

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

2004

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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 Bouchier (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 Bock

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 and Abbott Laboratories, New Zealand 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

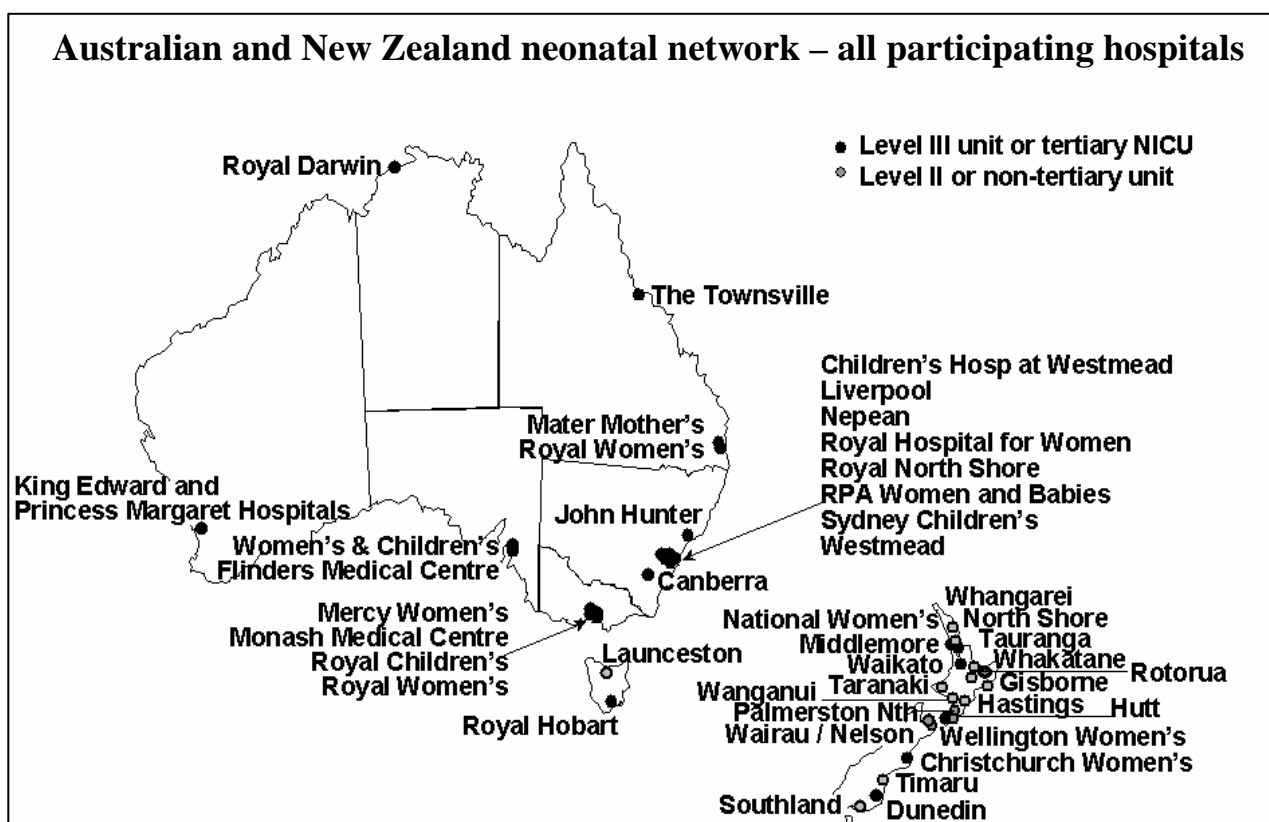
The Australian & New Zealand Neonatal Network's (ANZNN) audit of high-risk infants admitted to a newborn nursery and who met the following criteria:

- 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 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 2004 audit are listed on appendix 2. The definitions used for these variables were the same as in 2003.



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, 7399 fulfilled registration criteria for ANZNN (figure 1) and represent 2.37% of the 312,273 total live births in the two countries in 2004^{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 2004, 3209 (43.3%) were born at <32 weeks, 3263 (44.1%) were born after 31 weeks gestation, weighed more than 1500g and were given assisted ventilation. There were 185 babies born at more than 31 weeks gestation and weighed <1500g and did not require assisted ventilation. 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, 259 (8.1%) also had major surgery. In 2004, 91.9% of all registrants were given assisted ventilation (IPPV or CPAP). The total number of ANZNN registrants was increased by 221 in 2004, principally due to an increase in babies born at more than 31 weeks gestation who were given CPAP.

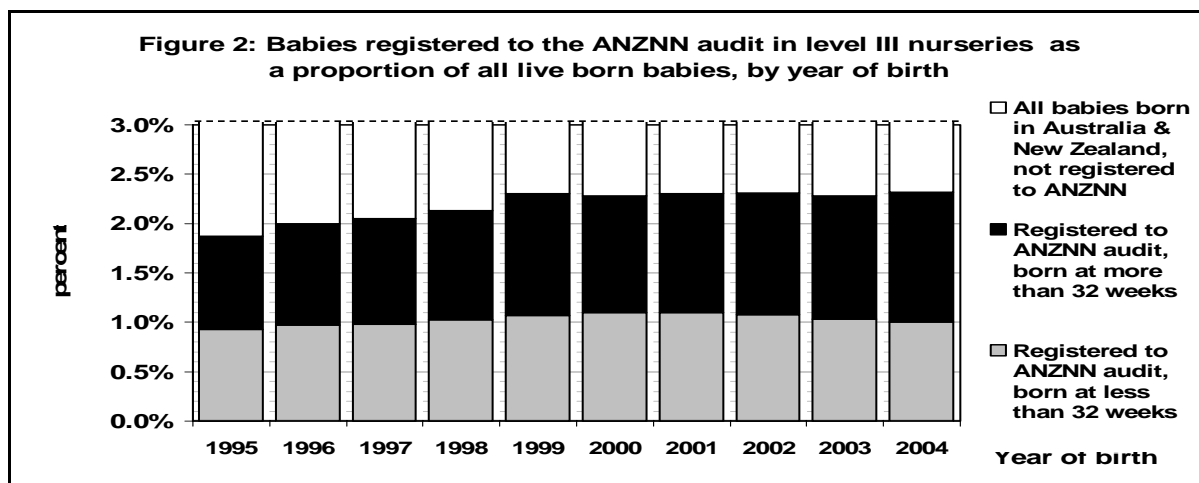
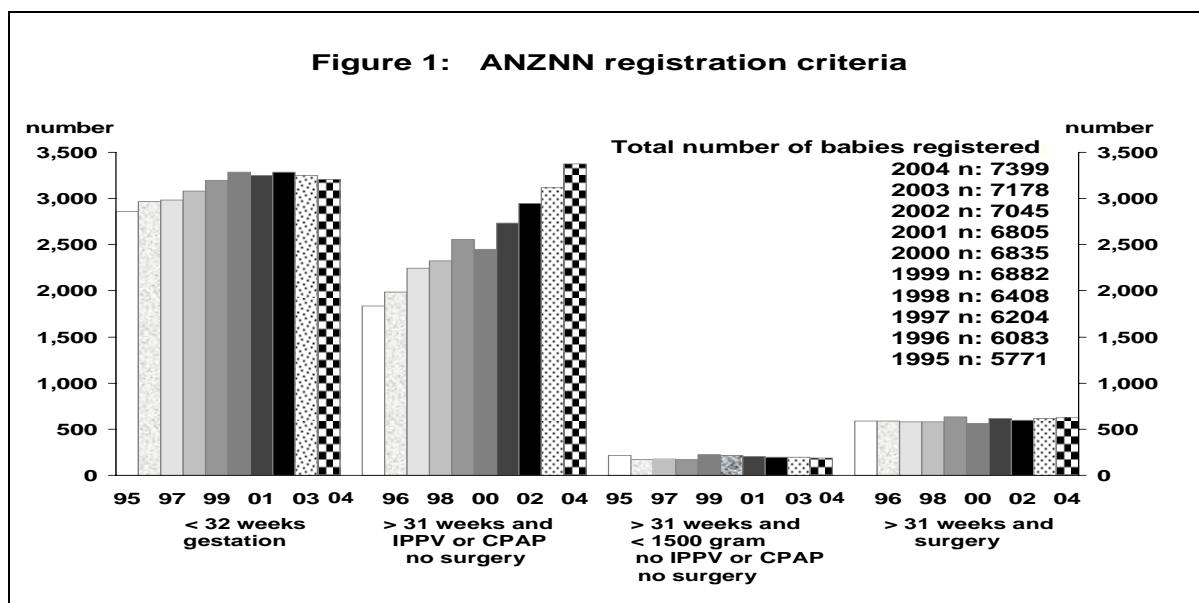
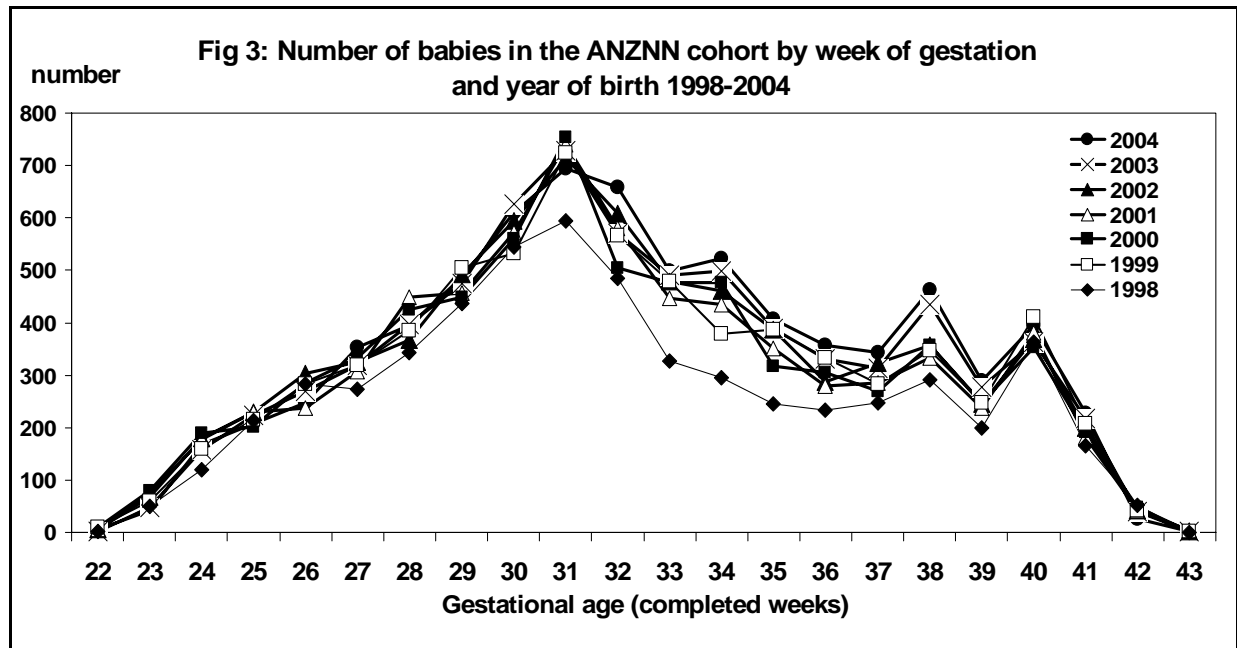


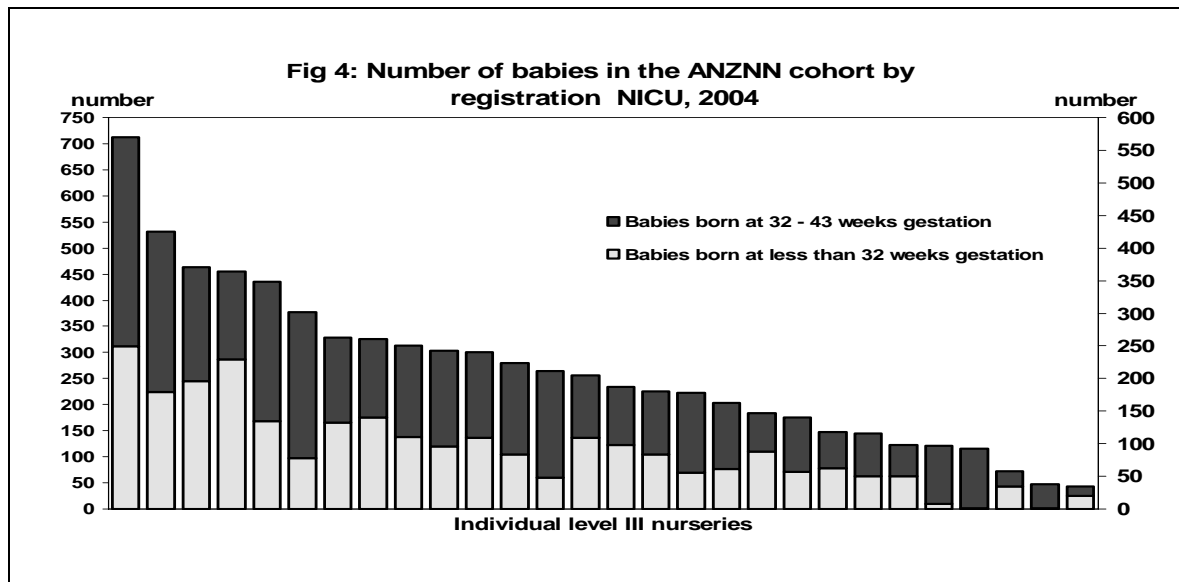
Table 1: Number of babies at each week of gestation, 2004

Gestational age (completed weeks)	Number of babies	cumulative per cent
22	5	0.07
23	42	0.64
24	168	2.91
25	207	5.70
26	247	9.04
27	354	13.83
28	395	19.16
29	486	25.73
30	610	33.98
31	695	43.37
All babies <32 wks	3209	
32	659	52.28
33	499	59.02
34	523	66.09
35	406	71.58
36	358	76.42
37	344	81.07
38	462	87.31
39	290	91.23
40	396	96.58
41	227	99.65
42	25	99.99
43	1	100.00
All babies	7399	

Table 2: Number of babies at each birth weight group, 2004

Birth weight group (grams)	Number of babies	Cumulative per cent
<500	33	0.4
500-599	89	1.6
600-699	177	4.0
700-799	215	6.9
800-899	238	10.2
900-999	271	13.8
1000-1099	300	17.9
1100-1199	302	22.0
1200-1299	320	26.3
1300-1399	349	31.0
1400-1499	436	36.9
All babies 1500g	2730	
1500-1999	1409	55.9
2000-2499	955	68.8
2500-2999	828	80.0
3000-3499	744	90.1
3500-3999	467	96.4
4000 +	266	100
All babies	7399	





Babies born in Australia

There were 5724 babies registered to ANZNN from 22 NICUs in Australia representing 2.25% of total live births in 2004¹. Of those babies 73.9% were born in a hospital with tertiary care facilities. There were 2652 babies born before 32 weeks gestation representing 1.04% of all live births in 2004. The proportion of babies registered to ANZNN who were male was 57.8% 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 5190 (2% of live births) and 2075 had CPAP as their only form of respiratory assistance. The number of babies who had surgery was 751. Maternal ethnicity was provided for 91.4% of mothers and Caucasians represented 77.8% of them. Babies of the mothers who identified themselves as Aboriginal or Torres Strait Islanders were 5.4% a rate higher than that seen in the Australian population (3.5%). There were 5.7% babies born to Asian mothers. Of the babies registered to ANZNN, 1268 babies were from multiple births representing 29.3% of all multiple births in Australia (Confinements resulting in a multiple birth in Australia was 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, 1676 met ANZNN registration criteria representing 2.9% of all live births (In 2004, there were 58,073 live births registered in New Zealand²). Of those babies, 558 were born at less than 32 weeks gestation (0.96% of the all live births). Male babies represented 57.8% of the ANZNN registrants from New Zealand, a rate higher than that seen among live births in New Zealand². Most of the registrants received assisted ventilation (n: 1612, 2.8% of live births) with 67% of them (n: 1080) receiving CPAP only. There were 314 babies from multiple births. The number of babies who had major surgery was 130.

The ethnicity of the mother was reported for 98.9% of the babies. The proportion of Caucasian mothers in the cohort was 59.1%. A higher proportion of mothers identified themselves as Maori (20.5%) than in 2003. Another 9.96% of mothers were Pacific Islanders and 7.1% were Asian. There are 14 level II special care nurseries in New Zealand who are members of the ANZNN and they had 345 babies who met ANZNN criteria for the audit in 2004.

2.1 Maternal Characteristics

Table 3: Maternal age by babies' gestational age, 2004

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	5	78	138	64	66	114	465
20-24 years	8	169	337	132	196	283	1125
25-29 years	10	210	540	286	341	423	1810
30-34 years	12	284	681	415	393	567	2352
35-39 years	10	186	388	215	222	290	1311
40+ years	2	49	102	46	69	68	336
All babies	47	976	2186	1158	1287	1745	7399
Percent							
10-19 years	10.6	8.0	6.3	5.5	5.1	6.5	6.3
20-24 years	17.0	17.3	15.4	11.4	15.2	16.2	15.2
25-29 years	21.3	21.5	24.7	24.7	26.5	24.2	24.5
30-34 years	25.5	29.1	31.2	35.8	30.5	32.5	31.8
35-39 years	21.3	19.1	17.7	18.6	17.2	16.6	17.7
40+ years	4.3	5.0	4.7	4.0	5.4	3.9	4.5
All babies	100	100	100	100	100	100	100

In the ANZNN cohort, 6.3% 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 ANZNN registrants, 47.5% of the babies born to teenage mothers were born at less than 32 weeks gestation. Mothers over 34 years of age had 1647 babies (22.3% of the cohort) who fulfilled ANZNN high risk criteria and 33.6% of those babies were born before 32 weeks gestation. Most mothers (71.4%, n. 5287) were in the 20 – 34 years age group.

Of the mothers who had their babies registered to ANZNN, 894 (12.1%) reported that they had previous preterm deliveries, 255 (3.4%) had previous peri-natal loss and 187 (2.5%) had a history of both.

There were 667 (9%) mothers who had assisted conception and 261 (39.1%) of them were above 34 years of age. Of those mothers 525 had in vitro fertilization.

Presenting antenatal problem

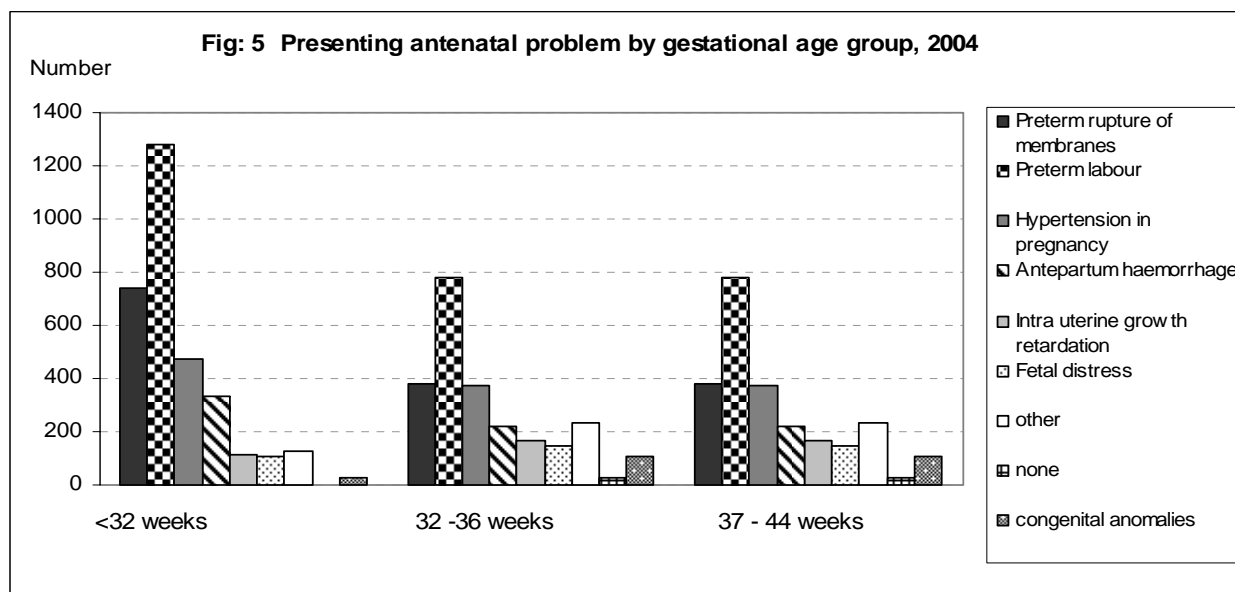
Table 4: Mother's presenting antenatal problem by gestational age group, ANZNN registrants 2004

Antenatal problem	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Prelabour rupture of membranes	5	95	142	197	302	192	188	3	1124
Preterm labour	33	213	263	323	445	365	414	3	2059
Hypertension in pregnancy	0	19	75	144	236	208	168	97	947
Antepartum haemorrhage	7	36	63	93	132	112	106	41	590
Intrauterine growth restriction	0	1	16	28	68	82	83	36	314
Fetal distress	0	3	10	36	60	65	84	334	592
Other problem	2	6	23	45	51	101	131	315	674
No antenatal problems	0	0	0	2	1	2	23	674	702
Congenital anomalies	0	2	8	9	9	27	82	188	325
Unknown	0	0	1	4	1	4	8	54	72
All babies	47	375	601	881	1305	1158	1287	1745	7399

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 (39.7%). Another 741 (23.1%) mothers had prelabour rupture of the membranes and 474 (14.7%) had hypertension in pregnancy (Figure 5). These proportions haven't changed significantly from 2003 findings.

The main presenting problem for mothers giving birth to babies at 32-36 weeks gestation remained preterm labour (n: 779, 31.9%). Hypertension in pregnancy (n: 376, 15.4%) and prelabour rupture of the membranes (n: 380, 15.5%) accounted for other major problems.

Of the term babies, a large proportion of mothers did not have an antenatal problem that could be identified (38.6%). However among term babies, 19.1% of the mothers presented with 'fetal distress' and 10.8% had a fetal malformation detected antenatally.



Antenatal corticosteroid use

Table 5: Antenatal corticosteroid use by gestational age group, Babies born at <34 weeks, 2004

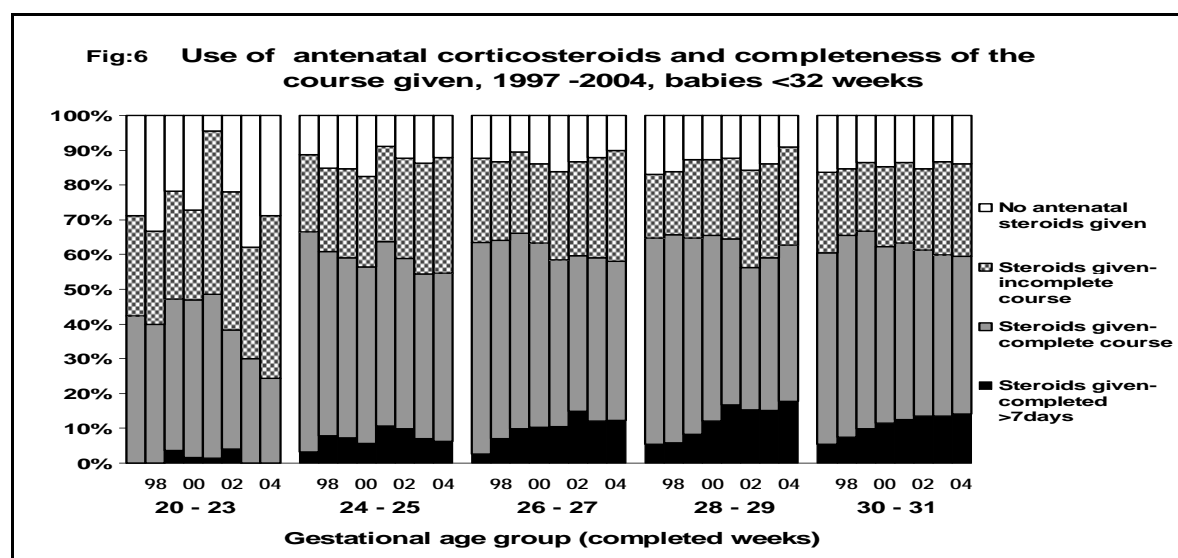
Steroid use	20-23	24-25	26-27	28-29	30-31	32-33	All babies
none	13	44	60	78	178	243	617
Incomplete course	21	124	191	241	340	276	1193
Course completed	11	182	274	385	578	429	1859
Completed >7days	0	23	73	152	181	172	601
unknown	2	2	3	25	28	38	100
All babies	47	375	601	881	1305	1158	4370
Percent							
None	28.9	11.8	10	9.1	13.9	21.7	14.4
Incomplete course	46.7	33.2	31.9	28.2	26.6	24.6	27.9
Course completed	24.4	48.8	45.8	45	45.3	38.3	43.5
Completed >7days	0	6.2	12.2	17.8	14.2	15.4	14.1
All babies	100	100	100	100	100	100	100

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 2004, 85.7% mothers of ANZNN registrants born before 34 weeks were given one or more doses of antenatal corticosteroids. Among the babies born before 32 weeks gestation, 86.4% 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 71.1% in 2004. Of the mothers who gave birth at 24 -31 weeks GA, 86.7% have received at least one dose of steroids. This data shows that more mothers who delivered before 32 weeks have received steroids in 2004 than in 2003. 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 in a tertiary care centre, 91% of the mothers had at least one dose of antenatal steroids. Only 58.5% 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, 2004

Method of delivery	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
vaginal	43	197	215	252	423	294	430	749	2603
vaginal with instruments	1	6	16	27	35	48	50	164	347
Caesarean section in labour	1	123	191	265	330	277	305	376	1867
Caesarean section no labour	1	49	177	332	517	538	500	445	2561
Unknown	1	0	2	5	0	1	2	11	21
All babies	47	375	601	881	1305	1158	1287	1745	7399
Percent									
vaginal	93.5	52.7	35.9	28.8	32.4	25.4	33.5	43.2	35.3
vaginal with instruments	2.2	1.6	2.7	3.1	2.7	4.1	3.9	9.5	4.7
Caesarean section in labour	2.2	32.7	31.9	30.3	25.3	23.9	23.7	21.7	25.3
Caesarean section no labour	2.2	13.0	29.5	37.9	39.6	46.5	38.9	25.7	34.7
All babies	100	100	100	100	100	100	100	100	100

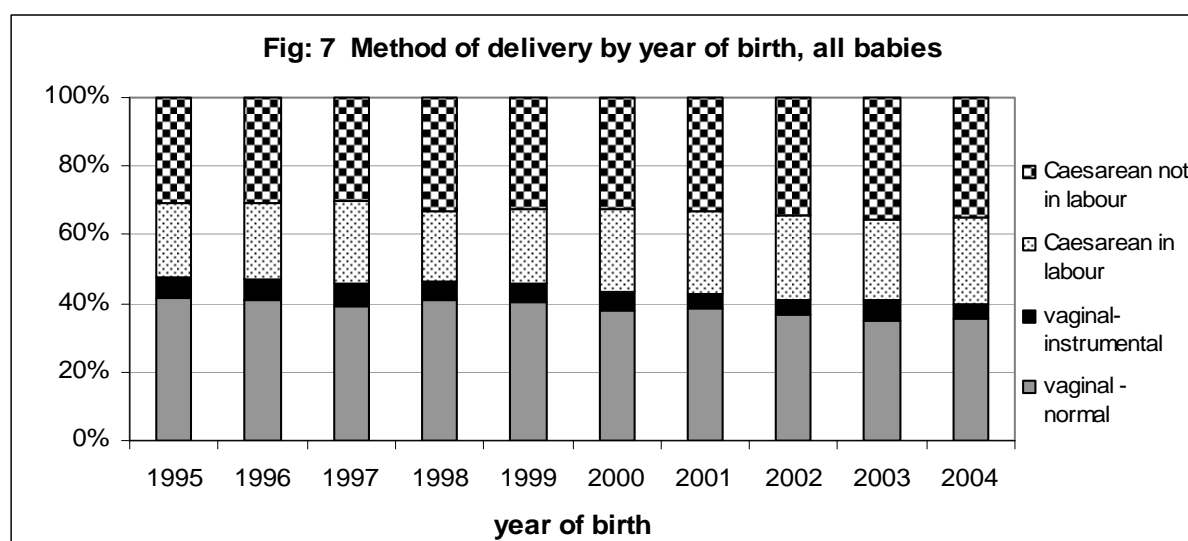
Note: 'Unknown' or 'not available' data are excluded from per cent calculations.

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, 59.8% of the registrants were born by Caesarean Section and 57.8% of those were performed before the onset of labour. (Data were available for 99.7% 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, 3568 (62.6%) had Caesarean Section deliveries and 2087 (58.5%) of those deliveries were performed before the onset of labour. Among outborn babies, 859 (52.4%) were born by Caesarean Sections.

In 2004, the head was the presenting part for 86% (n: 1501) of the term babies. Another 6.8% (n:118) were breech presentations and Caesarean Section was the major mode of delivery for them (n:99, 83.9%).



Place of birth

Table 7: Level of hospital of birth by gestational age group, all babies 2004

Place of birth	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Born in non tertiary hospital	5	35	60	98	151	155	393	741	1638
Born in a tertiary hospital	42	337	535	778	1145	999	890	974	5700
Not born in a hospital	0	3	6	5	9	4	4	30	61
All babies	47	375	601	881	1305	1158	1287	1745	7399
Percent									
Born in non tertiary hospital	10.6	9.6	9.8	11.1	11.6	13.4	30.5	42.5	22.1
Born in a tertiary hospital	89.4	89.6	89.2	88.3	87.7	86.3	69.2	55.8	77
Not born in a hospital	0.0	0.8	1.0	0.6	0.7	0.3	0.3	1.7	0.8
All babies	100	100	100	100	100	100	100	100	100

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

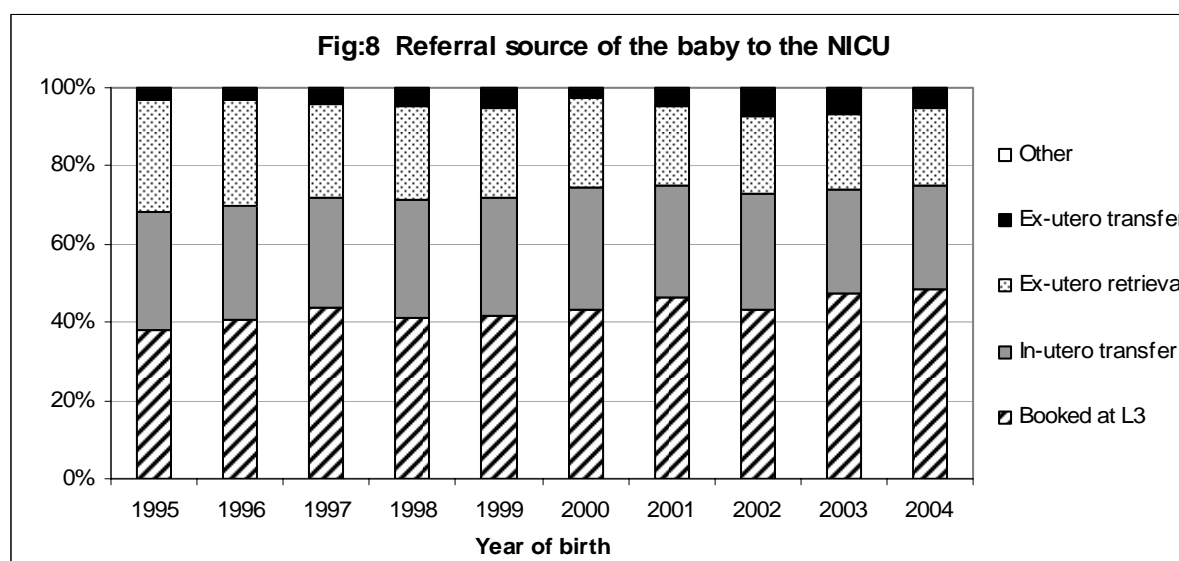
Please see the Appendix 1 for level of hospital of birth by birth weight data table.

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: 3422; 88.5%) and nearly a half of those mothers (n: 1841, 47.6%) had booked into a hospital with a NICU.

About 26.6% of the mothers of ANZNN registrants were transferred in-utero to a tertiary hospital and 67.8% of them had delivered before 32 weeks GA. A small number (n: 50) of babies were born before arrival to a hospital, in both countries.

Of the babies weighing below 1250g at birth, 90% were born in a tertiary care hospital. The proportion of high risk babies delivered at a tertiary care centre has gradually increased from 68% in 1995 to 77% in 2004. The proportion of mothers of ANZNN registrants who booked into a tertiary care centre also has increased from 38.2% in 1995 to 48.4% in 2004.



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 4279 males (57.8%) and 3116 females (42.1%) in 2004. Of the babies born at less than 32 weeks gestation, 53.8% (n: 1725) were male babies. Among the term babies, there were 63.2% (n: 1103) male babies. There were 53.1% males among multiple births. Gender was not able to be determined for four babies.

Transfer after birth

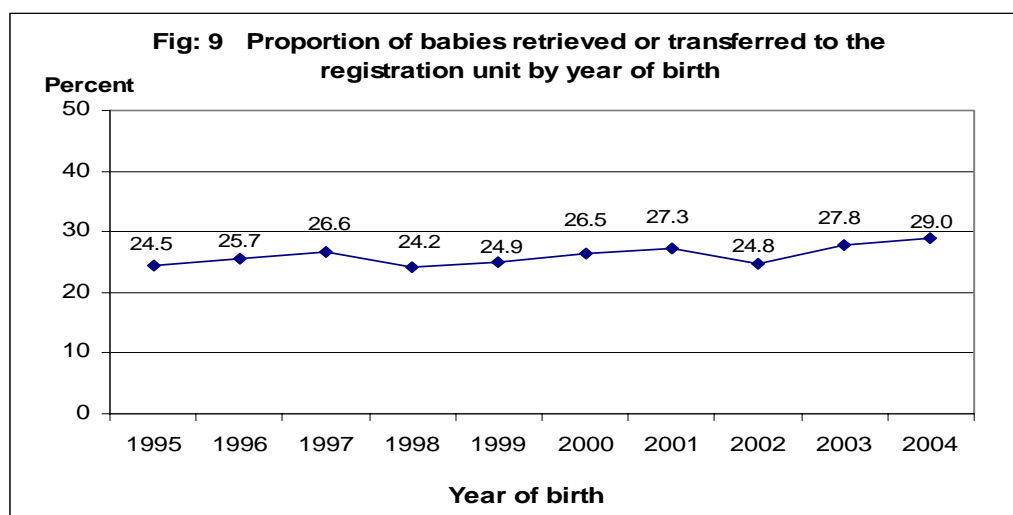
Table 8: Transport mode by gestational age group, babies transferred to a NICU, 2004

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44
Specialist transport team	5	36	57	88	120	143	355	657
nonspecialist transport	0	4	10	19	36	21	82	180
All babies	5	40	67	107	156	164	437	837
Percent								
Specialist transport team	100	90.0	85.1	82.2	76.9	87.2	81.2	78.5
nonspecialist transport	0	10.0	14.9	17.8	23.1	12.8	18.8	21.5
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 precipitate preterm birth in a hospital without a NICU or because no cot was available in the hospital of birth. Some babies may need to be transferred to a specialised children's unit, or a term baby may have an unexpected need for intensive care treatment, such as ventilation for meconium aspiration syndrome.

Of the ANZNN registrants, 22.1% (n: 1638) were transferred to a NICU after birth from a nontertiary hospital. A specialist transport team had retrieved 81.9% (n: 1342) of those babies. Of the out-born babies, 849 (51.8%) were transferred on the same day they were born and 1513 (92.4%) were transferred within 48 hours.



Multiple Births

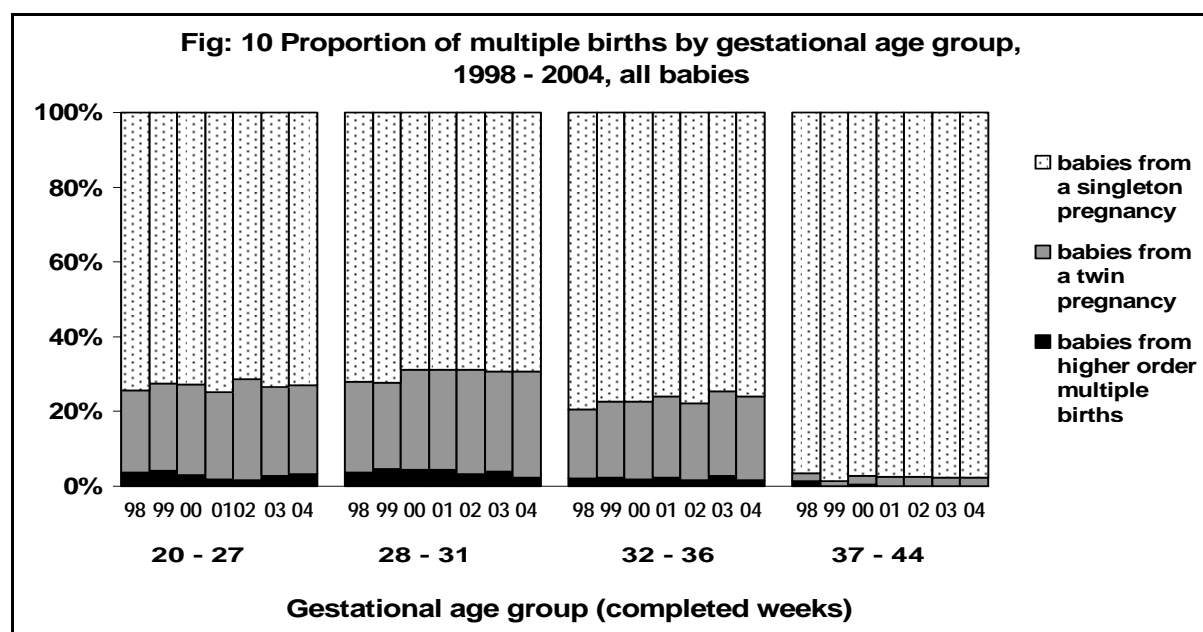
Table 9: Plurality by gestational age group, all babies, 2004

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Singleton	35	281	430	612	903	797	1057	1703	5818
Twins	12	80	151	242	376	329	221	42	1453
Triplets	0	14	11	27	26	28	9	0	115
Quadruplets	0	0	4	0	0	4	0	0	8
Quintuplets	0	0	5	0	0	0	0	0	5
All babies	47	375	601	881	1305	1158	1287	1745	7399
Percent									
Singleton	74.5	75.0	71.5	69.5	69.2	68.8	82.1	97.6	78.6
Twins	25.5	21.3	25.1	27.5	28.8	28.4	17.2	2.4	19.6
Triplets	0	3.7	1.8	3.1	2.0	2.4	0.7	0	1.6
Quadruplets	0	0	0.7	0	0	0.3	0	0	0.1
Quintuplets	0	0	0.8	0	0	0	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 1581 (21.4%) babies in our cohort from multiple pregnancies and that is similar to the proportion seen in 2003. They represent 26% of the total number of multiple births in Australia and New Zealand in 2004^{1,2}. Of those multiple births, 60% were born before 32 weeks gestation and 97.3% were born before 37 weeks. About a half of the babies (50.8%) from a multiple birth weighed less than 1500g.

Among the babies from multiple births, majority were male (n: 840, 53.1%) while 740 (46.8%) 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.

Congenital Abnormalities

In 2004, there were 994 ANZNN registrants (13.4%) who had congenital anomalies. Among them were 493 term babies and 209 babies born before 32 weeks. The number diagnosed during antenatal period was 367. The number of babies who had abnormalities of the cardio vascular system was 304 and 167 had gastro-intestinal abnormalities including 9 babies with cleft palate. There were 53 babies who had diaphragmatic hernia, 51 had gastroschisis and 27 had exomphalos. Of the babies who had congenital anomalies, 114 died of the abnormality and 591 underwent surgery.

Apgar score at birth

Table 10: The number of babies who had Apgar score <4 by gestational age group, 2004

	20-23	24-27	28-31	32-36	37-44	All babies
Apgar Score at 1 minute						
<4	23	259	256	253	365	1156
4-7	20	521	1016	944	628	3129
8+	4	196	914	1248	752	3114
All babies	47	976	2186	2445	1745	7399
Apgar Score at 5 minute						
<4	6	52	36	56	109	259
4-7	28	324	336	345	460	1493
8+	13	600	1814	2044	1176	5647
All babies	47	976	2186	2445	1745	7399

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 6% of the registrants and 3.5% had low scores at 5 minutes. Among the babies who had low Apgar scores at 1 minute, 46.5% were born at less than 32 weeks and 31.6% were term babies.

There were 1789 babies (24.2% of the cohort) who were intubated in labour ward to aid resuscitation at birth, including 1226 (16.6%) babies of less than 32 weeks and 306 (4.1%) babies born at term.

Exogenous surfactant

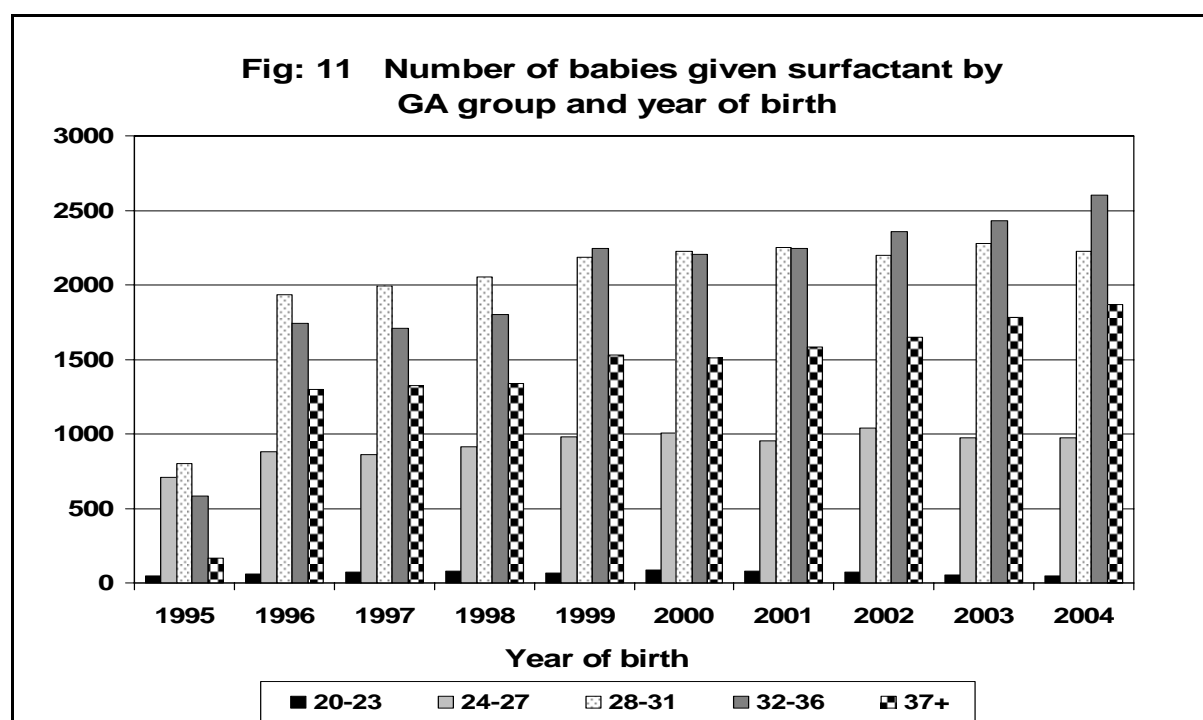
Table 11: Surfactant use by Gestational age group, 2004

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
none	5	41	165	426	981	909	1042	1546	5115
Survanta	42	333	435	451	319	246	241	191	2258
unknown		1	1	4	5	3	4	8	26
All babies	47	375	601	881	1305	1158	1287	1745	7399
Percent									
None	10.6	11.2	27.5	48.4	75.2	78.5	81.0	88.6	69.1
Survanta	89.4	88.6	72.4	51.2	24.4	21.2	18.7	10.9	30.5
Unknown	0	0.3	0.2	0.5	0.4	0.3	0.3	0.5	0.4
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 2324 babies who received IPPV for Hyaline Membrane Disease (HMD) in 2004. Exogenous surfactant was given to 2029 (87.3%) of them, a rate higher than in 2003 (Figure 11). The median proportion of surfactant used for HMD among different level III units (for babies who were ventilated) had a median of 86.1% (inter quartile range - 82% to 92.8%).

There were 25 babies diagnosed with HMD who were intubated to give surfactant, but not continued with IPPV. Twenty three of them were given CPAP. There were 202 other babies who didn't have HMD, but were given surfactant for other reasons. They include babies who had meconium aspiration syndrome (n: 44), non specific respiratory distress (n: 43) and some babies who had persistent pulmonary hypertension (n: 25).



Respiratory assistance

Table 12: Indication for assisted ventilation by gestational age group

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44
No support	0	0	2	25	203	112	71	71
non specific distress	0	7	24	100	312	355	385	417
hyaline membrane disease	45	353	548	689	677	554	552	246
meconium aspiration	0	0	0	0	0	3	2	181
pneumonia	0	1	2	3	5	6	22	50
persistent pulmonary hypertension	0	0	2	1	1	5	12	91
apnoea	0	3	9	30	46	23	14	41
congenital malformation	0	1		5	5	14	52	140
other	0	8	11	20	33	56	56	123
peri-surgical	1	0	0	1	5	19	78	211
neonatal encephalopathy	0	0	0	1	4	4	32	146
Unknown	1	2	3	6	14	7	11	28
all babies	47	375	601	881	1305	1158	1287	1745
Percent								
No support	0	0	0.3	2.8	15.6	9.7	5.5	4.1
non specific distress		1.9	4	11.4	23.9	30.7	29.9	23.9
hyaline membrane disease	95.7	94.1	91.2	78.2	51.9	47.8	42.9	14.1
meconium aspiration	0	0	0	0	0	0.3	0.2	10.4
Pneumonia	0	0.3	0.3	0.3	0.4	0.5	1.7	2.9
persistent pulmonary hypertension	0	0	0.3	0.1	0.1	0.4	0.9	5.2
Apnoea	0	0.8	1.5	3.4	3.5	2	1.1	2.3
congenital malformation	0	0.3	0	0.6	0.4	1.2	4	8
Other	0	2.1	1.8	2.3	2.5	4.8	4.4	7
peri-surgical	2.1	0	0	0.1	0.4	1.6	6.1	12.1
neonatal encephalopathy	0	0	0	0.1	0.3	0.3	2.5	8.4
Unknown	2.1	0.5	0.5	0.7	1.1	0.6	0.9	1.6
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, 92.5% (n: 6842) were given assisted ventilation for 4 or more hours in 2004.

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 2004, “CPAP only” was given to 3155 (46.1%) babies. A combination of IPPV and CPAP was given to 2464 babies. (Figure 12). ‘IPPV only’ was given to 1183 babies.

In 2004, IPPV was given to the babies in our cohort for a total of 655,915 hours (27,330 days) and CPAP was given for 1,060,817 hours (44,201 days). These 71,531 days of assisted ventilation equate to each baby receiving 9.7 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 2004 (13.1%). The use of HFOV among units varies between 0.3% -15%. 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 has increased to 9.3% in 2004 after a stable rate about 7% from 2001.

Table 13: Number of babies given assisted ventilation by gestational age group - 2004

assisted ventilation	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Number given IPPV	47	366	492	524	399	338	498	984	3648
Number given CPAP	19	294	550	804	993	950	974	1036	5620
Number given O2	41	359	556	725	898	773	984	1380	5716
Number given HFOV	19	135	78	64	31	25	25	99	476
Number given NO	8	38	37	25	15	15	36	164	338
Number given ECMO	0	0	0	0	0	0	0	4	4
All babies	47	375	601	881	1305	1158	1287	1745	7399
Percent									
proportion given IPPV	100	97.3	81.9	59.5	30.6	29.2	38.7	56.4	49.3
proportion given CPAP	40.4	78.2	91.5	91.3	76.1	82.0	75.7	59.4	76.0
proportion given O2	87.2	95.5	92.5	82.3	68.8	66.8	76.5	79.1	77.3
proportion given HFOV*	40.4	36.9	15.9	12.2	7.8	7.4	5.0	10.1	13.0
proportion given NO*	17.0	10.4	7.5	4.8	3.8	4.4	7.2	16.7	9.3

*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 14: Duration of assisted ventilation by gestational age group - 2004

Median hours of ventilation	20-23	24-27	28-31	32-33	34-36	37-44
IPPV hours - median	135	175	42	41	45	51
IQR	17-901	55-571	20-96	20-72	22-82	24-97
CPAP hours - median	828	696	70	29	27	17
IQR	430-1172	343-970	24-185	13-66	13-60	7-38
Oxygen days - median	23	56	5	3	2	4
IQR	2-94	20-92	2-26	1-6	1-4	2-9

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%). “Only CPAP” was given to 1078 (33.6%) babies and “only IPPV” was given to 246 (7.7%) in this GA group. Both IPPV and CPAP were given to 1581 (49.3%) babies. The duration of ventilation increases on average, with decreasing gestational age. The highest median duration of IPPV and oxygen was given to 24-27 weeks GA group.

In 2004, the total duration of IPPV used for these very preterm babies was 478,907 hours (19,955days) and duration of CPAP used was 911,272 hours (37,970 days). This shows that the total duration of CPAP and IPPV use was higher in 2004 than in 2003.

High frequency ventilation was given to 325 babies of this group representing 17.8% of the babies who were given IPPV. Nitric Oxide was given to 123 babies (6.7% of the babies given IPPV). About 72.4% (n: 2322) babies received oxygen therapy for 4 or more hours and a total of 81,952 ‘oxygen days’ were required for them. A small proportion of babies who received assisted ventilation required home oxygen (n: 180, 0.06%). This number represents 6.1% of the survivors discharged to home. Of the survivors born at less than 24 weeks, 16.6% required home oxygen.

Babies born at 32 to 36 weeks gestation

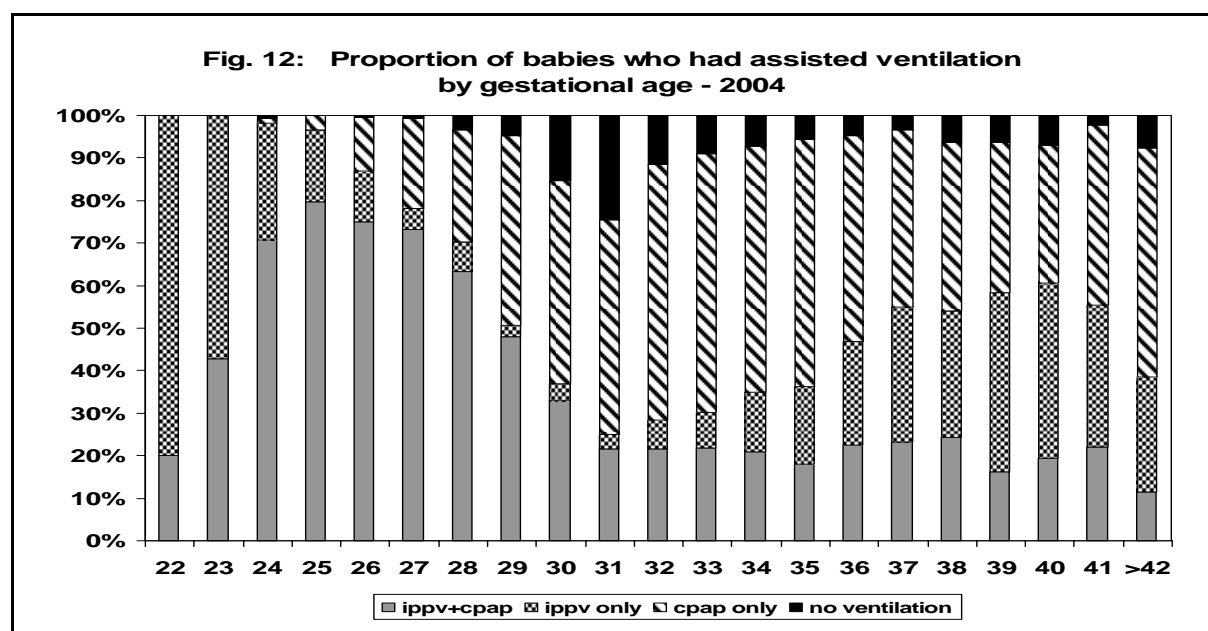
Among the babies born at 32-36 weeks gestational age group 91.9% (n: 2246) babies had assisted ventilation for 4 or more hours and again the respiratory distress syndrome was the main reason (45.2%). CPAP use in this GA group has shown a marked increase during 2004. Total duration of CPAP use for this GA group was 108,379 hours (4516days) and IPPV use was 81,343 hours (3390 days).

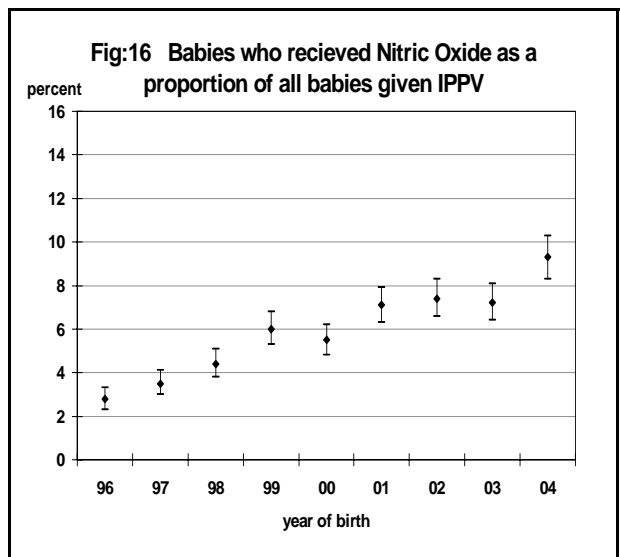
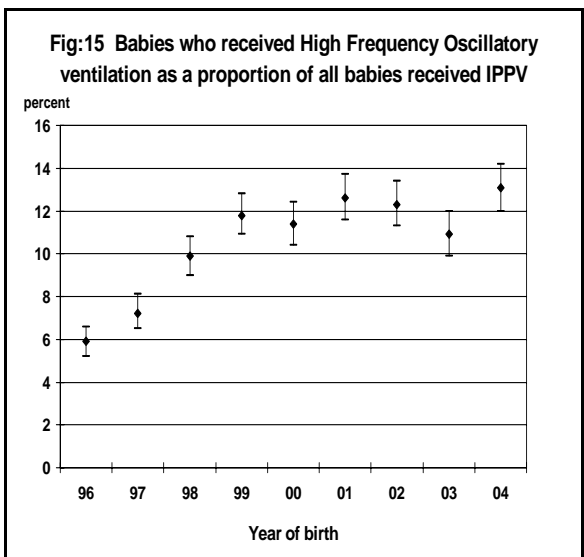
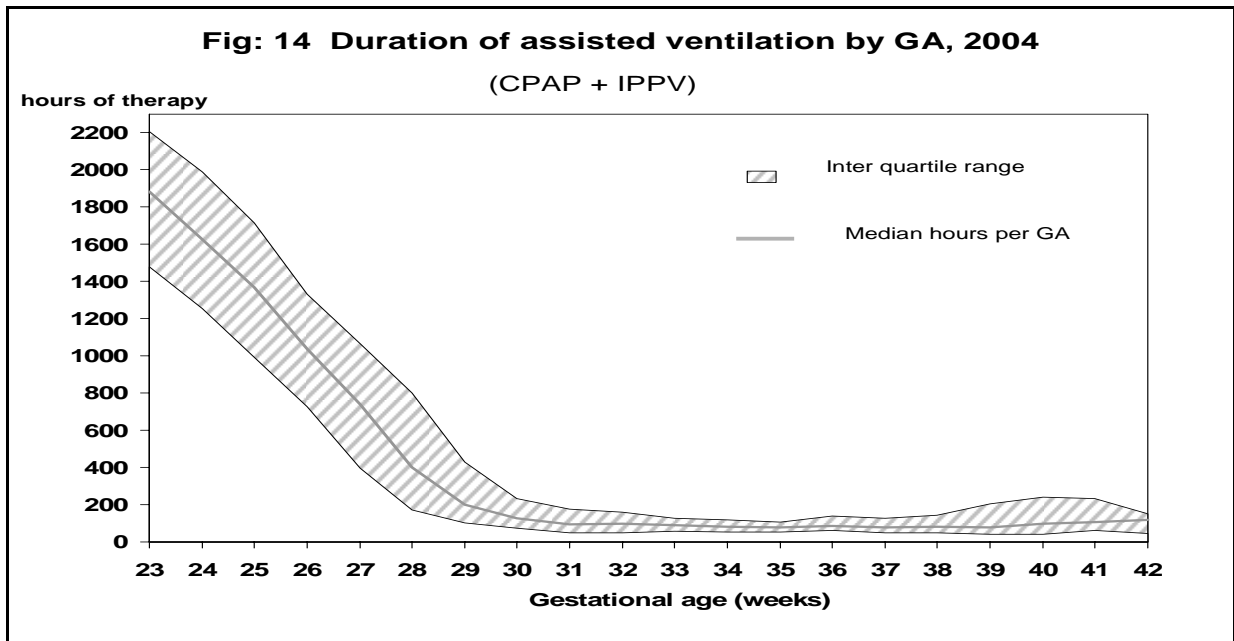
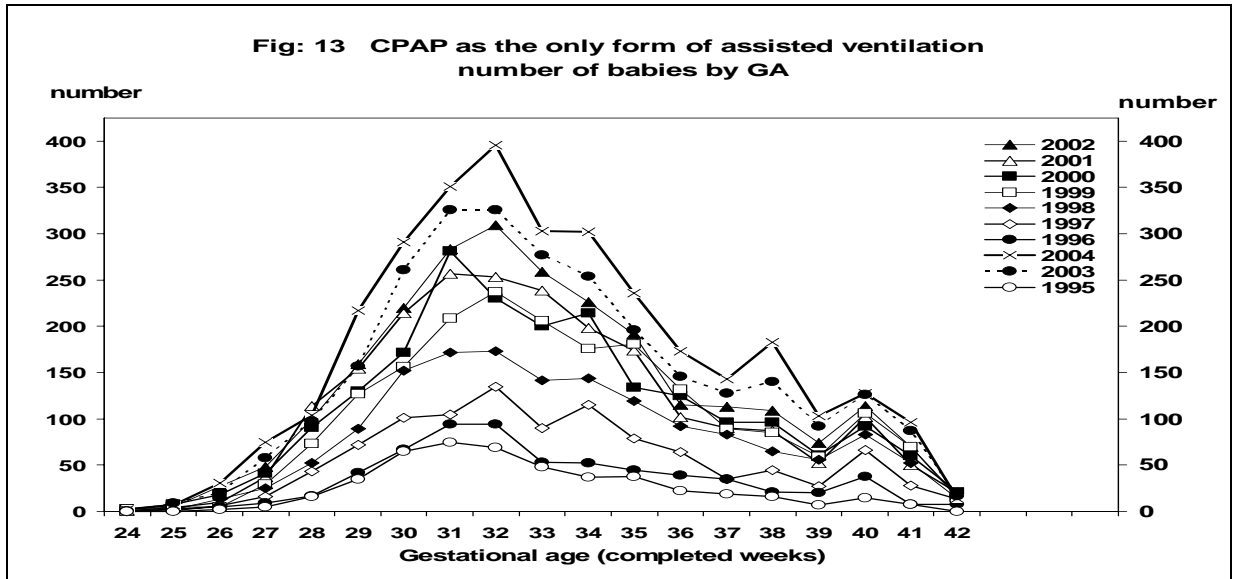
High frequency ventilation was given to 6% of the babies who received IPPV. Nitric oxide was given to 6.1% of the babies. Supplementary oxygen was given to 1757 (71.9%) babies and 13,893 days of oxygen was required for them. Of the survived babies 0.8% (n: 19) required home oxygen (Table 15).

Babies born at term

The main indication for respiratory support was non specific respiratory distress (23.9%). This group was given 1716 total days of CPAP and 3986 total days of IPPV.

High frequency ventilation was given to 10.1% of the term babies who were given IPPV. Nitric oxide was given to 16.7% who had IPPV. There were 4 babies who received extracorporeal membrane oxygenation.





Chronic Lung Disease

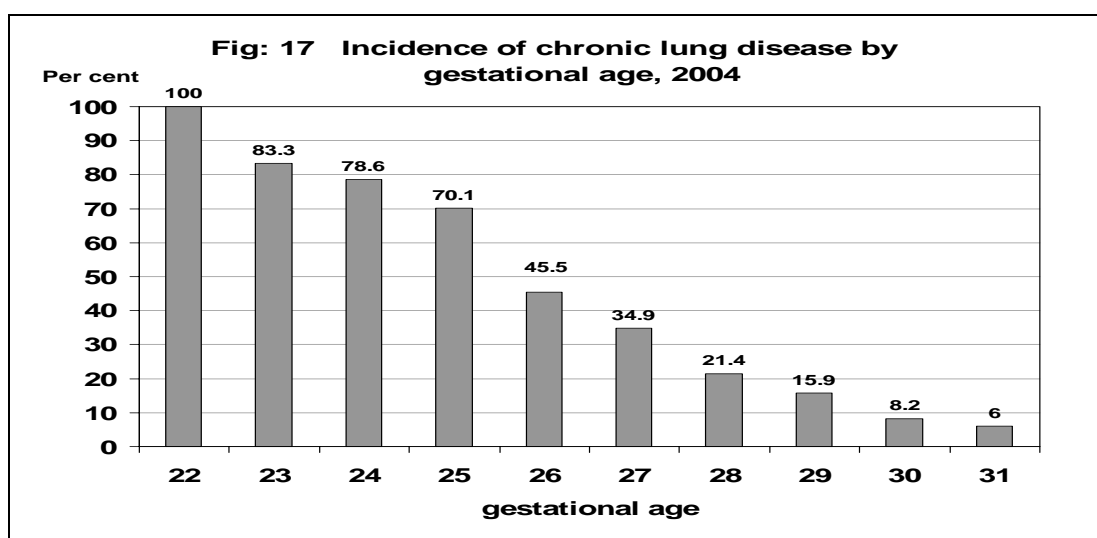
Table 15: Supplemental oxygen therapy and Chronic Lung Disease by gestational age group, 2004

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Oxygen on day 28, number	20	268	379	287	106	49	53	86	1248
Oxygen on day 28 & survived %	85.0	89.6	96.8	96.2	96.2	87.8	81.1	89.5	
Home Oxygen, number	3	77	55	33	12	10	9	26	225
CLD number	16	205	207	155	90				673
survivors with CLD, number	15	192	202	147	87				643
% survived with CLD	93.8	93.7	97.6	94.8	96.7				95.5

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 2004, there were 673 babies who had respiratory support at 36 weeks PMA (21% of the babies born before 32 weeks). A higher proportion of babies who had CLD were born at lower gestational ages (About 34% of the babies born before 24 weeks and 42.2% of the babies born before 28 weeks). The unadjusted rate of CLD among different units ranged from 7.1% to 35% with a median rate of 20.5%.



Air Leak

Table 16: Babies who had Pneumothorax that required drainage, by gestational age group, 2004

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Babies who had air leak, n:	8	37	27	42	33	29	56	95	328
given IPPV & had air leak ,n:	8	37	27	39	29	25	43	82	290
given "CPAP only" & had air leak, n:	0	0	1	3	4	4	13	13	38
Air leak / all babies %	17	9.8	4.5	4.8	2.5	2.5	4.4	5.5	4.4
Air leak / babies given IPPV %	17	10.1	5.5	7.4	7.3	7.4	8.6	8.3	7.9
Air leak / babies given "CPAP only" %	0	0	0.3	0.5	0.6	0.6	3.0	1.9	1.2

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

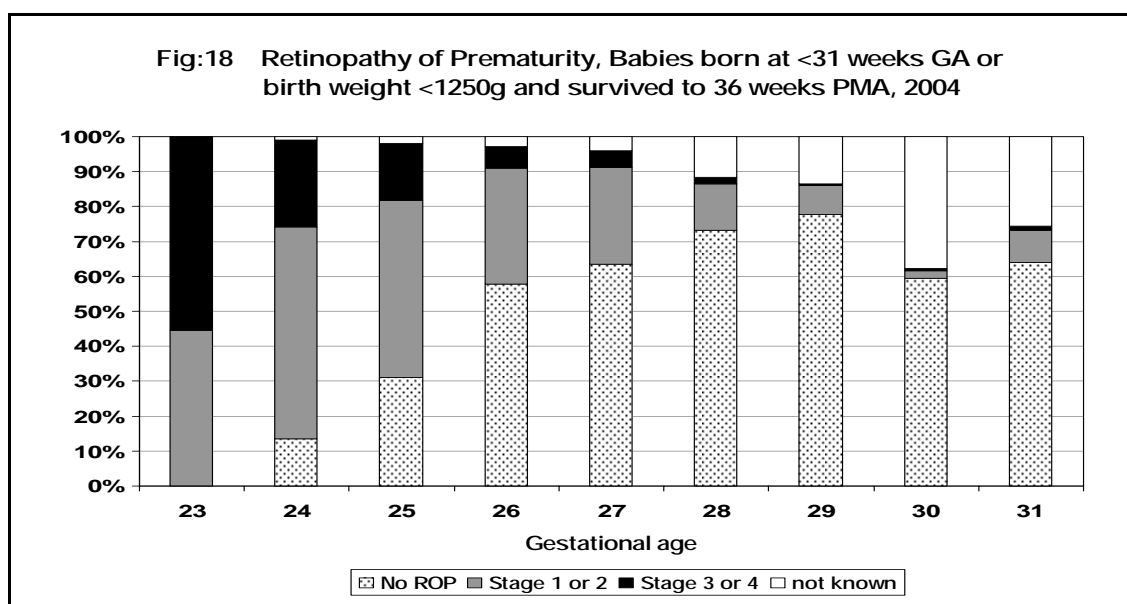
Table 17: Retinopathy of Prematurity by GA group, (<31 weeks GA or <1250g birth weight), 2004

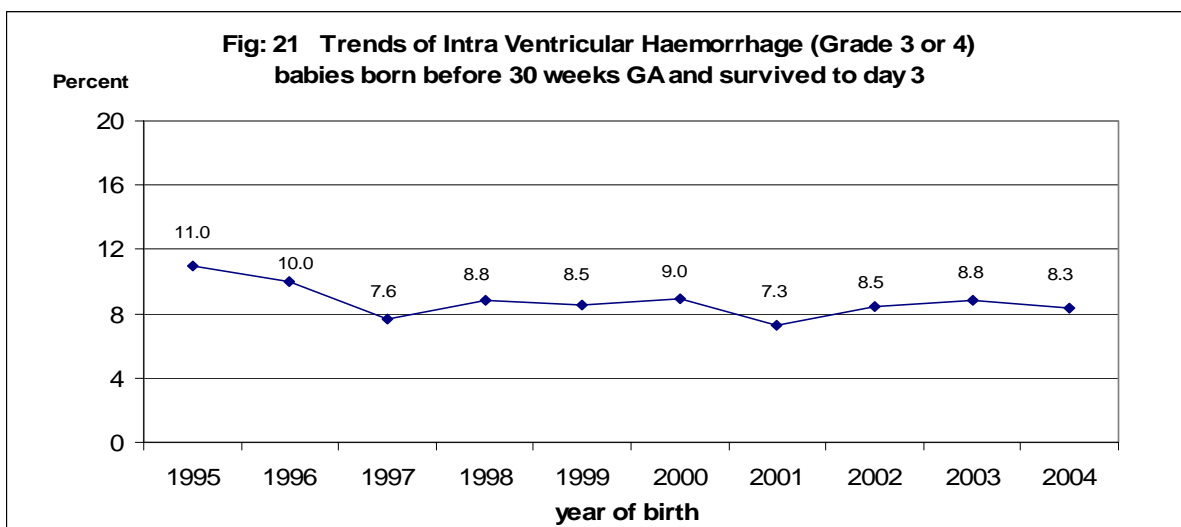
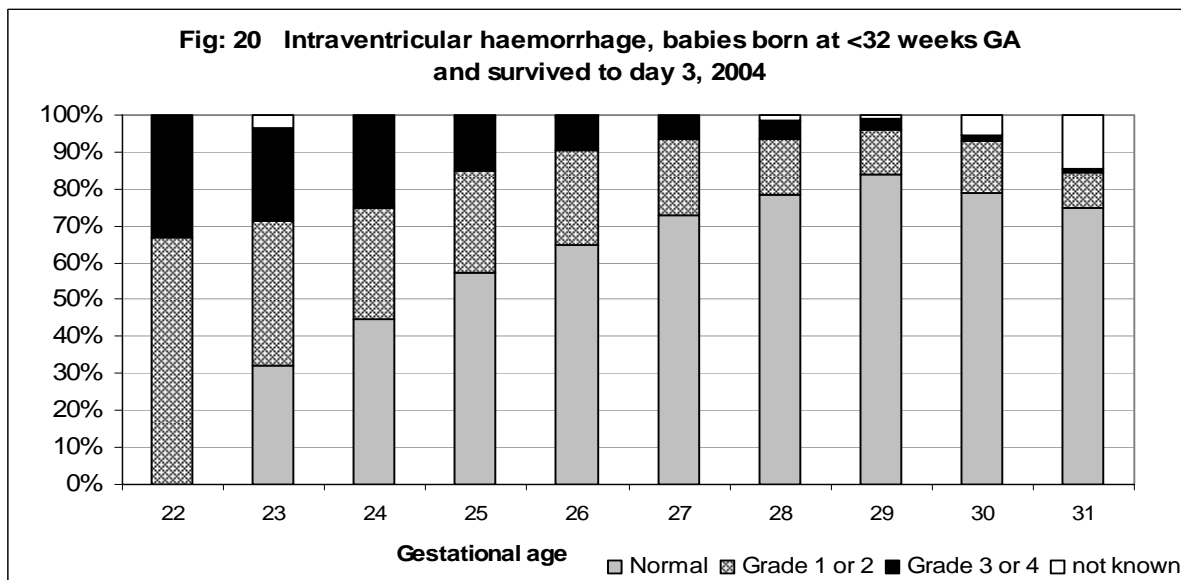
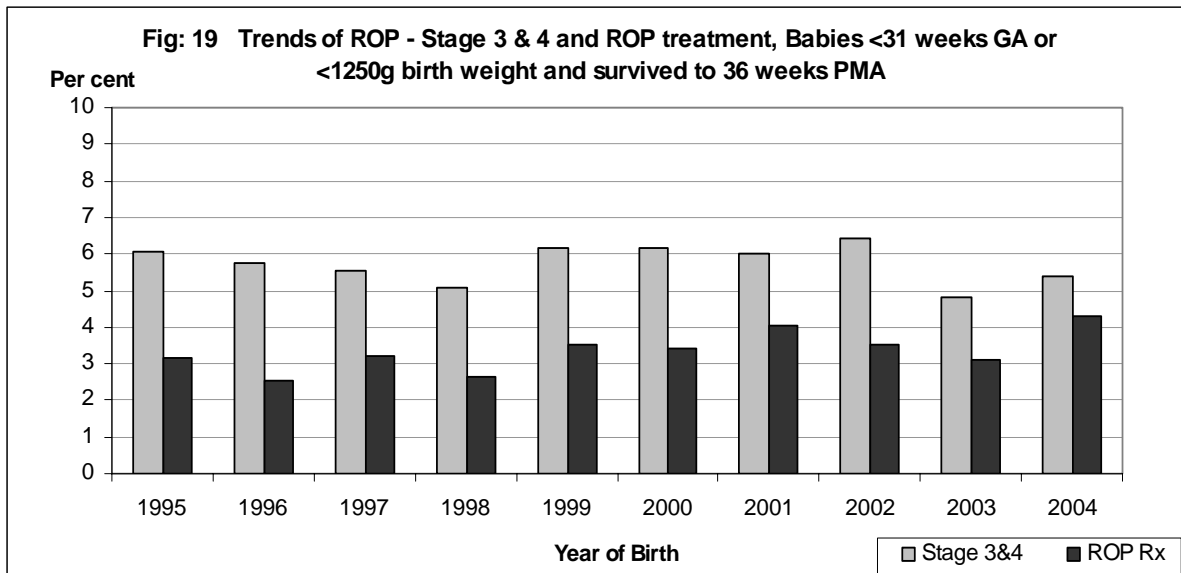
	20-23	24-25	26-27	28-29	30-31	32-33	>34	All Babies
No ROP	4	82	343	652	415	39	8	1543
Stage1	4	60	89	58	15	3	0	229
Stage11	4	92	70	30	6	1	0	203
Stage111	10	52	27	10	6	0	0	105
Stage1V	1	4	2	0	0	0	0	7
ROP treatment	9	49	22	5	2	0	0	87
Not examined	24	85	70	131	255	21	15	601
All Babies	47	375	601	881	697	64	23	2688
Per cent								
No ROP	17.4	28.3	64.6	86.9	93.9	90.7	100	73.9
Stage1	17.4	20.7	16.8	7.7	3.4	7.0	0	11.0
Stage11	17.4	31.7	13.1	4.0	1.3	2.3	0	9.7
Stage111	43.5	17.9	5.1	1.3	1.3	0.0	0	5.0
Stage1V	4.3	1.4	0.4	0	0	0	0	0.3
ROP treatment	39.1	16.9	4.1	0.7	0.5	0	0	4.2

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 2087 (77.6%) babies who had the results of their eye examination recorded. Among the babies not examined 232 were born at 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 (194) before completing 36 weeks GA. Of the examined babies, 112 (5.4%) had stage III or IV eye disease and 75 of them were treated. There were 12 babies who had treatment for stage 2 disease.





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

Cerebral ultrasound

Table 18: Intraventricular haemorrhage by GA group, babies born at < 32 weeks GA, 2004

	20-23	24-25	26-27	28-29	30-31	All Babies
None	12	184	414	711	999	2320
Grade1	5	63	80	89	133	370
Grade 11	8	39	51	29	22	149
Grade 111	1	24	18	19	12	74
Grade 1V	12	48	27	16	2	105
not examined	9	17	11	17	137	191
All Babies	47	375	601	881	1305	3209
Percent						
None	31.6	51.4	70.2	82.3	85.5	76.9
Grade1	13.2	17.6	13.6	10.3	11.4	12.3
Grade 11	21.1	10.9	8.6	3.4	1.9	4.9
Grade 111	2.6	6.7	3.1	2.2	1.0	2.5
Grade 1V	31.6	13.4	4.6	1.9	0.2	3.5

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 179 very preterm babies reported to have Grade III or IV IVH representing 5.6% of the babies born before 32 weeks gestation and 88 of them died before discharging home. The proportion of babies with significant haemorrhage increases as gestation decreases (Table 18, Figure 20). The median rate of significant haemorrhage in the individual units is 5.9% (with an inter quartile range of 5.1% to 6.8%).

The highest proportion of babies who had severe IVH was born before 26 weeks GA. More than a third (34.2%) of the babies born at 22 - 23 weeks gestation had severe IVH. However, 1.2% of the babies born at 30-31 weeks GA also had severe IVH. Of the babies who weighed less than 750g, 20.7% had severe IVH. Of the 191 (6%) babies who did not have an early ultrasound report, 137 (71.7%) 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 19: Late ultrasound results by gestational age group, babies <32 weeks GA, 2004

	20-23	24-25	26-27	28-29	30-31	All Babies
Porencephalic Cysts	2 (6.7%)	13 (4.2%)	8 (1.5%)	8 (1%)	5 (0.5%)	36 (1.4%)
Peri ventricular Leukomalacia	1 (3.3%)	10 (3.3%)	11 (2.1%)	6 (0.8%)	12 (1.2%)	40 (1.5%)
Encephaloclastic Porencephaly	0 (0%)	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.04%)
Hydrocephalus	1 (3.3%)	8 (2.6%)	10 (1.9%)	14 (1.8%)	10 (1%)	43 (1.6%)

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

There were 2027 (63.2%) babies born at less than 32 weeks gestation who had an ultrasound dated at least 3 weeks after birth, and 95.4% (n: 1934) of those had a normal report. Abnormal late head ultrasounds were reported for 93 (4.6%) babies who had ultrasound reported 3 weeks after birth. Of those babies Hydrocephalus was reported for 2.1%, Porencephalic Cysts for 1.8% and 2% had Periventricular Leukomalacia. Only one baby had Encephaloclastic Porencephaly.

Another 194 babies had an ultrasound reported between day 14 and day 21 that included 6 additional babies with abnormal scans. This group had 2 more babies with Hydrocephalus, 2 babies with Porencephalic Cysts and 2 with Periventricular Leukomalacia.

Neonatal surgery

Table 20: Characteristics of all ANZNN registrants who had surgery, 2004

	20-23	24-27	28-31	32-33	34-36	37-44	All babies
Sex male	4	75	70	21	89	254	513
female	2	66	42	26	63	168	367
Presence of congenital anomalies	0	27	46	28	129	361	591
Antenatal diagnosis of the anomaly	0	1	5	6	57	150	219
Born in a tertiary hospital	6	125	102	39	103	227	602
Born in other hospitals	0	16	10	8	49	196	272
Necrotising Enterocolitis	4	35	20	3	5	1	68
Died before discharging home	2	28	13	9	14	15	81

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 2004, there were 881 ANZNN registrants who had major surgery, of whom half (48%) were born at term. More than two-thirds of the babies who had major surgery (68.3%) were born at a tertiary hospital. Congenital abnormalities were found in 67.1% of the infants who underwent surgery and 37.1% of them were antenatally diagnosed allowing the birth to be planned, to be close to expert care. About 9.2% babies died after surgery. Of the infants who had congenital abnormalities and had surgery, 28 died. In 2004, the average length of stay in the hospital for the term babies requiring surgery was 31 days.

The main indication for assisted ventilation was surgery for 308 babies who had undergone surgery. Two thirds (66.9%) of them were term babies. Among the babies who were born at more than 31 weeks gestation and had surgery, 502 had mechanical ventilation and they consumed a total of 79,732 hours of IPPV (average of 6.6 days each).

Of the babies born at less than 32 weeks gestation or less than 1500g birth weight 272 had surgery and 45 (16.5%) of them died, but only 18 had a lethal congenital malformation.

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
GA <28 weeks, n:	69	92	51	74	56	68	78	75	77	85
GA >28 weeks, n:	74	73	68	74	56	57	60	65	76	63
GA <28 weeks, %	7.3	9.5	5.3	7.4	5.3	6.2	7.5	6.7	7.6	8.3
GA >28 weeks, %	1.5	1.4	1.3	1.3	0.9	0.9	1.0	1.0	1.2	0.9

Necrotising enterocolitis (NEC) is a rare disease, more common in preterm infants and has a high rate of morbidity and mortality. There were 148 babies among ANZNN registrants who had proven NEC representing 2% of the 2004 cohort. More than half (57.4%) of them were born before 28 weeks gestation and 87.2% (n:129) were born before 32 weeks. The incidence of NEC among babies born before 28 weeks was 8.3% in 2004.

The total number died in this group was 46 and 32 (69.6%) of them were born at less than 28 weeks. The disease was implicated in the death of 23 (50%) babies.

The number who had surgery for NEC was 68 (45.9%) and 24 of them died. Of those babies who had surgery for NEC, 39 were born at less than 28 weeks.

Neonatal infection

Table 22: Incidence of Septicaemia by gestational age group, all babies, 2004

	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44
No infection noted*	12	176	404	742	1222	1108	1224	1624
Sepsis, onset at <48 hours*	2	11	13	10	14	10	8	34
Sepsis, onset at >48 hours+	17	159	161	117	61	29	38	58
Sepsis, early and late onset **	1	2	6	2	1	1	1	3
Babies survived >2days	31	347	581	871	1299	1147	1271	1719
All babies	47	376	601	881	1305	1158	1287	1745
Percent								
No infection noted* %	25.5	46.8	67.2	84.2	93.6	95.7	95.1	93.1
Sepsis, onset at <48 hours* %	4.3	2.9	2.2	1.1	1.1	0.9	0.6	1.9
Sepsis, onset at >48 hours+%	54.8	45.8	27.7	13.4	4.7	2.5	3.0	3.4
Sepsis, early and late onset** %	2.1	0.5	1.0	0.2	0.1	0.1	0.1	0.2

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

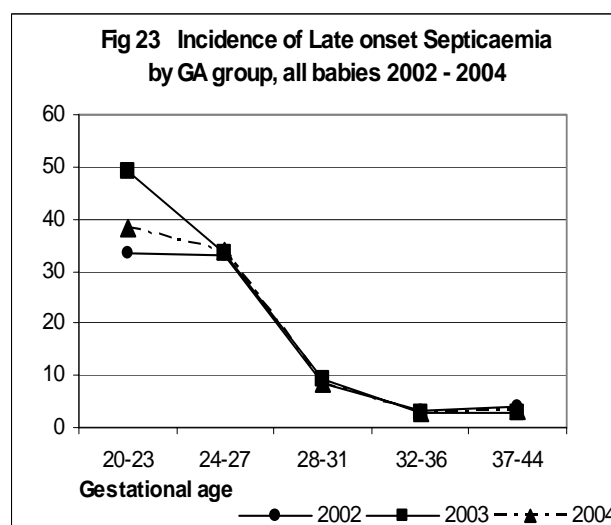
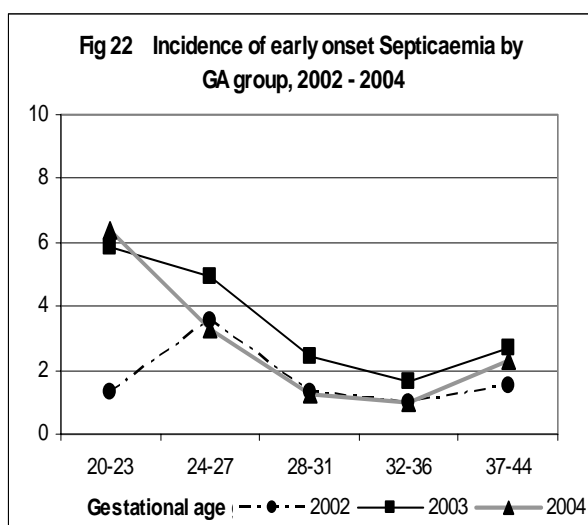
+ Denominator for this calculation is babies surviving beyond day 2, n: 7266

** 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.

In 2003, the definition of infection changed from episodes of any type of systemic infection to only those that are blood-borne (septicaemia). This will reduce the number of babies reported as having infection. Each episode of sepsis is also recorded as early (during the first 48 hours of life) or late (after 48 hours) and episodes involving the same organism must be at least 14 days apart.

In 2004, there were 760 (10.3%) babies, who had symptomatic, blood culture positive septicaemia. A half of those babies (49.1%) were born before 28 weeks gestation. About 1.9% babies born at less than 32 weeks gestation had early infections. Late infections were diagnosed for 16.9% babies who survived beyond day two. The proportion who had sepsis among babies born after 31 weeks is 4.3%. Of the babies who had septicaemia, 111 (14.6%) died and 41 (5.4% of those with sepsis) of them had infection implicated in their deaths. Early onset sepsis was noted in 15 and late infection was noted in 26 babies who died following infections.



Transfer from level 3 NICUs to other nurseries

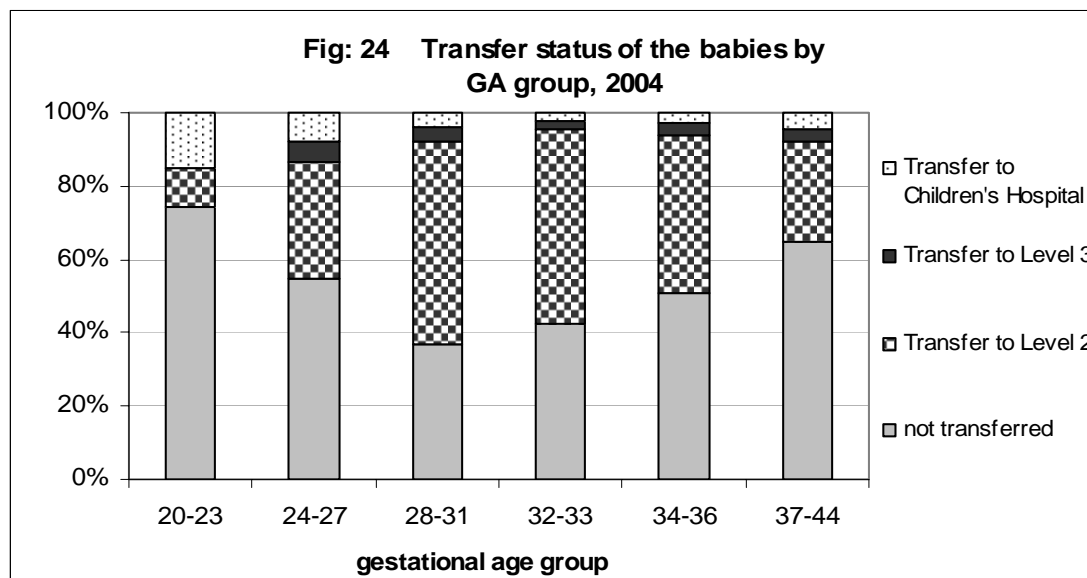
Table 23: Transfer status and level of hospital, by gestational age group, all babies, 2004

Transfer hospital level	20-23	24-25	26-27	28-29	30-31	32-33	34-36	37-44	All babies
Not transferred	35	222	311	350	457	492	653	1135	3656
Transferred to level 1 or 2	5	85	222	439	763	615	558	476	3163
Transferred to level 3	0	21	35	48	44	22	37	56	263
Transferred to NICUs in Children's hospitals	7	45	32	44	41	29	39	78	315
All babies	47	373	600	881	1305	1158	1287	1745	7397
Per cent									
Not transferred	74.5	59.5	51.8	39.7	35.0	42.5	50.7	65.0	49.4
Transferred to level 1 or 2	10.6	22.8	37.0	49.8	58.5	53.1	43.4	27.3	42.8
Transferred to level 3	0.0	5.6	5.8	5.4	3.4	1.9	2.9	3.2	3.6
Transferred to NICUs in Children's hospitals	14.9	12.1	5.3	5.0	3.1	2.5	3.0	4.5	4.3
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 2004, 53.2% (n: 3670) of the babies who survived were transferred to another hospital before discharge. A half (49.1%) of those transferred babies was born at less than 32 weeks and 16.1% were term babies.

There were 71 babies who died after transferring to other hospitals. This includes 11 babies transferred to level 1 or 2 units, 47 babies transferred to NICUs of children's hospitals and 13 babies transferred to other level 3 NICUs.



Length of stay

Table 24: Median length of stay in the hospital (Survivors) by gestational age group, 2004

Gestational age	Number survived	median LOS (days)	IQR (days)	Gestational age	Number survived	median LOS (days)	IQR (days)
23	17	128	112 -144	33	480	26	21 - 32
24	106	125	110 -141	34	501	21	16 - 27
25	157	106	94 - 123	35	389	16	11 - 23
26	206	89	80 - 106	36	338	14	10 - 23
27	324	77	68 - 91	37	325	12	8 - 24
28	367	69	58 - 79	38	438	12	8 - 22
29	473	59	50 - 68	39	265	12	7 - 22
30	595	47	41 - 56	40	365	10	6 - 19
31	687	40	33 - 48	41	212	9	6 - 18
32	634	34	28 - 41	42	23	7	4 - 12

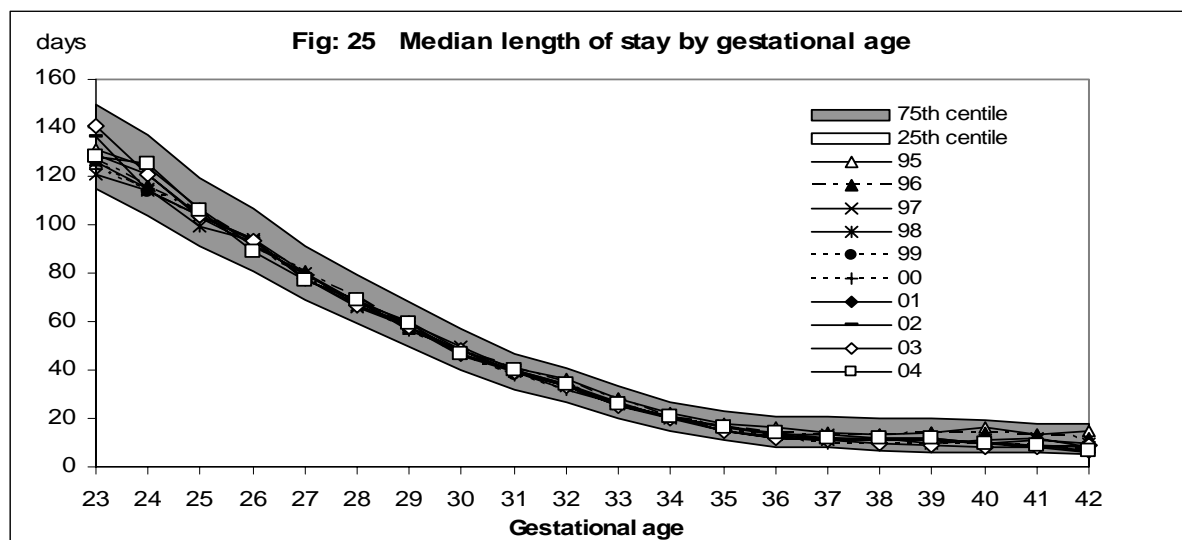
Notes: Discharge data are available for 6678 of the 6904 (96.7%) surviving babies. Data are for all babies, regardless of level of hospital at discharge.

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 96.9% (n: 7173) of babies. Over the period of 1995 to 2003, 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 34 days. 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 two weeks after birth. About three quarters of the term babies (74.2%, n: 1209) were discharged home by three weeks.

The babies born at less than 32 weeks spent 197,417 hospital bed days and babies born between 32–36 weeks spent 64,661 hospital bed days while term babies required 31,194 bed days.



Survival of the ANZNN registrants

Table 25: Survival to discharge home at each week of gestation, all babies, 2004

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	5	4	0	1	1	1	20.0
23	42	40	1	25	20	17	40.5
24	168	168	7	140	123	106	63.1
25	207	202	1	181	170	157	75.8
26	247	243	3	222	212	206	83.4
27	354	348	1	341	331	324	91.5
28	395	384	5	376	372	367	92.9
29	486	463	1	484	480	473	97.3
30	610	572	0	605	600	595	97.5
31	695	664	1	689	689	687	98.8
32	659	639	9	650	640	634	96.2
33	499	485	10	488	482	480	96.2
34	523	494	13	516	509	501	95.8
35	406	397	13	394	391	389	95.8
36	358	351	7	346	341	338	94.4
37	344	336	8	333	328	325	94.5
38	462	452	14	452	440	438	94.8
39	290	289	7	276	270	265	91.4
40	396	391	8	377	368	365	92.2
41	227	225	4	215	212	212	93.4
42	25	25	1	23	23	23	92.0
43	1	1	0	1	1	1	100.0
All babies	7399	7173	114	7135	7003	6904	93.3

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.

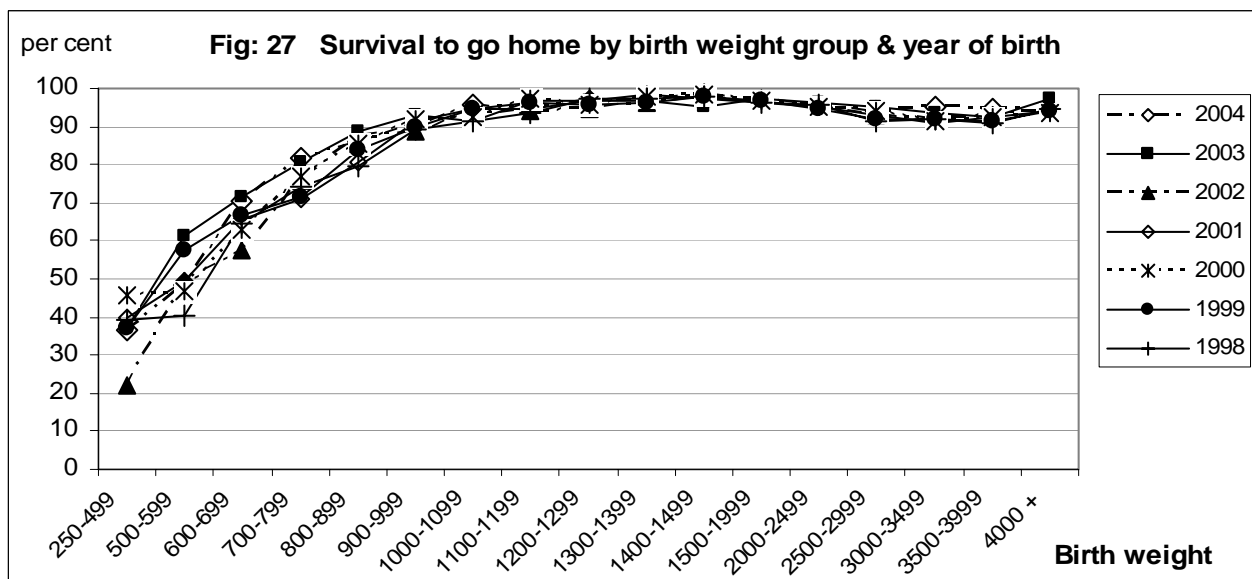
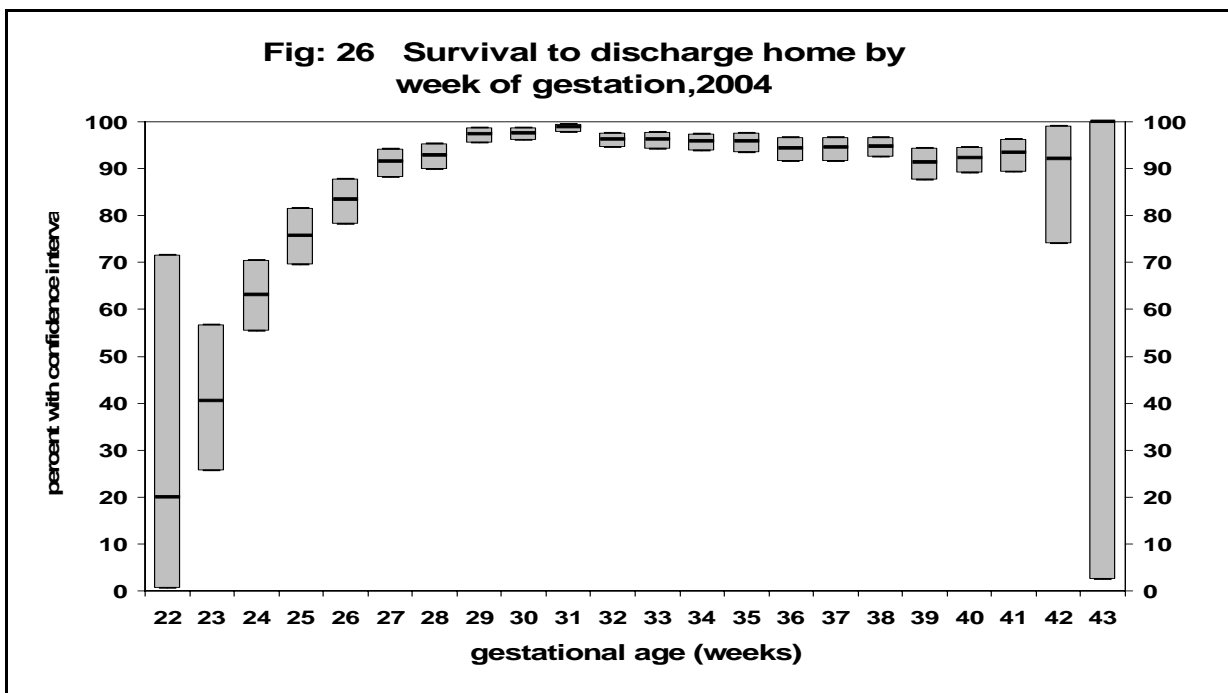
Please see the Appendix 1 for survival by birth weight data table.

In 2004, 93.3% of the ANZNN registrants survived to go home and this is similar to 2003. Survival status was available for all 7399 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 2004, 495 ANZNN registrants died before discharging home. The mortality was higher in babies born before 28 weeks and survival rate was 79.3% for that GA group. The survival improves with

the increasing gestational age. During the first day of life, 53 (10.7% of the deaths) babies died and this proportion is similar to 2003. About a quarter of the (n: 133, 26.9%) deaths occurred within the first 2 days of life and 64 of them were born before 28 weeks gestation. Most of those deaths (80%) occurred within the first 28 days of life.

The cause of death was congenital abnormalities for 114 of the babies who died. One third of the babies (36.8%) who died of congenital abnormalities were born at term and only 17.6% were born at less than 32 weeks. Half of those deaths (52.6%) 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 94.9%.



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 26: Number of babies by gestational age group, babies registered to. Level II units, 2004

Gestational age (completed weeks)	Number	Cumulative per cent
Less than 28	0	0
28-29	9	2.5
30-31	38	13.0
Babies less than 32 weeks	47	
32-33	59	29.4
34-36	114	60.9
37-39	70	80.3
More than 39	71	100
all babies	361	

Table 27: Number of babies by birth weight group babies registered to level II units, 2004

Birth weight group (grams)	Number	Cumulative per cent
500-749	0	
750-999	1	0.3
1000-1249	7	2.2
1250-1499	24	8.9
Babies less than 1500g	32	
1500-1999	60	25.5
2000-2499	73	45.7
2500-2999	70	65.1
3000-3499	46	77.8
3500-3999	53	92.5
4000-7000	27	100
All babies	361	

In 2004, 361 babies fulfilled the ANZNN criteria and were registered to one of the fifteen level II nurseries. Of those babies, 13% were born at less than 32 weeks gestation and 8.9% weighed less than 1500 grams at birth. Assisted ventilation was given for 337 (93.4%) and two babies had major surgery. Four hospitals did not have eligible babies for the audit while the maximum number registered to a unit was 56. Previous preterm births were reported by 12.5% (n: 45) of the mothers of registrants and 8 had previous peri-natal deaths.

There were 221 male (61.2%) and 139 female babies admitted to level 2 units. Nearly two thirds of the babies were born to Caucasian mothers (n: 234, 64.5%) and half of them (n: 117) were born at 32-36 weeks gestational age. The number of registrants born to Maori mothers was 86 (23.8%) and 91.9% of those babies had born after 31 weeks gestation. Pacific islanders represented 3% of this population.

There were 41 babies from multiple births and that include 38 twins and 3 triplets. Three quarters of the babies from multiple births were males (n: 31).

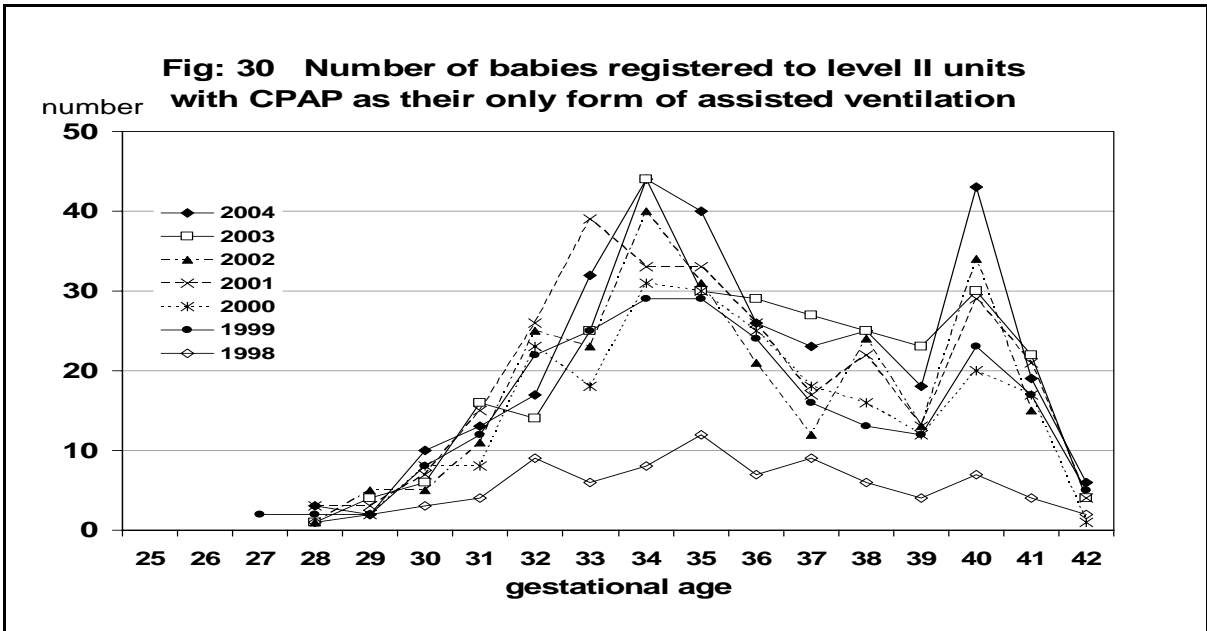
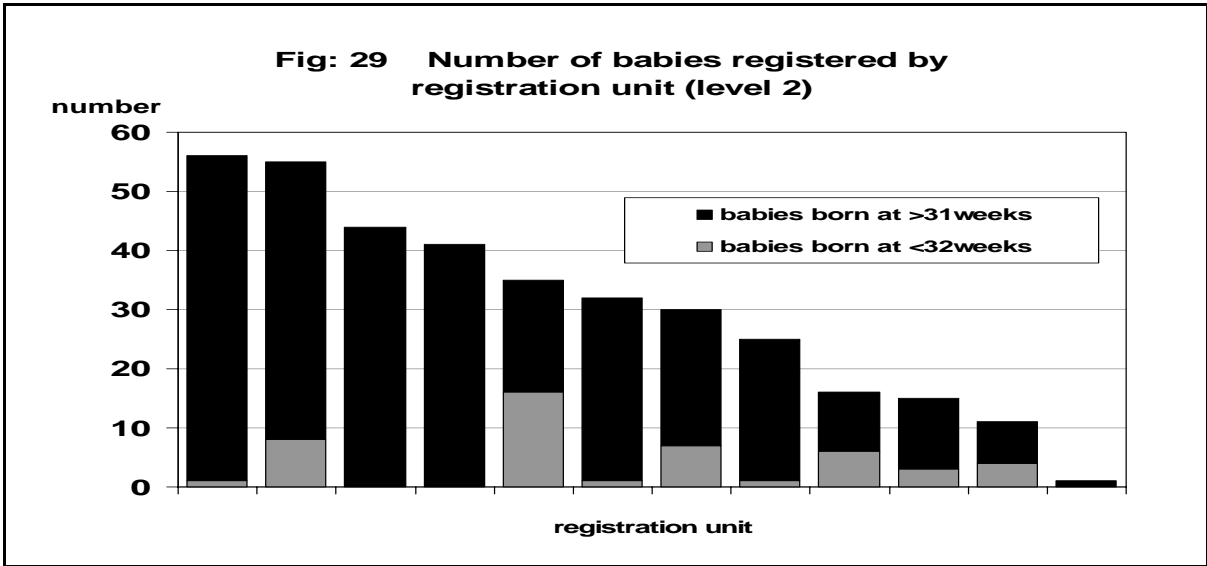
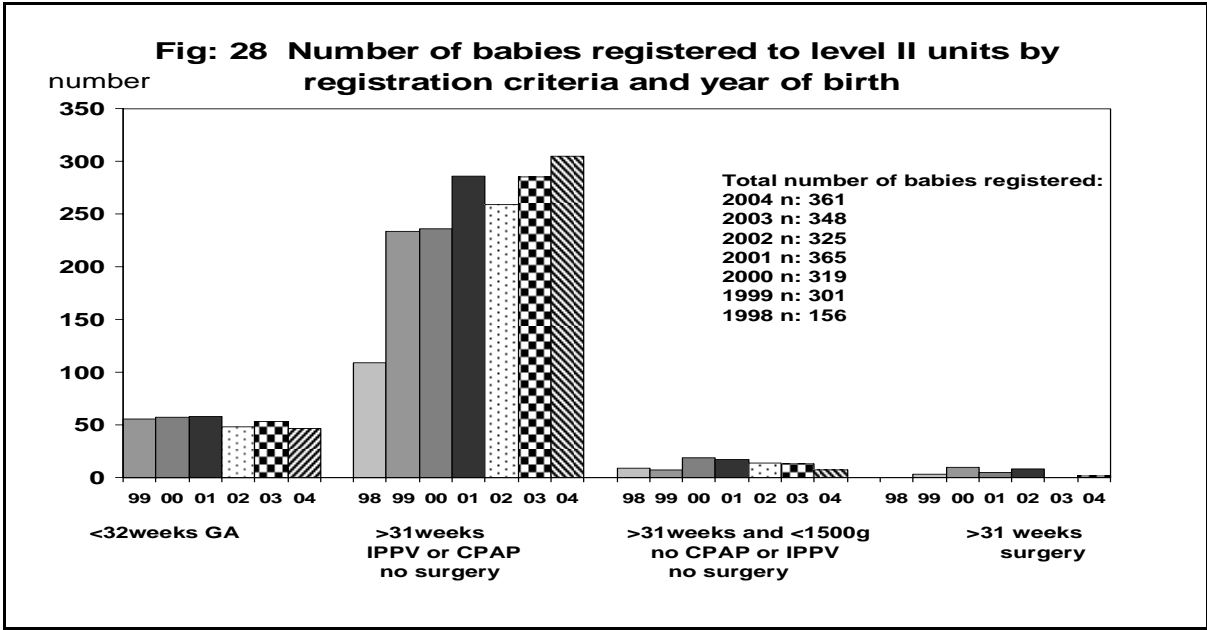


Table 28: Antenatal corticosteroid use by gestational age group, registrants of level II, 2004

Steroid use	28-29	30-31	32-33	34-36	All babies
none	1	8	25	86	120
incomplete course	5	10	13	3	31
course completed	3	16	10	9	38
completed >7 days	0	1	3	3	7
Unknown	0	3	8	13	24
All babies	9	38	59	114	220

Table 29: Mother's presenting antenatal problem by GA group, registrants of level II, 2004

Presenting problem	28-31	32-36	37-44	All Babies
Preterm rupture of membranes	10	28	0	38
Preterm labour	16	77	0	93
Hypertension in pregnancy	5	19	3	27
Antepartum haemorrhage	5	21	3	29
Intra uterine growth restriction	3	7	7	17
Fetal distress	4	9	27	40
Other problems	4	5	8	17
No antenatal problems	0	4	89	93
Congenital anomalies	0	2	3	5
Unknown	0	1	1	2
All Babies	47	173	141	361

Table 30: 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	9	32	49	103	63	61	317
In utero transfer	0	1	6	3	3	2	15
Ex utero retrieval to level 2 unit	0	2	0	1		1	4
Ex utero transfer	0	1	0	1	2	3	7
Other	0	2	4	6	2	4	18
All babies	9	38	59	114	70	64	361

Table 31: Method of delivery, registrants of level II, 2004

Delivery method	28-31	32-36	37-44	All babies
Vaginal	18	74	73	165
Vaginal - instrumental	1	9	13	23
CS in labour	6	43	18	67
CS not in labour	20	47	35	102
Not known	2	0	2	4
All Babies	47	173	141	361

Most mothers of level 2 registrants had booked into a level 2 hospital for delivery (87.8%). Of the level 2 registrants born before 34 weeks gestation, 84.9% were born at a level 2 hospital and 57.5% of the mothers were given antenatal steroids.

Nearly two thirds of the mothers of the term level 2 registrants did not present with any maternal complications (63.1%). Among babies born before 37 weeks, 42.3% mothers had presented with preterm labour. The Caesarean Section rate was slightly higher than in 2003 (47.3%) and 60.4% of those had Caesarean Section before labour began. A low Apgar score (less than 4) at 1 minute was recorded for 48 babies (13.3%) and 19 babies required endotracheal intubation in labour ward to assist in their adaptation to extrauterine life.

Respiratory Support

Table 32: Main indication for respiratory support, Level II registrants, 2004

Indication for support	28-31	32-36	37-44	All babies
No support	10	7	0	17
non specific distress	10	102	68	180
hyaline membrane disease	24	47	5	76
meconium aspiration	0	0	24	24
pneumonia	1	4	13	18
apnoea	1	2	3	6
congenital malformation	0	0	1	1
other	0	2	9	11
peri-surgical	0	0	1	1
neonatal encephalopathy	0	2	9	11
Unknown	1	7	8	16
all babies	47	173	141	361

Table 33: Respiratory support by gestational age group, level 2 registrants, 2004

	28-31	32-33	34-36	37-44	All babies
Surfactant given	5	4	1	2	12
intubated at resuscitation	1	4	4	10	19
Oxygen given	38	46	98	121	303
Median days of Oxygen	2	2	2	1	
IQR - days oxygen	1 - 2	1 - 3	1 - 5	1 - 5	
Home O2	0	0	1	1	2
CPAP given	32	51	112	138	333
Median days of CPAP	21	21	18	12	
IQR - hours CPAP	0-65	11 - 55	8 - 46	8 - 24	
CPAP not given	15	8	2	3	28
IPPV given	4	4	2	6	16
IPPV not given	43	55	112	135	345
Air Leak	0	0	0	2	2

Cerebral ultrasound

Out of 47 eligible babies 37 (78.7%) had head ultrasound and three of them had grade 1 or 2 IVH. Ten babies who didn't have an early head ultrasound report were born at 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 31 eligible babies. None of them had an abnormal report.

Other morbidities

Septicaemia was proven in 20 babies, of whom 13 had symptoms before day two. Two babies died following infections. There were no cases of necrotising enterocolitis. Major congenital malformations were reported for 9 babies and two of them had surgery before discharging home. Two babies who had congenital malformations died due to the effects of the anomaly.

Level III to level II transfers

There were 299 babies transferred from level III to level II ANZNN hospitals of whom, 87 were born in level 2 hospitals. Of those transferred babies 214 were transferred during neonatal period. About 14 babies continued their respiratory support after back-transfer and 33 babies received supplemental oxygen and 29 continued to have O2 for more than one day.

Survival

Table 34: Survival to discharge by gestational age group, babies registered to level II units, 2004

Gestational age (weeks)	All babies admitted	number with discharge home	number with lethal congenital malformation	Number alive at 7 days	Number alive at 28 days	Number alive at discharge	Per cent survival at discharge
28-29	9	9	-	8	8	8	88.9
30-31	38	38	-	37	37	37	97.4
32-33	59	59	-	57	57	57	96.6
34-36	114	114	-	114	114	114	100.0
37-39	70	70	1	68	68	68	97.1
40-41	64	64	1	63	63	63	98.4
42-44	7	6	-	7	7	7	100.0
All babies	361	360	2	354	354	354	98.1

Only 15 (8.31%) babies were transferred to another hospital prior to discharging home. Of those, 3 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): 4-9 days). For babies born at 32 to 36 weeks gestation, the median length of stay was 19 days (IQR: 13-25 days) and babies born at less than 32 weeks gestation were in hospital for a median 45 days (IQR: 37-55 days).

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5. Appendix 1

Data tables according to the birth weight

Table 35: Antenatal corticosteroid use by birth weight group, Babies weighed <2500g, 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	All babies
none	1	50	58	74	126	86	98	106	599
Incomplete course	7	107	182	211	227	194	146	102	1176
Course completed	22	182	287	344	368	309	178	140	1830
Completed >7days	2	30	77	120	120	110	70	61	590
unknown	1	6	10	6	22	16	14	20	95
All babies	33	375	614	755	863	715	506	429	4290
Percent									
none	3.1	13.6	9.6	9.9	15.0	12.3	19.9	25.9	14.3
Incomplete course	21.9	29.0	30.1	28.2	27.0	27.8	29.7	24.9	28.0
Course completed	68.8	49.3	47.5	45.9	43.8	44.2	36.2	34.2	43.6
Completed >7days	6.3	8.1	12.7	16.0	14.3	15.7	14.2	14.9	14.1
All babies	100	100	100	100	100	100	100	100	100

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

Table 36: Method of delivery by birth weight group, all babies, 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
vaginal	7	164	187	218	276	490	334	304	299	208	116	2603
vaginal with instruments	0	6	9	14	29	58	36	53	76	43	23	347
Caesarean section in labour	5	85	195	215	258	343	255	207	148	99	57	1867
Caesarean section-no labour	21	117	226	324	366	517	327	262	218	114	69	2561
unknown		1		3	4	1	3	2	3	3	1	21
All babies	33	373	617	774	933	1409	955	828	744	467	266	7399
Percent												
vaginal	21.2	44.1	30.3	28.3	29.7	34.8	35.1	36.8	40.4	44.8	43.8	35.3
vaginal with instruments	0	1.6	1.5	1.8	3.1	4.1	3.8	6.4	10.3	9.3	8.7	4.7
Caesarean section in labour	15.2	22.8	31.6	27.9	27.8	24.4	26.8	25.1	20.0	21.3	21.5	25.3
Caesarean section-no labour	63.6	31.5	36.6	42.0	39.4	36.7	34.3	31.7	29.4	24.6	26.0	34.7
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 37: Level of hospital of birth by birth weight group, all babies, 2004

Level of birth hospital	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
Born in a non tertiary hospital	2	21	61	77	113	209	241	294	301	208	111	1638
Born in a tertiary hospital	31	347	552	694	814	1190	711	529	431	250	151	5700
Not born in a hospital		5	4	3	6	10	3	5	12	9	4	61
All babies	33	373	617	774	933	1409	955	828	744	467	266	7399
Percent												
Born in a non tertiary hospital	6.1	5.6	9.9	9.9	12.1	14.8	25.2	35.5	40.5	44.5	41.7	22.1
Born in a tertiary hospital	93.9	93.0	89.5	89.7	87.2	84.5	74.5	63.9	57.9	53.5	56.8	77.0
Not born in a hospital		1.3	0.6	0.4	0.6	0.7	0.3	0.6	1.6	1.9	1.5	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 38: Transport mode by birth weight group, babies transferred to a NICU, 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
Specialist transport team	1	22	56	68	99	167	213	262	274	184	91	1461
nonspecialist transport	1	6	11	14	20	34	47	68	62	53	31	352
All babies	2	28	67	82	119	201	260	330	336	237	122	1813
Percent												
Specialist transport team	50.0	78.6	83.6	82.9	83.2	83.1	81.9	79.4	81.5	77.6	74.6	80.6
nonspecialist transport	50.0	21.4	16.4	17.1	16.8	16.9	18.1	20.6	18.5	22.4	25.4	19.4
All babies	100	100	100	100	100	100	100	100	100	100	100	100

Table 39: Plurality by birth weight group, all babies, 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
Singleton	18	269	459	554	627	946	737	747	728	467	266	5818
Twins	14	92	136	194	281	432	207	81	16	0	0	1453
Triplets	1	11	17	23	24	28	11	0	0	0	0	115
Quadruplets	0	0	2	2	1	3	0	0	0	0	0	8
Quintuplets	0	1	3	1	0	0	0	0	0	0	0	5
All babies	33	373	617	774	933	1409	955	828	744	467	266	7399
Percent												
Singleton	54.5	72.1	74.4	71.6	67.2	67.1	77.2	90.2	97.8	100	100	78.6
Twins	42.4	24.7	22.0	25.1	30.1	30.7	21.7	9.8	2.2	0	0	19.6
Triplets	3.0	2.9	2.8	3.0	2.6	2.0	1.2	0	0	0	0	1.6
Quadruplets	0	0	0.3	0.3	0.1	0.2	0	0	0	0	0	0.1
Quintuplets	0	0.3	0.5	0.1	0	0	0	0	0	0	0	0.1

Table 40: Surfactant use by birth weight group, 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-7000	All babies
none	3	58	208	415	671	1058	752	665	641	413	232	5116
Survanta	30	314	407	357	258	347	198	160	101	52	33	2257
unknown		1	2	2	4	4	5	3	2	2	1	26
All babies	33	373	617	774	933	1409	955	828	744	467	266	7399
Percent												
none	9.1	15.5	33.7	53.6	71.9	75.1	78.7	80.4	86.2	88.4	87.2	69.1
Survanta	90.9	84.2	66.0	46.1	27.7	24.6	20.7	19.2	13.6	11.1	12.4	30.5
unknown		0.3	0.3	0.3	0.4	0.3	0.5	0.4	0.3	0.4	0.4	0.4
All babies	100	100	100	100	100	100	100	100	100	100	100	100

Table 41: Number of babies given assisted ventilation by birth weight group- 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
IPPV given, n:	33	350	469	415	338	248	238	357	425	379	260	135
CPAP given, n:	19	272	546	661	666	640	507	791	595	483	268	171
O2 given, n:	31	349	550	594	593	546	463	727	673	599	376	215

Table 42: Duration of assisted ventilation by birth weight group - 2004

	500-749	750-999	1000-1249	1250-1499	1500-1749	1750-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000+
CPAPhrs- median	786	591	176	66	39	33	26	25	21	17	17
IQR	376-1104	240-893	50-523	22-150	15-87	14-68	12-58	11-60	8-47	7-40	9-32
IPPVhrs - median	421	140	63	41	32	42	42	46	51	60	48
IQR	76-933	43-422	22-138	20-81	18-71	19-75	19-80	24-83	25-108	26-94	21-98
O2 days - median	79	48	21	4	4	3	3	4	4	4	3
IQR	18-113	16-78	3-47	2-18	1-8	1-7	1-6	2-7	2-8	2-10	2-7

Table 43: Supplemental oxygen therapy by birth weight group, all babies, 2004

	<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	251	361	269	116	92	36	36	40	20	11	1248
O2 on day 28 & survived	11	221	346	263	114	84	29	30	38	18	11	1165
O2 on day 28 & survived %	68.8	88.0	95.8	97.8	98.3	91.3	80.6	83.3	95.0	90.0	100.0	93.3
Home Oxygen, n:	6	65	64	24	14	13	4	5	12	5	2	214
CLD n:	14	206	224	136	56	36	1					673
survivors with CLD, n:	11	190	216	134	55	36	1					643
% survived with CLD	78.6	92.2	96.4	98.5	98.2	100	100					95.5

Table 44: Retinopathy of Prematurity by birth weight group, <31 weeks GA or <1250g birth weight

	<499	500-749	750-999	1000-1249	1250-1499	1500+	All Babies
No ROP	7	100	337	529	390	180	1543
Stage1	4	53	76	76	12	8	229
Stage11	2	79	82	31	8	1	203
Stage111	6	47	34	12	6	0	105
Stage1V	0	5	2	0	0	0	7
ROP treatment	5	51	21	6	4	0	87
Not examined	14	89	86	126	128	158	601
All Babies	33	373	617	774	544	347	2688
Percent							
No ROP	36.8	35.2	63.5	81.6	93.8	95.2	73.9
Stage1	21.1	18.7	14.3	11.7	2.9	4.2	11.0
Stage11	10.5	27.8	15.4	4.8	1.9	0.5	9.7
Stage111	31.6	16.5	6.4	1.9	1.4	0	5.0
Stage1V	0	1.8	0.4	0	0	0	0.3
ROP treatment	26.3	18.0	4.0	0.9	1.0	0	4.2

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

Table 45: Intraventricular haemorrhage by birth weight group, babies of <1500g Birth weight, 2004

	<499	500-749	750-999	1000-1249	1250-1499	All Babies
None	16	195	413	555	567	1746
Grade1	5	55	84	76	68	288
Grade 11	5	36	43	31	17	132
Grade 111	0	18	18	16	13	65
Grade 1V	2	48	31	15	6	102
not examined	5	21	16	6	34	82
All Babies	33	373	605	699	705	2415
Percent						
None	57.1	55.4	70.1	80.1	84.5	74.8
Grade1	17.9	15.6	14.3	11.0	10.1	12.3
Grade 11	17.9	10.2	7.3	4.5	2.5	5.7
Grade 111	0	5.1	3.1	2.3	1.9	2.8
Grade 1V	7.1	13.6	5.3	2.2	0.9	4.4

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

Table 46: Incidence of Septicaemia by birth weight group, all babies, 2004

	<499	500-749	750-999	1000-1249	1250-1499	1500-1999	2000+	All babies
No infection noted*	14	168	414	635	857	1331	3082	6501
Sepsis, onset at <48 hours*	0	11	12	9	6	20	44	102
Sepsis, onset at >48 hours+	14	153	166	120	57	47	84	641
Sepsis, early and late onset **	0	3	3	4	2	1	4	17
Babies survived >2days	28	335	595	768	925	1401	3214	7266
All babies	33	373	617	774	933	1409	3260	7399

Table 47: Transfer status and level of hospital, by birth weight group, all babies, 2004

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	28	232	296	335	346	514	479	464	469	312	181
Transferred to level 1 or 2	3	80	229	365	521	816	431	305	216	125	72	3163
Transferred to level 3	0	18	40	37	37	43	20	29	18	15	6	263
NICU in Children's hospital	2	42	51	37	29	36	25	30	41	15	7	315
All babies	33	372	616	774	933	1409	955	828	744	467	266	7397
Per cent												
Not transferred	84.8	62.4	48.1	43.3	37.1	36.5	50.2	56.0	63.0	66.8	68.0	49.4
Transferred to level 1 or 2	9.1	21.5	37.2	47.2	55.8	57.9	45.1	36.8	29.0	26.8	27.1	42.8
Transferred to level 3	0	4.8	6.5	4.8	4.0	3.1	2.1	3.5	2.4	3.2	2.3	3.6
NICU in Children's hospital	6.1	11.3	8.3	4.8	3.1	2.6	2.6	3.6	5.5	3.2	2.6	4.3
All babies	100	100	100	100	100	100	100	100	100	100	100	100

Table 48: 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)	120	112	85	65	47	36	22	15	11	11	10
Interquartile range	100-160	97-133	71-102	54-77	38-57	28-44	16-30	10-22	7-19	7-20	6-20
Survivors with discharge data	12	251	543	739	909	1365	908	780	706	441	250

Table 49: Survival to discharge home by birth weight group, all babies, 2004

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	33	31	0	23	17	12	36.4
500-749	373	366	7	306	283	251	67.3
750-999	617	603	10	581	558	543	88
1000-1249	774	750	6	756	747	739	95.5
1250-1499	933	890	5	919	914	909	97.4
1500-1749	773	746	5	765	759	754	97.5
1750-1999	636	603	9	627	616	611	96.1
2000-2499	955	917	22	931	917	908	95.1
2500-2999	828	808	21	808	790	780	94.2
3000-3499	744	734	17	718	709	706	94.9
3500-3999	467	460	10	449	443	441	94.4
4000-7000	266	265	2	252	250	250	94
All babies	7399	7173	114	7135	7003	6904	93.3

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

1.1 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.

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: Complication, not specified

Coding: 99: unknown

- 0: no other significant antenatal complication
- 1: yes, other antenatal complication present

Sex

Definition: The sex of the patient.

Coding: 0: unknown

1: male

2: female

3: ambiguous - or indeterminate.

Infant weight

Definition: The first weight of the baby after birth. *Coding:* 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 - includes transverse.

Mode of birth

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

Coding: 0: unknown-

1: vaginal - vaginal birth, includes breech

2: instrument - vaginal birth using 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 TcPO₂ is 50-80

mmHg, or if FiO₂ is > 25%, SaO₂ is 88-95%, or if FiO₂ is < 25%, SaO₂ 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.

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

6: persistent pulmonary hypertension - echocardiatic (shunting or clinical evidence - O₂ need unexplained by chest x-ray or loud P₂, or differential pre /post ductal TCPO₂).

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.

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 baby.

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.

4: encephaloclastic porencephaly - relatively late development on cerebral scan of extensive dense, cystic lesions involving the periphery of the brain⁴.

Baby meets local criteria for ROP exam

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

Coding: 99: unknown

0: no

-1: yes, did meet local criteria.

Retinopathy of prematurity (ROP)

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

Coding: 0: none seen - no changes seen

1: stage I - demarcation line.

2: stage II - ridge.

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

4: stage IV - retinal detachment.

5: not examined - no eye examination

Therapy for retinopathy of prematurity

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

Coding: 99: unknown

0: no therapy for ROP received

-1: yes, therapy given for ROP.

Died

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

Coding: 99: unknown

0: no, survived to discharge to home.

-1: yes, died

Date of death

Definition: Date of death of the baby

Coding: DD / MM / YYYY

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

Post Mortem

Definition: Post mortem examination performed

Coding: 99: unknown

0: no post mortem performed

-1: yes, a post mortem was performed

Immediate cause of death

Definition: The cause of death .

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.

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, exotropia 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

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. O₂-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.

Publications of the ANZNN

Meyer M, Mildenhall L, Wong M. Outcomes for infants less than 1000g cared for with a nasal continuous positive airway pressure-based strategy. *J Paediat Child Health* 2004; 40: 38-41

Donoghue, DA. Report of the Australian and New Zealand Neonatal Network 2002. Sydney: ANZNN 2004.