REPORT OF THE AUSTRALIAN AND NEW ZEALAND NEONATAL NETWORK

2005

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Acknowledgements

This report is based on data from all level 3 Neonatal Intensive Care Units in both Australia and New Zealand, all level 2 Special care units in New Zealand and the special care unit in Tasmania. The ANZNN wishes to formally acknowledge all those who are involved in collecting information for this report, for their continuing support beyond the call of duty. We have listed these individuals according to their nursery of affiliation. Across both countries there are people in nearly 300 hospitals who also give us their time to track the outcomes of the audited babies and we would like to thank all of them.

We also thank the members of our Advisory Committee who continue to provide conceptual, intellectual and financial contributions, all of which have helped make this network the respected and world recognised organisation that it is today. We especially thank the members of the ANZNN Executive, Kaye Bawden, David Cartwright, Brian Darlow, John Doran, David Henderson-Smart and Paul Lancaster for their commitment and guidance for the all activities of the ANZNN.

We would like to thank Abbott Australasia Pty Ltd. for their ongoing generous support that helped us to achieve our aims. We acknowledge our colleagues from the NSW Pregnancy and newborn Services Network, especially the NSW Neonatal Intensive Care Units Study and the Centre for Perinatal Health Services Research for their continued support and encouragement.

Participating units and the staff supporting ANZNN

Level III nurseries:

New South Wales

Children's Hospital at Westmead
(nursery beds: 20):

Robert Halliday (Director) Nadia Badawi, Peter Barr, and Karen Walker.

John Hunter Hospital
(nursery beds: 29)***:***

Chris Wake (Director), Lynne Cruden

Liverpool Health Service
(nursery beds: 23)**:**
Robert Guaran (Director), Ian Callendar, Catherine Medlin, Jacqui Stack, Sara Wilson.

Nepean Hospital
(nursery beds: 27)**:**

Mark Tracy (Director), Mee Fong Chin.

Royal Hospital for Women
(nursery beds 34):

Kei Lui (Director), Diane Cameron

Royal North Shore Hospital
(nursery beds: 26)**:**

Tushar Bhuta (Director), Jennifer Bowen, Vicky Gallimore, Martin Kluckow.

RPA Women and Babies
(nursery beds: 32)**:**

Nick Evans (Director), Philip Beeby Shelley Reid.

Sydney Children's Hospital
(nursery beds: 20)**:**

Barry Duffy (Director) Janelle Young

Westmead Hospital
(nursery beds: 39)**:**

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

Australian Capital Territory

The Canberra Hospital
(nursery beds: 24)

Graham Reynolds (Director), John Edwards

Victoria

Mercy Hospital for Women
(nursery beds: 54)**:**

Andrew Watkins (Director), Catherine Fleming, Simon Fraser

Monash Medical Centre
(nursery beds: 48)

Andrew Ramsden (Director), Kaye Bawden, Rose Li, Victor Yu (Professor of Neonatology)

Royal Children's Hospital

(nursery beds: 22)**:**

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

Royal Women's Hospital
(nursery beds: 50)**:**

Colin Morley (Professor of Neonatal Medicine and Director), Caroline Collis, Lex Doyle (Professor of Neonatology), Sheryle Rogerson, Neil Roy, Mei Mok, Geraldine Norman, Wendy Simmons.

Queensland

Mater Misericordiae Mother's Hospital
(nursery beds: 60)**:**

David Tudehope (Director and Professor of Paediatrics and Child Health), Vicki Flenady, Peter Gray, Lyndon Kay

Royal Women's Hospital

(nursery beds: 66)**:**

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

The Townsville Hospital
(nursery beds: 28):
John Whitehall (Director), Gary Alcock, Caroline Allen, Jenny Binney, Donna Gandini, Guan Koh, Jacinta Lee

South Australia

Flinders Medical Centre
(nursery beds: 35)**:**
Peter Marshall (Director), Cordula Blank

Women's and Children's Hospital
(nursery beds: 49)**:**
Ross Haslam (Director), Elizabeth Gent, and Andy McPhee.

Western Australia

King Edward Memorial and Princess Margaret Hospitals (nursery beds: 104)**:**

Karen Simmer (Director and Professor of Neonatal Medicine), Annette Butler, Noel French, Ronnie Hagan, Rolland Kohan, Corrado Minutillo, Naomi Rynne, and Margaret Trotter.

Tasmania

Royal Hobart Hospital
nursery beds: 16**:**

Graham Bury (Director), Peter Dargaville (Director), Karen Butterley, Heather Giannaros and Simon Parsons (Director).

Northern Territory

Royal Darwin Hospital:
(nursery beds: 18)

Charles Kilburn (Director), Alan Ruben, Gurmeet Singh (Director) and 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:
Jenni Sokol

New Zealand

Christchurch Women's Hospital
(nursery beds: 37)**:**
Nicola Austin (Director), Brian Darlow (Professor of Paediatrics) and Nina Mogridge.

Dunedin Hospital
(nursery beds: 16)**:**
Roland Broadbent (Director).

Middlemore Hospital
(nursery beds: 20)**:**
Lindsay Mildenhall (Director), Maisie Wong

National Women's Health (at Auckland City Hospital)
(nursery beds: 46)**:**
Carl Kuschel (Director), Jane Harding (Professor of Neonatology), David Knight, Coila Bevan

Waikato Hospital
(nursery beds: 29)**:**
David Bourchier (Director), Phil Weston, Deborah Harris

Wellington Women's Hospital
(nursery beds: 35)**:**
Vaughan Richardson (Director), Dawn Elder, Keith Fisher, Michael Hewson, Joel Sadowsky**.**

Level II nurseries:

Tasmania

Launceston General Hospital
(nursery beds: 12):
Chris Bailey (Director), Jennifer James and Robyn Morey.

New Zealand

Gisborne Hospital
(nursery beds: 6)**:**
Graeme Lear (Director).

Hawkes Bay Hospital
(nursery beds: 12)**:**
Jenny Corban (Director), Lorna Asquith, Marion Bates.

Lower Hutt Hospital
(nursery beds: 8)**:**
Robyn Shaw (Director), Deryn Hogan, Adele Sullivan.

Nelson Hospital
(nursery beds: 10)**:**
Peter McIlroy (Director).

North Shore Hospital:
Nursery beds
Bobby Tsang (Director)

Palmerston North Hospital
(nursery beds: 17)**:**
Jeff Brown (Director) and Eta Raicebe.

Rotorua Hospital
(nursery beds: 10)**:**
Stephen Bradley (Director), Phillipa Clark, Gaye France and Judi Tapp.

Southland Hospital
(nursery beds: 6)**:**
Paul Tomlinson (Director).

Taranaki Base Hospital
(nursery beds: 8)**:**
John Doran (Director), Geoff Aiken, Jane Bocock

Tauranga Hospital
(nursery beds: 10)**:**
Hugh Lees (Director), Heather McAlley, Sue Rodda.

Timaru Hospital
(nursery beds: 3)**:**
Philip Morrison (Director), Sheliah O'Sullivan.

Wairau Hospital
(nursery beds: 4)**:**
Ken Dawson (Director), Graham Cross

Wanganui Hospital
(nursery beds: 4)**:**
John Goldsmith (Director).

Whakatane Hospital
(nursery beds: 5)**:**
Chris Moyes (Director), Marlon Radcliffe, Dharm Ramadas.

Whangarei Area Hospital
(nursery beds: 8)**:**
J Whale (Director), Lynne Clarke, Toni Fergus, Mark Goodman

1. Organisation of the ANZNN

History

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

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

Structure

The Australian and New Zealand Neonatal Network (ANZNN) consist of an Advisory Committee and an Executive Committee. The Advisory Committee consists of the Directors (or their nominee) of each participating unit and the academic neonatologists / neonatal nurses in the region. The role of the Advisory Committee is to monitor and direct the ANZNN, and to approve use of the data. The Executive Committee represents various areas of the network and is concerned with the general running and decision making.

Aims

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

The objectives of the ANZNN are:

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

Funding

Abbott Australasia Pty Ltd has been our major sponsors since 1997. ANZNN again thanks them for their ongoing and generous support. The ANZNN was established from seeding funding generously provided from 1994 by Glaxo Wellcome Australia Ltd and Glaxo Wellcome New Zealand Ltd. Funding also comes from an annual contribution from each of the hospitals with a level III nursery in recognition of their network membership and the annual individual unit feedback. This was a voluntary and unanimous decision undertaken by the tertiary centres.

Registration criteria

The Australian & New Zealand Neonatal Network's (ANZNN) audit of high-risk infants admitted to a newborn nursery and who met the following criteria:

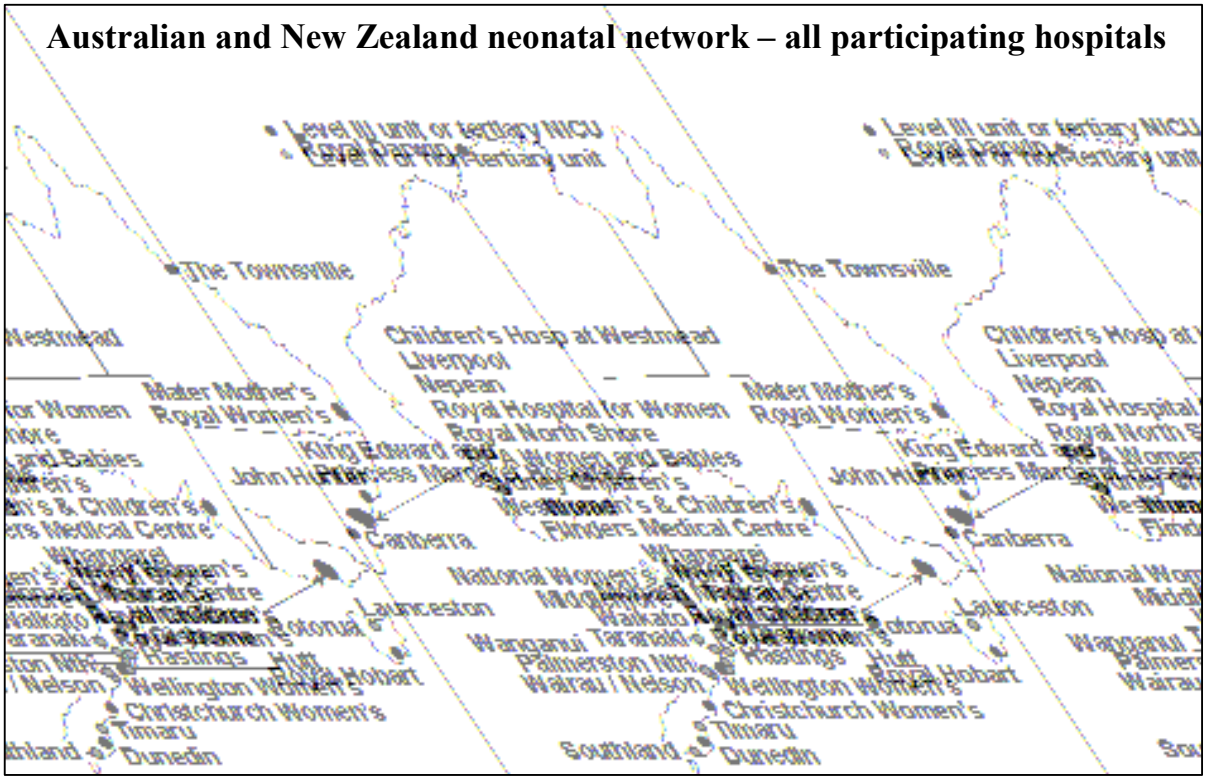
- born at less than 32 completed weeks' gestation; or
- weighed less than 1500 grams at birth; or
- received assisted ventilation (mechanical ventilation including intermittent positive pressure ventilation (IPPV) or continuous positive airways pressure (CPAP)) for four or more consecutive hours, or died while receiving mechanical ventilation prior to four hours of age; or
- received major surgery (surgery that involve opening a body cavity).

Babies who were discharged home and readmitted to a NICU during their neonatal period are not registered to the ANZNN. The hospital of registration for a baby 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 were registered to the first level II centre that they remained in for four or more hours .

Dataset variables

The variables used for the 2005 audit are listed on appendix 2.

Australian and New Zealand neonatal network – all participating hospitals



2. Babies registered to level III nurseries

This section includes data of the ANZNN registrants from all 28 level III NICUs in Australia and New Zealand. It also includes babies born in other hospitals and transferred to a level 3 NICU within 28 days of life.

Of the babies admitted to all NICUs in Australia and New Zealand, 7629 fulfilled registration criteria for ANZNN (figure 1) and represent 2.44% of the 312,545 total live births in the two countries in 2005[1,2]. The number of babies registered in ANZNN has gradually increased over the years, but the number born at less than 32 weeks is steady (figure 1 & 2).

Of those registered in 2005, 3349 (43.9%) were born at <32 weeks, a slightly higher proportion than in 2004. There were 3439 (45.1%) babies born after 31 weeks gestation, weighed more than 1500g and were given assisted ventilation. The number who did not require assisted ventilation, born at more than 31 weeks gestation and weighed <1500g were 185. The number of babies born after 31 weeks gestation and had surgery was 622 (8.4%). Of the registrants born at less than 32 weeks gestation, 298 (8.9%) also had major surgery. In 2005, 91.1% of all registrants were given assisted ventilation (IPPV or CPAP). The total number of ANZNN registrants was increased by 230 in 2005, principally due to an increase in babies born at more than 31 weeks gestation who were given CPAP.

Figure 1: ANZNN registration criteria

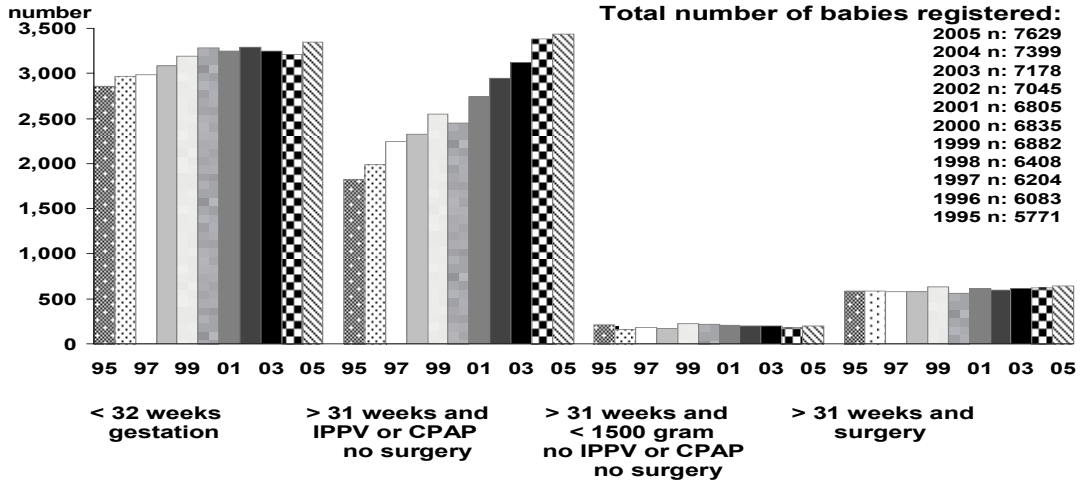


Figure 2: Babies registered to the ANZNN audit in level III nurseries as a proportion of all live born babies, by year of birth

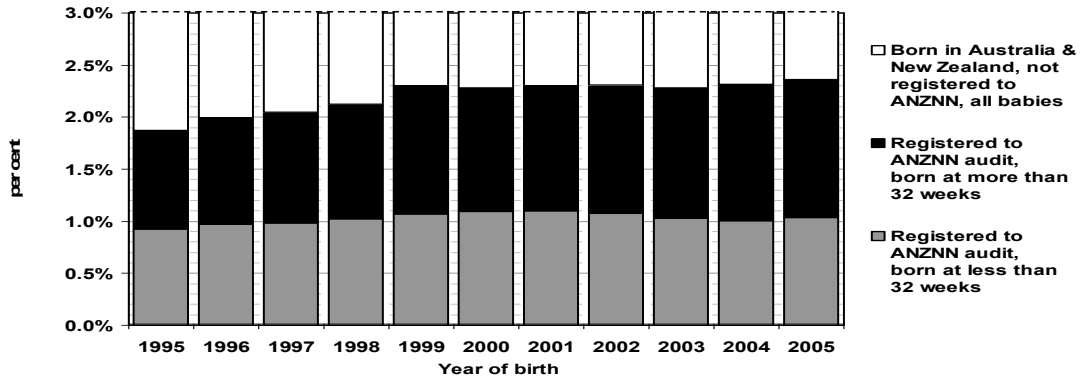


Table 1: Number of babies at each week of gestation, 2005

Gestational age (completed weeks)	Number of babies	cumulative per cent
22	4	0.05
23	47	0.67
24	171	2.91
25	204	5.58
26	278	9.23
27	321	13.44
28	390	18.55
29	503	25.14
30	627	33.36
31	804	43.90
All babies <32 wks	**3349**	
32	671	52.69
33	536	59.72
34	483	66.05
35	425	71.62
36	349	76.20
37	364	80.97
38	457	86.96
39	307	90.98
40	423	96.53
41	216	99.36
42	48	99.99
43	1	100
All babies	**7629**	

Table 2: Number of babies at each birth weight group, 2005

Birth weight group (grams)	Number of babies	Cumulative per cent
<500	29	0.38
500-599	83	1.47
600-699	198	4.06
700-799	223	6.99
800-899	230	10.00
900-999	283	13.71
1000-1099	280	17.38
1100-1199	316	21.52
1200-1299	379	26.49
1300-1399	356	31.16
1400-1499	416	36.61
All babies 1500g	**2793**	
1500-1999	1471	55.89
2000-2499	984	68.79
2500-2999	823	79.58
3000-3499	779	89.79
3500-3999	537	96.83
4000 +	242	100
All babies	**7629**	

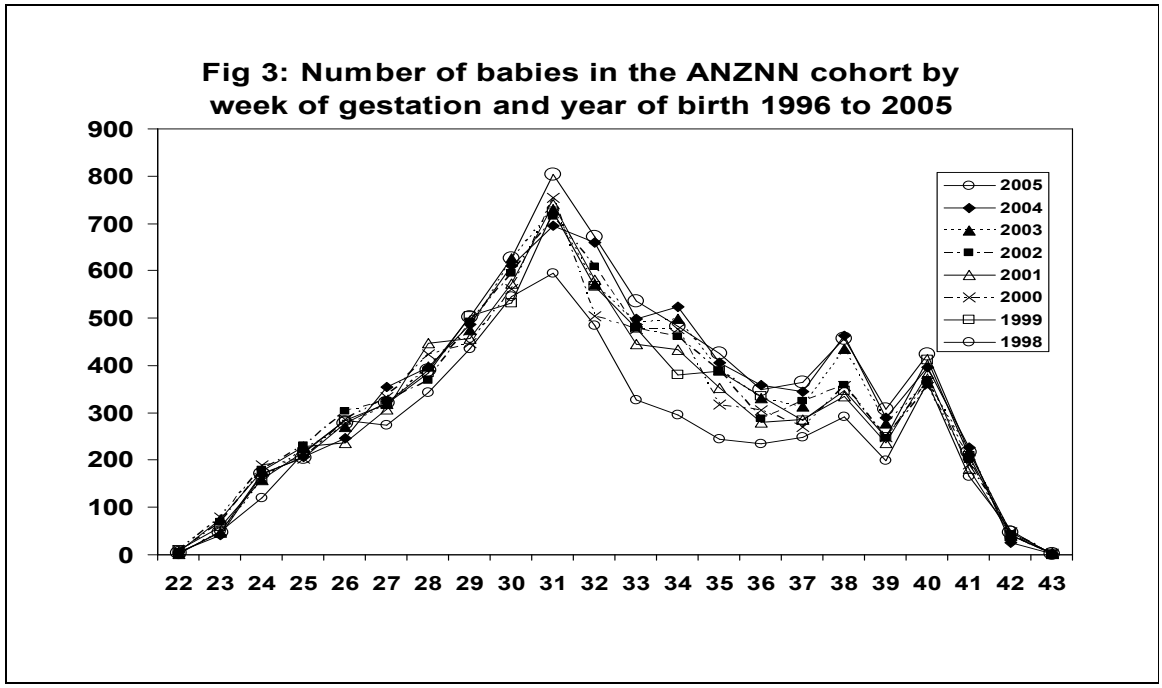
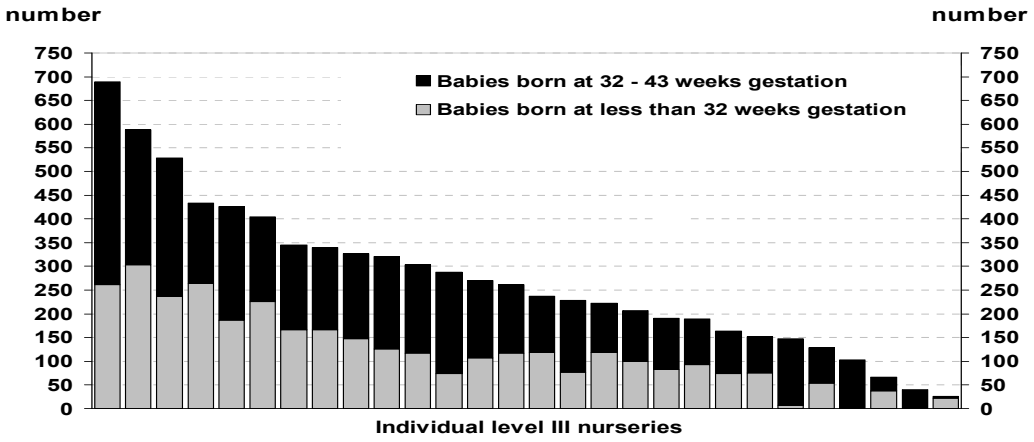


Figure 4: Number of babies registered to the ANZNN by NICU



Babies born in Australia

There were 6044 babies registered to ANZNN from 22 NICUs in Australia representing 2.3% of total live births in 2005[1]. Of those babies 72.5% were born in a hospital with tertiary care facilities. There were 2752 babies born before 32 weeks gestation representing 1.05% of all live births in 2004. The proportion of babies registered to ANZNN who were male was 57.5% where the proportion of male live births in Australia was 51.4%[1] indicating the requirement of neonatal intensive care for more male babies.

The number of babies given assisted ventilation was 5446 (2.1% of live births) and 2203 had CPAP as their only form of respiratory assistance. The number of babies who had surgery was 774. Maternal ethnicity was provided for 92.5% of mothers and Caucasians represented 85.8% of them. Babies of the mothers who identified themselves as Aboriginal or Torres Strait Islanders were 5.2% a rate similar to that seen in the Australian population (5% in 2005). There were 6% babies born to Asian mothers who were admitted to NICUs. Of the babies registered to ANZNN, 1262 babies were from multiple births representing 20.9% of ANZNN admissions in Australia. (Confinements resulting in a multiple birth in Australia were 1.7% of the total births in 2004)[1].

Babies born in New Zealand

Among the babies admitted to all level III NICUs in New Zealand, 1585 met ANZNN registration criteria representing 2.7% of all live births (In 2005, there were 57,745 live births registered in New Zealand[2]). Of those babies, 597 were born at less than 32 weeks gestation (1.03% of the all live births). Male babies represented 57.3% of the ANZNN registrants from New Zealand, a rate higher than that seen among live births in New Zealand[2]. Most of the registrants received assisted ventilation (n: 1506, 2.6% of live births) with 59.7% of them (n: 947) receiving CPAP only. There were 277 babies from multiple births. The number of babies who had major surgery was 167.

The ethnicity of the mother was reported for 98.9% of the babies. The proportion of Caucasian mothers in the cohort was 56.9%. A higher proportion of mothers identified themselves as Maori (20.6%) than in 2003. Another 11% of mothers were Pacific Islanders and 7.3% were Asian. There are 14 level II special care nurseries in New Zealand who are members of the ANZNN and they had 411 babies who met ANZNN criteria for the audit in 2005.

2.1. Maternal Characteristics

Table 3: Maternal age by babies' gestational age, 2005

Mother's age	20-23 weeks	24-27 weeks	28-31 weeks	32-33 weeks	34-36 weeks	37-44 weeks	All babies
10-19 years	6	84	140	80	79	143	532
20-24 years	7	138	359	162	182	284	1132
25-29 years	14	217	566	304	278	447	1826
30-34 years	13	319	709	375	403	561	2380
35-39 years	9	169	431	241	245	301	1396
40+ years	2	47	114	45	66	77	351
unknown	0	0	5	0	4	3	12
All babies	**51**	**974**	**2324**	**1207**	**1257**	**1816**	**7629**
Percent							
10-19 years	11.8	8.6	6.0	6.6	6.3	7.9	7.0
20-24 years	13.7	14.2	15.4	13.4	14.5	15.6	14.8
25-29 years	27.5	22.3	24.4	25.2	22.1	24.6	23.9
30-34 years	25.5	32.8	30.5	31.1	32.1	30.9	31.2
35-39 years	17.6	17.4	18.5	20.0	19.5	16.6	18.3
40+ years	3.9	4.8	4.9	3.7	5.3	4.2	4.6
unknown			0.2	0.0	0.3	0.2	0.2
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**

In the ANZNN cohort, 7% of the babies were born to teenage mothers while in Australia and New Zealand 4.2% of all confinements were to teenage mothers, indicating more babies born to teenage mothers require level 3 NICU care. However, the proportion of the babies born to teenage mothers and admitted to NICUs has gradually declined during past years. Among the ANZNN registrants, 43.2% of the babies born to teenage mothers were born at less than 32 weeks gestation. Mothers over 34 years of age had 1747 babies (22.9% of the cohort) who fulfilled ANZNN high risk criteria and 44.2% of those babies were born before 32 weeks gestation, a proportion higher than in 2004. Most mothers (70%, n. 5338) were in the 20 – 34 years age group.

Of the mothers who had their babies registered to ANZNN, 904 (12.1%) reported that they had previous preterm deliveries, 304 (3.4%) had previous peri-natal loss and 199 (2.5%) had a history of both.

There were 641 (8.4%) mothers who had assisted conception and 267 (41.7%) of them were above 34 years of age. Of those mothers 521 had in vitro fertilization.

Presenting antenatal problem

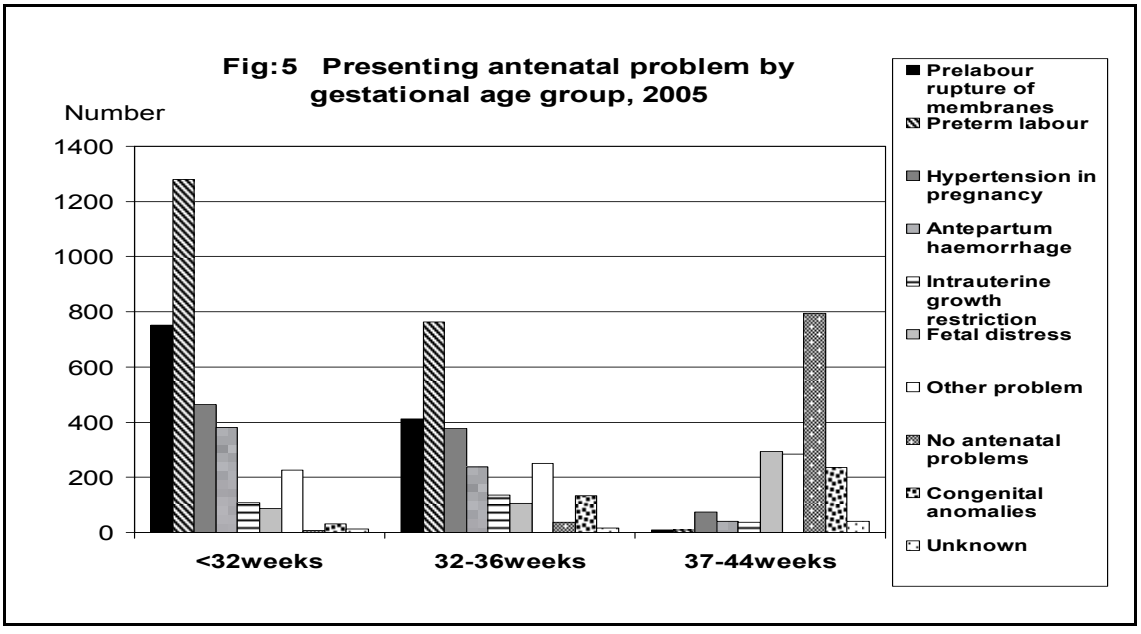
Table 4: Mother's presenting antenatal problem by gestational age group, ANZNN registrants 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Prelabour rupture of membranes	10	86	127	189	340	230	180	8	1170
Preterm labour	24	198	248	307	503	380	382	10	2052
Hypertension in pregnancy	3	16	89	130	227	202	174	75	916
Antepartum haemorrhage	11	52	69	112	136	123	116	41	660
Intrauterine growth restriction	0	1	15	37	55	73	62	37	280
Fetal distress	0	4	11	25	48	54	50	293	485
Other problem	3	12	39	74	98	99	151	283	759
No antenatal problems	0	0	0	1	5	5	33	795	839
Congenital anomalies	0	2	0	15	15	38	96	235	401
Unknown	0	4	1	3	4	3	13	39	67
All babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**	**7629**

Data were available for 99.1% of the babies and the presenting problem given is for the mother's most recent stay in the hospital. The most common presenting problem for mothers giving birth before 32 weeks in the ANZNN cohort was preterm labour (38.2%, n:1280). Another 752 (22.5%) mothers had prelabour rupture of the membranes and 465 (13.9%) had hypertension in pregnancy (Figure 5). These proportions haven't changed significantly from 2003 findings.

The main presenting antenatal problem for mothers giving birth at 32-36 weeks gestation remained preterm labour (n: 762, 30.9%). Hypertension in pregnancy (n: 376, 15.1%) and prelabour rupture of the membranes (n: 410, 16.6%) accounted for the other major problems.

Of the term babies, a large proportion of mothers did not have an antenatal problem that could be identified (43.8%). However among the term babies, 16.1% of the mothers presented with 'fetal distress' and 12.9% had a fetal malformation detected antenatally.



Antenatal corticosteroid use

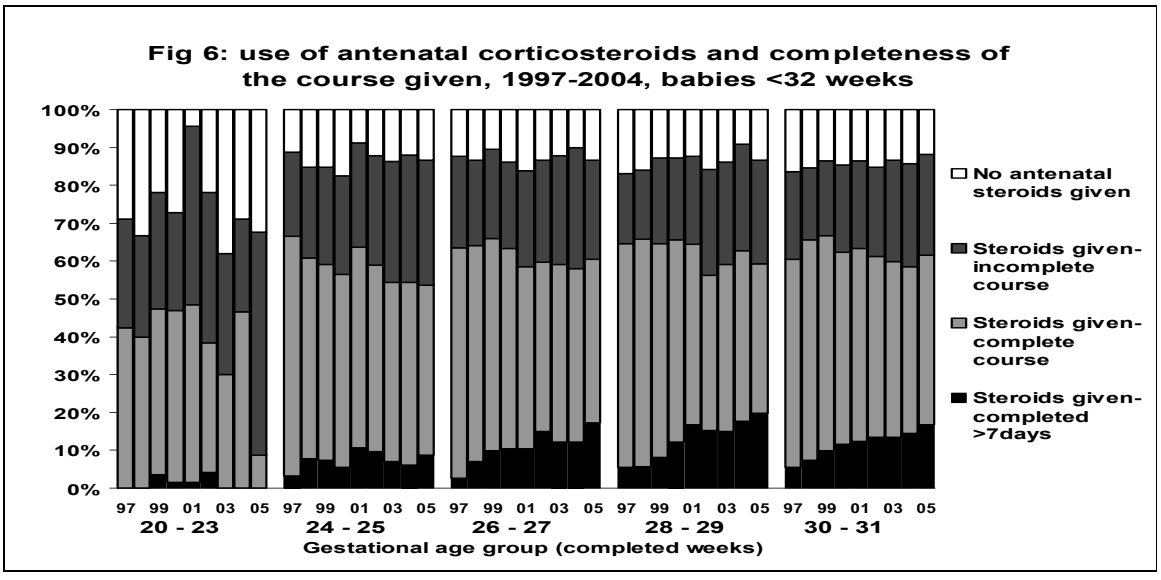
Table 5: Antenatal corticosteroid use by gestational age group, Babies born at <34 weeks, 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	All babies
none	11	49	78	116	163	248	665
Incomplete course	20	121	153	238	369	324	1225
Course completed	13	164	251	345	622	408	1803
Completed >7days	0	32	101	172	233	196	734
unknown	7	9	16	22	44	31	129
All babies	51	375	599	893	1431	1207	4556
Percent							
None	21.6	13.1	13.0	13.0	11.4	20.5	14.6
Incomplete course	39.2	32.3	25.5	26.7	25.8	26.8	26.9
Course completed	25.5	43.7	41.9	38.6	43.5	33.8	39.6
Completed >7days	0.0	8.5	16.9	19.3	16.3	16.2	16.1
All babies	13.7	2.4	2.7	2.5	3.1	2.6	2.8

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

Please see the Appendix 1 for antenatal corticosteroid use by birth weight data table.

In 1997, NHMRC recommended that maternal corticosteroids be considered before all births at less than 34 weeks in order to improve neonatal outcomes. In 2005, 85% mothers of the ANZNN registrants born before 34 weeks were given one or more doses of antenatal corticosteroids. Among the babies born before 32 weeks gestation, 87.1% mothers were given one or more doses of antenatal steroids. The proportion of mothers who delivered before 24 weeks and received steroids has increased from 60.8% in 2003 to 74.4% in 2005. Of the mothers who gave birth at 24-31 weeks GA, 87.3% have received at least one dose of steroids. This data shows that more mothers who delivered before 32 weeks have received steroids in 2005 than in 2004.The proportion of mothers who were given a steroid course more than a week prior to birth has increased over the years (Figure 6). Of the babies born before 32 weeks gestation in a tertiary care centre, 91.4% of the mothers had at least one dose of antenatal steroids. Only 57% mothers of very preterm out-born babies were given at least one dose of steroids.



Method of delivery

Table 6: Method of delivery by gestational age group, all babies, 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
vaginal	33	192	203	285	443	294	393	764	2607
vaginal with instruments	1	16	7	9	34	36	60	187	350
Caesarean section in labour	8	79	166	222	354	305	265	360	1759
Caesarean section no labour	9	87	222	376	598	570	534	492	2888
Unknown	0	1	1	1	2	2	5	13	25
All babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**	**7629**
Percent									
vaginal	64.7	51.3	33.9	32.0	31.0	24.4	31.4	42.4	34.3
vaginal with instruments	2.0	4.3	1.2	1.0	2.4	3.0	4.8	10.4	4.6
Caesarean section in labour	15.7	21.1	27.8	24.9	24.8	25.3	21.2	20.0	23.1
Caesarean section no labour	17.6	23.3	37.1	42.2	41.8	47.3	42.7	27.3	38.0
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

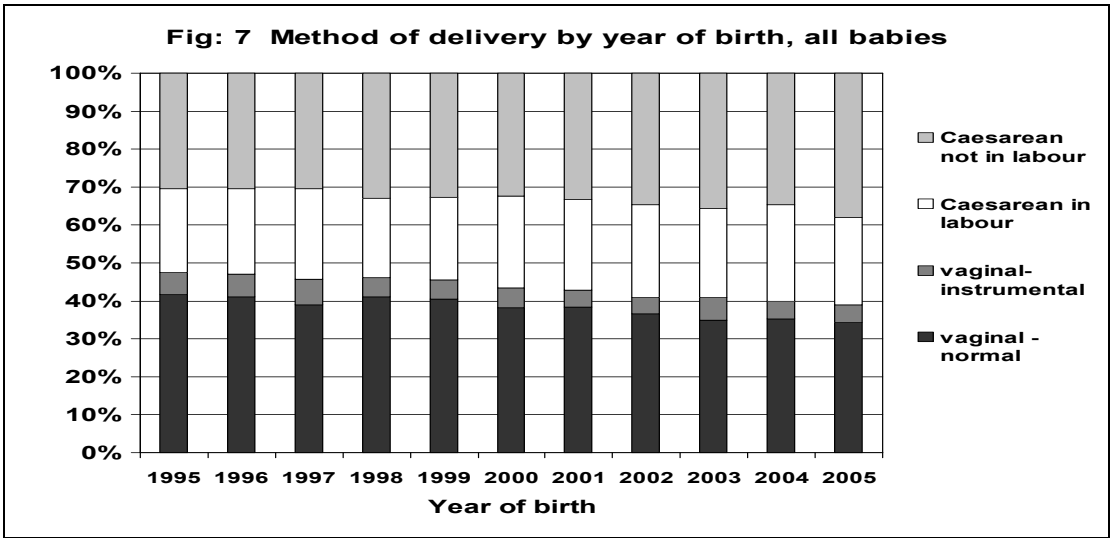
Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

Please see the Appendix 1 for method of delivery by birth weight data table.

The method of the birth varies with gestational age, presenting part of the baby and other factors. Major mode of delivery for babies registered to ANZNN is Caesarean Section and the rate was gradually increasing since the beginning of the data collection in 1995. In 2004, 61.1% of the registrants were born by Caesarean Section and 62.1% of those were performed before the onset of labour. (Data were available for 99.9% of the babies).

The major mode of delivery for babies born before 24 weeks was normal vaginal delivery. The vaginal births assisted with instruments for ANZNN babies show a decreasing trend over the years. Of the babies born in hospitals with tertiary care, 3694 (63.7%) had Caesarean Section deliveries and 2294 (62.1%) of those deliveries were performed before the onset of labour. Among out born babies, 948 (53.9%) were born by Caesarean Sections.

In 2005 the head was the presenting part for 90% (n: 1636) of the term babies. Another 4.7% (n:85) were breech presentations and Caesarean Section was the major mode of delivery for them (n:78, 91.8%).



Place of birth

Table 7: Level of hospital of birth by gestational age group, all babies 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Born in non tertiary hospital	10	51	61	112	156	178	414	778	1760
Born in a tertiary hospital	41	319	533	775	1266	1023	835	1010	5802
Not born in a hospital	0	5	5	6	9	5	8	28	66
All babies	**51**	**375**	**599**	**893**	**1431**	**1206**	**1257**	**1816**	**7628**
Percent									
Born in non tertiary hospital	19.6	13.6	10.2	12.5	10.9	14.8	32.9	42.8	23.1
Born in a tertiary hospital	80.4	85.1	89.0	86.8	88.5	84.8	66.4	55.6	76.1
Not born in a hospital	0	1.3	0.8	0.7	0.6	0.4	0.6	1.5	0.9
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

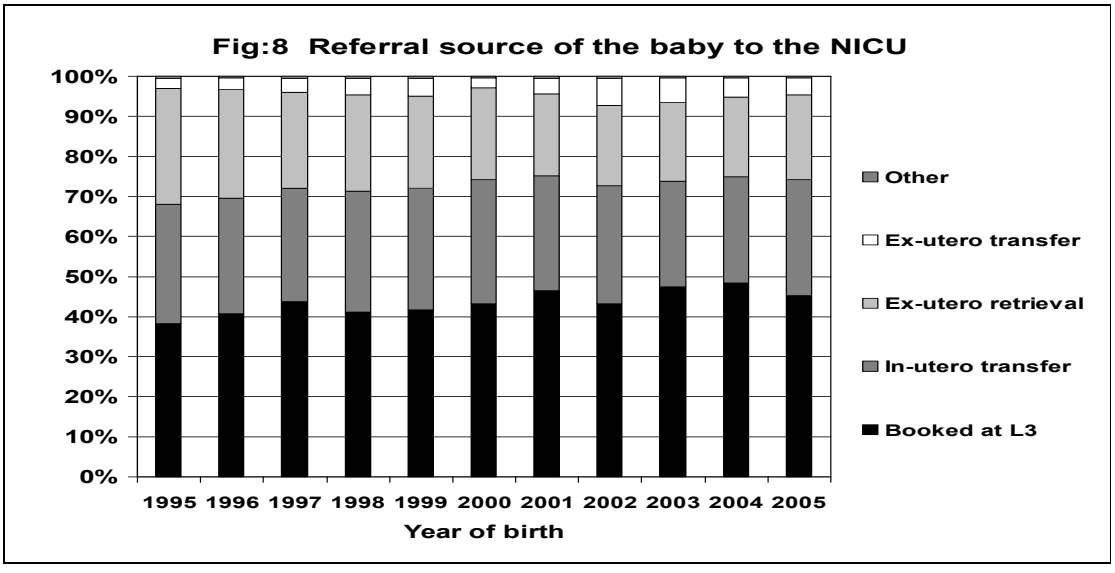
Please see the Appendix 1 for level of hospital of birth by birth weight data table.

The NHMRC's clinical practice guidelines (1997) recommend that wherever possible, births at less than 33 weeks should occur in a perinatal centre with a NICU. When the requirement of a NICU can be anticipated, either the mother can 'book' at a hospital with tertiary care or the mother may be transferred before the birth (in-utero).

In the ANZNN cohort, most babies born at less than 33 weeks gestation were born in a hospital with a NICU (n: 3533; 87.8%) and 44.5% of those mothers (n:1789) had booked into a hospital with a NICU.

About 28.7% of the mothers of ANZNN registrants were transferred in-utero to a tertiary hospital and 67.3% of them (n:1476) had delivered before 32 weeks GA. A small number (n.66) of babies were delivered at home or were born before arrival to a hospital, in both countries.

Of the babies weighing below 1250g at birth, 87.7% (n: 1636) were born in a tertiary care hospital. (There were 1857 babies who weighed less than 1250 grams in 2005 cohort) The proportion of mothers of ANZNN registrants who booked into a tertiary care centre was 45.4% in 2005. There were 3700 babies born at less than 32 weeks gestation or weighed <1500g at birth. Most of them (87.9%) were born at a tertiary care centre.



2.2 The Baby

Gender

In Australia and New Zealand, there are more male babies born than female babies with males accounting for 51.4% of live births in both countries in 2004. In the ANZNN cohort, there were 4387 males (57.5%) and 3240 females (42.5%) in 2005. Of the babies born at less than 32 weeks gestation, 53.4% (n: 1790) were male babies. Among the term babies, there were 60.9% (n: 1106) male babies. There were 53.6% (n: 825) males among multiple births. Gender was not able to be determined for one baby.

Transfer after birth to a level 3 NICU

Table 8: Transport mode of out born babies to NICUs, by gestational age group, 2005

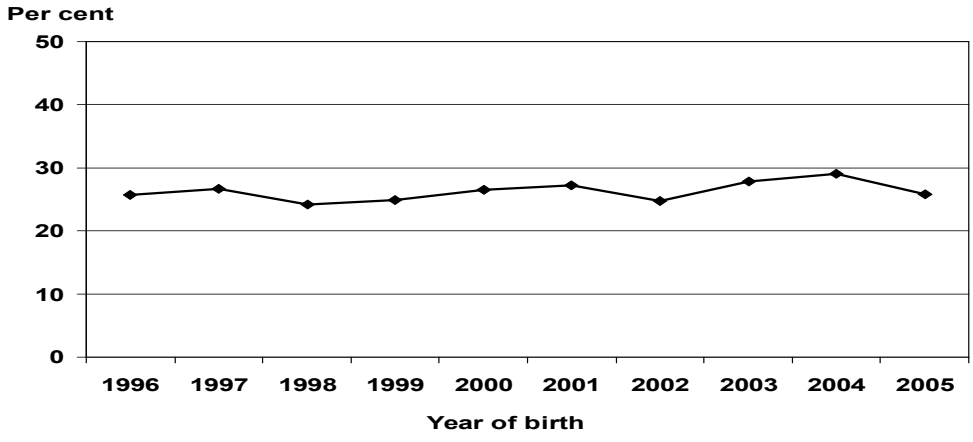
Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44
Specialist transport team	9	48	57	99	136	165	388	726
nonspecialist transport	1	9	9	20	26	27	49	173
All babies	10	57	66	119	162	192	437	899
Percent								
Specialist transport team	90	84.2	86.4	83.2	84.0	85.9	88.8	80.8
nonspecialist transport	10	15.8	13.6	16.8	16.0	14.1	11.2	19.2
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Please see the Appendix 1 for transport mode by birth weight data table.

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

Of the ANZNN registrants, 25.5% (n: 1942) were transferred to a NICU after birth from a non-tertiary hospital. A specialist transport team had retrieved 83.8 % (n: 1628) of those babies. Of the out-born babies, 916 (52%) were transferred on the same day they were born and 1650 (93.8%) were transferred within 48 hours.

Fig: 9 Proportion of babies retrieved or transferred to the registration unit by year of birth



Multiple Births

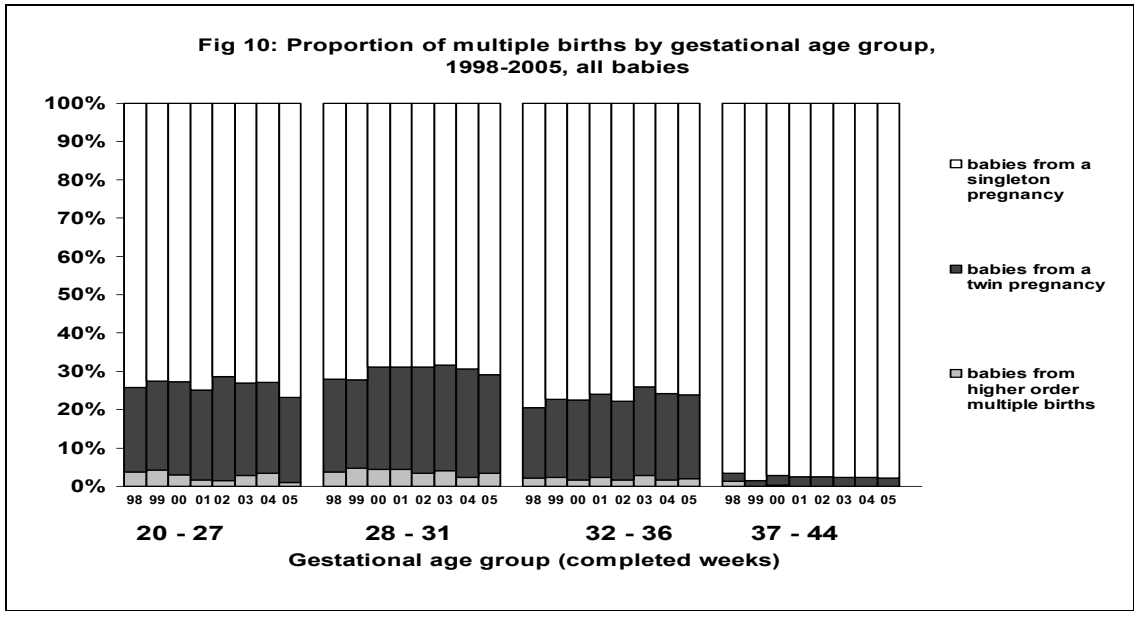
Table 9: Plurality by gestational age group, all babies, 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Singleton	35	289	463	666	983	833	1044	1777	6090
Twins	16	86	125	201	394	336	202	39	1399
Triplets	0	0	11	26	47	35	11	0	130
Quadruplets	0	0	0	0	7	3	0	0	10
All babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**	**7629**
Percent									
Singleton	68.6	77.1	77.3	74.6	68.7	69.0	83.1	97.9	79.8
Twins	31.4	22.9	20.9	22.5	27.5	27.8	16.1	2.1	18.3
Triplets	0	0	1.8	2.9	3.3	2.9	0.9	0	1.7
Quadruplets	0	0	0	0	0.5	0.2	0	0	0.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Please see the Appendix 1 for plurality by birth weight data table.

Babies from multiple pregnancies have an increased risk of being preterm and of having other morbidities independent of their prematurity. There were 1539 (20.2%) babies in our cohort from multiple pregnancies and that is slightly lower than the proportion seen in 2004. They represent 25.7% of the total number of multiple births in Australia and New Zealand in 2005[1,2]. Of those multiple births, 59.3% (n:913) were born before 32 weeks gestation and 97.5% were born before 37 weeks gestation. About a half of the babies (50.9%, n:783) from a multiple birth weighed less than 1500g.

Among the babies from multiple births, majority were male (n: 826, 53.7%) while 713 (46.3%) were females.



Morbidity

This audit reports only on those who fulfilled ANZNN registration criteria amongst the babies who are admitted to a level III NICU. These morbidities are principally associated with preterm birth, with a baby's difficulty with adapting to life outside the uterus or to other complications such as congenital malformations. Only the outcomes that are identifiable during the first admission are reported here.

Admission temperature

Temperature at admission to the NICU is reported to the network for all babies born before 32 weeks gestation. The admission temperature is used to calculate CRIB score for the babies admitted. The median temperature at admission to the NICU is below 37^0C for all gestational ages for babies born before 32 weeks.

Table 10: Median admission temperature and interquartile ranges by gestational age, 2005

	23	24	25	26	27	28	29	30	31
Median temp:	34.8	35.4	35.8	36	36.1	36.3	36.3	36.4	36.4
IQR	33.8-35.6	34.4-36.0	35.2-36.4	35.4-36.6	35.6-36.6	35.8-36.7	35.9-36.8	35.9-36.7	36.0-37.1

Apgar score at birth

Table 11: The number of babies who had Apgar score <4 by gestational age group, 2005

Gestational age group	20-23	24-27	28-31	32-36	37-44	All babies
Apgar Score at 1 minute						
<4	22	269	266	270	376	1203
4-7	26	531	1095	980	608	3240
8+	3	174	962	1214	832	3185
All babies	**51**	**974**	**2323**	**2464**	**1816**	**7628**
Apgar Score at 5 minute						
<4	5	48	31	51	123	258
4-7	26	361	394	401	448	1630
8+	20	565	1898	2012	1245	5740
All babies	**51**	**974**	**2323**	**2464**	**1816**	**7628**

The Apgar score is a clinical indicator noting a baby's condition at birth with a score from 0 to 10. A low score (less than 4) at one minute indicates that the baby needs specialised resuscitation. NHMRC's clinical practice guidelines for care around preterm birth (1997) recommend that ideally, very preterm births should be attended by NICU staff, and those less than 34 weeks should be attended by someone with up-to-date skills in endotracheal intubation.

An Apgar score of less than 4 at 1 minute was noted in 15.8% of the registrants and 3.4% had low scores at 5 minutes. Among the babies who had low Apgar scores at 1 minute, 46.3% were born at less than 32 weeks and 31.2% were term babies.

There were 1815 babies (23.8% of the cohort) who were intubated in labour ward to aid resuscitation at birth, including 1198 (15.7%) babies of less than 32 weeks and 354(4.6%) babies born at term.

Exogenous surfactant

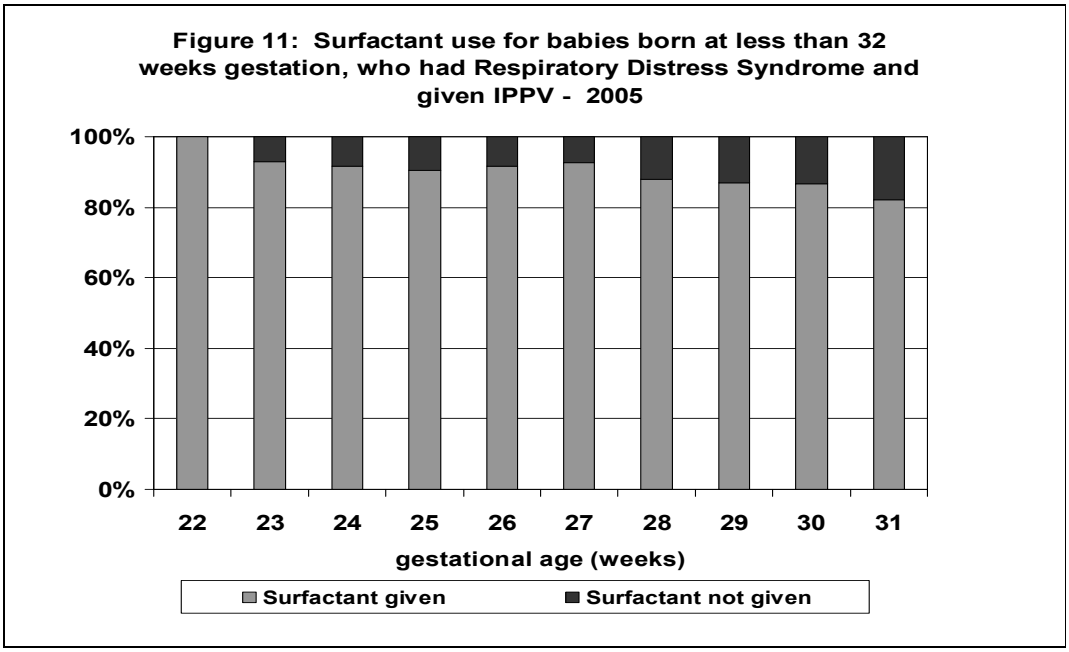
Table 12: Surfactant use by Gestational age group, 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
none	4	48	127	431	1106	959	958	1573	5206
Survanta	44	301	429	422	307	234	284	227	2248
Curosurf	2	26	35	34	16	6	11	11	141
Survanta & Curosurf	1	0	8	4	0	6	4	5	28
Unknown	0	0	0	2	2	2	0	0	6
All babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**	**7629**
Percent									
none	7.8	12.8	21.2	48.3	77.3	79.5	76.2	86.6	68.2
Survanta	86.3	80.3	71.6	47.3	21.5	19.4	22.6	12.5	29.5
Curosurf	3.9	6.9	5.8	3.8	1.1	0.5	0.9	0.6	1.8
Survanta & Curosurf	2.0	0.0	1.3	0.4	0.0	0.5	0.3	0.3	0.4
Unknown	0.0	0.0	0.0	0.2	0.1	0.2	0.0	0.0	0.1
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Please see the Appendix 1 for surfactant use by birth weight data table.

There were 2410 babies who received IPPV for Hyaline Membrane Disease (HMD) in 2005. Exogenous surfactant was given to 2133 (88.5%) of them, a rate higher than in the past years. (Figure 11) The median proportion of surfactant used for HMD among different level III units (for babies who were ventilated) was 85.6% (inter quartile range – 72.3% to 93.4%).

There were 60 babies diagnosed with HMD who were given surfactant, but not continued with IPPV. Fifty seven of them were given CPAP. There were 224 other babies who didn't have HMD, but were given surfactant for other reasons. They include babies who had meconium aspiration syndrome (n: 64), non specific respiratory distress (n: 33) , persistent pulmonary hypertension (33) congenital anomalies (n: 30) and newborn encephalopathy (17).



Respiratory assistance

Table 13: Indication for assisted ventilation by gestational age group, 2005

Gestational age goup	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44
No support	1	4	0	27	243	129	56	77
non specific distress	0	6	23	104	288	300	359	381
hyaline membrane disease	49	355	559	721	740	616	551	296
meconium aspiration	0	0	0	2	0	1	6	229
pneumonia	0	1	0	2	7	4	11	49
persistent pulmonary hypertension	0	0	2	2	5	4	20	74
apnoea	0	2	5	15	58	29	29	19
congenital malformation	0	0	0	4	13	23	58	154
other	1	4	6	8	56	56	64	113
peri-surgical	0	1	1	2	7	25	68	232
neonatal encephalopathy	0	1	1	3	4	11	25	174
Unknown	0	1	2	3	10	9	10	18
all babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**
Percent								
No support	2.0	1.1	0	3.0	17.0	10.7	4.5	4.2
non specific distress	0	1.6	3.8	11.6	20.1	24.9	28.6	21.0
hyaline membrane disease	96.0	94.6	93.3	80.7	51.7	51.0	43.8	16.3
meconium aspiration	0	0.0	0.0	0.2	0.0	0.1	0.5	12.6
Pneumonia	0	0.3	0.0	0.2	0.5	0.3	0.9	2.7
persistent pulmonary hypertension	0	0.0	0.3	0.2	0.3	0.3	1.6	4.1
Apnoea	0	0.5	0.8	1.7	4.1	2.4	2.3	1.0
congenital malformation	0	0.0	0.0	0.4	0.9	1.9	4.6	8.5
Other	2.0	1.1	1.0	0.9	3.9	4.6	5.1	6.2
peri-surgical	0	0.3	0.2	0.2	0.5	2.1	5.4	12.8
neonatal encephalopathy	0	0.3	0.2	0.3	0.3	0.9	2.0	9.6
Unknown	0	0.3	0.3	0.3	0.7	0.7	0.8	1.0
All babies	100	100	100	100	100	100	100	100

Type of assisted ventilation

The two major forms of assisted ventilation used are intermittent positive pressure ventilation (IPPV) and continuous positive airways pressure (CPAP). Both forms require specialised nursing, medical and paramedical care and utilise a large component of the available resources. Of the babies registered to ANZNN cohort, 91.1% (n: 6952) were given assisted ventilation for 4 or more hours in 2005

The most common form of ventilation was CPAP and a continuing trend of increasing use of CPAP and decreasing use of IPPV was observed since the beginning of ANZNN data collection in 1995 (Figure 13). In 2005, “CPAP only” was given to 3150 (41.3%) babies. A combination of IPPV and CPAP was given to 2569 babies. (Figure 12). ‘IPPV only’ was given to 1233 babies.

In 2005, IPPV was given to the babies in our cohort for a total of 654,442 hours (27,269 days) and CPAP was given for 1,194,960 hours (49,790 days). These 77058 days of assisted ventilation equate to each baby receiving 10.1 days of assisted ventilation.

In Australia and New Zealand, high frequency ventilation (HFOV) is mainly given as a rescue manoeuvre. Only HFOV without IPPV is given very rarely. Therefore the rate of HFOV is given

as a proportion of the babies given IPPV. The rate of use was stable since 1999 and slightly increased in 2005 (14%). The use of HFOV among units varies between 0.3% -17%. A higher proportion of babies given HFOV were born at less than 32 weeks gestation.

The rate of Nitric Oxide (NO) is also given as a proportion of the babies given IPPV. The use of Nitric Oxide was 9.0% in 2005 and similar to the rate in 2004.

Table 14: Number of babies given assisted ventilation by gestational age group - 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Number given IPPV	50	363	503	526	414	364	526	1056	3802
Number given CPAP	25	300	566	823	1044	954	961	1046	5719
Number given O2	50	363	566	750	913	797	938	1396	5773
Number given HFOV	27	131	93	73	37	22	32	118	533
Number given NO	5	45	37	19	21	9	40	165	354
Number given ECMO	0	0	0	0	0	0	0	4	4
All babies	51	375	599	893	1431	1207	1257	1816	7629
Percent									
proportion given IPPV	98.0	96.8	84.0	58.9	28.9	30.2	41.8	58.1	49.8
proportion given CPAP	49.0	80.0	94.5	92.2	73.0	79.0	76.5	57.6	75.0
proportion given O2	98.0	96.8	94.5	84.0	63.8	66.0	74.6	76.9	75.7
proportion given HFOV*	54.0	36.1	18.5	13.9	8.9	6.0	6.1	11.2	14.0
proportion given NO*	10.0	12.4	7.4	3.6	5.1	2.5	7.6	15.6	9.0

*The proportion of the babies given HFOV and NO are given as a proportion of the babies given IPPV

Please see the Appendix 1 for assisted ventilation by birth weight data table.

Table 15: Duration of assisted ventilation given to babies by gestational age group – 2005

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-39	40-41
IPPV hours - median	555	428	109	42	37	36	43	51	47
IQR	44 - 1102	110 - 792	32 - 324	19 - 102	17 - 74	17 - 75	20-76	27 - 97	22 - 111
CPAP hours- median	721	852	636	166	46	27	26	24	16
IQR	528-1008	534-160	293-931	64-454	19 -99	12 - 67	11 - 60	10 - 57	7 - 34
Oxygen days- median	37	72	41	7	3	2	3	4	3
IQR	2 - 124	20 - 106	11 - 74	2 - 36	1 - 6	1 - 5	2 - 6	2 - 7	1 - 9

Please see the Appendix 1 for duration of ventilation by birth weight data table.

Babies born at less than 32 weeks gestation

The major indication for assisted ventilation in babies born at less than 32 weeks was respiratory distress syndrome (72.4%, n: 2424) and 2980 babies born before 32 weeks were given IPPV or CPAP. “CPAP only” was given to 1124 (33.6%) babies and “IPPV only” was given to 224 (6.7%) in this GA group. Both IPPV and CPAP were given to 1634 babies. The duration of ventilation increases on average, with decreasing gestational age.

In 2004 the total duration of IPPV used for these very preterm babies was 447,030 hours (18,626days) and duration of CPAP used was 1,028,010 hours (42,834 days). This shows that the

total duration of IPPV use was lower than in 2004, but CPAP use has considerably increased in 2005.

High frequency ventilation was given to 365 babies of this group representing 19.5% of the babies who were given IPPV, a higher proportion than in 2004. Nitric Oxide was given to 127 babies (6.8% of the babies given IPPV).

About 72.4% (n.2642) babies received oxygen therapy for 4 or more hours and a total of 83,442 'oxygen days' were required for them. A small proportion of babies who received assisted ventilation required home oxygen (n.192). This number represents 6.3% of the survivors discharged to home. Of the survivors born at less than 24 weeks, 34.8% required home oxygen.

Babies born at 32 to 36 weeks gestation

Among the babies born at 32-36 weeks gestational age group 91.4% (n: 2251) babies had assisted ventilation for 4 or more hours and again the respiratory distress syndrome was the main reason (47.4%). Total duration of CPAP use for this GA group was 118,023 hours (4917days) and IPPV use was 84,349 hours (3515days). CPAP use in this GA group has further increased during 2005.

High frequency ventilation was given to 6.1% of the babies who received IPPV. Nitric oxide was given to 5.5% of the babies and this is a slightly lower proportion than in 2004. Supplementary oxygen was given to 1735 (71.9%) babies and 10,764 days of oxygen was required for them. Of the survived babies 0.4% (n.9) required home oxygen.

Babies born at term

The main indication for respiratory support was non specific respiratory distress (21%). This group required 123,063 hours of IPPV (5128 days) and 48,932 hours (2039 days) of CPAP.

High frequency ventilation was given to 11.2% of the term babies who were given IPPV. Nitric oxide was given to 15.6% who had IPPV, a lower proportion than in 2004. There were 4 babies who received extracorporeal membrane oxygenation.

Figure 12: CPAP as the only form of ventilation Number of babies by GA

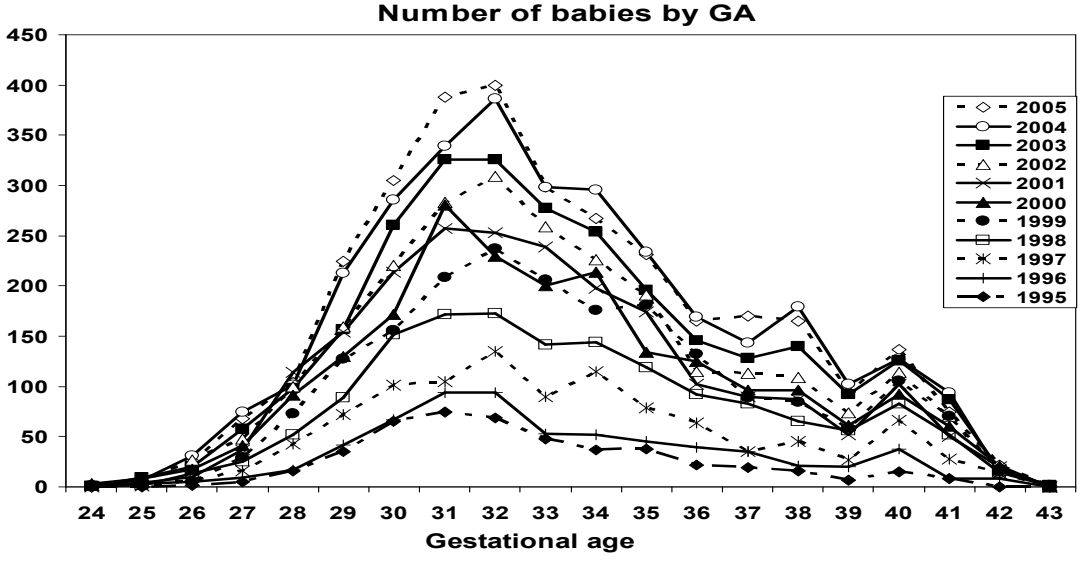


Figure 13: Number of babies given assisted ventilation by year of birth

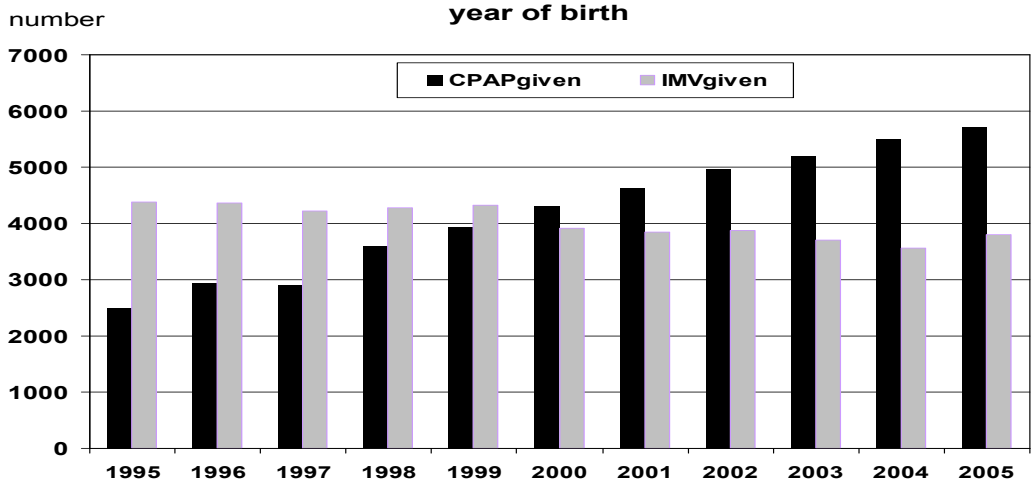


Figure 14: High frequency ventilation by GA group as a proportion of babies given IPPV

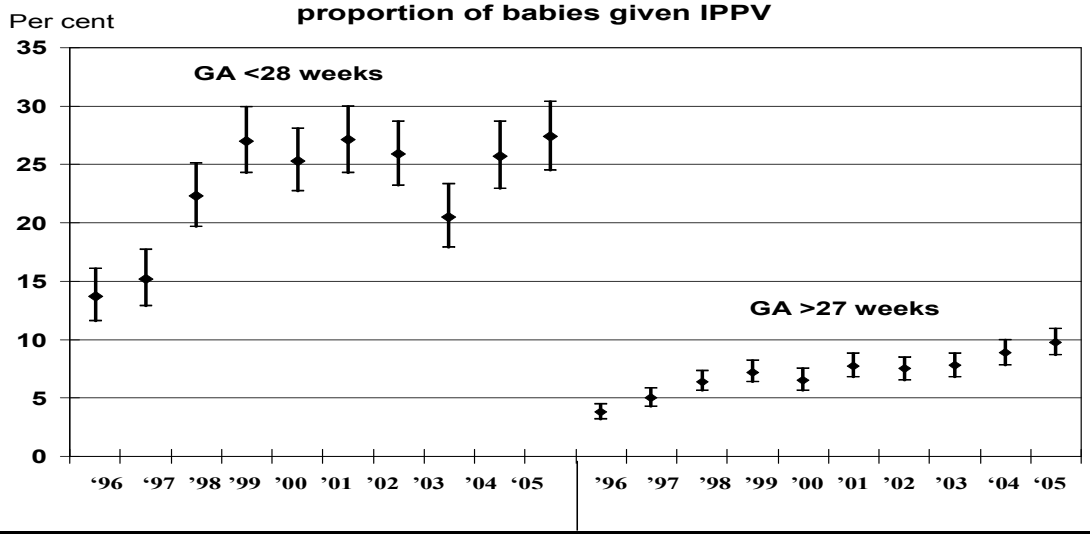
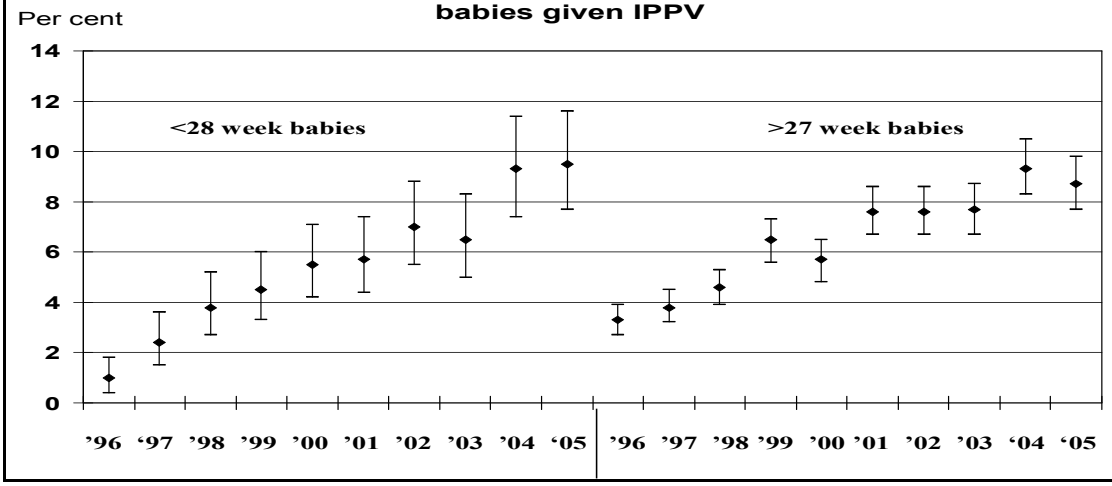


Figure 15: Nitric Oxide use by GA group as a proportion of babies given IPPV



Chronic Lung Disease

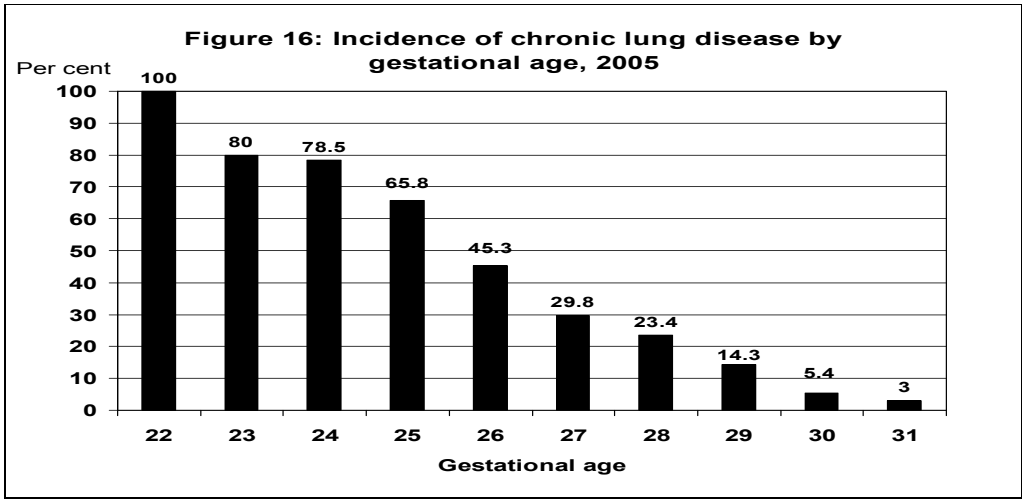
Table 16: Supplemental oxygen therapy and Chronic Lung Disease by gestational age group, 2005

Gestational age	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Oxygen on day 28, number	27	269	379	273	90	49	32	59	1178
Oxygen on day 28 & survived %	85.2	89.2	96.3	95.6	90	83.7	84.4	86.4	85.2
Number of babies given home O2	8	82	54	34	14	6	2	18	218

Gestational age	<=23	24	25	26	27	28	29	30	31	All babies
Chronic lung disease (Babies alive at 36wks)	17	84	106	110	91	87	70	34	24	623
CLD and survived to go home	15	78	98	105	88	81	68	30	20	584
CLD and % survived to go home	88.2	92.9	92.5	95.5	96.7	93.1	97.1	88.2	83.3	93.7

Please see the Appendix 1 for supplemental oxygen therapy by birth weight data table.

Chronic lung disease (CLD) is diagnosed in babies born at less than 32 weeks, and if they receive any form of respiratory support (supplemental oxygen and/ or assisted ventilation) for their initial chronic respiratory disease at 36 weeks post menstrual age (PMA - gestational age plus age after birth, in weeks).
In 2005, there were 623 babies who had respiratory support at 36 weeks PMA (18.6% of the babies born before 32 weeks). A higher proportion of babies who had CLD were born at lower gestational ages (About 33% of the babies born before 24 weeks and 40% of the babies born before 28 weeks). The unadjusted rate of CLD among different units ranged from 5.5% to 32.5% with a median rate of 18%.



Air Leak

Table 17: Babies who had Pneumothorax that required drainage, by gestational age group, 2004

Gestational age group	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Babies who had air leak, n:	10	40	36	42	49	36	69	108	328
given IPPV & had air leak ,n:	10	40	36	41	44	30	55	91	290
given "CPAP only" & had air leak, n:	0	0	0	1	4	6	14	16	1
Air leak / all babies %	19.6	10.7	6.0	4.7	3.4	3.0	5.5	5.9	5.1
Air leak / babies given IPPV %	20.0	11.0	7.2	7.8	10.6	8.2	10.5	8.6	9.1
Air leak / babies given "CPAP only" %	0	0	0	0.3	0.6	0.9	2.1	2.5	1.3

Babies born before 28 weeks had the highest rate (7.1%) of pneumothorax that required drainage. Of those babies 88.1% were given IPPV and 11.5% were given CPAP only.

Retinopathy of Prematurity

Table 18: Retinopathy of Prematurity by GA group, (<31 weeks GA or <1250g birth weight), 2005

Gestatioal age	<=23	24	25	26	27	28	29	30	31	>=32	All Babies
No ROP	4	36	60	125	204	279	380	363	65	49	1565
Stage1	4	16	27	58	51	39	17	27	0	3	242
Stage11	9	28	37	36	40	17	17	7	5	0	196
Stage111	7	30	35	21	7	11	7	4	0	0	122
Stage1V	0	1	2	1	0	0	0	0	0	0	4
ROP treatment	7	26	32	19	5	9	5	1	1	0	105
Not examined	27	60	43	37	19	44	82	226	25	47	610
Percent											
No ROP	16.7	32.4	37.3	51.9	67.5	80.6	90.3	90.5	92.9	94.2	73.5
Stage1	16.7	14.4	16.8	24.1	16.9	11.3	4.0	6.7	0.0	5.8	11.4
Stage11	37.5	25.2	23.0	14.9	13.2	4.9	4.0	1.7	7.1	0.0	9.2
Stage111	29.2	27.0	21.7	8.7	2.3	3.2	1.7	1.0	0	0	5.7
Stage1V	0	0.9	1.2	0.4	0	0	0	0	0	0	0.2
ROP treatment	29.2	23.4	19.9	7.9	1.7	2.6	1.2	0.2	1.4	0.0	4.9

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

Please see the Appendix 1 for ROP by birth weight data table.

The staging criteria used to classify Retinopathy of Prematurity (ROP) for ANZNN registrants are the classification recommended by the International Committee for the Retinopathy of Prematurity. The criteria most commonly used for ROP screening in our cohort are birth at less than 31 weeks gestation or weighing less than 1250 grams and there were 2129 (77.7%) babies who had the results of their eye examination recorded. Among the babies not examined 298 were born >=30 weeks gestational age indicating the different local criteria used to qualify for ROP examination. Some of the infants who didn't have eye examination have died (233) before completing 36 weeks GA. Of the examined babies, 126 (5.9%) had stage III or IV eye disease and 72 of them were treated. There were 32 babies who had treatment for stage 2 disease.

Figure 17: Retinipathy of Prematurity, babies born at <32 weeks GA or birthweight <1250g and survived to 36 weeks PMA, 2005

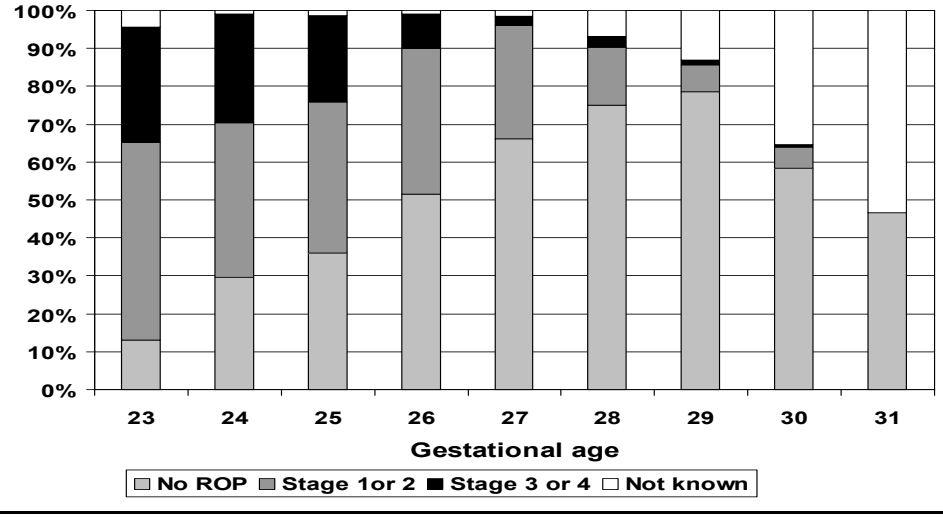


Figure 18: Trends of ROP - Stage 3 & 4 and ROP treatment, Babies <31 weeks GA or <1250g birth weight and survived to 36 weeks PMA

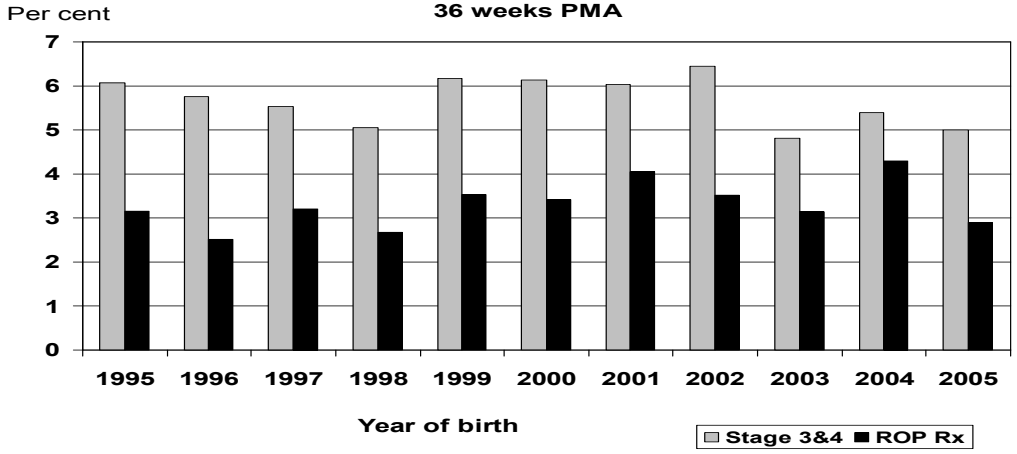


Figure 19: Intraventricular haemorrhage, babies born at <32 weeks GA and survived to day 3, 2005

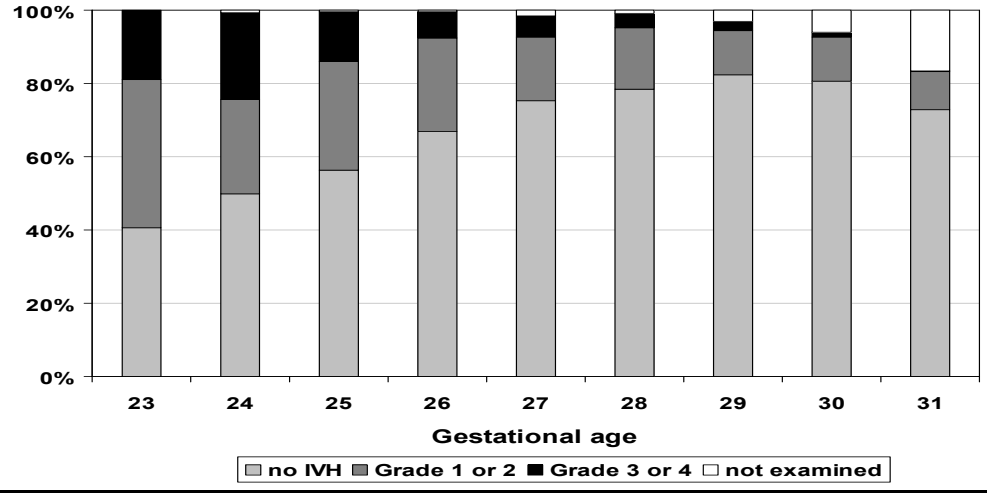
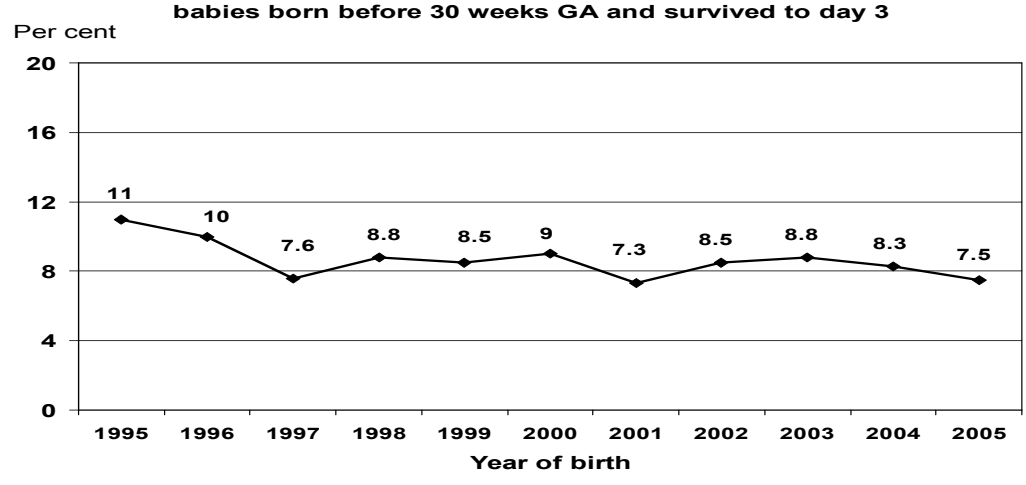


Fig 20: Trends of Intra Ventricular Haemorrhage (Grade 3 or 4) babies born before 30 weeks GA and survived to day 3



Babies who didn't have an ultrasound report are not included in the proportions

Cerebral ultrasound

Table 19: Intraventricular haemorrhage by GA group, babies born at < 32 weeks GA, 2005

Gestational age	23	24	25	26	27	28	29	30	31	All Babies
None	20	82	110	183	238	304	415	505	581	2438
Grade1	11	26	32	43	37	49	47	60	71	376
Grade 11	6	15	26	26	19	15	13	16	11	147
Grade 111	5	16	14	10	8	10	7	4	2	76
Grade 1V	6	25	13	11	10	5	6	3	1	80
not examined	3	7	9	5	9	7	15	39	138	232
All Babies	**51**	**171**	**204**	**278**	**321**	**390**	**503**	**627**	**804**	**3349**
Percent										
None	41.7	50.0	56.4	67.0	76.3	79.4	85.0	85.9	87.2	78.2
Grade1	22.9	15.9	16.4	15.8	11.9	12.8	9.6	10.2	10.7	12.1
Grade 11	12.5	9.1	13.3	9.5	6.1	3.9	2.7	2.7	1.7	4.7
Grade 111	10.4	9.8	7.2	3.7	2.6	2.6	1.4	0.7	0.3	2.4
Grade 1V	12.5	15.2	6.7	4.0	3.2	1.3	1.2	0.5	0.2	2.6
All Babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Note: 'Not examined' and 'not available' data are excluded from per cent calculations.
Please see the Appendix 1 for IVH by birth weight data table.

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

There were 156 very preterm babies reported to have Grade III or IV IVH representing 4.7% of the babies born before 32 weeks gestation, a proportion lower than in 2004. Seventy five of them (48%) died before discharging home. The proportion of babies with significant haemorrhage increases as gestation decreases (Table 18, Figure 19). The median rate of significant haemorrhage in the individual units was 4.2% (with an inter quartile range of 3% to 6.8%).

The highest proportion of babies who had severe IVH was born before 26 weeks GA. About a third (33.3%) of the babies born at 22 - 24 weeks gestation had severe IVH. However, 0.3% of the babies born at 30-31 weeks GA also had severe IVH. Of the babies who weighed less than 750g, 14.9% (n: 63) had severe IVH, a proportion lower than in 2004. Of the 232 (6.9%) babies who did not have an early ultrasound report, 177 (76.3%) were born at more than 29 weeks gestation indicating that some units are screening only the babies born at less than 30 weeks gestation.

Table 20: Late ultrasound results by gestational age group, babies <32 weeks GA, 2004

Gestational age	23	24	25	26	27	28	29	30	31	All babies
Porencephalic Cysts	0	1	4	3	6	3	2	3	2	24
Peri ventricular Leukomalacia	1	4	3	6	5	2	8	3	3	35
Encephaloclastic Porencephaly	0	0	0	0	1	0	1	0	0	2
Hydrocephalus	0	2	3	3	2	4	2	5	2	23
Percent										
Porencephalic Cysts	0	0.8	2.4	1.3	2.1	0.9	0.5	0.6	0.3	0.9
Peri ventricular Leukomalacia	3.1	3.4	1.8	2.5	1.8	0.6	1.9	0.6	0.5	1.3
Encephaloclastic Porencephaly	0	0	0	0	0.4	0	0.2	0	0	0.1
Hydrocephalus	0	1.7	1.8	1.3	0.7	1.2	0.5	1.0	0.3	0.9

Babies who didn't have late head ultrasound reports were excluded when calculating percentages

There were 2142(64%) babies born at less than 32 weeks gestation who had an ultrasound dated at least 3 weeks after birth, and 96.8% (n: 2074) of those had a normal report. Abnormal late head ultrasounds were reported for 68 babies who had ultrasound reported 3 weeks after birth. Of those babies Hydrocephalus was reported for 0.9%, Porencephalic Cysts for 0.9% and 1.3% had Periventricular Leukomalacia. Only two babies had Encephaloclastic Porencephaly.

Another 178 babies had an ultrasound reported between day 14 and day 21 that included 4 additional babies with abnormal scans. This group had 1 more baby with Hydrocephalus, 1 baby with Porencephalic Cysts and 2 with Periventricular Leukomalacia.

Necrotising Enterocolitis

Table 21: Babies who had Necrotising Enterocolitis by year of birth

Year of birth	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GA <28 weeks, n:	69	92	51	74	56	68	78	75	77	85	81
GA >28 weeks, n:	74	73	68	74	56	57	60	65	76	63	50
GA <28 weeks, %	7.3	9.5	5.3	7.4	5.3	6.2	7.5	6.7	7.6	8.3	7.9
GA >28 weeks, %	1.5	1.4	1.3	1.3	0.9	0.9	1	1	1.2	0.9	0.8

Necrotising enterocolitis (NEC) is a rare disease, more common in preterm infants and has a high rate of morbidity and mortality. There were 131 babies among ANZNN registrants who had proven NEC representing 1.7% of the 2005 cohort. More than half (61.8%) of them were born before 28 weeks gestation and 87.8% (n:115) were born before 32 weeks. The proportion of babies who had NEC among babies born before 28 weeks was 7.9% in 2005.

The total number died in this group was 52 and 36 (69.2%) of them were born at less than 28 weeks. The disease was implicated in the death of 37 (71%) babies. The number who had surgery for NEC was 92 (70.2%) and 38(41.3%) of them died. Of those babies who had surgery for NEC, 61 were born at less than 28 weeks.

Neonatal surgery

Table 22: Characteristics of all ANZNN registrants who had surgery, 2005

	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Sex male	10	103	64	48	71	242	538
female	6	81	34	17	59	206	403
Presence of congenital anomalies	1	13	27	43	112	372	568
Antenatal diagnosis of the anomaly	0	3	11	34	82	204	334
Born in a tertiary hospital	15	152	82	56	95	249	649
Born in other hospitals	1	30	16	8	33	196	284
Necrotising Enterocolitis	7	54	19	3	4	5	92
Died before discharging home	5	34	20	6	9	25	99

The information given in this report includes only the babies admitted to a NICU before discharging home after birth. The babies who were discharged home and readmitted for surgery during neonatal period are not included. In 2005, there were 941 ANZNN registrants who had major surgery, of whom 47.6% were born at term. More than two-thirds of the babies who had major surgery (69%) were born at a tertiary hospital. Congenital abnormalities were found in 60.4% of the infants who underwent surgery and 58.8% of them were antenatally diagnosed allowing the birth to be planned, to be close to expert care. About 10.5% babies died after surgery. Of the infants who had congenital abnormalities and had surgery, 45 died. In 2005, the average length of stay in the hospital for the term babies requiring surgery was 37 days.

The main indication for assisted ventilation was surgery for 327 babies who had undergone surgery. Two thirds (69.1%) of them were term babies. Among the babies who were born at more than 31 weeks gestation and had surgery, 523 had mechanical ventilation and they consumed a total of 100167 hours of IPPV (average of 8 days each). Of the babies born at less than 32 weeks gestation or less than 1500g birth weight, 319 had surgery and 61 (19%) of them died, but only 4 were reported to have a lethal congenital malformation.

Neonatal infection

Table 23: Incidence of Septicaemia by gestational age group, all babies, 2005

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44
No infection noted*	22	198	424	756	1362	1154	1211	1741
Sepsis, onset at <48 hours*	1	17	11	17	12	10	8	25
Sepsis, onset at >48 hours+	17	142	154	123	57	44	30	45
Sepsis, early and late onset **	0	8	4	3	0	2	1	0
Babies survived >2days	39	348	582	882	1419	1198	1242	1787
All babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**
Percent								
No infection noted* %	43.1	52.5	70.3	84.7	95.1	95.6	96.3	95.9
Sepsis, onset at <48 hours* %	2.0	4.5	1.8	1.9	0.8	0.8	0.6	1.4
Sepsis, onset at >48 hours+%	43.6	41.3	27.0	13.9	4.1	3.7	2.5	2.5
Sepsis, early and late onset** %	0	2.1	0.7	0.3	0	0.2	0.1	0

* Denominator for these calculations are all babies, n: 7399

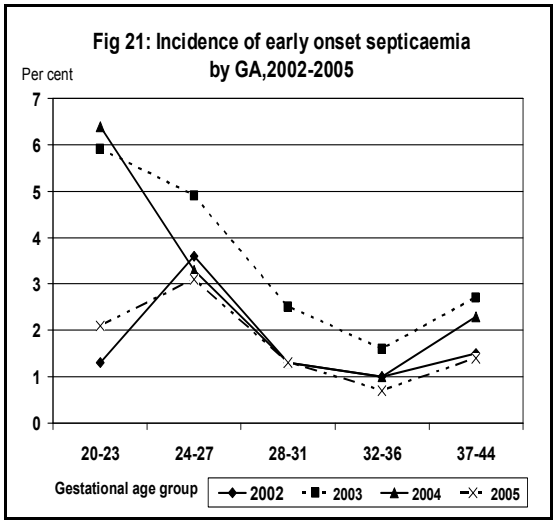
\+ Denominator for this calculation is babies surviving beyond day 2, n: 7266

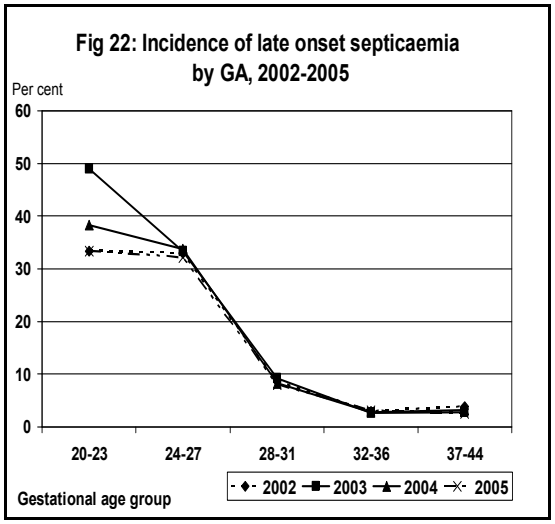
** These babies who had both early and late sepsis are not included in "sepsis at <48 hours" or "sepsis at >48 hours" groups

Please see the Appendix 1 for septicaemia by birth weight data table.

Each episode of sepsis is recorded as early (detected during the first 48 hours of life) or late (detected 48 hours after birth) and episodes involving the same organism must be at least 14 days apart. In 2005, there were 738 (9.7%) babies, who had symptomatic, blood culture positive septicaemia. About 47% (n:347) of babies who had infections were born <28 weeks gestation.

Of the babies born at less than 32 weeks gestation, 1.7% had early infections. Late infections were diagnosed in 15.3% of the babies who were born before 32 weeks gestation and survived beyond day two. The proportion who had late sepsis among babies born after 31 weeks is 2.8%. About 14.6% (n:108) of the babies who had septicaemia died and 27 of them had infection implicated in their deaths.





Congenital Abnormalities

In 2005, there were 942 ANZNN registrants (12.3%) who had congenital anomalies.

Among them were 494 term babies and 163 babies born before 32 weeks. The number diagnosed during antenatal period was 426. About 70% of them were born in a hospital with level 3 NICU. Mothers of 22.3% of the babies, who had congenital anomalies, were over 35 years of age. A higher proportion of babies who had congenital anomalies were males (59.2%, n:558).

The number of babies who had abnormalities of the cardio vascular system was 366 and 240 had gastro-intestinal abnormalities including 15 babies with cleft palate and 3 babies with cleft lip. There were 60 babies who had diaphragmatic hernia, 73 had gastroschisis and 30 had exomphalos. Of the babies who had congenital anomalies, 121 died of the abnormality and 62 of them died within 7 days of birth.

About 725 babies (77%) were given mechanical ventilation. Nearly half of them (46.2%) were given CPAP and 83 babies had high frequency ventilation. The number of those babies who underwent surgery was 568 and 41 of them were born before 32 weeks gestation. Fourty six of the babies who had surgery died.

Breast feeding at discharge

Data on breast feeding at discharge was available for 6673 babies (93.8% of the babies survived to go home). The number of babies who were breast fed at discharge was 4803 (72% of the babies who had data on breast feeding).

Of the babies born before 32 weeks gestation, 2173 babies were on breast feeding at discharge. It is similar to 71% of the babies who were born before 32 weeks and survived to go home.

Among the babies born at more than 31 weeks, 2590 babies were having breast feeding at discharge. There were 4056 babies born at >31 weeks and survived to go home and 63.9% of them were breast fed at discharge.

Transfer from level 3 NICUs to other nurseries

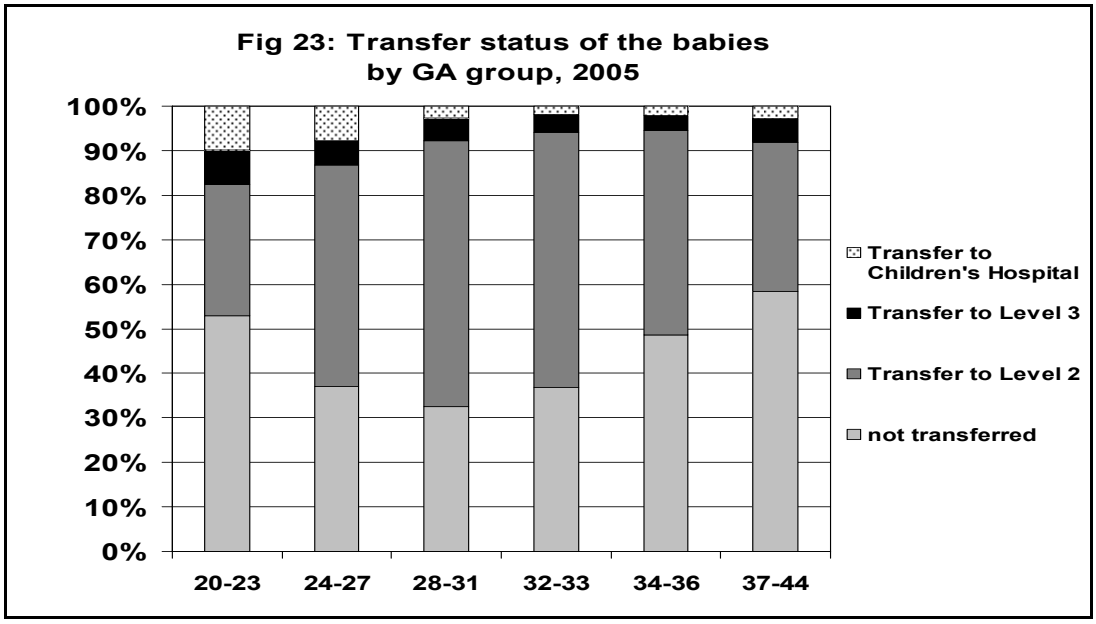
Table 24: Transfer status and level of hospital, by gestational age group, all babies, 2005

Transfer hospital level	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Not transferred	36	215	275	375	560	515	678	1208	3862
Transferred to level 1 or 2	6	109	246	435	776	621	511	461	3165
Transferred to level 3	4	15	38	48	68	49	41	97	360
Transferred to NICUs in Children's hospitals	5	36	40	35	27	22	27	50	242
All babies	**51**	**375**	**599**	**893**	**1431**	**1207**	**1257**	**1816**	**7629**
Per cent									
Not transferred	70.6	57.3	45.9	42.0	39.1	42.7	53.9	66.5	50.6
Transferred to level 1 or 2	11.8	29.1	41.1	48.7	54.2	51.4	40.7	25.4	41.5
Transferred to level 3	7.8	4.0	6.3	5.4	4.8	4.1	3.3	5.3	4.7
Transferred to NICUs in Children's hospitals	9.8	9.6	6.7	3.9	1.9	1.8	2.1	2.8	3.2
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Please see the Appendix 1 for transfer status by birth weight data table.

Some babies cared in level III NICUs are transferred to level II nurseries in either the same hospital or elsewhere to convalesce before discharging to home. In 2005, 51.7% (n: 3678) of the babies who survived were transferred to another hospital before discharge. A half (50.1%) of those transferred babies were born at less than 32 weeks and 15.9% were term babies.

There were 89 babies who died after transferring to other hospitals and 47 of them were born before 32 weeks gestation. This includes 28 babies transferred to level 1 or 2 units, 50 babies transferred to NICUs of children's hospitals and 11 babies transferred to other level 3 NICUs. Among the babies who died after transfer, 37 had congenital anomalies and 13 of those were lethal anomalies.



Length of stay

Table 25: Median length of stay in the hospital (Survivors) by gestational age group, 2005

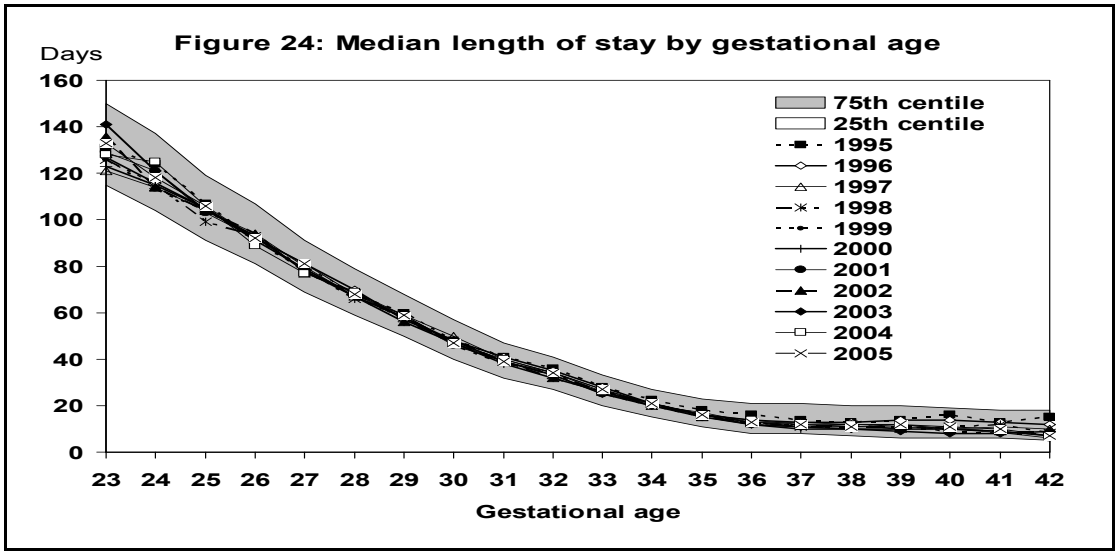
Gestational age	Number survived	median LOS (days)	IQR (days)	Gestational age	Number survived	median LOS (days)	IQR (days)
23	22	133	115 -156	33	522	27	21 - 33
24	102	118	102 -134	34	466	21	16 - 27
25	153	106	93 -121	35	406	16	11 - 21
26	237	92	80 -109	36	334	13	9 - 19
27	302	81	70 - 92	37	347	12	8 - 22
28	363	68	60 - 79	38	417	11	8 - 19
29	482	59	50 - 68	39	287	12	7 - 23
30	613	47	41 - 54	40	387	11	6 - 21
31	783	39	33 - 47	41	195	10	5 - 20
32	654	33	27 - 40	42	43	7	6 - 19

Notes: Discharge data are available for 6678 of the 6904 (96.7%) surviving babies. Data are for all babies, regardless of level of hospital at discharge.
LOS – length of stay IQR – inter quartile range

Please see the Appendix 1 for length of stay by birth weight data table.

The length of stay (LOS) includes the period of baby's stay in all hospitals within the first admission. The date of discharge is collected from all local hospitals where the baby was transferred for convalescence if the baby was transferred from the original registration hospital and data is available for 97.8% (n: 7461) of babies. Over the period of 1995 to 2005, there has been little change in the median length of stay of ANZNN babies when considering the time spent in hospital against gestational age at birth. The duration of their stay in the nursery of registration ranged widely from 1 day to 11 months. The median length of stay for the whole cohort was 33 days (similar to 2004). The length of stay varies according to the babies' gestational age and the complications they had during antenatal, intrapartum and postnatal period. Extremely preterm babies are usually discharged home around the age they complete 40 weeks PMA. Babies born at beyond 34 weeks, who tend to be in our audit for respiratory or other acquired reasons, go home at a median of 11 days after birth. About three quarters of the term babies (76%, n: 1379) were discharged home by three weeks.

The babies born at less than 32 weeks spent about 206,867 hospital bed days and babies born between 32–36 weeks spent 67,117 hospital bed days while term babies required 34,028 bed days.



Survival of the ANZNN registrants

Table 26: Survival to discharge home at each week of gestation, all babies, 2005

gestational age (weeks)	All babies admitted	number with discharge home date	number with lethal congenital abnormality	Number alive at day 7	Number alive at day 28	Number alive at discharge	Per cent survival at discharge
22	4	4	0	1	1	1	25.0
23	47	46	0	32	26	22	46.8
24	171	170	0	138	117	102	59.6
25	204	201	3	182	170	153	75.0
26	278	269	3	257	246	237	85.3
27	321	311	2	312	308	302	94.1
28	390	384	4	380	373	363	93.1
29	503	492	4	494	485	482	95.8
30	627	612	6	622	619	613	97.8
31	804	774	9	789	787	783	97.4
32	671	643	4	665	662	655	97.6
33	536	523	4	528	526	522	97.4
34	483	469	14	475	466	464	96.1
35	425	413	9	416	409	406	95.5
36	349	345	9	342	337	334	95.7
37	364	357	8	355	350	346	95.1
38	457	455	19	431	422	416	91.0
39	307	305	11	298	290	287	93.5
40	423	420	9	403	391	387	91.5
41	216	216	3	203	196	195	90.3
42	48	48	2	44	43	43	89.6
43	1	1	0	1	1	1	100.0
All babies	7629	7458	123	7368	7225	7114	93.2

Notes: 1.Per cent survival to discharge is calculated from 'number alive at discharge' divided by 'all babies admitted' (to the level III NICUs). Hence, these survival calculations include those babies with congenital malformations that are considered to have directly contributed to their death (lethal malformations).

2. Where babies have been transferred to a peripheral hospital and the date of discharge to home is not available (3.1% of all babies) these babies have been assumed to have survived to go home.

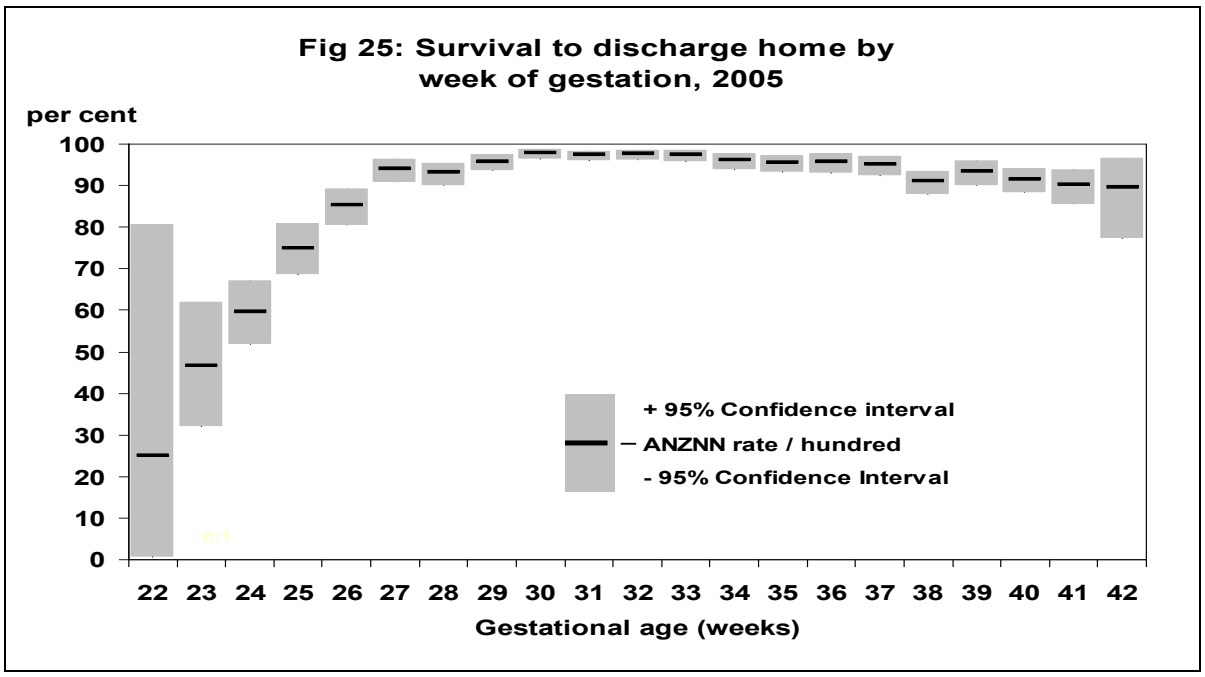
Please see the Appendix 1 for survival by birth weight data table.

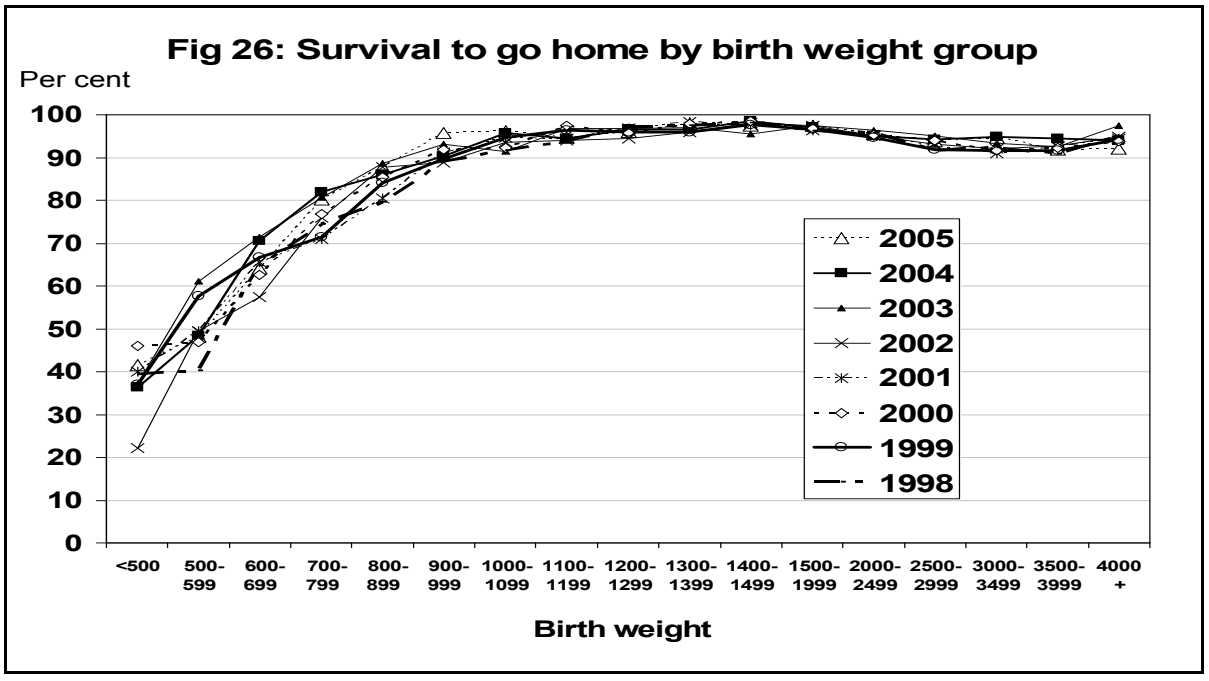
In 2005, 93.2% of the ANZNN registrants survived to go home and this is similar to 2004. Survival status was available for 7628 babies. These data include babies who are back-transferred to level I or II nurseries, and those who are transferred to another level III unit. However these survival rates do not include babies who were stillborn or who died in labour ward, or born in level II hospitals and not transferred to a NICU.

In 2005, 514 ANZNN registrants died before discharging home. The mortality was higher in babies born before 28 weeks and survival rate was 79.7% for that GA group. The survival improves with the increasing gestational age. During the first day of life, 29 (5.7% of the deaths) babies died and

this is a lower proportion than in previous years. A quarter of the (n.129, 25.2%) deaths occurred within the first 2 days of life and 56 of them were born before 28 weeks gestation. Most of those deaths (79%, no:404) occurred within the first 28 days of life.

The cause of death was congenital abnormalities for 123 (24%) of the babies who died. A quarter of the babies (25.2%) who died of congenital abnormalities were born at <32 weeks and 42.3% were born at term. Nearly half of those deaths (46.3%) due to congenital abnormalities occurred within the first week of life. When those babies with lethal congenital abnormalities were excluded from the cohort, survival rate of ANZNN improves to 94.8%.





3. Babies registered to level II nurseries

In general

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

Table 27: Number of babies by gestational age group, babies registered to. Level II units, 2005

Gestational age (completed weeks)	Number	Cumulative per cent
Less than 28	4	1.0
28-29	9	3.2
30-31	45	14.1
Babies less than 32 weeks	**58**	
32-33	68	30.7
34-36	140	64.7
37-39	87	85.9
More than 39	58	100.0
all babies	**411**	

Table 28: Number of babies by birth weight group babies registered to level II units, 2004

Birth weight group (grams)	Number	Cumulative per cent
500-749	3	0.7
750-999	2	1.2
1000-1249	9	3.4
1250-1499	28	10.2
Babies less than 1500g	42	
1500-1999	75	28.5
2000-2499	94	51.5
2500-2999	64	67.1
3000-3499	69	83.8
3500-3999	43	94.1
4000-7000	24	100.0
All babies	**411**	

In 2005, 411 babies fulfilled the ANZNN criteria and were registered to one of the fifteen level II nurseries. Of those babies, 14.1% were born at less than 32 weeks gestation and 10.2% weighed less than 1500 grams at birth. Assisted ventilation was given for 385 (93.7%) and six babies had major surgery. Three hospitals did not have eligible babies for the audit while the maximum number registered to a unit was 58. Previous preterm births were reported by 13.1% (n: 54) of the mothers of registrants and 6 had previous peri-natal deaths.

There were 254 male (61.8%) and 157 female babies admitted to level 2 units. More than half of the babies were born to Caucasian mothers (n: 245, 59.6%) and 65.3% of them (n: 160) were born at less than 37 weeks gestational age. The number of registrants born to Maori mothers was 98 (23.8%) and 65% (n: 64) of them were born at less than 37 weeks gestation. There were 11 babies born to Pacific Islander mothers.

There were 64 babies from multiple births and that include 58 twins and 6 triplets. Thirty six babies from multiple births were males.

Figure 27: Number of babies registered to level II units by registration criteria and year of birth

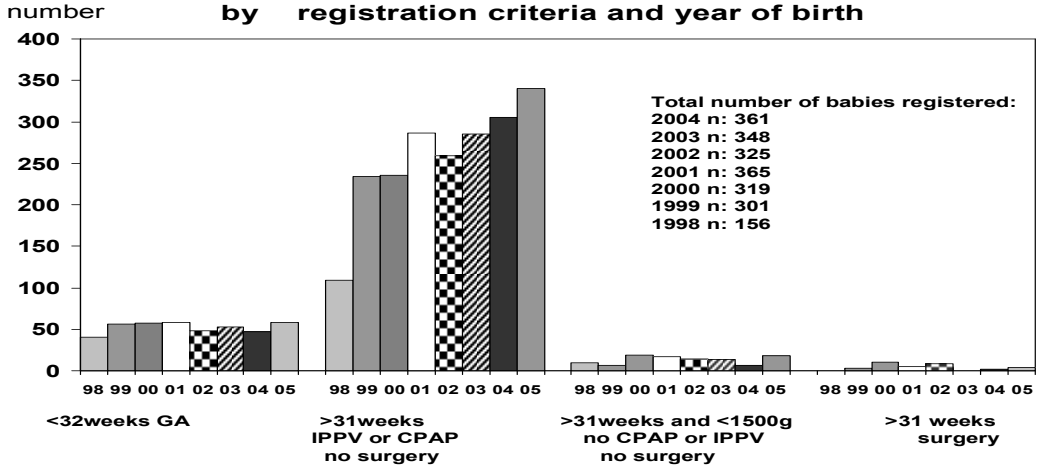


Figure 28: Number of babies registered to level II units by registration unit

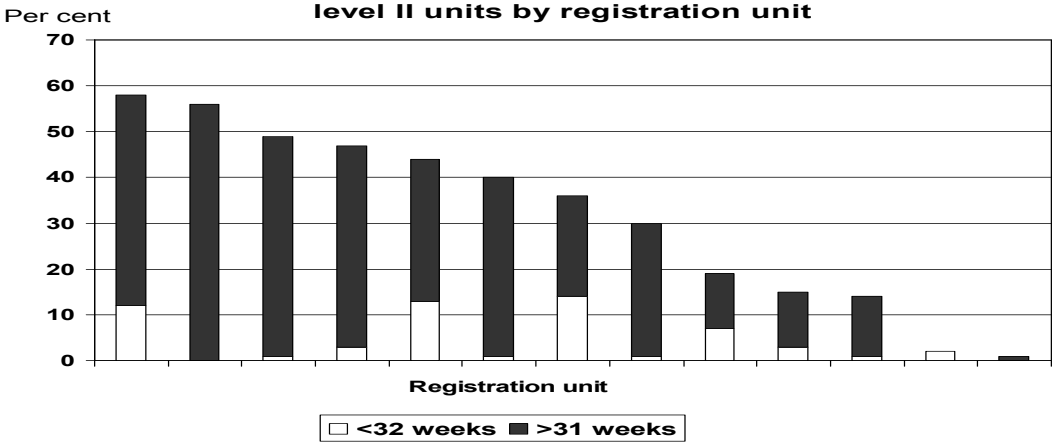


Figure 29: Number of babies registered to level II units with CPAP as their only form of assisted ventilation

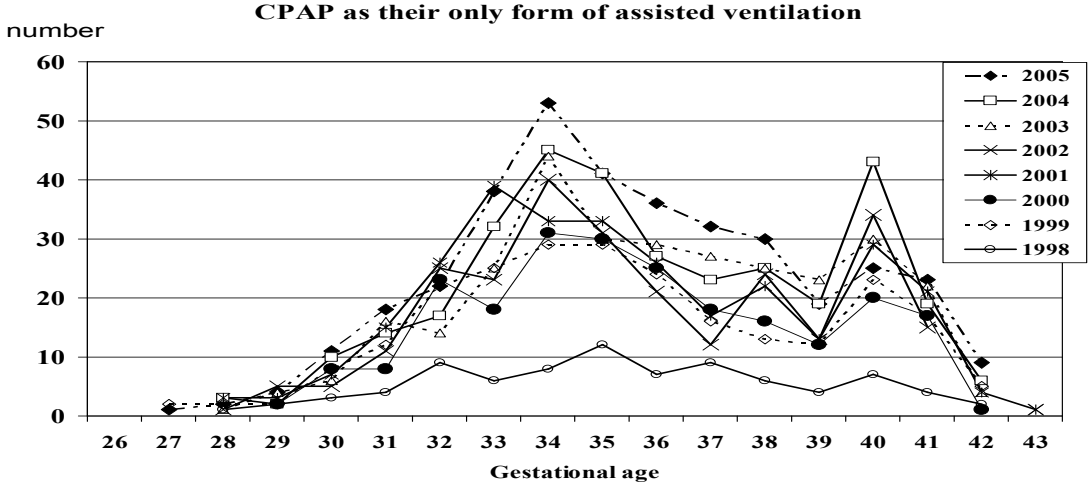


Table 29: Antenatal corticosteroid use by gestational age group, registrants of level II, 2005

Steroid use	28-29	30-31	32-33	34-36	All babies
none	3	8	31	112	154
incomplete course	3	8	11	1	23
course completed	1	17	15	9	42
completed >7 days	0	2	4	5	11
Unknown	2	10	7	13	32
All babies	**9**	**45**	**68**	**140**	**262**

Table 30: Mother's presenting antenatal problem by GA group, registrants of level II, 2005

Presenting problem	26-27	28-31	32-36	37-44	All Babies
Preterm rupture of membranes	0	13	37	2	**52**
Preterm labour	1	24	93	4	**122**
Hypertension in pregnancy	0	5	18	1	**24**
Antepartum haemorrhage	1	6	15	0	**22**
Intra uterine growth restriction	0	2	13	8	**23**
Fetal distress	0	4	8	20	**32**
Other problems	0	0	11	5	**16**
No antenatal problems	0	0	8	97	**105**
Congenital anomalies	0	0	4	3	**7**
Unknown	0	0	1	1	**2**
All Babies	**2**	**54**	**208**	**141**	**405**

Table 31: Referral source to the level II unit, 2004

Referral source	28-29	30-31	32-33	34-36	37-39	>39	All babies
Booked at level 2 Hospital	6	31	54	120	74	42	**327**
In utero transfer	0	7	7	3	0	5	**22**
Ex utero retrieval to level 2 unit	0	0	0	1	1	2	**4**
Ex utero transfer	0	0	0	4	4	5	**13**
Other	2	7	5	7	6	1	**28**
All babies	**8**	**45**	**66**	**135**	**85**	**55**	**394**

Table 32: Method of delivery, registrants of level II, 2005

Delivery method	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Vaginal	1	3	15	26	65	66	**176**
Vaginal - instrumental	0	0	0		5	14	**19**
CS in labour	0	4	11	15	33	28	**91**
CS not in labour	1	2	17	27	35	37	**119**
Not known	0	0	2	0	2	0	**4**
All Babies	**2**	**9**	**45**	**68**	**140**	**145**	**409**

Most mothers of level 2 registrants had booked into a level 2 hospital for delivery (80.3%). Of the level 2 registrants born before 34 weeks gestation, 74.6% were born at a level 2 hospital and 50% of those mothers were given antenatal steroids.

More than two thirds of the mothers of the term level 2 registrants did not present with any maternal complications (66.9%). Among babies born before 37 weeks, 44.7% mothers had presented with preterm labour. The Caesarean Section rate was higher than in 2004 (51.3%) and 43.1% of those had Caesarean Section before labour began. A low Apgar score (less than 4) at 1 minute was recorded for 39 babies (9.5%) and 20 babies required endotracheal intubation in labour ward to assist in their adaptation to extrauterine life.

Respiratory Support

Table 33: Main indication for respiratory support, Level II registrants, 2005

Indication for support	28-31	32-36	37-44	All babies
No support	10	10	0	**17**
non specific distress	13	125	79	**180**
hyaline membrane disease	29	55	7	**76**
meconium aspiration	0	2	22	**24**
pneumonia	0	4	15	**18**
persistent pulmonary hypertension	0	0	3	**3**
apnoea	2	5	1	**6**
congenital malformation	0	0	2	**1**
other	0	3	8	**11**
peri-surgical	0	1	0	**1**
neonatal encephalopathy	0	0	3	**11**
Unknown	0	3	5	**16**
all babies	**54**	**208**	**145**	**407**

Table 34: Respiratory support by gestational age group, level 2 registrants, 2005

	28-31	32-33	34-36	37-44	All babies
Surfactant given	7	2	6	0	**15**
intubated at resuscitation	4	2	3	8	**17**
Oxygen given	25	43	104	119	**291**
Median days of Oxygen	2	2	2	1	
IQR - days oxygen	1-3	1-3	1-4	1-3	
Home O2	1	0	0	0	**1**
CPAP given	41	61	135	143	**380**
Median hours of CPAP	33	20	23	12	
IQR - hours CPAP	12-69	9-53	12-57	7-24	
IPPV given	7	2	5	9	**23**
median hours	48	49	14	24	
Air Leak	0	1	4	3	**8**

Cerebral ultrasound

Out of 61 babies born at less than 32 weeks 46 (75.4%) had head ultrasound and none of them had IVH. Most babies who didn't have an early head ultrasound report were born at 30 or 31 weeks gestation. A late head ultrasound was reported for 34 babies and none of the reports showed abnormal results.

Eye examination

Screening for retinopathy of prematurity (ROP) was reported for 42 eligible babies. None of them had an abnormal report.

Other morbidities

Septicaemia was proven in 30 babies, of whom 19 had symptoms before day two. One baby died following septicaemia. There were no cases of necrotising enterocolitis. Major congenital malformations were reported for 11 babies and four of them had surgery before discharging home. None of the babies died due to congenital malformations.

Level III to level II transfers

There were 316 babies transferred from level III to level II ANZNN hospitals of whom, 66 were born in level 2 hospitals. Of those transferred babies 209 were transferred during neonatal period. About 93 babies continued their respiratory support after back-transfer and 27 babies received supplemental oxygen and all of them continued to have O2 for more than one day.

Survival

Table 35: Survival to discharge by gestational age group, babies registered to level II units, 2004

Gestational age (weeks)	All babies admitted	number with discharge home date	number with lethal cong. malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
28-29	9	9	-	9	9	9	**100**
30-31	45	44	-	45	45	45	**100**
32-33	68	68	-	68	68	68	**100**
34-36	140	139	-	140	140	140	**100**
37-39	87	87		86	85	85	**97.7**
40-41	49	49		48	48	48	**98**
42-44	9	9	-	9	9	9	**100**
All babies	**407**	**405**	**2**	**407**	**406**	**404**	**99.3**

Four babies born at <28 weeks and died on the same day are not included here

About 31 (7.5%) babies were transferred to another hospital prior to discharging home. Of those, 5 babies were transferred to a hospital with facilities for major surgery. Babies who were born at term and survived to go home tended to stay in hospital for a week (median days: 6; interquartile range (IQR): 5-8 days). For babies born at 32 to 36 weeks gestation, the median length of stay was 18 days (IQR: 12-26 days) and babies born at less than 32 weeks gestation were in hospital for a median 44 days (IQR: 35-50 days).

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5. Appendix 1

Data tables by birth weight

Table 36: Antenatal corticosteroid use by birth weight group, Babies weighed <2500g, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	All babies
none	3	50	77	101	146	114	170	459	1120
Incomplete course	8	97	162	216	216	221	159	163	1242
Course completed	15	185	273	330	390	330	198	149	1870
Completed >7days	1	48	97	139	154	137	92	130	798
unknown	2	13	15	25	30	27	23	83	218
All babies	**29**	**393**	**624**	**811**	**936**	**829**	**642**	**984**	**5248**
Percent									
none	11.1	13.2	12.6	12.8	16.1	14.2	27.5	50.9	22.3
Incomplete course	29.6	25.5	26.6	27.5	23.8	27.6	25.7	18.1	24.7
Course completed	55.6	48.7	44.8	42.0	43.0	41.1	32.0	16.5	37.2
Completed >7days	3.7	12.6	15.9	17.7	17.0	17.1	14.9	14.4	15.9
All babies	100	100	100	100	100	100	100	100	100

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

Table 37: Method of delivery by birth weight group, all babies, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000
vaginal	8	145	191	220	271	281	199	360	295	313	223	101
vaginal with instruments	0	9	13	7	18	25	19	35	66	65	57	36
Caesarean section in labour	4	78	144	202	213	209	186	239	175	146	110	53
Caesarean section-no labour	17	160	274	380	434	314	237	343	281	250	146	52
unknown	0	1	2	2	0	0	1	7	6	5	1	0
All babies	**29**	**393**	**624**	**811**	**936**	**829**	**642**	**984**	**823**	**779**	**537**	**242**
Percent												
vaginal	27.6	37.0	30.7	27.2	29.0	33.9	31.0	36.8	36.1	40.4	41.6	41.7
vaginal with instruments	0	2.3	2.1	0.9	1.9	3.0	3.0	3.6	8.1	8.4	10.6	14.9
Caesarean section in labour	13.8	19.9	23.2	25.0	22.8	25.2	29.0	24.5	21.4	18.9	20.5	21.9
Caesarean section-no labour	58.6	40.8	44.1	47.0	46.4	37.9	37.0	35.1	34.4	32.3	27.2	21.5
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

Table 38: Level of hospital of birth by birth weight group, all babies, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000
Born in a non tertiary hospital	1	44	71	98	108	103	98	260	301	346	237	93
Born in a tertiary hospital	28	346	546	709	824	722	536	713	517	425	294	142
planned home birth	0	0	0	0	0	0	0	3	0	2	3	5
Born before arrival	0	3	7	4	4	4	7	8	5	6	3	2
All babies	**29**	**393**	**624**	**811**	**936**	**829**	**641**	**984**	**823**	**779**	**537**	**242**
Percent												
Born in a non tertiary hospital	3.4	11.2	11.4	12.1	11.5	12.4	15.3	26.4	36.6	44.4	44.1	38.4
Born in a tertiary hospital	96.6	88.0	87.5	87.4	88.0	87.1	83.6	72.5	62.8	54.6	54.7	58.7
planned home birth	0	0	0	0	0	0	0	0.3	0.0	0.3	0.6	2.1
Born before arrival	0	0.8	1.1	0.5	0.4	0.5	1.1	0.8	0.6	0.8	0.6	0.8
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

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

Table 39: Transport mode by birth weight group, babies transferred to a NICU, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000
Specialist transport team	1	37	65	92	100	89	90	253	288	309	222	82
nonspecialist transport	0	8	14	11	17	18	19	34	46	86	41	20
All babies	**1**	**45**	**79**	**103**	**117**	**107**	**109**	**287**	**334**	**395**	**263**	**102**
Percent												
Specialist transport team	100	82.2	82.3	89.3	85.5	83.2	82.6	88.2	86.2	78.2	84.4	80.4
nonspecialist transport	0	17.8	17.7	10.7	14.5	16.8	17.4	11.8	13.8	21.8	15.6	19.6
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 40: Plurality by birth weight group, all babies, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000
Singleton	21	298	474	585	632	553	446	799	751	757	532	242
Twins	7	91	140	198	273	241	178	173	71	22	5	0
Tripplets	1	4	10	25	27	32	18	12	1	0	0	0
Quadruplets	0	0	0	3	4	3	0	0	0	0	0	0
All babies	**29**	**393**	**624**	**811**	**936**	**829**	**642**	**984**	**823**	**779**	**537**	**242**
Percent												
Singleton	72.4	75.8	76.0	72.1	67.5	66.7	69.5	81.2	91.3	97.2	99.1	100.0
Twins	24.1	23.2	22.4	24.4	29.2	29.1	27.7	17.6	8.6	2.8	0.9	0
Tripplets	3.4	1.0	1.6	3.1	2.9	3.9	2.8	1.2	0.1	0	0	0
Quadruplets	0	0	0	0.4	0.4	0.4	0	0	0	0	0	0
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 41: Surfactant use by birth weight group, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000
none	2	55	188	438	679	619	479	775	675	638	446	212
Survanta	23	312	397	347	237	194	154	198	140	135	83	28
Curosurf	3	26	34	20	18	10	6	6	7	5	4	2
Survanta & Curosurf	1	0	5	5	0	4	2	5	1	1	4	0
Unknown	0	0	0	1	2	2	1	0	0	0	0	0
All babies	**29**	**393**	**624**	**811**	**936**	**829**	**642**	**984**	**823**	**779**	**537**	**242**
Percent												
none	6.9	14.0	30.1	54.0	72.5	74.7	74.6	78.8	82.0	81.9	83.1	87.6
Survanta	79.3	79.4	63.6	42.8	25.4	23.4	24.0	20.1	17.0	17.3	15.5	11.6
Curosurf	10.3	6.6	5.4	2.5	1.9	1.2	0.9	0.6	0.9	0.6	0.7	0.8
Survanta & Curosurf	3.4	0	0.8	0.6	0	0.5	0.3	0.5	0.1	0.1	0.7	0
Unknown	0	0	0	0.1	0.2	0.2	0.2	0	0	0	0	0
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 42: Number of babies given assisted ventilation by birth weight group- 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000
IPPV given, n:	16	298	580	694	645	655	516	787	586	480	307	155
CPAP given, n:	28	367	491	433	303	284	219	391	406	434	314	132
O2 given, n:	27	373	558	635	581	554	448	741	640	615	416	185

Table 43: Duration of assisted ventilation by birth weight group - 2005

	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
CPAPhrs- median	842	599	176	63	42	29	28	26	22	22	18
IQR	456-1181	209-924	57-504	21-158	14-97	12-75	13-66	11-55	11-59	9-45	8-42
IPPVhrs - median	430	120	48	37	34	32	43	46	49	53	48
IQR	91-847	31-407	20-120	18-86	17-66	16-64	21-80	24-94	23-93	25-111	19-99
O2 days - median	67	43	9	3	3	2	3	4	4	4	3
IQR	10-110	7-80	2-39	1-13	1-6	1-5	1-6	2-6	2-8	2-10	2-9

Table 44: Supplemental oxygen therapy by birth weight group, all babies, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
O2 on day 28, n:	16	257	346	216	100	60	22	23	25	12	1	1078
O2 on day 28 & survived	11	222	332	212	93	51	14	17	22	12	1	987
O2 on day 28 & survived %	68.8	86.4	96.0	98.1	93.0	85.0	63.6	73.9	88.0	100.0	100.0	91.6
Home Oxygen, n:	5	77	66	23	14	12	1	9	7	4	1	219
CLD n:	12	199	218	118	49	29						625
survivors with CLD, n:	10	179	211	117	45	22						584
% survived with CLD	83.3	89.9	96.8	99.2	91.8	75.9						93.4

Table 45: Retinopathy of Prematurity by birth weight group,<31 weeks GA or <1250g birth weight,2005

	<499	500-749	750-999	1000-1249	1250-1499	1500+	All Babies
No ROP	5	99	333	565	342	221	1565
Stage1	2	48	100	67	22	3	242
Stage11	3	68	83	34	7	2	197
Stage111	4	60	45	8	4	1	122
Stage1V	1	3	0	0	0	0	4
ROP treatment	5	55	37	7	1		105
Not examined	14	115	63	137	133	148	610
All Babies	**29**	**393**	**624**	**811**	**936**	**375**	**2740**
Percent							
No ROP	33.3	35.6	59.4	83.8	42.6	97.4	73.5
Stage1	13.3	17.3	17.8	9.9	2.7	1.3	11.4
Stage11	20.0	24.5	14.8	5.0	0.9	0.9	9.2
Stage111	26.7	21.6	8.0	1.2	0.5	0.4	5.7
Stage1V	6.7	1.1	0.0	0.0	0.0	0.0	0.2
ROP treatment	33.3	19.8	6.6	1.0	0.1	0.0	4.9

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

Table 46: Intraventricular haemorrhage by birth weight group, babies of <1500g birth weight, 2005

	<499	500-749	750-999	1000-1249	1250-1499	All Babies
None	19	231	435	623	726	2034
Grade1	5	59	79	85	73	301
Grade 11	1	27	51	40	17	136
Grade 111	0	23	25	15	8	71
Grade 1V	4	36	21	12	5	78
not examined	0	17	13	36	107	173
All Babies	**29**	**393**	**624**	**811**	**936**	**2793**
Percent						
None	65.5	61.4	71.2	80.4	87.6	77.6
Grade1	17.2	15.7	12.9	11.0	8.8	11.5
Grade 11	3.4	7.2	8.3	5.2	2.1	5.2
Grade 111		6.1	4.1	1.9	1.0	2.7
Grade 1V	13.8	9.6	3.4	1.5	0.6	3.0

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

Table 47: Incidence of Septicaemia by birth weight group, all babies, 2005

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000+	All babies
No infection noted*	17	241	434	698	859	1403	3240	6892
Sepsis, onset at <48 hours*	1	6	10	10	7	19	30	83
Sepsis, onset at >48 hours+	10	107	134	59	46	32	52	440
Sepsis, early and late onset **	0	7	0	7	1	0	3	18
All babies	**29**	**393**	**624**	**811**	**936**	**1471**	**3365**	**7629**

Table 48: Transfer status and level of hospital, by birth weight group, all babies, 2005

Transfer hospital level	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All Babies
Not transferred	17	165	206	251	339	524	427	418	431	320	162	3260
Transferred to level 1 or 2	8	168	339	480	528	861	511	344	286	175	67	3767
Transferred to level 3	0	22	32	50	50	60	33	38	43	27	5	360
NICU in Children's hospital	4	38	47	30	19	26	13	23	19	15	8	242
All babies	**29**	**393**	**624**	**811**	**936**	**1471**	**984**	**823**	**779**	**537**	**242**	**7629**
Per cent												
Not transferred	58.6	42.0	33.0	30.9	36.2	35.6	43.4	50.8	55.3	59.6	66.9	42.7
Transferred to level 1 or 2	27.6	42.7	54.3	59.2	56.4	58.5	51.9	41.8	36.7	32.6	27.7	49.4
Transferred to level 3	0.0	5.6	5.1	6.2	5.3	4.1	3.4	4.6	5.5	5.0	2.1	4.7
NICU in Children's hospital	13.8	9.7	7.5	3.7	2.0	1.8	1.3	2.8	2.4	2.8	3.3	3.2
All babies	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 49: Median length of stay in the hospital (Survivors) by birth weight group, 2004

Days to discharge	250-499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
Median (days)	135	111	85	62	46	37	22	14	11	11	10
Interquartile range	117–148	96–130	71–102	52–75	37–58	33-47	16-30	9–21	7–20	7–19	6–20
Survivors with discharge data	12	252	567	773	912	1434	939	771	738	493	223

Table 50: Survival to discharge home by birth weight group, all babies, 2005

Birth weight group (grams)	All babies admitted	No. with discharge home date	Number with lethal congenital malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
<499	29	29	0	21	17	12	41.4
500-749	393	387	6	328	291	252	64.1
750-999	624	610	4	593	583	567	90.9
1000-1249	811	787	6	796	778	773	95.3
1250-1499	936	913	8	925	920	912	97.4
1500-1749	829	798	9	815	814	808	97.5
1750-1999	642	619	8	634	631	626	97.5
2000-2499	984	958	22	964	951	939	95.4
2500-2999	823	811	24	795	777	771	93.7
3000-3499	779	774	18	758	745	738	94.7
3500-3999	537	534	12	510	496	493	91.8
4000-7000	242	241	6	230	223	223	92.1
All babies	7629	7461	123	7369	7226	7114	93.2

Notes 1.Per cent survival to discharge is calculated from 'number alive at discharge' divided by 'all babies admitted' (to the level III NICUs). Hence, these survival calculations include those babies with congenital malformations that are considered to have directly contributed to their death (lethal malformations).

2. Where babies have been transferred to a peripheral hospital and the date of discharge to home is not available (3.1% of all babies) these babies have been assumed to have survived to go home.

6. Appendix 2

6.1 Minimum dataset 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 4 or more hours.
Coding: numeric code representing registration hospital.
Guide for use:. If a baby dies within 4 hours, they are registered to the unit where they die.

Maternal age
Definition: Age in completed years of the woman giving birth on the date of her baby's birth. *Coding:* 2-digit number representing maternal age in completed years.

Previous preterm birth
Definition: This mother has had a previous birth that was at less than 37 weeks gestation and more than 20 completed weeks, regardless of outcome.
Coding: 99: unknown
0: no previous preterm birth
-1: yes, there was a previous preterm birth

Previous perinatal death
Definition: Mother has had a previous perinatal loss.
Coding: 99: unknown
0: no previous perinatal death
-1: yes, has had a previous perinatal death
Guide for use: A perinatal loss is when a baby with a birth weight of more than 400 grams or a gestational age of more than 20 completed weeks died during the first 28 days of life.

Assisted conception in this pregnancy
Definition: The type of infertility treatment used during the conception or used to conceive this pregnancy.
Coding: 0: unknown
1:none - used for this pregnancy.
2:hyperovulation - any hormone therapy used to stimulate ovulation.
3:IVF / GIFT etc. - any method of in vitro fertilisation. Including in-vitro fertilisation gamete intra-fallopian transfer, zygote intra-fallopian transfer, and IC sperm injection.
4: other - infertility treatment used, that is not mentioned above, incl. artificial insemination.
Guide for use: Disregard any treatment for any previous pregnancies.

Ethnicity of mother
Definition: Ethnic origin of the mother of baby, as identified by the mother.
Coding: 0: unknown
1: Aboriginal or Torres Strait Islander (TI) - by descent who identifies as an Aboriginal or TI and is accepted as such by the community with which she is associated
2: Asian - from countries of Asia, Including Fijian Indian.
3: Caucasian - of Caucasoid heritage, includes Arabic, European, Russian Middle Eastern.
4: Other - includes African Negroes, Inuit, American Blacks and Indians, Melanesian.
5: Pacific Islander
6: Maori - maternal self-identification

Source of referral
Definition: Source of referral to registration unit
Coding: 0: unknown
1: booked at tertiary obstetric hospital - mother booked at a hospital with a NICU and not transferred during the most recent admission.
2: in-utero transfer from obstetric hospital - mum transferred during admission
3: ex-utero retrieval - baby transferred from any hospital by a specialist retrieval team.
4: ex-utero transfer - baby transferred from any hospital by non-specialist team, includes transport by ambulance.
5: other- born in transit or not booked.
6: booked at this level II unit - mother booked into this hospital, no NICU.
7: in-utero transfer to this level II unit - mother transferred, baby in utero.
8: ex-utero retrieval to this level II unit - baby 'retrieved' from any other hospital.
9: ex-utero transfer to this level II unit -
Guide for use: Use most recent referral.

Presenting antenatal problem

Definition: The antenatal complication that the mother presented with in this pregnancy,
Coding:

0:unknown information not available
1: preterm pre-labour rupture of membranes confirmed, spontaneous rupture of membranes occurring prior to the onset of labour and before 37 weeks' gestation.
2: preterm labour
3: hypertension in pregnancy
4: antepartum haemorrhage
5: suspected intrauterine growth restriction
6: fetal distress
7: other
8: none - no presenting problem. Born at term.
9: antenatal diagnosis of fetal malformation.

Other antenatal complications

Definition: Any other antenatal complication.
Coding: 99: unknown

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

Prolonged rupture of membranes (ROM)

Definition: Confirmed spontaneous ROM (obvious gush of clear amniotic fluid from vagina or if fluid available, by differentiation with urine or vaginal secretions) for > 24 hrs 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[1].
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 >1 obstetric ultrasound.
Coding: 99: unknown
0: no intrauterine growth restriction
-1: yes, IUGR suspected

Fetal distress

Definition: Any 'distress' of this fetus leading to intervention by the obstetric team.
Coding: 99: unknown
0: no intervention necessary
-1: yes, obstetric intervention required

Antenatal diagnosis of fetal malformation

Definition: A fetal malformation is diagnosed prior to the baby's birth, by any method.
Coding: 99: unknown
0: no
-1: yes, malformation detected prior to birth
Guide for use: The diagnosis of the malformation may or may not be confirmed after birth.

Other antenatal complication

*Definition: C*omplication, 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:* 4-digit number representing birth weight in grams.
Guide for use: The weight is usually measured to the nearest five grams and is obtained within one hour of birth, or shortly after the infant has been admitted.

Gestational age
Definition: The estimated gestational age of the baby in completed weeks
Coding: 2-digit number representing the number of completed weeks of gestation.
Guide for use: Derived from clinical assessment when accurate information is not available.

Place of birth
Definition: Place of baby's birth
Coding: 0: unknown
1: non tertiary hospital - born in a hospital with no level III NICU.
2: born in a hospital with a level 3 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 - icludes 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 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 antenatally 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 <24 hours prior to this baby's birth.
3: complete - More than 1 dose of steroids given, and 1st dose at >24 hrs and <8 days before birth.
4: given at > 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 >= 400 g are taken into account.. Fetuses aborted at < 20 weeks or fetuses compressed in the placenta at >= 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 5 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 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 malformations
Definition: Structural abnormalities (including deformations) present at birth and diagnosed prior to separation from care (discharge home).
Coding: 99: unknown
0: no major congenital malformations noted
-1: yes, major congenital malformation noted

Specified congenital malformations
Definition: Detail of the major congenital malformation.
Coding: free text field representing congenital malformation coded by ICD-10 AM.

Temperature on admission
Definition: Temperature on admission to NICU or closest to admission to registration unit. Use rectal temperature or, if not available, per axillae.
Coding: 4-digit number representing temperature measured in degrees Celsius to 1 decimal place.
Guide for use: If the baby is transported by a specialist neonatal retrieval team, admission is considered to commence when the team arrive at the baby's bedside. If the baby is more than 12 hours when NICU care started, or if an admission temperature is not recorded, use '0' to denote missing.

Highest appropriate inspired oxygen
Definition: Highest appropriate inspired oxygen (FiO2), between admission to NICU and 12 hours after birth. Appropriate range is when: arterial PaO2 or $TcPO_2$ is 50-80 mmHg, or if FiO_2 is > 25%, SaO_2 is 88-95%, or if FiO_2 is < 25%, SaO_2 is > 88%.
Coding: FiO2 recorded as a percentage.
Guide for use: use '0' to denote missing.

Lowest appropriate inspired oxygen
Definition: Lowest appropriate FiO2, between admission to NICU and 12 hours after birth - as for Highest appropriate inspired oxygen.
Coding: FiO2 recorded as a percentage.
Guide for use: use '0' to denote missing.

Worst base excess
Definition: Worst base deficit recorded between admission to NICU and 12 hours after birth. *Coding:* 3 digit numbered field representing base excess measured in mmol/l. May be negative.
Guide for use: use '99' to denote missing.

Main respiratory diagnosis
Definition: Main indication for respiratory support.
Coding: 0: unknown
1: normal - no respiratory support.
2: non specific - any non-specific respiratory distress (RD) in a infant requiring respiratory support (combines previous items transient tachypnoea of newborn and immature lung).
3: hyaline membrane disease - increasing RD or oxygen (O2) requirements, or the need for ventilator support from the first 6 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, gasping respirations, and often signs of underlying asphyxia. Chest x-ray shows over-expansion of lungs with widespread coarse, fluffy infiltrates[6].
5: pneumonia - RD with proven or suspected infection (toxic blood count), and chest x-ray showing persisting opacities.
6: persistent pulmonary hypertension - echocardiac (shunting or clinical evidence - O2 need unexplained by chest x-ray or loud P_2, or differential pre /post ductal $TCPO_2$).
8: apnoea - recurrent pauses in breathing for more than 20 seconds, or for less than 20 seconds associated with bradycardia or any desaturation requiring intervention.
9: congenital malformation - malformation is the primary reason for RD, e.g. diaphragmatic hernia (list malformation in appropriate field).

10: other - unspecified other RD.
11: peri surgical - no RD, support given for surgical intervention.
12: newborn encephalopathy - a syndrome of disturbed neurological function in an infant with difficulties initiating or maintaining respiration, depression of tone reflexes or consciousness and often with seizures
Guide for use: For a diagnosis other than 'normal' the baby must receive respiratory support. If more than one diagnosis is possible, use the most serious condition

Exogenous surfactant
Definition: Any treatment with exogenous surfactant
Coding: 0: unknown 1: none - no exogenous surfactant ever given.
2: Exosurf - any treatment using 'Exosurf'
3: Survanta - any treatment using 'Survanta'
4: both - any combination of surfactant.
5. Curosurf- any treatment using 'Curosurf'
6. Curosurf and Survanta
Guide for use: Includes incomplete use

Air leak requiring drainage
Definition: Any form of pulmonary air leak requiring drainage (transient or continuous).
Coding: 99: unknown
0: no air leak requiring drainage present.
-1: yes, air leak requiring drainage

Hours of intermittent positive pressure ventilation (IPPV)
Definition: Total number of hours of IPPV given via an endotracheal tube, at any rate.
Coding: 4- digit number - IPPV hours.
Guide for use: The hours of all forms of assisted ventilation via an endotracheal tube are summed. The usual rounding up applies,

Hours of continuous positive airways pressure (CPAP)
Definition: Total number of hours of CPAP via any route, and nasopharyngeal ventilation
*Coding:*4-digit number - CPAP hours
Guide for use: as for hours of IPPV.

High frequency ventilation (HFOV)
Definition: Mechanical ventilation presented at high frequencies (small tidal volumes with frequencies > 4Hz) initiated for this baby7.
Coding: 99: unknown
0: no high frequency ventilation not initiated
-1: yes, HFOV 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 the baby.
Coding: 99*:* unknown
0: no ECMO initiated
-1: yes, ECMO initiated

Date of final added oxygen therapy
Definition: Date supplemental oxygen (O2) ceased appropriately.
Coding: DD / MM / YYYY
Guide for use: Four consecutive hours in any 24 hour period constitutes a 'day'.

Chronic lung disease
Definition: The baby received respiratory support (supplemental O2 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: 4 consecutive hrs in any one 24 hr period constitutes respiratory support on that day

Home oxygen therapy
Definition: Supplemental oxygen therapy was used at home after discharge from hospital.
Coding*:* 99: unknown
0: no supplemental oxygen used at home
-1: yes, home oxygen therapy given
Guide for use: Must have required supplemental oxygen in hospital.

Neonatal surgery
Definition: Did this baby have major surgery that involved opening a body cavity?
Coding: 99: unknown
0: no
-1: yes

Proven necrotising enterocolitis
Definition: Diagnosis of proven necrotising enterocolitis (NEC) is definite.
Coding: *99: unknown*
0: no necrotising enterocolitis proven

-1: yes, NEC proven
Has at least four of the following symptoms:
1. At least one systemic sign: temperature instability, apnoea, bradycardia or lethargy; and one intestinal sign: a residual of more than 25% of the previous feed on 2 consecutive occasions, abdominal distension, vomiting or faecal blood;
2. Has profile consistent with definite NEC including at least one of the following: abdominal wall cellulitis and palpable abdominal mass, or pneumatosis intestinalis, or portal vein gas, or a persistent dilated loop on serial x-rays, or a surgical or post mortem diagnosis.
3. Plus the baby warranted treatment for NEC, which included nil by mouth and antibiotics.

Early infection

Definition: An episode of systemic sepsis with initial symptoms occurring before 48 hours after birth.
Coding: 99: Unknown
0: No early infection noted.
-1: Yes, early infection noted.
Guide for use: These conditions must apply: isolation of an organism from at least one blood culture and, after consideration of the clinical and laboratory evidence, a decision is made to give antibiotics with therapeutic intent against this organism. Mixed coagulase negative staphylococci or other skin flora – contaminant are not included.

Episodes of late-onset sepsis

Definition: At least one episode of systemic sepsis with initial symptoms from 48 hours after birth.
Coding: 2-digit field representing total episodes of late onset septicaemia.
Guide for use: isolation of organisms from 1 blood culture and, after considering clinical / laboratory evidence, decision made to give antibiotics with therapeutic intent against this organism. The following must not apply: mixed CNS or other skin flora contaminant. Same blood organism isolated from blood during previous 14 days – repeat isolate.

Maximum grade of IVH

Definition: Worst level of IVH seen on either side by ultrasound or post mortem examination.
Coding: 0: none - no IVH.
1: -subependymal germinal matrix IVH.
2: -IVH with no ventricular distension.
3: -the ventricle is distended with blood.
4: -intraparenchymal haemorrhage.
5: -Not examined

Date of late head ultrasound

Definition: Date of the cerebral ultrasound scan nearest to six weeks of age.
Coding: DD / MM / YYYY

Ventricle size

Definition: Size of ventricle at the ultrasound closest to 6 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 < 97th centile.
2: dilatation - VI 97th centile / 97th cent+ 4mm
3: hydrocephalus - VI > 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 6 weeks of age (date above)
Coding: 4-digit number representing VI in mm correct to 1 decimal place.
Guide for use: Record if ventricular dilatation is present ie, '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 IV IVH.
3: periventricular leukomalacia - ischaemic brain injury affecting periventricular white matter in the boundary zones supplied by terminal branches of both centripetal and centrifugal arteries[8].
4: encephaloclastic porencephaly - relatively late development on cerebral scan of extensive dense, cystic lesions involving the periphery of the brain[4].

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[9].
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 .
Coding: unspecified free text field
Guide for use: To be described in morbid anatomical terms.

Death due to congenital malformation
Definition: The death of the infant directly attributed to the congenital malformation.
Coding: 99: unknown
0: no
-1: yes
Guide for use: Must be coded as "yes" for major congenital malformation 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.

6.2 Minor congenital malformations

Skin
skin cysts; naevus flammeus; non cavernous, single, small haemangioma; birth mark; benign skin neoplasms; mongolian spots; cutis marmorata; cafe au lait spots; scalp defects, cutis aplasia; lanugo excessive or persistent; accessory nipple; pilonidal or sacral dimple.

Skull
Brachycephaly,dolichocephaly,
plagiocephaly; craniotabes; large, small or absent fontanelles; macrocephaly; head asymmetry

Eyes
Esotropia, exotrophia strabismus; nystagmus; blue sclera; Brushfield spots; epicanthal folds; eye slant (up or downward); narrow palpebral fissures; nasolacrimal duct obstruction or dacryostenosis

Face
Facial palsy; facial asymmetry micrognathia; flat or wide nasal bridge, upturned nose, or other minor nose malformation; deviation of the nasal septum.

Ears
ear tags; bat, cauliflower, elfin, lop, pointed, posteriorly rotated, or low-set ears; Darwin's tubercle; pre-auricular sinus, cyst or pit; macrotia

Mouth, tongue and palate
tongue-tie; tongue cyst; ranula; cleft gum; macroglossia; microglossia; natal teeth; big, wide or small lips; high-arched palate; bifid uvula

Neck
Branchial cleft or sinus; redundant neck skin folds webbing of neck; short neck

Gastrointestinal system
Mekel's diverticulum; anal tags; anal or rectal fissure; hepatomegaly; splenomegaly; inguinal hernia-boys; inguinal hernia-girls (GA < 37 weeks or BW < 2500g); umbilical hernia (skin covered)

Cardiovascular system
Patent ductus arteriosus or foramen ovale (GA <37 weeks/BW < 2500g); mild, trivial or physiological valvular regurgitation; cardiomegaly; dextroposition of heart; heart block; persistent fetal circulation; single umbilical artery.

Genitourinary system
imperforate hymen; prominent clitoris; fusion of vulva; vaginal or hymenal tags; cyst of vagina, vulva, canal of Nuck or ovary; hydrocele; undescended testis (GA <37 wks, BW <2500g); small penis; chordee; patent urachus or urachal cyst; ectopic kidney.

Respiratory system
hypoplastic lungs (GA <37 weeks); laryngeal stridor; laryngomalacia

Limbs
skin tags on hands or feet; partial syndactyly of
toes, webbing of toes; brachydactyly, unspecified clinodactyly; camptodactyly; flexion deformity of digits; long fingers and toes; nail hypoplasia; enlarged or hypertrophic nails; widely spaced first and second toes; overlapping toes; tibial torsion or bowing; genu valgum, varum or recurvatum; dislocation or subluxation of knee; hallux valgus; hallux varus; talipes equinovarus or talipes calcaneovalgus; cervical rib, other extra ribs; rockerbottom feet; simian or Sydney lines, abnormal palmar creases; hip subluxation, clicky hips

Other conditions
balanced autosomal translocations; birth injuries, cephalhaematoma; cystic fibrosis; enzyme deficiencies; hydrops fetalis; meconium ileus; metabolic disorders; pyloric stenosis; sternomastoid tumour; torticollis; volvulus

6.3 Abbreviations

1. ANZNN - Australian and New Zealand Neonatal Network
2. CPAP - continuous positive airways pressure - a form of assisted ventilation
3. CI – confidence intervals
4. HMD - hyaline membrane disease - a disorder of the respiratory system
5. ICD 10-AM -International Classification of Diseases number 10 -Australian modification
6. IPPV - intermittent positive pressure ventilation - a mechanical support for breathing.
7. IVH- intraventricular haemorrhage
8. IQR – Inter quartile range
9. Level II - a nursery for babies who require intermediate care
10. Level III - a nursery for babies who require intensive care
11. LOS - length of stay
12. n - number
13. NEC - necrotising enterocolitis - a disorder of the gut.
14. NHMRC - National Health and Medical Research Council of Australia
15. NICUs - neonatal intensive care units
16. O_2 - oxygen - normal air is 21% oxygen.
17. PMA - post menstrual age (completed weeks). Gestational age plus postnatal age - eg when a baby born at 25 weeks GA is 15 weeks old, they are 40 weeks PMA (also known as term equivalent age).
18. RD – respiratory distress
19. ROP - retinopathy of prematurity - disorder of the developing eye sepsis overwhelming infection of the blood stream by toxin-producing bacteria - also known as septicaemia.

7. Appendix 3:

Confidentiality guidelines

Confidentiality guidelines were devised and agreed to by the Advisory Committee, to provide an unambiguous framework for the handling of data that met the strict criteria of governing bodies. Confidentiality guidelines for the collection, processing, and analysis of data from the national minimum data set of the ANZNN are set out in full below.*(As revised at the ANZNN Advisory Committee Meeting, Auckland, NZ, 2nd April 1995)*

The purpose of these guidelines is to set out the principles under which the National Minimum Data set (NMD) for Neonatal Intensive Care Units (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 NMD is to provide national unit record data 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 / national nature. In certain other instances, data may be provided internally in the following manner:

1.as de-identified summary tables not provided in the annual report, but available upon request;

2.as de-identified unit record data for analytical purposes as approved by the ANZNN; and

3.as identifiable summary and / or unit record data for clinical audit purposes by the respective NICU providing the data. These guidelines will cover the collection and provision of data retrospectively from 1st Jan 1994.

Principles of ownership and maintenance of data

1. The ANZNN will be responsible for collection and maintenance of the data set and decision making with respect to its use.
2. The Custodians of the data will be the ANZNN Executive. All queries related to the NMD should be referred to a Custodian, who will address them personally or refer them to the appropriate source person.

Conditions for data collection

It is expected that all participating NICUs will collect an agreed-upon minimum set of data in a standardised format. Data entry on to hard-copy data forms or into an electronic data form will be performed at the respective NICU.

Conditions for use and release of data

1. Use of the data would entail agreement by the Advisory Committee (Directors, or their nominee, of each contributing NICU) and the Executive.
2. Data will not be published or supplied with any patient identifying information.
3. Data will not be published or supplied with any NICU or State/Territory/nation identifying information without the written approval of all the NICU Directors of the State/Territory or nation concerned.
4. External requests for a hard copy of patient de-identified data will be made in writing to the data custodians. Any requests for data that could potentially identify a unit or State/ Territory/nation will be referred to the Advisory Committee. External requests for patient de-identified data on computer disk will be made in writing to the data custodians, and then referred to the Advisory Committee. Requests in writing must be in the form of a one page research proposal. A confidentiality agreement must be signed by the person(s) requesting data prior to the release of the data. 4a. Requests for data involving unit identifying data analysis - if a Director had not responded within six (6) weeks (having received a reminder at three (3) weeks), then it was to be assumed that the Director did not object to the project and consent is given.
   4b. Requests for individual patient data that did not identify unit or region – the Coordinators (or the new expanded Coordinator panel) could approve the request in principle and notify the members of the Advisory Committee in writing, seeking replies only if there are objections. If no objections are received within 4 weeks then the data is released. When there are any objections then written approval of all members should be obtained as in 4a.

   4c. Data requests tabled at the annual meeting do not have to go to attendees for approval only to those who did not attend. Responses as in 4b.
5. Publication of data in any form must be endorsed in writing by seventy-five percent (75%) of the Advisory Committee prior to the material being submitted for publication. The mechanism for this will be by prior notification and then endorsement at an Advisory Committee meeting, or by faxing each committee member.
   All published data must acknowledge the ANZNN Advisory Committee and Executive.
6. Data will be released annually in a report provided free to each participating Director. This report will summarise the pooled, deidentified data. This report will be distributed widely after the majority of the Advisory Committee agree on content and form. Data will also be released to each Director in electronic form with their own unit data identified, and the rest of the data completely de-identified.

Conditions for data security

Patient-identifiable data should not leave the site of the ANZNN. The electronic version of this data will be maintained on a single central computer protected by password. All hard copy patient identifiable data and electronic backup files will be kept in locked cabinets. Master lists of code material will be kept in a separate locked area. All rooms and offices used by ANZNN are locked when not in use. Filing cabinets containing data are locked when not in use. Computerised data are protected by passwords known only to each person who has access to computerised data. Security disposal of data is available through use of designated bags or a shredding machine.

8. Appendix 4

Publications of the ANZNN members

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