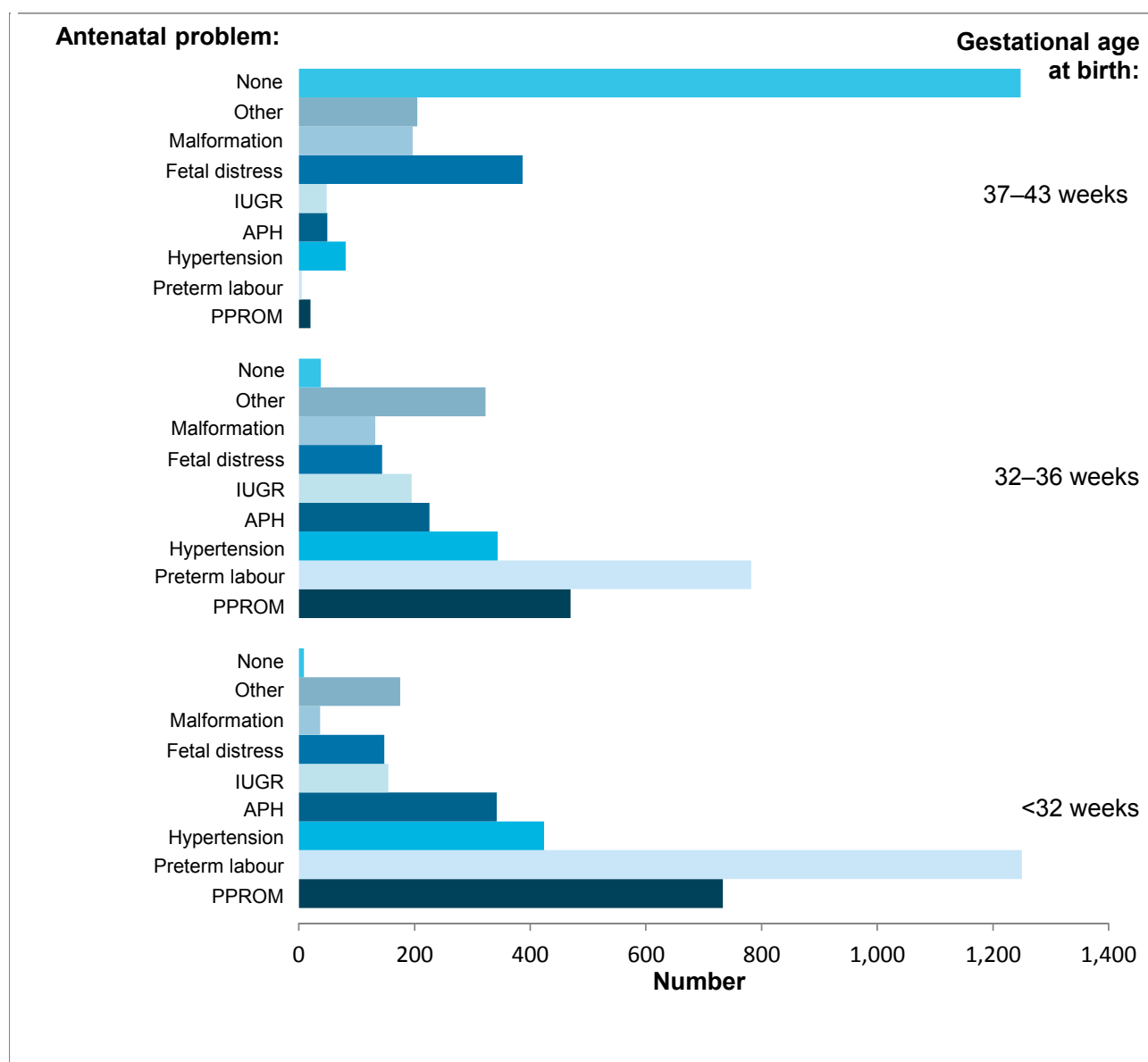
(a) These mothers presented with preterm labour, then went on to deliver at term.

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

Maternal data for babies of a multiple birth are presented for each registrant.



**FIGURE 5: Presenting antenatal problem for mothers of level III registrants by gestational age group, 2010**



## 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 2010, 87.3% of mothers of ANZNN registrants born before 34 weeks of gestation received one or more doses of antenatal corticosteroids leaving 12.7% of mothers of registrants in this group who did not report receiving any antenatal corticosteroids. Of the mothers who received antenatal corticosteroids, 15.6% received them more than seven days prior to giving birth.

For mothers of ANZNN registrants born before 32 weeks of gestation, 88.5% received one or more doses of antenatal corticosteroids and 11.5% of mothers of registrants in this group did not report receiving any antenatal corticosteroids. Of the mothers who received antenatal corticosteroids, 15.2% received them more than seven days prior to giving birth (Table 5). The 10-year trend (2001–2010) 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, 2010**

Antenatal corticosteroids	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
None	16	39	46	86	160	176	822	1,836	3,181
Incomplete course	22	119	191	243	375	319	115	15	1,399
Course completed	27	201	278	369	631	558	219	24	2,307
Completed >7 days prior to birth	0	37	81	124	199	177	147	28	793
Not stated	1	3	6	6	13	23	110	394	556
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
	Per cent								
None	24.6	9.8	7.7	10.5	11.7	14.3	63.1	96.5	41.4
Incomplete course	33.8	30.1	32.0	29.6	27.5	25.9	8.8	0.8	18.2
Course completed	41.5	50.8	46.6	44.9	46.2	45.4	16.8	1.3	30.0
Completed >7 days prior to birth	0.0	9.3	13.6	15.1	14.6	14.4	11.3	1.5	10.3
<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.

Maternal data for babies of a multiple birth are presented for each registrant.

## 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 2010, 19.7% of ANZNN registrants were reported as being from a multiple pregnancy with the greatest percentage of multiple births being twins (18.0%). Of the 2010 ANZNN registrants from multiple births, 57.9% were born before 32 weeks gestation and 97.4% were born before 37 weeks gestation (Table 6). The 10-year trend (2001–2010) for multiple births is represented by Figure 12 in Appendix 1.

**TABLE 6: Plurality of level III registrants by gestational age group, 2010**

Plurality	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
Singletons	46	315	426	582	966	843	1,184	2,255	6,617
Twins	19	83	161	218	364	369	224	41	1,479
Triplets and higher orders	1	1	15	28	48	41	5	1	140
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
Per cent									
Singletons	69.7	78.9	70.8	70.3	70.1	67.3	83.8	98.2	80.3
Twins	28.8	20.8	26.7	26.3	26.4	29.4	15.9	1.8	18.0
Triplets and higher orders	1.5	0.3	2.5	3.4	3.5	3.3	0.4	0.0	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>

## 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 2010 registrants (58.1%) the method of birth was caesarean section with 64.9% of caesarean sections occurring before the onset of labour. Just over one-third of registrants (34.8%) 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 59.2% in 2009. The 2010 data show a decrease of 1.1% from 2009.

The most common method of birth for registrants born before 24 weeks was vaginal birth (86.4%) with no babies requiring assistance with instruments (Table 7). The 10-year trend (2001–2010) 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, 2010**

	Gestational age group								
Method of birth	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
Vaginal	57	211	197	253	424	346	440	878	2,806
Vaginal instrumental birth	0	14	18	26	62	53	91	311	575
Caesarean section in labour	2	74	144	192	280	228	288	438	1,646
Caesarean section no labour	7	97	240	348	597	609	566	581	3,045
Not stated	0	3	3	9	15	17	28	89	164
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
Per cent									
Vaginal	86.4	53.3	32.9	30.9	31.1	28.0	31.8	39.8	34.8
Vaginal instrumental birth	0.0	3.5	3.0	3.2	4.5	4.3	6.6	14.1	7.1
Caesarean section in labour	3.0	18.7	24.0	23.4	20.5	18.4	20.8	19.8	20.4
Caesarean section no labour	10.6	24.5	40.1	42.5	43.8	49.3	40.9	26.3	37.7
<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>

*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 2010, 77.8% of all babies and 86.8% of babies less than 32 weeks gestation at birth were born in a tertiary centre equipped with an NICU; 21.2% of all ANZNN registrants were born in a non-tertiary hospital; while 1.0% 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, 2010**

	Gestational age group								
Level of birth hospital	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
Tertiary hospital	57	350	517	700	1,216	1,076	1,043	1,442	6,401
Non-tertiary hospital	7	41	80	117	147	174	362	818	1,746
Not born in a hospital <sup>(a)</sup>	2	8	5	11	15	3	7	31	82
Not stated	0	0	0	0	0	0	1	6	7
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
Per cent									
Tertiary hospital	86.4	87.7	85.9	84.5	88.2	85.9	73.9	62.9	77.8
Non-tertiary hospital	10.6	10.3	13.3	14.1	10.7	13.9	25.6	35.7	21.2
Not born in a hospital <sup>(a)</sup>	3.0	2.0	0.8	1.3	1.1	0.2	0.5	1.4	1.0
<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>

*(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 2010, 24.3% of ANZNN registrants were transferred to an NICU after birth. Of these the greatest percentage (80.2%) were transported by a specialist team with 15.9% transported by a non-specialist team (Table 9). The 10-year trend (2001–2010) 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, 2010**

	Gestational age group								
Mode of Transport	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
Not transported	54	344	513	699	1,201	1,063	1,014	1,341	6,229
Specialist retrieval team	10	42	74	100	137	154	347	741	1,605
Non-specialist team	0	6	9	23	20	29	41	191	319
Other	2	7	6	6	19	6	10	21	77
Not stated	0	0	0	0	1	1	1	3	6
Total	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Per cent									
Not transported	81.8	86.2	85.2	84.4	87.2	84.9	71.8	58.5	75.7
Specialist transport team	15.2	10.5	12.3	12.1	9.9	12.3	24.6	32.3	19.5
Non-specialist team	0.0	1.5	1.5	2.8	1.5	2.3	2.9	8.3	3.9
Other	3.0	1.8	1.0	0.7	1.4	0.5	0.7	0.9	0.9
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.*

## Breastfeeding at discharge

Data on breastfeeding at discharge were available for 3,936 babies (50.8% of the babies who survived to go home). Among registrants who provided data on breastfeeding, 78.9% were breastfed at discharge.

The rate of breastfeeding among surviving very preterm babies at discharge was 76.9% compared to 80.5% for surviving preterm and term babies. Care should be taken with interpretation of these data as breastfeeding status on discharge was not available for half (49.2%) of the surviving ANZNN registrants.

## 4. Characteristics of level III registrants, 2010

### Baby gender

Male births exceeded female births in both Australia and New Zealand and accounted for 51.2% of combined live births in both countries in 2010 (Li et al. 2012; Statistics New Zealand 2010). The percentage was higher among ANZNN registrants with male births representing 57.4%. Gender was not available for six babies. For births at less than 32 weeks gestation, 53.9% were male; of births at term, 62.4% were male.

### Resuscitation in delivery suite

The type of resuscitation given to babies immediately after birth ranges 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; 25.3% of registrants were intubated in the delivery suite to establish independent respiration and heart rate. For babies born before 32 weeks the percentage was 43.4% and for babies born at term the percentage was 16.2%.

### 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 17.3% of ANZNN registrants, with 4.4% 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, 45.2% of babies were born at less than 32 weeks and 35.3% were born at term (Table 10).

**TABLE 10: Apgar scores at birth for level III registrants by gestational age group, 2010**

	Gestational age group								
Apgar score	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
Apgar at 1 minute									
Apgar less than 4	37	152	157	132	164	116	162	501	1,421
Apgar between 4 and 7	27	211	349	462	661	575	547	775	3,607
Apgar greater than 8	1	36	95	233	553	562	704	1,019	3,203
Not Stated	1	0	1	1	0	0	0	2	5
Total	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Number									
Apgar at 5 minutes									
Apgar less than 4	7	41	34	31	23	22	32	169	359
Apgar between 4 and 7	48	205	256	246	320	261	298	627	2,261
Apgar greater than 8	10	153	311	551	1,035	969	1,083	1,499	5,611
Not Stated	1	0	1	0	0	1	0	2	5
Total	66	399	602	828	1,378	1,253	1,413	2,297	8,236

## 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 2010. 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 36.4°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, 2010**

Gestational age group	Number of babies	Temperature	
		Median	Inter quartile range
<24	66	35.3	34.5–35.9
24–25	399	36.0	35.3–36.6
26–27	602	36.4	35.8–36.8
28–29	828	36.4	36.0–36.8
30–31	1,378	36.3	35.9–36.8
32–33	1,253	36.4	35.9–36.7
34–36	1,413	36.4	35.9–36.8
37–43	2,297	36.6	35.7–37.0
<b>Total</b>	<b>8,236</b>	<b>36.4</b>	<b>35.8–36.8</b>

## Indication for respiratory support

In 2010, only 5.7% 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 47.0%. Non-specific respiratory distress accounted for 27.8% of babies, surgery for 4.2%, while congenital anomaly and encephalopathy each accounted for 3.0% (Table 12).

For babies born before 37 weeks gestation, HMD (61.4%) remained the most common indication for respiratory support. For babies born at term, non-specific respiratory distress (35.1%) was the most common indication followed by surgery (10.4%) and meconium aspiration (9.7%) (Table 12). The 10-year trend (2001–2010) 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, 2010**

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	0	1	12	173	117	56	104	463
Non-specific respiratory distress	0	1	17	112	347	446	549	784	2,256
Hyaline membrane disease	65	395	571	683	796	583	511	204	3,808
Meconium aspiration syndrome	0	0	0	1	0	1	8	216	226
Pneumonia	0	1	0	0	1	3	10	56	71
Persistent pulmonary hypertension	0	0	5	1	2	5	9	105	127
Apnoea	0	1	3	8	20	20	22	31	105
Congenital anomaly	1	0	0	3	9	18	58	152	241
Other	0	1	2	2	5	19	46	148	223
Peri-surgery	0	0	0	0	2	17	88	233	340
Newborn encephalopathy	0	0	0	1	8	5	26	202	242
Not stated	0	0	3	5	15	19	30	62	134
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
	Per cent								
No respiratory support	0.0	0.0	0.2	1.4	12.6	9.3	4.0	4.5	5.7
Non-specific respiratory distress	0.0	0.3	2.8	13.6	25.5	36.1	39.7	35.1	27.8
Hyaline membrane disease	98.5	99.0	95.3	83.0	58.4	47.2	36.9	9.1	47.0
Meconium aspiration syndrome	0.0	0.0	0.0	0.1	0.0	0.1	0.6	9.7	2.8
Pneumonia	0.0	0.3	0.0	0.0	0.1	0.2	0.7	2.5	0.9
Persistent pulmonary hypertension	0.0	0.0	0.8	0.1	0.1	0.4	0.7	4.7	1.6
Apnoea	0.0	0.3	0.5	1.0	1.5	1.6	1.6	1.4	1.3
Congenital anomaly	1.5	0.0	0.0	0.4	0.7	1.5	4.2	6.8	3.0
Other	0.0	0.3	0.3	0.2	0.4	1.5	3.3	6.6	2.8
Peri-surgery	0.0	0.0	0.0	0.0	0.1	1.4	6.4	10.4	4.2
Newborn encephalopathy	0.0	0.0	0.0	0.1	0.6	0.4	1.9	9.0	3.0
<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>

**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 2010, one-third of ANZNN registrants (33.3%) were administered exogenous surfactant (Table 13). There were 2,443 babies who received IPPV for HMD in 2010. Exogenous surfactant was given to 2,281 of these babies (93.4%). There were 162 babies diagnosed with HMD who were not given exogenous surfactant.

**TABLE 13: Exogenous surfactant use for level III registrants by gestational age group, 2010**

Exogenous surfactant	Gestational age group								Total
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	
	Number								
None	1	21	83	292	932	963	1,125	2,064	5,481
Curosurf	48	293	408	403	328	219	196	153	2,048
Survanta	17	77	104	129	111	69	86	71	664
SurvCuro	0	7	5	2	4	1	3	6	28
Exosurf	0	0	0	0	0	0	0	0	0
Any combination	0	0	2	2	0	0	0	0	4
Not stated	0	1	0	0	3	1	3	3	11
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
Per cent									
None	1.5	5.3	13.8	35.3	67.8	76.9	79.8	90.0	66.6
Curosurf	72.7	73.6	67.8	48.7	23.9	17.5	13.9	6.7	24.9
Survanta	25.8	19.3	17.3	15.6	8.1	5.5	6.1	3.1	8.1
SurvCuro	0.0	1.8	0.8	0.2	0.3	0.1	0.2	0.3	0.3
Exosurf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Any combination	0.0	0.0	0.3	0.2	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>	<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.*

## 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 2010, 93.3% 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 (2001–2010) for assisted ventilation is represented in Figures 16 to 18 in Appendix 1.

In 2010, IPPV was given for a total of 633,627 hours to ANZNN registrants and CPAP was given for 1,426,971 hours. The total number of hours of ventilation equates to each baby receiving 10.4 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 2010 remains CPAP with 46.9% of registrants receiving CPAP only, 13.6% receiving IPPV only and 32.9% 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, with the exception of 2007 (11.2%). In 2010, 16.3% of registrants who received IPPV also received HFOV. The use of HFOV among individual units varied between 0.4% and 16.1% with the highest percentage of babies receiving HFOV born at less than 24 weeks (72.3%) followed by babies born at 24–25 weeks gestation (45.4%) (Table 15). The 10-year trend (2001–2010) 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, 2010**

Median & Interquartile range (IQR)	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>	601	393.5	96.5	30	20	26	41	51
<b>IQR</b>	152–1,018	131–711	25–312	11–92	10–48	12–61	17–89	22–109
<b>CPAP (hours)</b>								
<b>Median</b>	863	961	811.5	235	52	25	23	16
<b>IQR</b>	162–1,267.5	537–1,249	459.5–1,167	71–588	20–126	11–68	10–58	7–40
<b>Oxygen (days)</b>								
<b>Median</b>	89.5	69	53.5	19	3	3	3	3
<b>IQR</b>	8–124	26–112	23–87	3–46	1–9	2–6	2–5	2–7

*Note: IQR = Interquartile range*

The percentage of ANZNN registrants who received nitric oxide (NO) was 4.7%. The use of NO continues to have a U-shaped distribution with the highest percentage of babies to receive NO born at less than 24 weeks gestation (18.5%) (Table 15). The 10-year trend (2001–2010) for NO is represented in Figure 20 in Appendix 1

**TABLE 15: Assisted ventilation for level III registrants by gestational age group, 2010**

	Gestational age group								
Ventilation type	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
CPAP given	40	321	552	770	1,123	1,064	1,125	1,574	6,569
IPPV given	65	390	518	519	446	322	517	1,049	3,826
Oxygen given	62	371	560	673	915	740	903	1,520	5,744
HFOV given	47	177	130	66	28	22	39	115	624
NO given	12	45	43	28	13	14	29	202	386
ECMO given	0	0	1	0	0	0	2	16	19
Total in each age group	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Per cent									
CPAP given	60.6	80.5	91.7	93.0	81.5	84.9	79.6	68.5	79.8
IPPV given	98.5	97.7	86.0	62.7	32.4	25.7	36.6	45.7	46.5
Oxygen given	93.9	93.0	93.0	81.3	66.4	59.1	63.9	66.2	69.7
Per cent of babies given IPPV									
HFOV given	72.3	45.4	25.1	12.7	6.3	6.8	7.5	11.0	16.3
NO given	18.5	11.5	8.3	5.4	2.9	4.3	5.6	19.3	10.1
ECMO given	0.0	0.0	0.2	0.0	0.0	0.0	0.4	1.5	0.5

*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 3,273 babies born before 32 weeks gestation, 93.0% 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 33.8% and IPPV was the only form of ventilation for 7.3% of registrants. Both IPPV and CPAP were given to 51.9% of registrants.

The total duration of IPPV for these very preterm babies was 449,808 hours (18,742 days), and the duration of CPAP was 1,239,520 hours (51,647 days).

Of the babies born before 32 weeks gestational age and given IPPV in 2010, 23.1% were given high frequency ventilation while 7.3% of these babies were given NO (Table 15).

Among 2010 ANZNN registrants born at less than 32 weeks gestation 41.2% of registrants received supplemental oxygen at 28 days of age, with 16.5% 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, 92.9% received assisted ventilation. Non-specific respiratory distress was the main reason for ventilation. Total duration of CPAP use by registrants in this gestational age group was 120,085 hours (5,004 days) and IPPV use was 70,955 hours (2,956 days).

Of the babies born at 32–36 weeks gestation and given IPPV in 2010, 7.3% were given high frequency ventilation while 5.1% of these babies were given NO. Supplementary oxygen was given to 61.6% of registrants (Table 15).

## Ventilation in babies born at term

The main indication for respiratory support in term babies was non-specific respiratory distress (35.1%). This group required 112,864 hours of IPPV (4,703 days) and 67,366 hours (2,807 days) of CPAP.

Of the babies born at term and given IPPV in 2010, 11.0% were given high frequency ventilation while 19.3% of these babies were given NO. There were 16 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 2010 ANZNN registrants, 20.4% received supplemental oxygen on day 28, a higher percentage than in 2009 (19.0%), and 21.2% 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, 2010**

	Gestational age group								
Oxygen therapy	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
No oxygen on day 28	1	31	141	521	1,229	1,202	1,332	2,096	6,553
Oxygen on day 28	65	368	461	307	149	51	80	200	1,681
▪ survived to discharge home	35	243	386	273	122	32	30	69	1,190
▪ died before discharge	30	125	75	34	27	19	50	131	491
Not stated	0	0	0	0	0	0	1	1	2
Total in each age group	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Number									
Babies given home oxygen	14	75	80	41	13	4	8	17	252
Per cent									
No oxygen on day 28	1.5	7.8	23.4	62.9	89.2	95.9	94.3	91.3	79.6
Oxygen on day 28	98.5	92.2	76.6	37.1	10.8	4.1	5.7	8.7	20.4
▪ survived to discharge home	53.8	66.0	83.7	88.9	81.9	62.7	37.5	34.5	70.8
▪ died before discharge	46.2	34.0	16.3	11.1	18.1	37.3	62.5	65.5	29.2
Per cent									
Babies given home oxygen	40.0	30.9	20.7	15.0	10.7	12.5	26.7	24.6	21.2

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

## Nasal high flow therapy

Nasal high flow therapy (NHFT) as a form of non invasive respiratory support for premature babies, is an emerging trend within neonatal units. Humidified blended air and oxygen mix is administered through a high flow device via high flow nasal cannula (HFNC). NHFT may deliver a positive end-expiratory pressure and for this reason can be preferred to nasal CPAP for use in premature infants (Wilkinson et al. 2011).

In 2010 nasal high flow therapy was reported for 1,009 babies (12.3%) of all level III registrants (Table 17). This overall increase of 4.2% from 2009 was observed predominantly in the babies born at less than 30 weeks gestation. In this gestational age group, approximately 30% of babies received NHFT. The minimum flow recorded was 1 litre/min and the maximum 14 litres/min. Of the babies receiving NHFT 80.1% received a minimum rate of 2–4 litres/min while 69.3% received a maximum of 6–8 litres /min.

Care should be taken in interpretation of these data as this is only the second year of collection for ANZNN and NHFT is an emerging trend amongst member units.

**TABLE 17: Nasal high flow respiratory support for level III registrants by gestational age group, 2010**

Gestational age group									
Nasal high flow	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
High flow	21	118	218	201	172	90	70	119	1,009
No high flow	45	281	384	627	1206	1163	1343	2178	7,227
Total	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Per cent									
None	31.8	29.6	36.2	24.3	12.5	7.2	5.0	5.2	12.3
Curosurf	68.2	70.4	63.8	75.7	87.5	92.8	95.0	94.8	87.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

## 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 8.7% of babies in 2010 were reported to have had respiratory support at 36 weeks PMA, indicating the presence of CLD. The prevalence of chronic lung disease continues to be highest in babies born less than 27 weeks gestation. The highest percentage of chronic lung disease was in those babies born before 24 weeks gestation (51.5%) (Table 18). 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 18: Chronic lung disease for level III registrants by gestational age group, 2010**

Chronic lung disease (CLD)	Gestational age										Total
	<24	24	25	26	27	28	29	30	31	≥32	
	Number										
No CLD	32	94	109	145	209	306	368	568	722	4,963	7,516
CLD	34	81	115	131	117	74	80	58	30	0	720
▪ CLD and survived	34	75	109	130	110	70	76	57	29	0	690
▪ CLD and died	0	6	6	1	7	4	4	1	1	0	30
Total	66	175	224	276	326	380	448	626	752	4,963	8,236
Per cent											
No CLD	48.5	53.7	48.7	52.5	64.1	80.5	82.1	90.7	96.0	100.0	91.3
CLD	51.5	46.3	51.3	47.5	35.9	19.5	17.9	9.3	4.0	0.0	8.7
▪ CLD and survived	100.0	92.6	94.8	99.2	94.0	94.6	95.0	98.3	96.7	0.0	95.8
▪ CLD and died	0.0	7.4	5.2	0.8	6.0	5.4	5.0	1.7	3.3	0.0	4.2

*Note: 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 19).

**TABLE 19: Pulmonary air leak for level III registrants by gestational age group, 2010**

	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	31	34	31	29	39	75	137	385
No air leak	56	368	568	797	1,349	1,214	1,338	2,159	7,849
Not stated	1	0	0	0	0	0	0	1	2
Total	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Per cent									
Air leak	13.8	7.8	5.6	3.7	2.1	3.1	5.3	6.0	4.7
No air leak	86.2	92.2	94.4	96.3	97.9	96.9	94.7	94.0	95.3
<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.*

## 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 8.1% of ANZNN registrants in 2010. Of these babies, 48.9% were born at less than 28 weeks gestation, 75.7% were born at less than 32 weeks gestation and 98.9% of registrants survived up to 2 days of life (Table 19). The 5-year trends (2006–2010) for early and late sepsis are represented by Figure 24 and Figure 25 respectively in Appendix 1.

**TABLE 20: Neonatal sepsis for level III registrants by gestational age group, 2010**

	Gestational age group								
Sepsis	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
No sepsis	38	266	437	727	1,301	1,216	1,375	2,210	7,570
Sepsis	28	133	165	101	77	37	38	87	666
▪ <48 hrs	1	10	10	13	10	7	9	31	91
▪ ≥48 hrs	26	120	152	88	66	28	28	55	563
▪ both <48 and ≥48 hrs	1	3	3	0	1	2	1	1	12
Babies alive on day 2	60	380	590	821	1,369	1,248	1,404	2,271	8,143
Babies who did not survive to day 2	6	19	12	7	9	5	9	26	93
Total in each age group	66	399	602	828	1,378	1,253	1,413	2,297	8,236
Per cent									
No sepsis <sup>(a)</sup>	57.6	66.7	72.6	87.8	94.4	97.0	97.3	96.2	91.9
Sepsis <sup>(a)</sup>	42.4	33.3	27.4	12.2	5.6	3.0	2.7	3.8	8.1
▪ <48 hrs <sup>(a)</sup>	1.5	2.5	1.7	1.6	0.7	0.6	0.6	1.3	1.1
▪ ≥48 hrs <sup>(b)</sup>	43.3	31.6	25.8	10.7	4.8	2.2	2.0	2.4	6.9
▪ both <48 and ≥48 hrs <sup>(a)</sup>	1.5	0.8	0.5	0.0	0.1	0.2	0.1	0.0	0.1

(a) Denominator is all registrants.

(b) Denominator is registrants alive at 48 hours.

## 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 2010 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 2010 registrants, 32.5% were eligible for ROP examination and of these eligible registrants, 74.1% were examined and had the results of their eye examination recorded.

Of those ANZNN registrants who were eligible for an eye examination, 60 died before their ROP status could be determined. Of those examined, 5.4% had stage 3 or 4 eye disease and of these babies 68.2% received treatment (Table 21, Figure 6). The 6-year trend (2005–2010) for stages 3 and 4 ROP and treatment are represented by Figure 22 in Appendix 1.

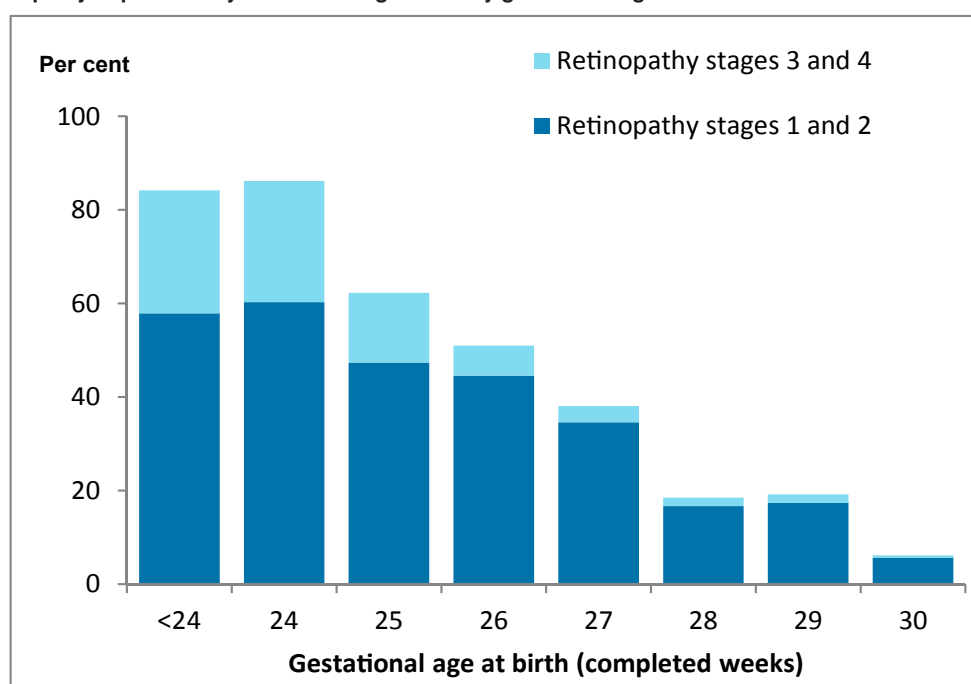
**TABLE 21: Retinopathy of prematurity for level III registrants by gestational age, 2010**

	Gestational age									
Retinopathy of prematurity (ROP)	<24	24	25	26	27	28	29	30	>30	Total
Number										
No ROP	6	16	66	122	175	278	316	364	0	1,343
▪ Stage 1	3	26	39	50	65	41	50	18	0	292
▪ Stage 2	19	44	44	61	33	16	18	4	0	239
▪ Stage 3	10	30	26	16	10	5	6	2	0	105
▪ Stage 4	0	0	0	0	0	1	1	0	0	2
Not examined	28	59	48	27	43	39	57	237	0	538
Not stated	0	0	1	0	0	0	0	1	153	155
<b>Total</b>	<b>66</b>	<b>175</b>	<b>224</b>	<b>276</b>	<b>326</b>	<b>380</b>	<b>448</b>	<b>626</b>	<b>153</b>	<b>2,674</b>
Number										
Treatment for ROP <sup>(a)</sup>	6	21	14	13	9	6	2	2	0	73
Per cent										
No ROP	15.8	13.8	37.7	49.0	61.8	81.5	80.8	93.8	0.0	67.8
▪ Stage 1	7.9	22.4	22.3	20.1	23.0	12.0	12.8	4.6	0.0	14.7
▪ Stage 2	50.0	37.9	25.1	24.5	11.7	4.7	4.6	1.0	0.0	12.1
▪ Stage 3	26.3	25.9	14.9	6.4	3.5	1.5	1.5	0.5	0.0	5.3
▪ Stage 4	0.0	0.0	0.0	0.0	0.0	0.3	0.3	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>0.0</b>	<b>100.0</b>
Per cent										
Treatment for ROP	60.0	70.0	53.8	81.3	90.0	100.0	28.6	100.0	n/a	68.2

(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.

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

**FIGURE 6: Retinopathy of prematurity for level III registrants by gestational age in 2010**



## 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 3,273 babies born at less than 32 weeks gestation eligible for a cerebral ultrasound, 3,191 survived to day 3 and 92.6% had an examination recorded. A normal report was recorded for 78.5% of these 2010 ANZNN registrants.

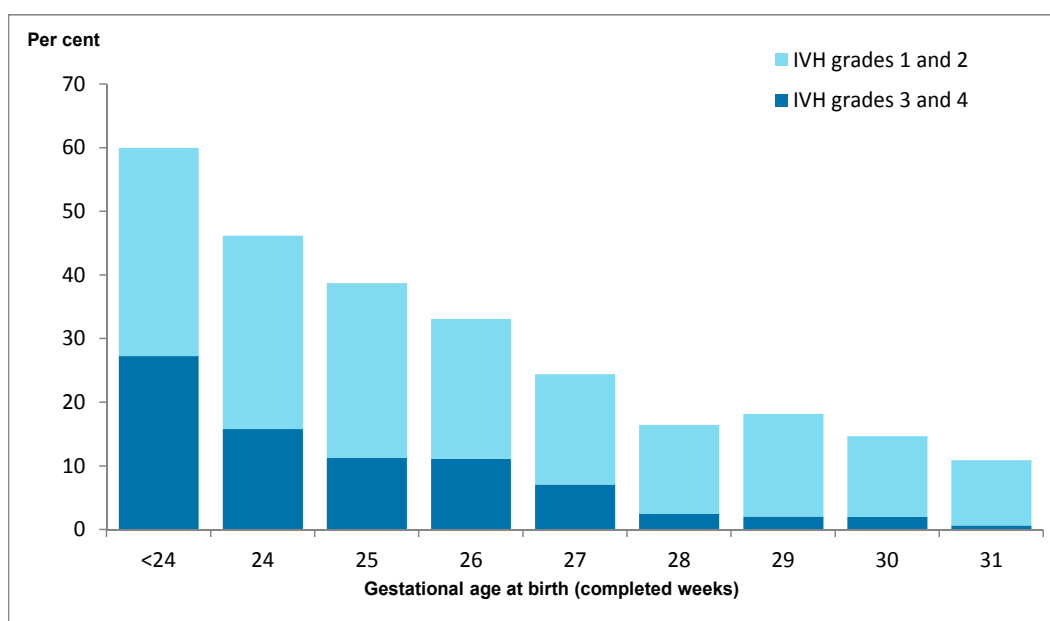
There were 148 babies reported to have grade 3 or 4 IVH representing 4.6% of the babies born before 32 weeks gestation. The highest percentage of babies who had severe IVH (grade 4) were born before 28 weeks gestational age, with the majority (53.3%) of the babies born between 24 and 26 weeks gestation (Table 22). The 10-year trend (2001–2010) for registrants with grades 3 and 4 IVH who survived to day 3 is represented in Figure 23 in Appendix 1.

**TABLE 22: Intraventricular haemorrhage for level III registrants born before 32 weeks and survived to day 3 by gestational age, 2010**

Intraventricular haemorrhage	Gestational age									Total
	<24	24	25	26	27	28	29	30	31	
Number										
None	22	85	125	180	235	305	355	471	540	2,318
▪ Grade 1	8	28	34	35	33	36	52	58	57	341
▪ Grade 2	10	20	22	24	21	15	18	12	5	147
▪ Grade 3	4	7	9	13	8	5	4	4	2	56
▪ Grade 4	11	18	14	17	14	4	5	7	2	92
Not examined	0	2	4	2	2	5	13	69	140	237
<b>Total</b>	<b>55</b>	<b>160</b>	<b>208</b>	<b>271</b>	<b>313</b>	<b>370</b>	<b>447</b>	<b>621</b>	<b>746</b>	<b>3,191</b>
Per cent										
None	40.0	53.8	61.3	66.9	75.6	83.6	81.8	85.3	89.1	78.5
▪ Grade 1	14.5	17.7	16.7	13.0	10.6	9.9	12.0	10.5	9.4	11.5
▪ Grade 2	18.2	12.7	10.8	8.9	6.8	4.1	4.1	2.2	0.8	5.0
▪ Grade 3	7.3	4.4	4.4	4.8	2.6	1.4	0.9	0.7	0.3	1.9
▪ Grade 4	20.0	11.4	6.9	6.3	4.5	1.1	1.2	1.3	0.3	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>	<b>100.0</b>

*Note: Not stated and not examined 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, 2010**



## 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 3,273 babies born at less than 32 weeks gestation eligible for a cerebral ultrasound, 3,191 survived until day 3 and late ultrasound results were available for 2,483 of these babies. A normal report of no cysts was recorded for 96.8% of these registrants, 1.2% reported porencephalic cysts, 2.0% reported periventricular leukomalacia (PVL) and no reports of encephaloclastic porencephaly. Hydrocephalus was reported for 1.2% of these registrants in 2010 (Table 23).

**TABLE 23: Late cerebral ultrasound results for level III registrants born before 32 weeks by gestational age, 2010**

	Gestational age									
Cerebral ultrasound results	<24	24	25	26	27	28	29	30	31	Total
	Number									
No cysts	52	128	183	242	277	330	367	430	395	2,404
Porencephalic cysts	3	3	2	1	3	4	4	3	6	29
Periventricular leukomalacia	1	7	3	10	3	4	8	9	5	50
Encephaloclastic porencephaly	0	0	0	0	0	0	0	0	0	0
Not stated	10	37	36	23	43	42	69	184	346	790
<b>Total</b>	<b>66</b>	<b>175</b>	<b>224</b>	<b>276</b>	<b>326</b>	<b>380</b>	<b>448</b>	<b>626</b>	<b>752</b>	<b>3,273</b>
Hydrocephalus	4	3	4	5	1	2	3	4	3	29
	Per cent									
No cysts	92.9	92.8	97.3	95.7	97.9	97.6	96.8	97.3	97.3	96.8
Porencephalic cysts	5.4	2.2	1.1	0.4	1.1	1.2	1.1	0.7	1.5	1.2
Periventricular leukomalacia	1.8	5.1	1.6	4.0	1.1	1.2	2.1	2.0	1.2	2.0
Encephaloclastic porencephaly	0.0	0.0	0.0	0.0	0.0	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>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
Hydrocephalus	7.1	2.2	2.1	2.0	0.4	0.6	0.8	0.9	0.7	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 parenteral nutrition and antibiotic treatment. If medical treatment is unsuccessful surgery may be required to remove the affected bowel.

For ANZNN registrants in 2010 the percentage of babies with confirmed NEC was 2.2%. Of these babies, 62.0% were born before 28 weeks gestation with 57.7% of them undergoing surgery, and 38.0% were born after 27 weeks gestation; surgery was required for 57.4% of them. In total 57 registrants died from NEC. The number of registrants with confirmed NEC is more than in 2009 (Table 24).

**TABLE 24: Necrotising enterocolitis in level III registrants by year of birth, 2001–2010**

Necrotising enterocolitis	Year of birth									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Number									
NEC at <28 weeks	78	75	78	85	85	95	80	118	97	111
▪ No NEC at <28 weeks	952	1,042	943	941	951	944	1,005	1,052	1,032	952
▪ Not stated	1	0	2	0	0	20	24	15	2	4
NEC at ≥28 weeks	57	65	77	63	50	72	50	74	50	68
▪ No NEC at ≥28 weeks	5,718	5,861	6,091	6,316	6,560	6,428	6,773	7,339	7,801	7,093
▪ Not stated	5	2	4	2	0	32	70	27	3	8
<b>Total</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>	<b>8,628</b>	<b>8,986</b>	<b>8,236</b>
	Per cent									
NEC <28 weeks	7.6	6.7	7.6	8.3	8.2	9.1	7.4	10.1	8.6	10.4
NEC ≥28 weeks	1.0	1.1	1.2	1.0	0.8	1.1	0.7	1.0	0.6	0.9

**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 their first 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 2010, there were 957 ANZNN registrants who had major surgery, of whom almost half (46.6%) were born at term. Of registrants born in a hospital, 72.4% were born in a hospital with tertiary care facilities. Of registrants who had major surgery, 68.3% also had a congenital anomaly present with 51.5% of these diagnosed during the antenatal period. 10.8% had surgery for proven NEC. The median length of stay (LOS) for survivors was 20 days (Table 25).

**TABLE 25: Characteristics of level III registrants who underwent surgery by gestational age group, 2010**

	Gestational age group								
Characteristics	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
	Number								
Male	13	59	47	40	22	33	78	273	565
Female	6	34	35	23	18	22	81	173	392
Congenital anomaly present	2	12	17	23	15	44	141	400	654
Congenital anomaly diagnosed antenatally	0	2	4	6	8	26	97	194	337
Proven NEC	4	37	23	14	7	6	10	2	103
Hospital of birth									
▪ Tertiary	18	84	73	55	34	42	115	265	686
▪ Non-tertiary	1	9	9	7	6	13	43	174	262
Median LOS for survivors (days)	132.5	126	115	87	69	43	36	21	20
Died before discharge home	2	20	17	8	7	5	13	19	91
Total in each age group	19	93	82	63	40	55	159	446	957
	Per cent								
Male	68.4	63.4	57.3	63.5	55.0	60.0	49.1	61.2	59.0
Female	31.6	36.6	42.7	36.5	45.0	40.0	50.9	38.8	41.0
Congenital anomaly present	10.5	12.9	20.7	36.5	37.5	80.0	88.7	89.7	68.3
Congenital anomaly diagnosed antenatally	0.0	2.2	4.9	9.5	20.0	47.3	61.0	43.5	35.2
Hospital of birth									
▪ Tertiary	94.7	90.3	89.0	87.3	85.0	76.4	72.3	59.4	71.7
▪ Non-tertiary	5.3	9.7	11.0	11.1	15.0	23.6	27.0	39.0	27.4
Proven NEC	21.1	39.8	28.0	22.2	17.5	10.9	6.3	0.4	10.8
Died before discharge home	10.5	21.5	20.7	12.7	17.5	9.1	8.2	4.3	9.5
Total in each age group	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

## Congenital anomalies

In 2010, 1,116 ANZNN registrants (13.6%) had one or more congenital anomalies. For registrants who had a congenital anomaly, 18.0% were born before 32 weeks gestation, 28.7% were born between 32 and 36 weeks gestation and more than half of registrants (53.3%) were born at term.

Over half of ANZNN registrants (53.0%) with congenital anomalies were diagnosed during the antenatal period with 8.8% of babies recorded as having a fatal congenital anomaly. A higher percentage of babies with congenital anomalies were male (58.2%).

## 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 2010, more than one-third of ANZNN registrants (37.0%) were transferred from a level III unit to a level II unit before discharge home. Almost half of the registrants (47.9%) transferred from level III to level II units were born at less than 32 weeks gestation compared to 14.9% born at term.

Some level III registrants required transfer to a specialist children's hospital and in 2010 these accounted for 3.5% of transfers from level III units. Overall 56.1% of level III registrants were not transferred after registration (Table 26).

**TABLE 26: Transfer after registration of level III registrants by level of destination hospital and gestational age group, 2010**

	Gestational age group								
Transfer status	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–43	Total
Number									
Not transferred	51	234	317	363	571	544	852	1,687	4,619
Level III hospital	2	27	34	39	35	49	32	62	280
Level II hospital	4	98	212	399	749	637	497	455	3,051
Children's hospital	9	40	39	27	23	23	32	93	286
<b>Total</b>	<b>66</b>	<b>399</b>	<b>602</b>	<b>828</b>	<b>1,378</b>	<b>1,253</b>	<b>1,413</b>	<b>2,297</b>	<b>8,236</b>
Per cent									
Not transferred	77.3	58.6	52.7	43.8	41.4	43.4	60.3	73.4	56.1
Level III hospital	3.0	6.8	5.6	4.7	2.5	3.9	2.3	2.7	3.4
Level II hospital	6.1	24.6	35.2	48.2	54.4	50.8	35.2	19.8	37.0
Children's hospital	13.6	10.0	6.5	3.3	1.7	1.8	2.3	4.0	3.5
<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>

## 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 94.0% of ANZNN registrants in 2010. The median length of stay was 30 days with an interquartile range of 12–55 days (Table 27). 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 198,728 days in hospital, babies born between 32 and 36 weeks spent 65,505 days and babies born at term spent 31,444 days in hospital.

**TABLE 27: Median length of stay for level III registrants who survived until discharge home by gestational age, 2010**

Gestational age (completed weeks)	Number of babies	Median LOS (in days)	Interquartile range (in days)
<24	36	132	117–142
24	106	122	111–149
25	168	103.5	94–126
26	247	97	84–111
27	280	80.5	70–96
28	359	68	60–79
29	435	59	51–74
30	610	48	42–58
31	741	39	33–47
32	674	33	27–40
33	560	26	20.5–32.5
34	551	19	15–26
35	444	14	10–20
36	367	11	7–18
37	373	9	6–19
38	510	9	5–19
39	435	8	4–16
40	480	8	4–16
41	328	7	4–14
42	39	7	4–12
<b>Total</b>	<b>7,743</b>	<b>30</b>	<b>12–55</b>

*Note: Death status was not provided for two babies.*

## Survival of the ANZNN registrants

In 2010, 94.0% 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 26 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 2010, there were 491 neonatal deaths, of which 244 occurred in the early neonatal period that is within seven days of birth (Table 28). Mortality was highest among babies born before 26 weeks gestation with a survival rate at discharge increasing week on week from 54.5% for babies born before 24 weeks to 94.5% for babies born at 28 weeks (Table 28 and Figure 8). A similar pattern of increasing survival with increasing birthweight is seen in Figure 9.

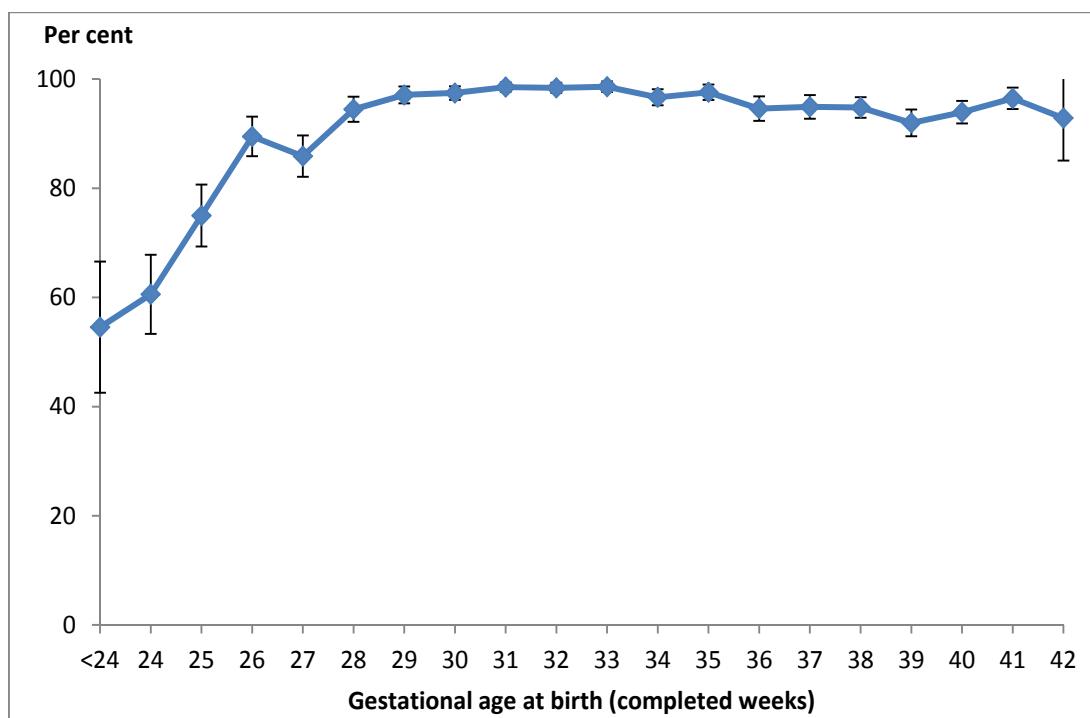
Lethal congenital anomaly was the cause of death for 1.2% of registrants, with most occurring in babies born between 36–39 weeks gestation (Table 28).

**TABLE 28: Survival to discharge home for level III registrants by gestational age at birth, 2010**

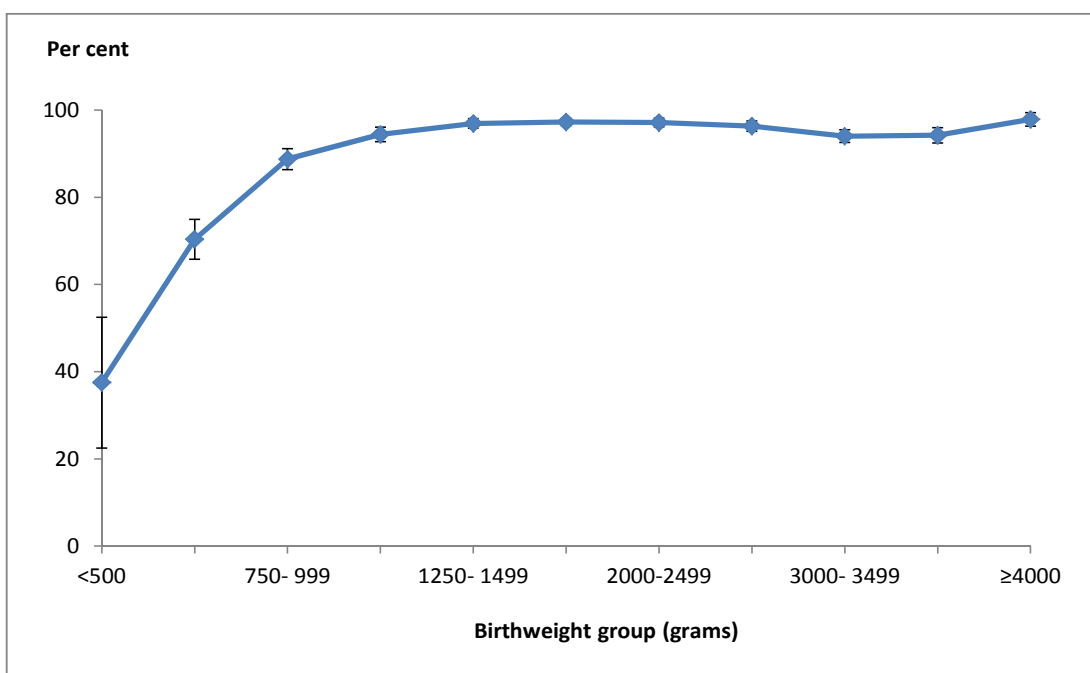
<b>Gestational age (completed weeks)</b>	<b>Number of babies</b>	<b>Lethal congenital anomalies</b>	<b>Babies alive on day 7</b>	<b>Babies alive on day 28</b>	<b>Survived to go home</b>	<b>Per cent survival at discharge home</b>
<24	66	1	51	38	36	54.5
24	175	0	145	127	106	60.6
25	224	2	199	182	168	75.0
26	276	2	266	254	247	89.5
27	326	5	306	293	280	85.9
28	380	4	368	364	359	94.5
29	448	3	443	440	435	97.1
30	626	3	618	614	610	97.4
31	752	3	746	742	741	98.5
32	685	5	681	679	674	98.4
33	568	5	562	561	560	98.6
34	570	8	561	555	551	96.7
35	455	4	448	446	444	97.6
36	388	12	376	371	367	94.6
37	393	11	384	379	373	94.9
38	538	14	525	520	510	94.8
39	473	11	450	440	435	92.0
40	511	1	490	482	480	93.9
41	340	3	334	332	328	96.5
42	42	1	39	39	39	92.9
<b>Total</b>	<b>8,236</b>	<b>98</b>	<b>7,992</b>	<b>7,858</b>	<b>7,743</b>	<b>94.0</b>

*Note: Death status was not provided for two babies.*

**FIGURE 8: Survival of level III registrants to discharge home (with 95% CI) by gestational age, 2010**



**FIGURE 9: Survival of level III registrants to discharge home (with 95% CI) by birthweight group, 2010**



## 5. Babies registered to level II units, 2010

### 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 16 level II units in New Zealand and eight in Australia that are members of the ANZNN. Altogether, 20 level II units contributed data for this 2010 report.

In 2010, 778 babies fulfilled the ANZNN criteria for registration to a level II unit. Of those babies, 12.2% were born at less than 32 weeks gestation and 8.5% weighed less than 1,500 grams at birth (Table 29 and Table 30). The highest number of babies registered to a level II unit in 2010 was 93.

**TABLE 29: Level II registrants born at each completed week of gestation, 2010**

Gestational age group	Number of babies	Per cent	Cumulative per cent
<28	8	1.0	1.0
28–29	25	3.2	4.2
30–31	62	8.0	12.2
<b>All babies &lt;32 weeks gestation</b>	<b>95</b>	<b>12.2</b>	
32–33	140	18.0	30.2
34–36	232	29.8	60.0
37–43	311	40.0	100.0
<b>Total</b>	<b>778</b>	<b>100.0</b>	

*Note: Gestational age groups below 28 weeks have been combined to maintain confidentiality of small numbers.*

**TABLE 30: Level II registrants by birthweight group, 2010**

Birthweight group (grams)	Number of babies	Per cent	Cumulative per cent
<1,000	8	1.0	1.0
1,000–1,099	5	0.6	1.7
1,100–1,199	6	0.8	2.4
1,200–1,299	8	1.0	3.5
1,300–1,399	17	2.2	5.7
1,400–1,499	22	2.8	8.5
<b>All babies &lt;1,500g birthweight</b>	<b>66</b>	<b>8.5</b>	
1,500–1,999	120	15.4	23.9
2,000–2,499	165	21.2	45.1
2,500–2,999	140	18.0	63.1
3,000–3,499	132	17.0	80.1
3,500–3,999	102	13.1	93.2
≥4,000	53	6.8	100.0
<b>Total</b>	<b>778</b>	<b>100.0</b>	

*Note: Birthweight groups below 1,000g have been combined to maintain confidentiality of small numbers. Birthweight was not provided for one baby.*

More than half of the level II registrants, 496 babies (63.8%), were born to Caucasian mothers, 60.0% of whom were born preterm. The number of registrants born to Maori mothers was 127 (16.3%), and 82 (64.6%) were born preterm. There were 31 babies (4.0%) born to Pacific Islander mothers.

There were 467 male (60.0%) and 300 female (38.6%) registrants in the audit. No gender was recorded for 11 registrants (1.4%). 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, 26.9% did not present with any maternal complications. Among babies born before 37 weeks, 43.5% of mothers had presented with preterm labour (Table 31).

**TABLE 31: Mothers of level II registrants presenting antenatal problem by gestational age group, 2010**

Presenting antenatal problem	Gestational age group						Total
	<28	28–29	30–31	32–33	34–36	37–43	
	Number						
No antenatal problems	0	n.p.	0	n.p.	17	188	209
Preterm pre-labour rupture of membranes	0	n.p.	18	21	45	n.p.	90
Preterm labour	n.p.	16	30	57	92	n.p.	207
Hypertension in pregnancy	0	n.p.	n.p.	17	21	15	59
Antepartum haemorrhage	0	6	6	19	21	5	57
Intrauterine growth restriction	0	0	n.p.	10	n.p.	7	23
Fetal distress	0	0	0	5	14	61	80
Other problem	0	0	n.p.	n.p.	16	18	43
Congenital anomalies	n.p.	0	0	0	n.p.	7	8
Not stated	0	0	0	1	0	1	2
<b>Total</b>	<b>8</b>	<b>25</b>	<b>62</b>	<b>140</b>	<b>232</b>	<b>311</b>	<b>778</b>
Per cent							
No antenatal problems	0.0	n.p.	0.0	n.p.	7.3	60.6	26.9
Preterm pre-labour rupture of membranes	0.0	n.p.	29.0	15.1	19.4	n.p.	11.6
Preterm labour	n.p.	64.0	48.4	41.0	39.7	n.p.	26.7
Hypertension in pregnancy	0.0	n.p.	n.p.	12.2	9.1	4.8	7.6
Antepartum haemorrhage	0.0	24.0	9.7	13.7	9.1	1.6	7.3
Intrauterine growth restriction	0.0	0.0	n.p.	7.2	n.p.	2.3	3.0
Fetal distress	0.0	0.0	0.0	3.6	6.0	19.7	10.3
Other problem	0.0	0.0	n.p.	n.p.	6.9	5.8	5.5
Congenital anomalies	n.p.	0.0	0.0	0.0	n.p.	2.3	1.0
<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>

*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 78 (10.0%) of the mothers of level II registrants and 25 mothers (3.2%) had had a previous perinatal death(s).

Most mothers (84.8%) of level II registrants had booked into a level II hospital for delivery. Of the level II registrants born before 34 weeks gestation, 56.2% of the mothers were given antenatal corticosteroids within seven days of the birth (Table 32).



**TABLE 32: Antenatal corticosteroid use by mothers of level II registrants by gestational age group, 2010**

Antenatal corticosteroids	Gestational age group						Total
	<28	28–29	30–31	32–33	34–36	37–43	
	Number						
None	5	7	16	36	184	298	546
Incomplete course	n.p.	n.p.	15	34	15	n.p.	75
Complete course	n.p.	8	24	40	19	n.p.	93
Completed >7 days	0	n.p.	5	24	5	n.p.	36
Not stated	0	1	2	6	9	10	28
<b>Total</b>	<b>8</b>	<b>25</b>	<b>62</b>	<b>140</b>	<b>232</b>	<b>311</b>	<b>778</b>
Per cent							
None	62.5	29.2	26.7	26.9	82.5	99.0	72.8
Incomplete course	n.p.	n.p.	25.0	25.4	6.7	n.p.	10.0
Complete course	n.p.	33.3	40.0	29.9	8.5	n.p.	12.4
Completed >7 days	0.0	n.p.	8.3	17.9	2.2	n.p.	4.8
<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>	<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.

Caesarean section was the most common method of birth for 53.7% of level II registrants, with half of these occurring before the onset of labour, followed by vaginal delivery (46.3%) (Table 33).

**TABLE 33: Method of delivery for level II registrants by gestational age group, 2010**

Method of delivery	Gestational age group						Total
	<28	28–29	30–31	32–33	34–36	37–43	
Number							
Vaginal <sup>(a)</sup>	8	12	26	49	99	162	356
Caesarean <sup>(b)</sup>	0	13	36	90	131	143	413
Not stated	0	0	0	1	2	6	9
<b>Total</b>	<b>8</b>	<b>25</b>	<b>62</b>	<b>140</b>	<b>232</b>	<b>311</b>	<b>778</b>
Per cent							
Vaginal	100.0	48.0	41.9	35.3	43.0	53.1	46.3
Caesarean	0.0	52.0	58.1	64.7	57.0	46.9	53.7
<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>

<sup>(a)</sup> Vaginal and assisted births have been combined to maintain confidentiality of small numbers.

<sup>(b)</sup> 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 778 babies registered to level II units, 83 were from multiple births (10.7%). There were 467 male births and 11 babies whose gender was not recorded.

A low Apgar score of less than 4 at one minute of age was recorded for 14.5% of babies and 38.1% of them required endotracheal intubation in the labour ward to assist in their adaptation to extrauterine life.

Non-specific respiratory distress (50.4%) was the major reason for assisted ventilation for level II registrants, followed by hyaline membrane disease (29.7%) (Table 34).

For level II registrants, the median duration of assisted ventilation by IPPV was 20.5 hours and 17 hours by CPAP. The median duration of oxygen was 2 days (Table 35).

**TABLE 34: Indication for respiratory support for level II registrants by gestational age group, 2010**

Indication for respiratory support	Gestational age group						Total
	<28	28–29	30–31	32–33	34–36	37–43	
	Number						
No support	0	n.p.	18	n.p.	5	n.p.	44
Non specific distress	0	n.p.	n.p.	51	132	192	384
Hyaline membrane disease	8	18	33	72	76	19	226
Meconium aspiration syndrome	0	0	0	0	0	48	48
Pneumonia	0	n.p.	0	n.p.	10	13	26
Persistent pulmonary hypertension	0	0	0	n.p.	n.p.	7	9
Apnoea	0	0	n.p.	0	n.p.	n.p.	7
Congenital anomaly	0	n.p.	0	0	0	n.p.	5
Other	0	0	0	0	0	8	8
Peri-surgery	0	0	0	0	0	0	0
Newborn encephalopathy	0	0	0	0	n.p.	n.p.	5
Not stated	0	0	2	2	4	8	16
<b>Total</b>	<b>8</b>	<b>25</b>	<b>62</b>	<b>140</b>	<b>232</b>	<b>311</b>	<b>778</b>
Per cent							
No support	0.0	n.p.	30.0	n.p.	2.2	n.p.	5.8
Non specific distress	0.0	n.p.	n.p.	37.0	57.9	63.4	50.4
Hyaline membrane disease	100.0	72.0	55.0	52.2	33.3	6.3	29.7
Meconium aspiration syndrome	0.0	0.0	0.0	0.0	0.0	15.8	6.3
Pneumonia	0.0	n.p.	0.0	n.p.	4.4	4.3	3.4
Persistent pulmonary hypertension	0.0	0.0	0.0	n.p.	n.p.	2.3	1.2
Apnoea	0.0	0.0	n.p.	0.0	n.p.	n.p.	0.9
Congenital anomaly	0.0	n.p.	0.0	0.0	0.0	n.p.	0.7
Other	0.0	0.0	0.0	0.0	0.0	2.6	1.0
Peri-surgery	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newborn encephalopathy	0.0	0.0	0.0	0.0	n.p.	n.p.	0.7
<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>

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

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

TABLE 35: Duration of assisted ventilation and oxygen use by level II registrants by gestational age group, 2010

Median & Interquartile range (IQR)	Gestational age group						Total
	<28	28–29	30–31	32–33	34–36	37–43	
IPPV (hours)							
Median	3.5	19	1	31	56.5	24	20.5
IQR	1.5–5	12–33	1–89	4–85	16–97.5	2–52	2–52
CPAP (hours)							
Median	10	85	33	24	17	13.5	17
IQR	10–10	19.5–171.5	17–66	11.5–62	10–48	8–25	10–41
Oxygen (days)							
Median	1	1	3	2	2	2	2
IQR	1–2	1–4	1–4.5	1–4	2–4	1–3	1–3

Note: IQR = Interquartile range.

## Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 28 of the 51 eligible babies born at less than 31 weeks gestational age and/or weighing less than 1,250 grams at birth. Most were reported as normal except for two babies who had stage 1 and 2 ROP, respectively.

## Cerebral ultrasound

Of the 95 babies born at less than 32 weeks, 60 (63.2%) had a cerebral ultrasound in the first week after birth. Fifty-four of them were reported as normal, that is no intraventricular haemorrhage (IVH), four reported a grade 1 IVH, one reported a grade 2 IVH and one reported a grade 4 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 40 babies, all of whom had normal reports.

## Other morbidities

Septicaemia was proven in 30 babies, including 20 before day two, that is less than 48 hours. There were no cases of necrotising enterocolitis. Major congenital anomalies were reported for 29 babies, three required surgery, and two registrants died due to congenital anomalies.

## Level II transfers

In total 55 level II registrants were transferred to other units, 24 were transferred to a level I or II unit, 23 were transferred to a level III unit and the remaining eight to a children's hospital.

## Survival

There were 759 level II registrants who survived to discharge home (97.6%). Twelve babies died within the first seven days of birth and a further seven babies died before discharge home. Two babies were reported to have had a lethal congenital anomaly (Table 36).

**TABLE 36: Survival to discharge home for level II registrants by gestational age group, 2010**

<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>
<28	8	0	n.p.	n.p.	n.p.	12.5
28-29	25	n.p.	n.p.	n.p.	n.p.	96.0
30-31	62	0	62	61	60	96.8
32-33	140	0	140	140	140	100.0
34-36	232	0	231	231	230	99.1
37-43	311	n.p.	307	306	304	97.7
<b>All babies</b>	<b>778</b>	<b>2</b>	<b>766</b>	<b>764</b>	<b>759</b>	<b>97.6</b>

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

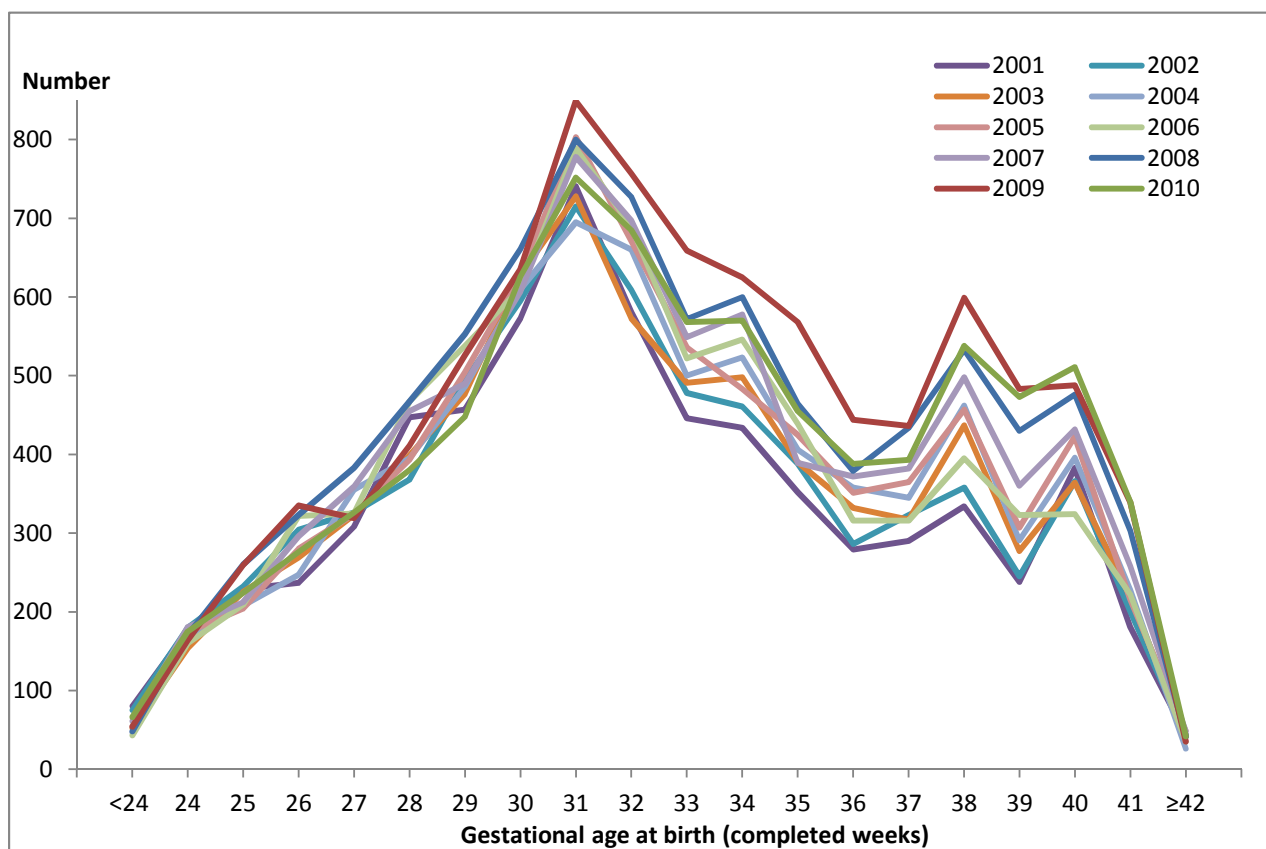
**Note:** Gestational age groups below 28 weeks have been combined to maintain confidentiality of small numbers.

Death status was not provided for four babies.

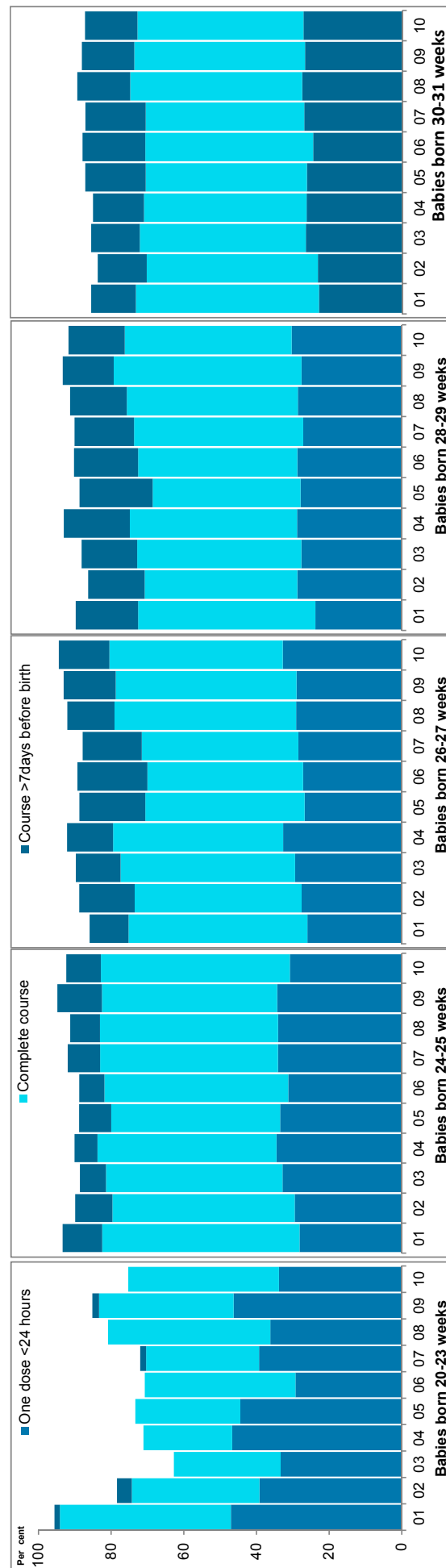
# APPENDICES

## Appendix 1: Trends

FIGURE 10: Trends in gestational age at birth of level III registrants, 2001–2010

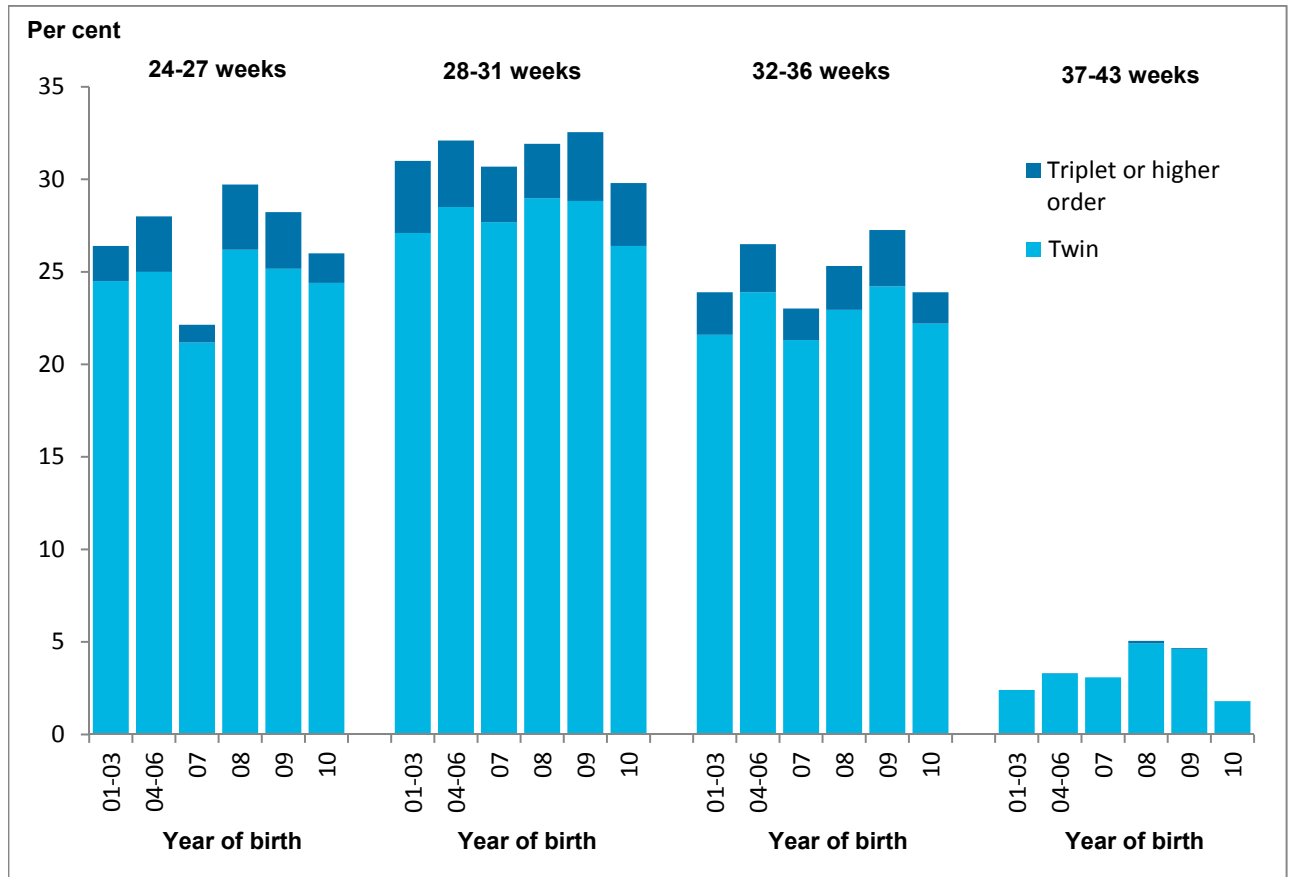


**FIGURE 11: Trends in the use of corticosteroids for mothers of babies less than 32 weeks gestation, 2001–2010**



*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, 2001–2010**



**FIGURE 13: Trends in method of birth for level III registrants by year of birth, 2001–2010**

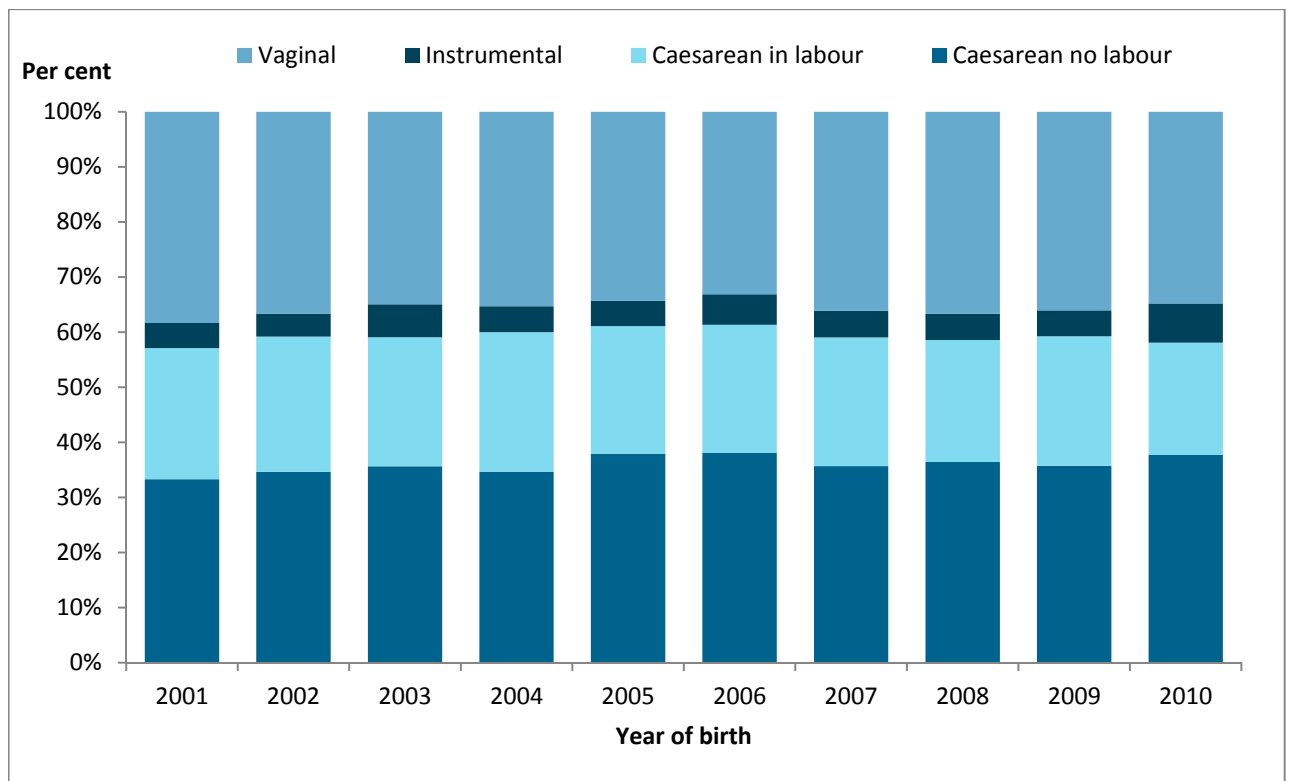


FIGURE 14: Trends in referral source to level III NICU by year of birth, 2001–2010

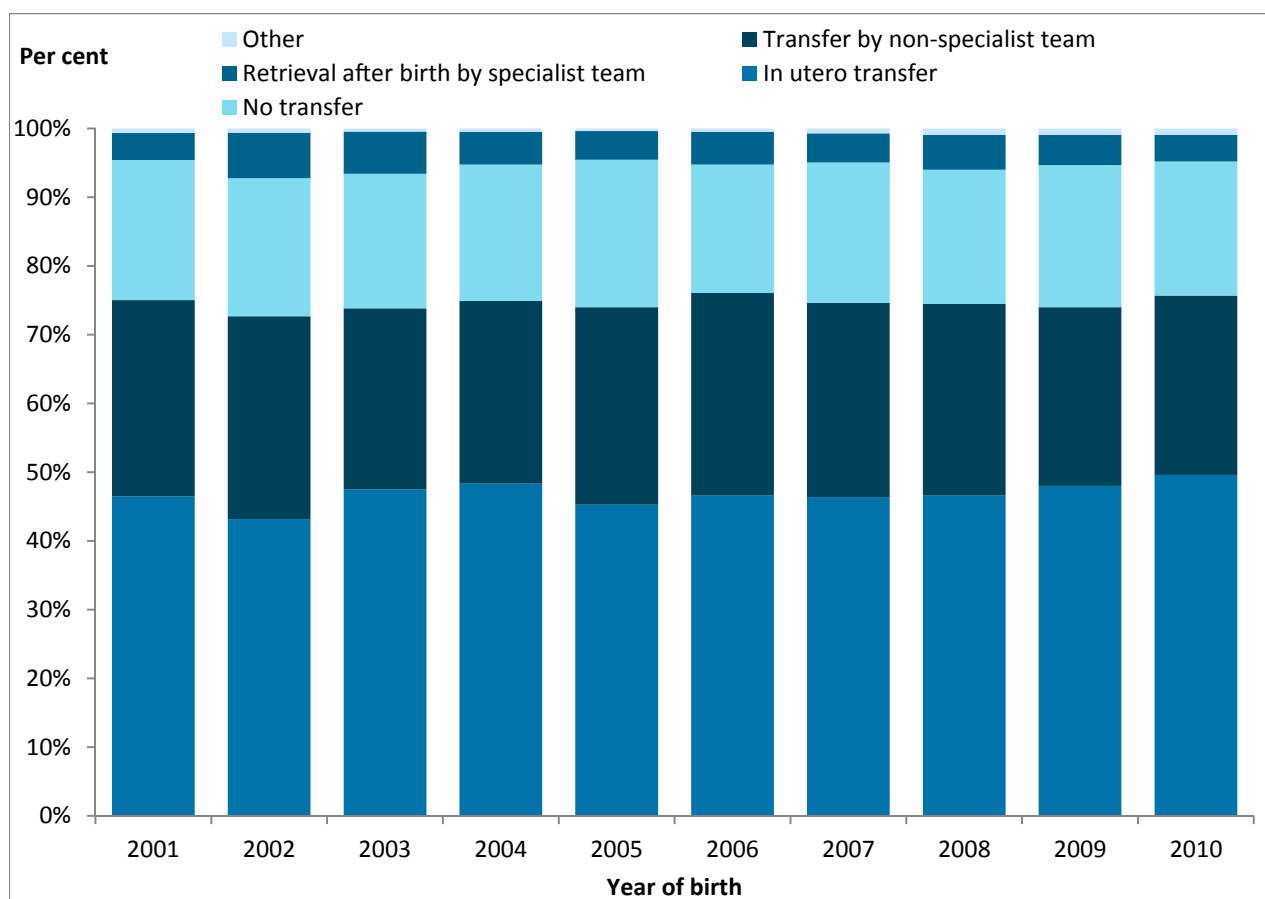
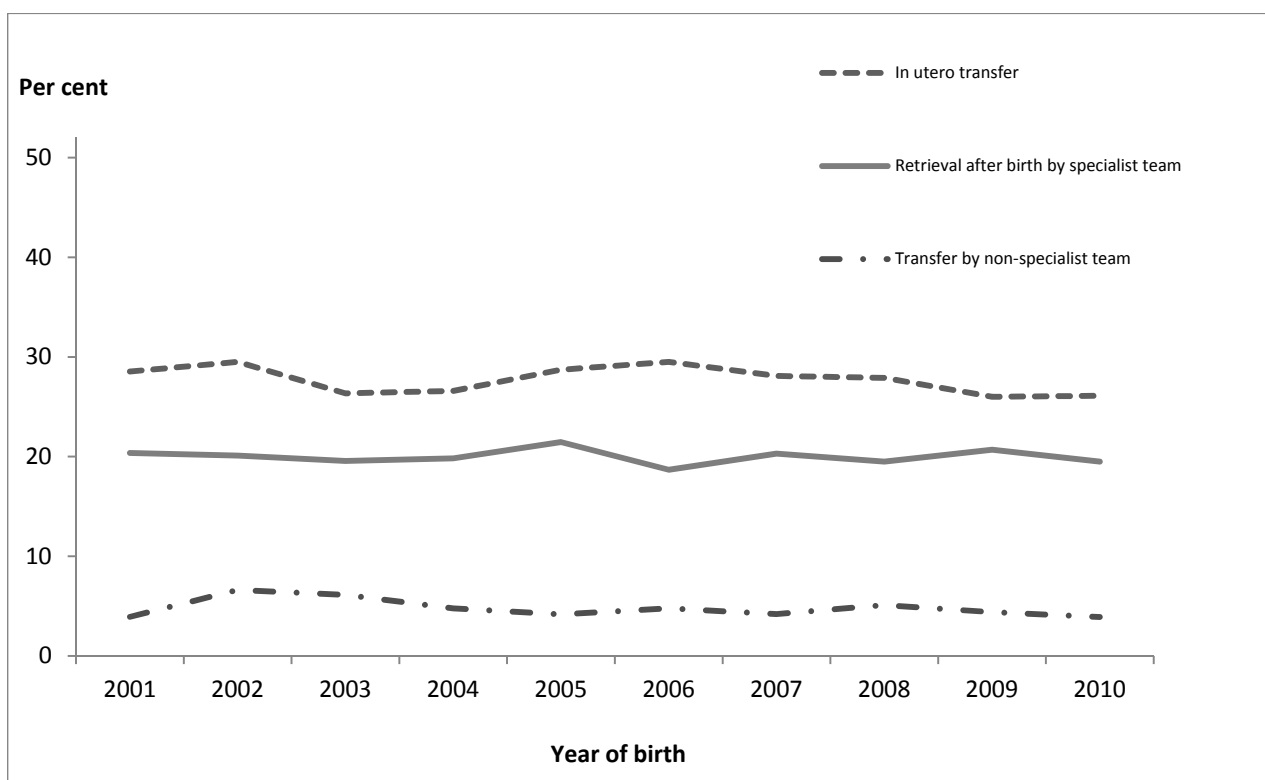
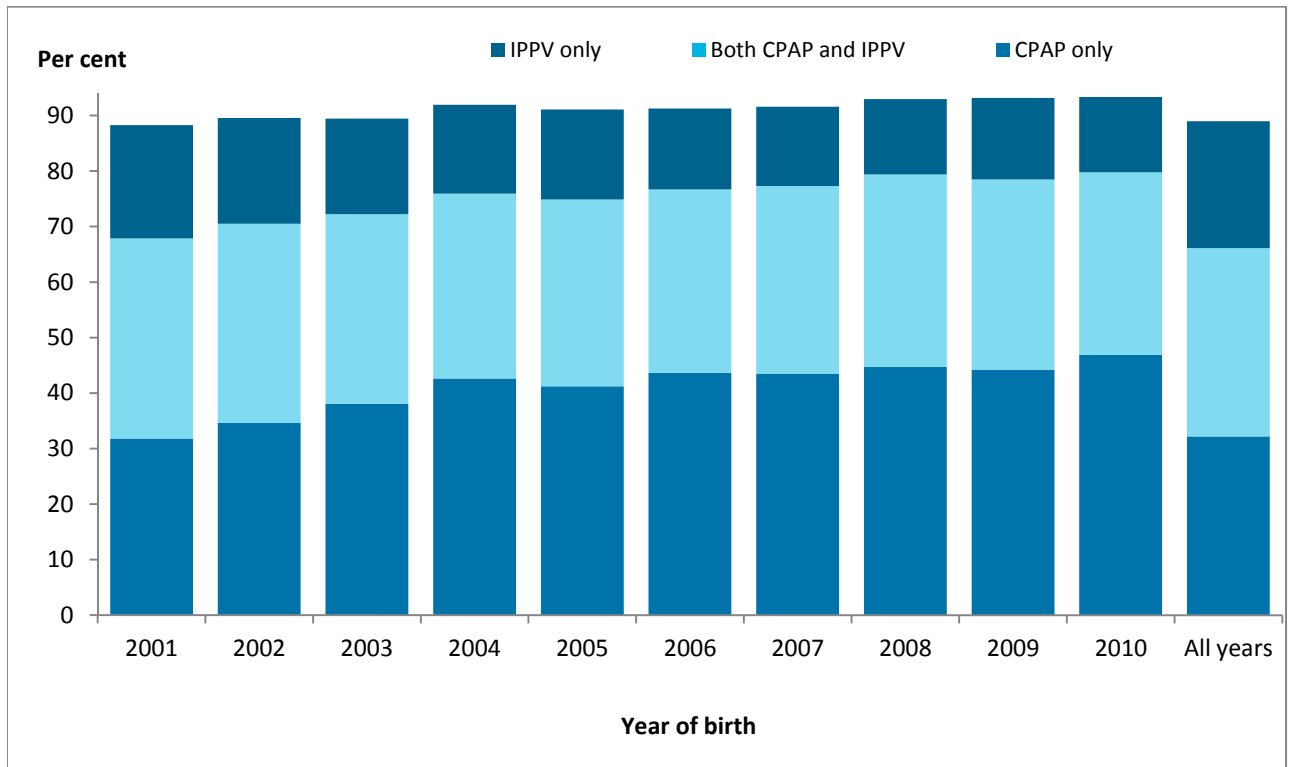


FIGURE 15: Trends in mode of transport to level III NICU, 2001-2010

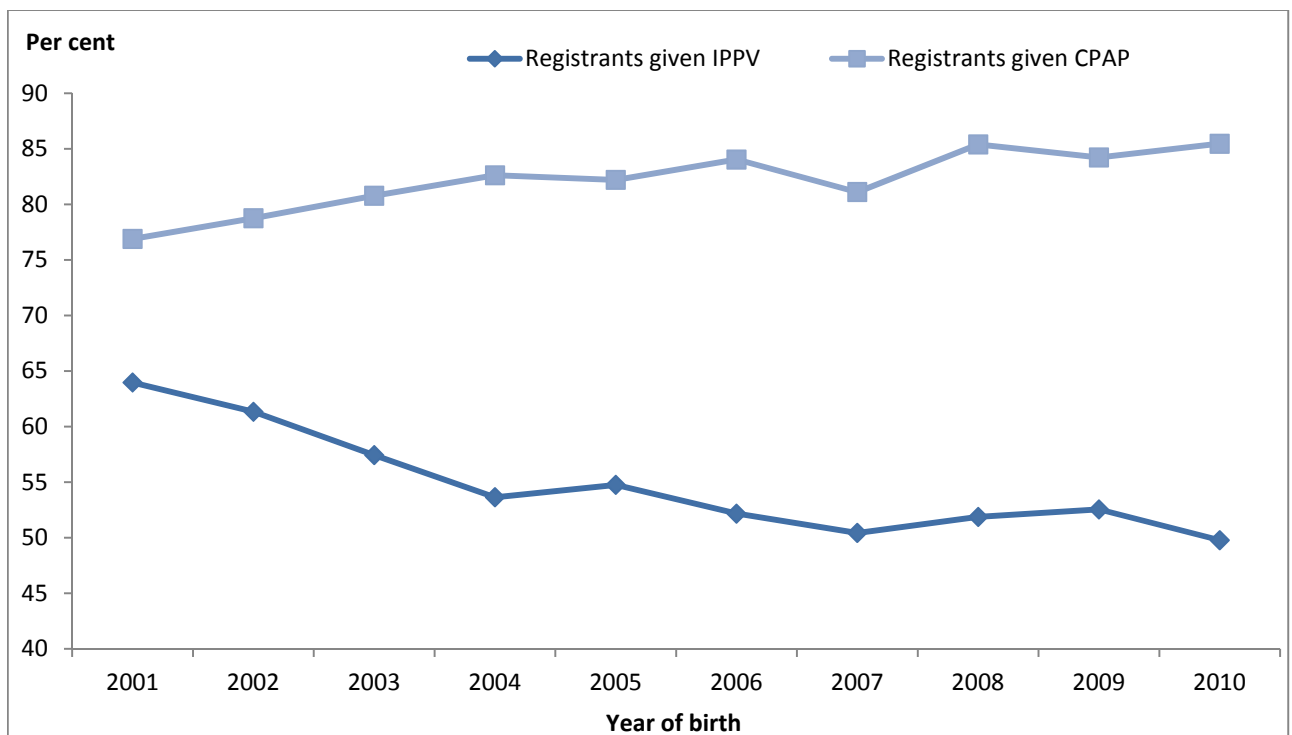




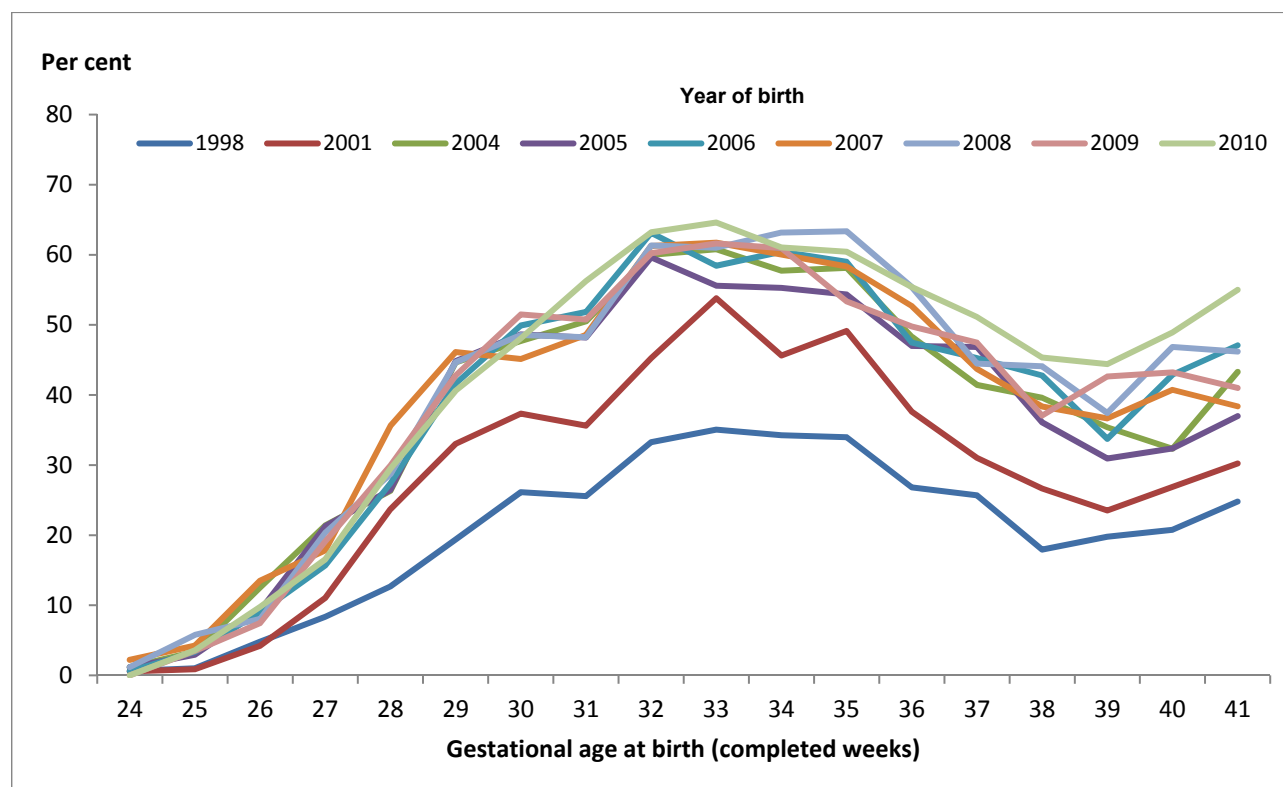
**FIGURE 16: Trends in mode of assisted ventilation for level III registrants, 2001–2010**



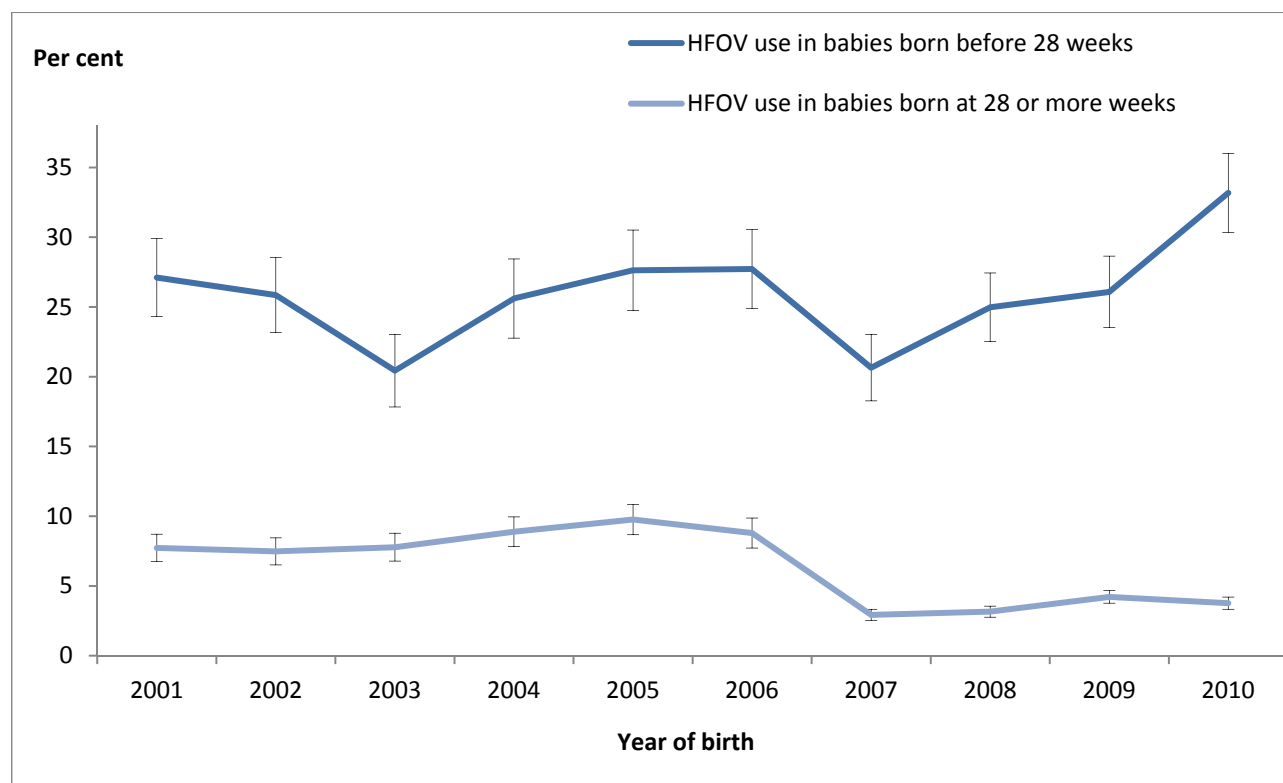
**FIGURE 17: Trends in provision of intermittent positive pressure ventilation and continuous positive pressure ventilation by year of birth for level III registrants ventilated, 2001–2010**



**FIGURE 18: Trends in the use of CPAP as the only form of ventilation by gestational age for level III registrants, 1998, 2001, 2004–2010**

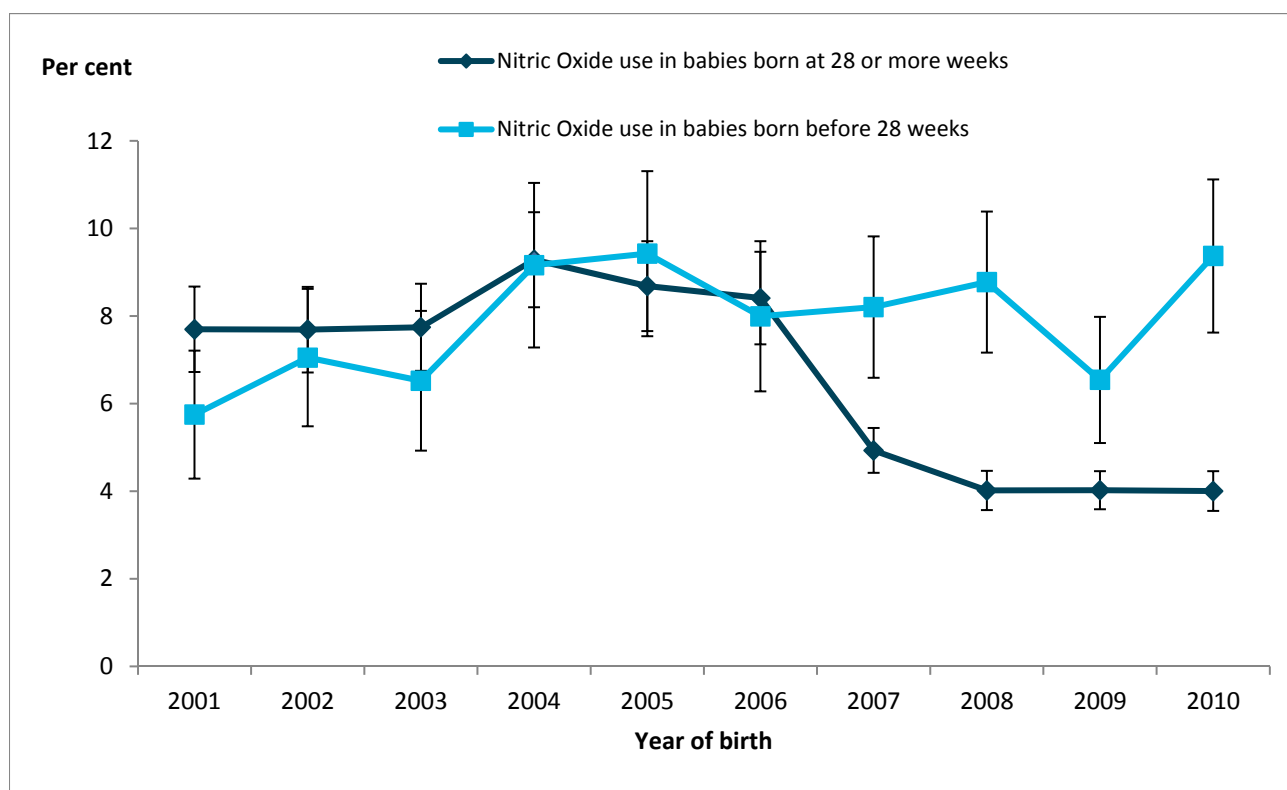


**FIGURE 19: Trends in provision of high frequency oscillatory ventilation (with 95% CI) for level III registrants born before 28 weeks and at 28 or more weeks gestation, 2001–2010**



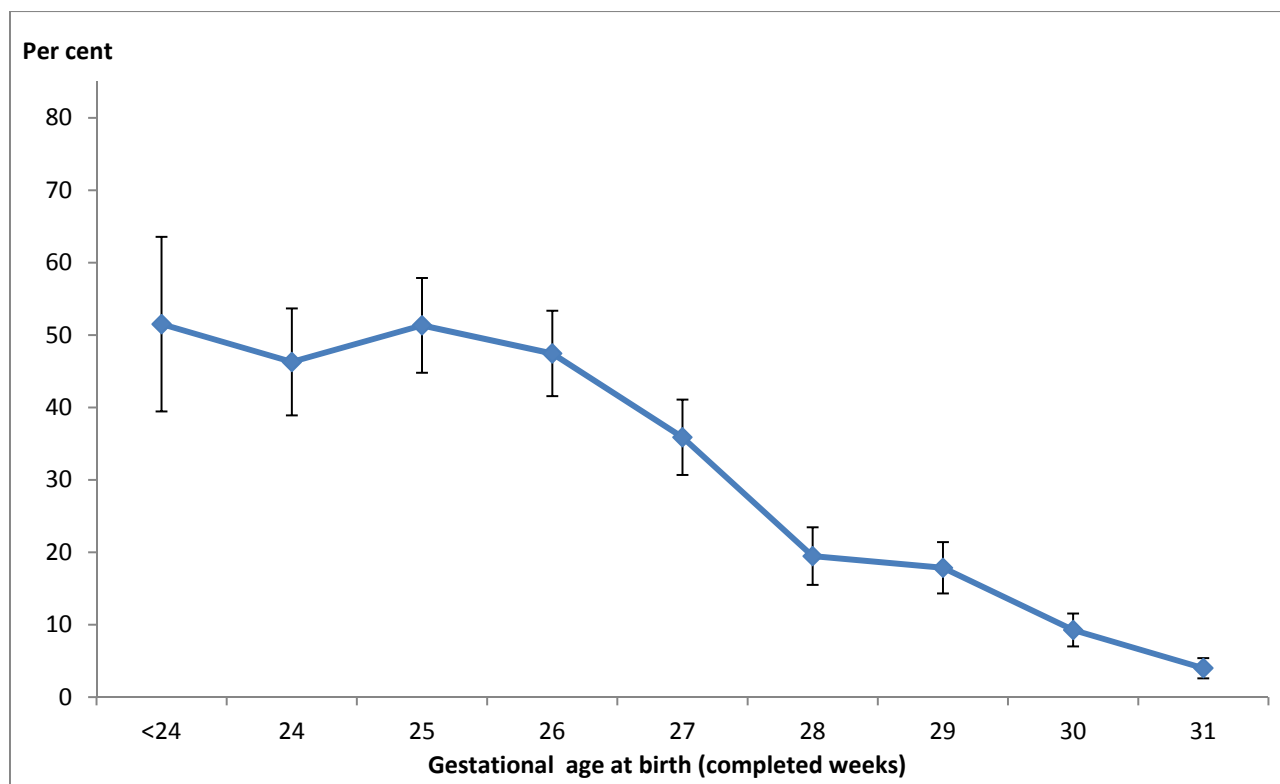
*Note: The results are given as the percentage of babies given IPPV.*

**FIGURE 20: Trends in nitric oxide (with 95% CI) provision for level III registrants born before 28 weeks and 28 or more weeks gestation, 2001–2010**

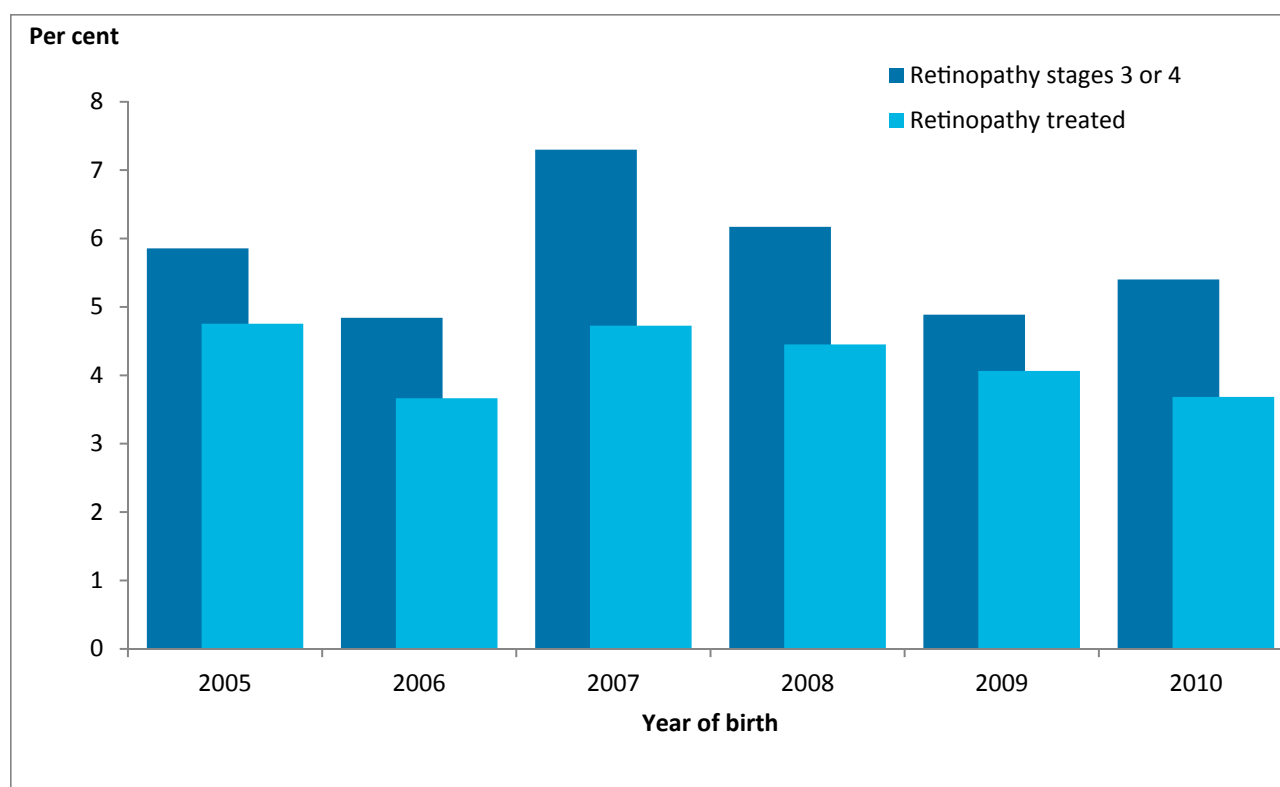


*Note: Results are given as the percentage of babies given IPPV.*

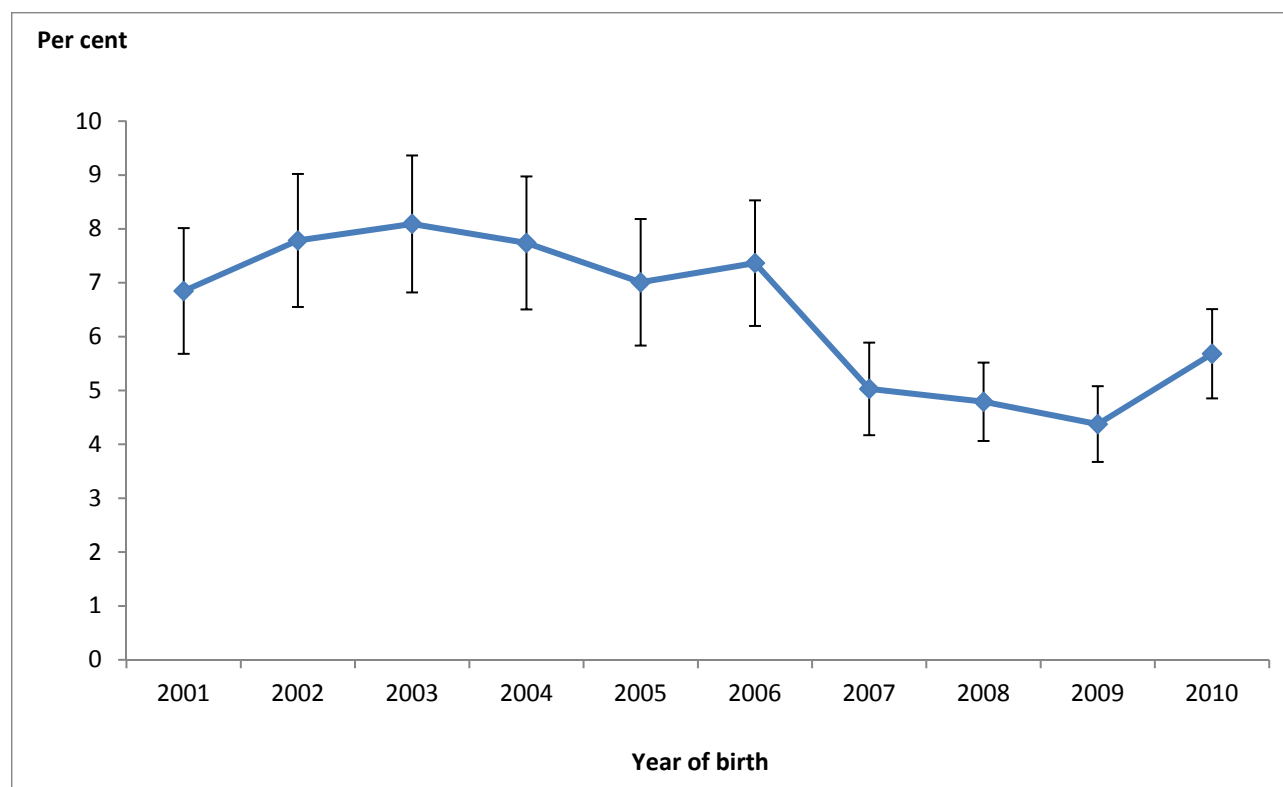
**FIGURE 21: Incidence of chronic lung disease (with 95% CI) for level III registrants by gestational age, 2010**



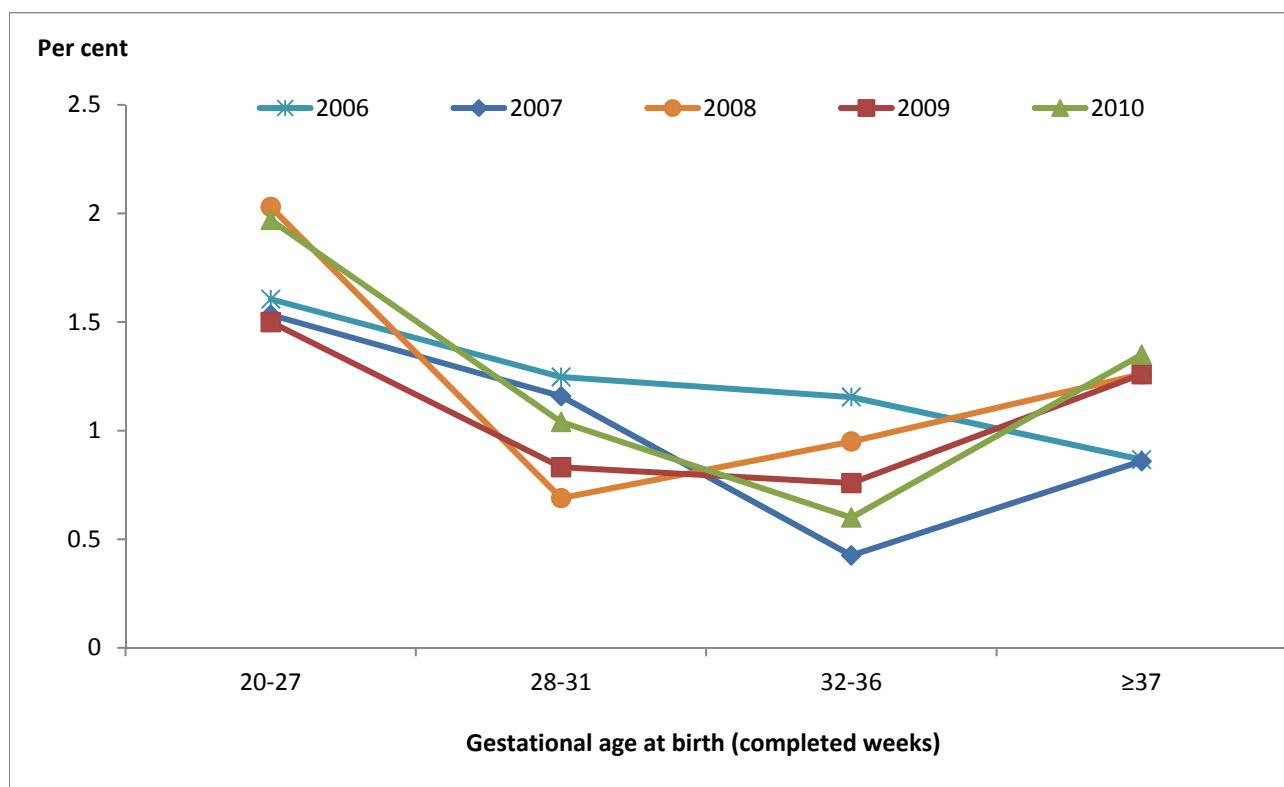
**FIGURE 22: Stage 3 or 4 retinopathy of prematurity and treated retinopathy among babies born before 31 weeks gestation and/or birthweight of less than 1,250 grams who survived to 36 weeks corrected age for level III registrants, 2005–2010**



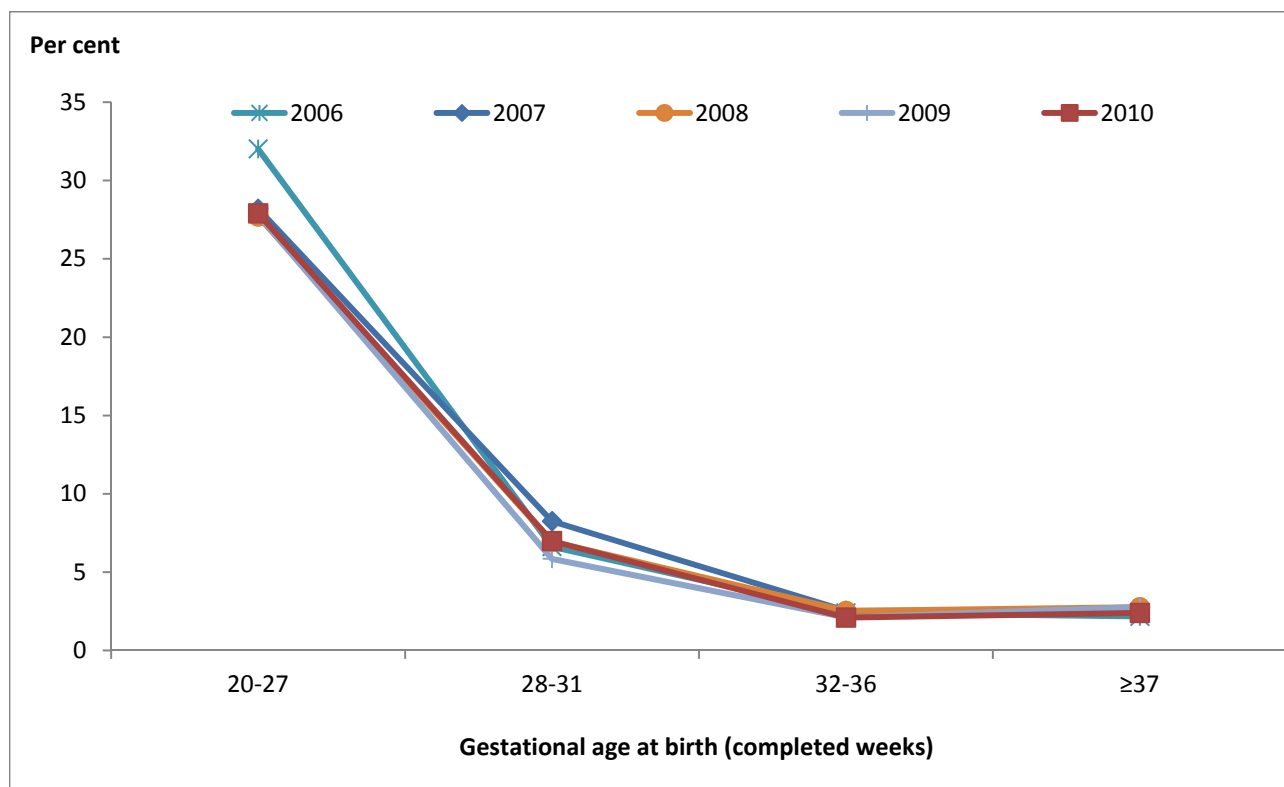
**FIGURE 23: Trends in grade 3 or 4 intraventricular haemorrhage (with 95% CI) in babies born at less than 32 weeks gestation who survived to day 3 for level III registrants, 2001–2010**



**FIGURE 24: Incidence of early sepsis for level III registrants by gestational age group, 2006–2010**



**FIGURE 25: Incidence of late sepsis for level III registrants by gestational age group, 2006–2010**



## Appendix 2: Data tables by birthweight, 2010

Table 37: Antenatal corticosteroid use for level III registrants by birthweight group, 2010

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	3	35	63	80	100	250	438	634	772	534	272	3,181
Incomplete course	7	100	202	188	230	413	175	66	13	2	3	1,399
Course completed	26	205	312	348	452	590	265	83	19	5	2	2,307
Completed > 7 days	4	35	87	115	154	188	120	59	20	11	0	793
Not stated	0	6	3	2	11	29	59	106	164	122	54	556
Total	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
None	7.5	9.3	9.5	10.9	10.7	17.3	43.9	75.3	93.7	96.7	98.2	41.4
Incomplete course	17.5	26.7	30.4	25.7	24.6	28.7	17.5	7.8	1.6	0.4	1.1	18.2
Course completed	65.0	54.7	47.0	47.6	48.3	40.9	26.6	9.9	2.3	0.9	0.7	30.0
Completed > 7 days	10.0	9.3	13.1	15.7	16.5	13.0	12.0	7.0	2.4	2.0	0.0	10.3
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 38: Plurality of level III registrants by birthweight group, 2010

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	29	290	472	504	628	1028	829	861	973	672	331	6,617
Twins	11	87	174	202	283	401	219	86	14	2	0	1,479
Triplets and higher orders	0	4	21	27	36	41	9	1	1	0	0	140
<b>Total</b>	<b>40</b>	<b>381</b>	<b>667</b>	<b>733</b>	<b>947</b>	<b>1,470</b>	<b>1,057</b>	<b>948</b>	<b>988</b>	<b>674</b>	<b>331</b>	<b>8,236</b>
Per cent												
Singleton	72.5	76.1	70.8	68.8	66.3	69.9	78.4	90.8	98.5	99.7	100.0	80.3
Twins	27.5	22.8	26.1	27.6	29.9	27.3	20.7	9.1	1.4	0.3	0.0	18.0
Triplets and higher orders	0.0	1.0	3.1	3.7	3.8	2.8	0.9	0.1	0.1	0.0	0.0	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>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table 39: Method of delivery for level III registrants by birthweight group, 2010**

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	5	172	208	212	265	480	379	322	357	279	127	2,806
Vaginal instrumental birth	1	3	21	18	31	75	75	88	114	102	47	575
Caesarean in labour	0	45	134	170	178	297	232	211	187	124	68	1,646
Caesarean no labour	33	158	297	331	454	604	355	299	293	144	77	3,045
Not stated	1	3	7	2	19	14	16	28	37	25	12	164
<b>Total</b>	<b>40</b>	<b>381</b>	<b>667</b>	<b>733</b>	<b>947</b>	<b>1,470</b>	<b>1,057</b>	<b>948</b>	<b>988</b>	<b>674</b>	<b>331</b>	<b>8,236</b>
	Per cent											
Vaginal	12.8	45.5	31.5	29.0	28.6	33.0	36.4	35.0	37.5	43.0	39.8	34.8
Vaginal instrumental birth	2.6	0.8	3.2	2.5	3.3	5.2	7.2	9.6	12.0	15.7	14.7	7.1
Caesarean in labour	0.0	11.9	20.3	23.3	19.2	20.4	22.3	22.9	19.7	19.1	21.3	20.4
Caesarean no labour	84.6	41.8	45.0	45.3	48.9	41.5	34.1	32.5	30.8	22.2	24.1	37.7
<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>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

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

**Table 40: Level of hospital of birth for level III registrants by birthweight group, 2010**

Level of hospital	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	38	347	568	634	836	1,261	827	666	599	420	205	6,401
Non-tertiary	1	28	91	92	102	196	224	274	381	238	119	1,746
Born before arrival	1	6	8	7	9	13	5	6	7	13	7	82
Not stated	0	0	0	0	0	0	1	2	1	3	0	7
<b>Total</b>	<b>40</b>	<b>381</b>	<b>667</b>	<b>733</b>	<b>947</b>	<b>1,470</b>	<b>1,057</b>	<b>948</b>	<b>988</b>	<b>674</b>	<b>331</b>	<b>8,236</b>
	Per cent											
Tertiary	95.0	91.1	85.2	86.5	88.3	85.8	78.3	70.4	60.7	62.6	61.9	77.8
Non-tertiary	2.5	7.3	13.6	12.6	10.8	13.3	21.2	29.0	38.6	35.5	36.0	21.2
Born before arrival	2.5	1.6	1.2	1.0	1.0	0.9	0.5	0.6	0.7	1.9	2.1	1.0
<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>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

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

Table 41: Mode of transport for level III registrants to level III unit after birth by birthweight group, 2010

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	36	343	563	632	832	1,230	799	635	564	403	192	6,229
Specialist retrieval team	2	25	88	86	86	180	224	262	338	208	106	1,605
Non-specialist retrieval	0	10	8	9	22	39	28	43	75	53	32	319
Other	2	3	8	6	6	19	6	8	10	8	1	77
Not stated	0	0	0	0	1	2	0	0	1	2	0	6
All babies	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
Not transported	90.0	90.0	84.4	86.2	87.9	83.8	75.6	67.0	57.1	60.0	58.0	75.7
Specialist retrieval team	5.0	6.6	13.2	11.7	9.1	12.3	21.2	27.6	34.2	31.0	32.0	19.5
Non-specialist retrieval	0.0	2.6	1.2	1.2	2.3	2.7	2.6	4.5	7.6	7.9	9.7	3.9
Other	5.0	0.8	1.2	0.8	0.6	1.3	0.6	0.8	1.0	1.2	0.3	0.9
All babies	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

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

Table 42: Exogenous surfactant use by level III registrants by birthweight group, 2010

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	2	28	134	305	601	1,062	823	777	855	591	303	5,481
Curosurf	29	272	399	342	257	296	168	128	89	50	18	2,048
Survanta	8	77	124	81	86	107	64	38	39	31	9	664
SurvCuro	1	4	6	5	1	2	2	1	3	2	1	28
Exosurf	0	0	0	0	0	0	0	0	0	0	0	0
Any combination	0	0	2	0	2	0	0	0	0	0	0	4
Not stated	0	0	2	0	0	3	0	4	2	0	0	11
Total	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
None	5.0	7.3	20.2	41.6	63.5	72.4	77.9	82.3	86.7	87.7	91.5	66.6
Curosurf	72.5	71.4	60.0	46.7	27.1	20.2	15.9	13.6	9.0	7.4	5.4	24.9
Survanta	20.0	20.2	18.6	11.1	9.1	7.3	6.1	4.0	4.0	4.6	2.7	8.1
SurvCuro	2.5	1.0	0.9	0.7	0.1	0.1	0.2	0.1	0.3	0.3	0.3	0.3
Exosurf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Any combination	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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 43: Assisted ventilation for level III registrants by birthweight group, 2010**

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 given	28	300	609	630	735	1,243	885	715	683	484	257	6,569
IPPV given	40	362	546	412	350	475	363	411	471	282	114	3,826
Oxygen given	36	357	597	557	600	947	678	642	662	446	222	5,744
HFOV given	28	172	140	68	29	30	27	36	51	25	18	624
NO given	11	41	45	20	14	22	30	44	84	54	22	387
ECMO given	0	0	0	1	0	1	2	3	8	3	1	19
Total in each birthweight group	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
CPAP given	70.0	78.7	91.3	85.9	77.6	84.6	83.7	75.4	69.1	71.8	77.6	79.8
IPPV given	100.0	95.0	81.9	56.2	37.0	32.3	34.3	43.4	47.7	41.8	34.4	46.5
Oxygen given	90.0	93.7	89.5	76.0	63.4	64.4	64.1	67.7	67.0	66.2	67.1	69.7
Per cent of babies given IPPV												
HFOV given	70.0	47.5	25.6	16.5	8.3	6.3	7.4	8.8	10.8	8.9	15.8	16.3
NO given	27.5	11.3	8.2	4.9	4.0	4.6	8.3	10.7	17.8	19.1	19.3	10.1
ECMO given	0.0	0.0	0.0	0.2	0.0	0.2	0.6	0.7	1.7	1.1	0.9	0.5

**Table 44: Medians and interquartile ranges of assisted ventilation for level III registrants by birthweight group, 2010**

Median & interquartile range (IQR)	Birthweight group (grams)										
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000
IPPV (hours)											
Median	523.5	378.5	125.5	36	21	26	35	45	51	46.5	49
IQR	147–1,024.5	110–770	27–391	13–114	9–53	12–61	15–78	18–96	22–112	22–97	20–97
CPAP (hours)											
Median	847	893	751	265	68	35	22	23	18	14	17
IQR	95–1,472.5	384–1,284.5	273–1143	74–684	24–213	13–91	10–60	9–55	8–47	7–34.5	7–39
Oxygen (days)											
Median	28.5	77	56.5	23.5	4	3	3	3	4	3	3
IQR	9–136	22–118	23–89	3–50	2–18.5	1–6	1–5	2–6	2–7	2–6	2–9

**Table 45: Chronic lung disease for level III registrants by birthweight group, 2010**

Chronic lung disease (CLD)	Birthweight group (grams)							Total
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	≥2000	
Number								
No CLD	22	176	389	606	889	1,439	3,995	7,516
CLD	18	205	278	127	58	31	3	720
▪ CLD and survived	12	193	271	124	57	30	3	690
▪ CLD and died	6	12	7	3	1	1	0	30
<b>Total</b>	<b>40</b>	<b>381</b>	<b>667</b>	<b>733</b>	<b>947</b>	<b>1,470</b>	<b>3,998</b>	<b>8,236</b>
Per cent								
No CLD	55.0	46.2	58.3	82.7	93.9	97.9	99.9	91.3
CLD	45.0	53.8	41.7	17.3	6.1	2.1	0.1	8.7
▪ CLD and survived	66.7	94.1	97.5	97.6	98.3	96.8	100.0	95.8
▪ CLD and died	33.3	5.9	2.5	2.4	1.7	3.2	0.0	4.2

**Table 46: Supplemental oxygen therapy for level III registrants by gestational age group, 2010**

Oxygen therapy	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 oxygen on day 28	4	35	185	439	806	1363	997	883	902	621	318	6,553
Oxygen on day 28	36	346	482	294	141	107	59	65	86	52	13	1,681
▪ survived to discharge home	11	233	407	253	112	67	30	30	27	14	6	1,190
▪ died before discharge	25	113	75	41	29	40	29	35	59	38	7	491
Not stated	0	0	0	0	0	0	1	0	0	1	0	2
<b>Total</b>	<b>40</b>	<b>381</b>	<b>667</b>	<b>733</b>	<b>947</b>	<b>1,470</b>	<b>1,057</b>	<b>948</b>	<b>988</b>	<b>674</b>	<b>331</b>	<b>8,236</b>
Number												
Babies given home oxygen	10	74	92	28	14	9	4	8	7	2	4	252
Per cent												
No oxygen on day 28	10.0	9.2	27.7	59.9	85.1	92.7	94.4	93.1	91.3	92.3	96.1	79.6
Oxygen on day 28	90.0	90.8	72.3	40.1	14.9	7.3	5.6	6.9	8.7	7.7	3.9	20.4
▪ survived to discharge home	30.6	67.3	84.4	86.1	79.4	62.6	50.8	46.2	31.4	26.9	46.2	70.8
▪ died before discharge	69.4	32.7	15.6	13.9	20.6	37.4	49.2	53.8	68.6	73.1	53.8	29.2
Per cent												
Babies given home oxygen	90.9	31.8	22.6	11.1	12.5	13.4	13.3	26.7	25.9	14.3	66.7	21.2

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

**TABLE 47: Transfer after registration of level III registrants by level of destination hospital by birthweight group, 2010**

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	31	238	325	328	386	663	570	628	683	517	250	4,619
Level III hospital	1	13	46	41	34	45	26	30	18	20	6	280
Level II hospital	3	78	258	340	513	735	434	263	244	117	66	3,051
Children's hospital	5	52	38	24	14	27	27	27	43	20	9	286
Total	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
Not transferred	77.5	62.5	48.7	44.7	40.8	45.1	53.9	66.2	69.1	76.7	75.5	56.1
Level III hospital	2.5	3.4	6.9	5.6	3.6	3.1	2.5	3.2	1.8	3.0	1.8	3.4
Level II hospital	7.5	20.5	38.7	46.4	54.2	50.0	41.1	27.7	24.7	17.4	19.9	37.0
Children's hospital	12.5	13.6	5.7	3.3	1.5	1.8	2.6	2.8	4.4	3.0	2.7	3.5
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

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

**Table 48: Retinopathy of prematurity for level III registrants by birthweight group, 2010**

Retinopathy of prematurity (ROP)	Birthweight group (grams)						Total
	<500	500-749	750-999	1000-1249	1250-1499	≥1500	
Number							
No ROP	5	83	319	411	335	190	1,343
▪ Stage 1 ROP	4	54	119	76	33	6	292
▪ Stage 2 ROP	8	91	95	33	10	2	239
▪ Stage 3 ROP	4	50	38	9	2	2	105
▪ Stage 4 ROP	1	0	1	0	0	0	2
Not examined	18	99	70	79	131	141	538
Not stated	0	4	25	125	436	5,127	5,717
<b>Total</b>	<b>40</b>	<b>381</b>	<b>667</b>	<b>733</b>	<b>947</b>	<b>5,468</b>	<b>8,236</b>
Number							
Treatment for ROP	2	33	29	7	0	2	73
Per cent							
No ROP	22.7	29.9	55.8	77.7	88.2	95.0	67.8
▪ Stage 1 ROP	18.2	19.4	20.8	14.4	8.7	3.0	14.7
▪ Stage 2 ROP	36.4	32.7	16.6	6.2	2.6	1.0	12.1
▪ Stage 3 ROP	18.2	18.0	6.6	1.7	0.5	1.0	5.3
▪ Stage 4 ROP	4.5	0.0	0.2	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>
Per cent							
Treatment for ROP	40.0	66.0	74.4	77.8	0.0	100.0	68.2

*Note: Weight criterion less than 1,250 grams for ANZNN but 1,500 grams for some individual units.*

*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.*

*Not stated and not examined data are excluded from per cent calculations.*

**Table 49: Intraventricular haemorrhage for level III registrants survived to day 3 by birthweight group, 2010<sup>(a)</sup>**

Intraventricular haemorrhage	Birthweight group (grams)						Total
	<500	500-749	750-999	1000-1249	1250-1499	≥1500	
	Number						
None	24	219	457	515	527	576	2,318
▪ Grade 1 IVH	4	54	78	69	64	72	341
▪ Grade 2 IVH	3	31	45	33	19	16	147
▪ Grade 3 IVH	2	12	20	8	8	6	56
▪ Grade 4 IVH	4	28	32	15	7	6	92
Not examined	1	3	8	18	49	158	237
Not stated	0	1	13	60	260	4,571	4,905
<b>Total</b>	<b>38</b>	<b>348</b>	<b>653</b>	<b>718</b>	<b>934</b>	<b>5,405</b>	<b>8,096</b>
Per cent							
None	64.9	63.7	72.3	80.5	84.3	85.2	78.5
▪ Grade 1 IVH	10.8	15.7	12.3	10.8	10.2	10.7	11.5
▪ Grade 2 IVH	8.1	9.0	7.1	5.2	3.0	2.4	5.0
▪ Grade 3 IVH	5.4	3.5	3.2	1.3	1.3	0.9	1.9
▪ Grade 4 IVH	10.8	8.1	5.1	2.3	1.1	0.9	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>

(a) Weight criterion for IVH is a birthweight of less than 1,500 grams.

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

**Table 50: Neonatal sepsis for level III registrants by birthweight group, 2010**

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	27	247	504	621	895	1,407	1,020	920	955	658	316	7,570
Sepsis	13	134	163	112	52	63	37	28	33	16	15	666
▪ <48 hrs	0	5	10	15	8	13	7	4	14	7	8	91
▪ ≥48 hrs	12	127	151	95	42	50	28	23	19	9	7	563
▪ both <48 and ≥48 hrs	1	2	2	2	2	0	2	1	0	0	0	12
Babies alive on day 2	40	361	657	723	938	1,461	1,049	941	978	667	328	8,143
Babies who did not survive to day 2	0	20	10	10	9	9	8	7	10	7	3	93
Total in each birthweight group	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
No sepsis <sup>(a)</sup>	67.5	64.8	75.6	84.7	94.5	95.7	96.5	97.0	96.7	97.6	95.5	91.9
Sepsis <sup>(a)</sup>	32.5	35.2	24.4	15.3	5.5	4.3	3.5	3.0	3.3	2.4	4.5	8.1
▪ <48 hrs <sup>(a)</sup>	0.0	1.3	1.5	2.0	0.8	0.9	0.7	0.4	1.4	1.0	2.4	1.1
▪ ≥48 hrs <sup>(b)</sup>	30.0	35.2	23.0	13.1	4.5	3.4	2.7	2.4	1.9	1.3	2.1	6.9
▪ both <48 and ≥48 hrs <sup>(a)</sup>	2.5	0.5	0.3	0.3	0.2	0.0	0.2	0.1	0.0	0.0	0.0	0.1

(a) Denominator is all registrants (b) Denominator is registrants alive at 48 hours

**Table 51: Median length of stay for level III registrants who survived until discharge home by birthweight group, 2010**

Birthweight group (grams)	Number of babies	Median LOS (days)	Interquartile range (days)
<500	15	130	108–146
500-749	268	118	98.5–137.5
750-999	592	90	75–106
1000-1249	692	66	52–79
1250-1499	918	48	37–58
1500-1999	1,430	36	28–45
2000-2499	1,027	22	15–29
2500-2999	913	13	8–21
3000-3499	929	10	6–17
3500-3999	635	8	5–15
≥4000	324	8	5–15
<b>Total</b>	<b>7,743</b>	<b>30</b>	<b>12–54</b>

*Note: Death status was not provided for two babies.*

**Table 52: Survival to discharge home for level III registrants by birthweight group, 2010**

	Birthweight group (grams)											
Survival until discharge home	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
Number												
Lethal congenital anomalies	1	2	4	10	9	13	16	14	19	8	2	98
Babies alive on day 7	33	332	638	709	929	1,448	1,041	928	958	650	326	7,992
Babies alive on day 28	23	297	617	699	923	1,438	1,032	922	939	643	325	7,858
Survived to go home	15	268	592	692	918	1,430	1,027	913	929	635	324	7,743
Total in each birthweight group	40	381	667	733	947	1,470	1,057	948	988	674	331	8,236
Per cent												
Survived to go home	37.5	70.3	88.8	94.4	96.9	97.3	97.2	96.3	94.0	94.2	97.9	94.0

*Note: Death status was not provided for two babies.*

## 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 2010 who qualified as high-risk neonates were requested from each participating unit in February 2012 with a deadline of April 2012. The data submitted were checked for consistency and completeness using a newly developed validation program, 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 August 2012. Apart from grouping, the data presented in the report reflect the database at that time with one exception: 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 $\{[(\text{Hours of IPPV} + \text{Hours of CPAP})/168] + \text{Gestational age}\} > 35.9 \text{ weeks}$
<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 2010 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 these 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 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, including artificial insemination

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

## Ethnicity of mother

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

Coding: 0: unknown.

- 1: Aboriginal or Torres Strait Islander – 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 (eg. 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 – all from Pacific Islander background, including Samoan, Cook Islands Maori, Niuean, Tokelauan, and other Pacific Islands groups (eg. Hawaiian, Tahitian). Excludes Maori.
- 6: Maori – a person of New Zealand Maori descent who identifies as Maori.

## 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.

- 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 complication 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 (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, intrauterine growth restriction 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: tertiary hospital – 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 anomalies

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 the 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 of age when NICU care started, or if an admission temperature is not recorded, use '0' to denote missing.

## Worst base excess

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

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

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

## Main respiratory diagnosis

Definition: Main indication for respiratory support.

Coding: 0: unknown.

- 1: normal – no respiratory support.
- 2: non-specific – any non-specific respiratory distress (RD) in an infant requiring respiratory support (combines previous items transient tachypnoea of newborn and immature lung).
- 3: hyaline membrane disease – increasing RD or oxygen (O<sub>2</sub>) requirements, or the need for ventilator support from the first six hours of life with a chest x-ray showing generalised reticulogranular pattern, plus or minus air bronchogram.
- 4: meconium aspiration – RD presenting from immediately after birth to 12 hours of age. Hypoxia, tachypnoea and gasping respirations are often signs of underlying asphyxia. Chest x-ray shows over-expansion of lungs with wide spread coarse, fluffy infiltrates.
- 5: pneumonia – RD with proven or suspected infection (toxic blood count), and chest x-ray showing persisting opacities.
- 6: persistent pulmonary hypertension – echocardiatic (shunting) or clinical evidence – O<sub>2</sub> need unexplained by chest x-ray or loud P2, 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: any combination – 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 oscillatory ventilation (HFOV)

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

Coding: 99: unknown.

- 0: no high frequency oscillatory ventilation initiated.
- 1: yes, high frequency oscillatory ventilation 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'.

## Nasal high flow therapy

Definition: Blended air and oxygen mix with a delivery flow of greater than 1 litre/min through any high flow device with humidification.

Coding: 99: unknown.

0: nasal high flow was never initiated.

-1: yes, nasal high flow was used for more than four hours.

## 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 (NEC)

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

Coding: 99: unknown.

0: no necrotising enterocolitis proven.

-1: yes, necrotising enterocolitis 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  $<35.0^{\circ}\text{C}$

Coding: 99: unknown.

0: no.

-1: yes.

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 sepsis.

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

## Maximum grade of intraventricular haemorrhage

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 (PVL) – 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 weeks of gestation.

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

**Preterm birth:** birth before 37 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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