2022

REPORT OF THE

AUSTRALIAN AND NEW ZEALAND NEONATAL NETWORK

UNSW SYDNEY

ANZNN

2022

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AUSTRALIAN AND NEW ZEALAND NEONATAL NETWORK

Sharon S.W. Chow, Prudence Creighton,
James R. Holberton, Georgina M. Chambers and Kei Lui

ANZNN Executive:

Kei Lui (Chair)
David Barker
Malcolm Battin
Margaret Broom
Georgina Chambers
Manbir Chauhan
Anjali Dhawan
Jim Holberton
Rod Hunt
Claire Jacobs
Melissa Luig
Natalie Merida
Laura Prado
Victor Samuel Rajadurai
Naomi Spotswood
Tobias Strunk
Kenneth Tan

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Any enquiries about or comments on this publication should be directed to:

Australian and New Zealand Neonatal Network
At the National Perinatal Epidemiology and Statistics Unit
Level 2, AGSM Building
UNSW Sydney
NSW 2052 Australia

Phone: +61 2 9385 9158

Email: anznn@unsw.edu.au

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Acknowledgements

This is the twenty-seventh report of the Australian and New Zealand Neonatal Network (ANZNN), the fifteenth report in the current format and the eleventh to include a report on 2 to 3-year follow-up. The ANZNN has endeavoured to retain the information provided in previous reports to allow comparative reporting over time. Details of the current format can be found under 'Structure of this report'.

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

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

We thank the following members of the ANZNN Executive Committee for their commitment and guidance for all the activities of the ANZNN: Kei Lui (Chairperson), David Barker, Malcolm Battin, Margaret Broom, Georgina Chambers, Manbir Chauhan, Anjali Dhawan, Jim Holberton, Rod Hunt, Claire Jacobs, Melissa Luig, Natalie Merida, Tori Oliver, Laura Prado, Victor Samuel Rajadurai, Naomi Spotswood, Tobias Strunk and Kenneth Tan.

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We acknowledge our colleagues from the National Perinatal Epidemiology and Statistics Unit (NPESU) and the Centre for Big Data Research in Health for their continued support and encouragement.

Structure of this report

Chapter 1: This chapter presents the structure and organisation of the ANZNN together with some historical information related to its establishment. Also included is information on funding, selection criteria as well as a brief synopsis of level III registrants in Australia and New Zealand for 2022.

Chapter 2: 'Babies registered to level III units' provides information and characteristics on the ANZNN registrants in 2022 who are either born in a hospital with a level III unit or who are born elsewhere and then transferred to a level III unit within the first 28 days of life.

Chapter 3: 'Mothers of level III registrants' provides information on the mothers of level III registrants registered to the ANZNN in 2022.

Chapter 4: 'Characteristics of level III registrants' provides information about the babies admitted to a level III neonatal unit during 2022.

Chapter 5: 'Babies registered to level II units' provides information about babies registered to the level II special care baby units during 2022.

Chapter 6: 'Extremely preterm follow-up, 2016–2019 births' provides 2 to 3 year follow-up information about extremely preterm and/or extremely low birthweight babies registered to the level III neonatal units during 2016 to 2019.

Appendices: Appendix 1 presents 10-year trends.

Appendix 2 presents data tables by birthweight for 2022.

Appendix 3 describes the methods employed for this report.

Appendix 4 contains confidentiality guidelines, and conditions for data collection, use and security.

Appendix 5 presents the Minimum Data Sets for the ANZNN.

Abbreviations

ANZNN	Australian and New Zealand Neonatal Network
APH	antepartum haemorrhage
Bayley-III	Bayley Scales of Infant and Toddler Development Third Edition
Bayley 4 (A&NZ)	Bayley Scales of Infant and Toddler Development (Australian and New Zealand Standardised 4th edition)
CI	confidence interval
CLD	chronic lung disease
CPAP	continuous positive airway pressure
CRIB	Clinical Risk Index for Babies
ECMO	extracorporeal membrane oxygenation
g	gram
GIFT	gamete intra-fallopian transfer
GMFCS	gross motor function classification system
HFOV	high frequency oscillatory ventilation
HMD	hyaline membrane disease
ICD-10-AM	The International Statistics Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
IPPV	intermittent positive pressure ventilation
IQR	interquartile range
IUGR	intrauterine growth restriction
IVF	in vitro fertilisation
IVH	intraventricular haemorrhage
$MgSO_4$	magnesium sulphate
NEC	necrotising enterocolitis
NHF	nasal high flow
NICU	neonatal intensive care unit
NPESU	National Perinatal Epidemiology and Statistics Unit
O_2	oxygen
PCR	polymerase chain reaction
PMA	post menstrual age
PPROM	preterm pre-labour rupture of membranes
PVL	periventricular leukomalacia
ROP	retinopathy of prematurity
SD	standard deviation
UNSW	University of New South Wales
WHO	World Health Organization
WPPSI	Wechsler Preschool and Primary Scale of Intelligence

Participating units and current supporting staff

Level III nurseries:

Australia

New South Wales

Children's Hospital at Westmead

(NICU & special care beds: 23)
Nadia Badawi (Co-director), Himanshu Popat (Co-director), Rob Halliday, Andrew Bedding, Karina Rogers

John Hunter Hospital

(NICU & special care beds: 43)
Larissa Korostenski (Director), Alissa Argomand, Stacey Leonard, Diane Sutherland

Liverpool Health Service

(NICU & special care beds: 31)
Jacqueline Stack (Director), Ian Callander, Amanda Beasley, Melanie Edmands

Nepean Hospital

(NICU & special care beds: 37)
Lyn Downe (Director), Vijay Shingde, Basiliki Lampropoulos, Jacqueline Furey, Mee Fong Chin

Royal Hospital for Women

(NICU & special care beds: 44)
Srini Bolisetty (Director), Kei Lui, Diane Cameron, Brianna Draskovic, Joanne Blaeck

Royal North Shore Hospital

(NICU & special care beds: 27)
Eveline Staub (Director), Jennifer Bowen, Amy Sparks, Lyn Barnes

RPA Women and Babies

(NICU & special care beds: 34)
Mark Greenhalgh (Director), Shelley Reid

Sydney Children's Hospital

(NICU & special care beds: 4)
Hari Ravindranathan (Director), Janelle Young

Westmead Hospital

(NICU & special care beds: 44)
Melissa Luig (Director), Melissa Ross, Tracey Anne Goyen, Jane Baird, Gemma Lowe

Neonatal Intensive Care Units' (NICUS) Data Registry

(New South Wales and Australian Capital Territory)
Sara Sedgley, Rose Boland, Sarah West, Mark Leckie

Australian Capital Territory

The Canberra Hospital

(NICU & special care beds: 29)
Hazel Carlisle (Director), Allana Carter, Judith Smith, Laura Maher, Amanda Dyson, Laura Briguglio, Melanie Rosin

Victoria

Joan Kirner Women's & Children's at Sunshine Hospital

(Special care beds: 30)
Clare Collins (Director), Damien Gilby, Elizabeth Noble

Mercy Hospital for Women

(NICU & special care beds: 58)
Arun Nair (Director), Dan Casalaz, Jim Holberton, Emily Burke

Monash Medical Centre

(NICU & special care beds: 64)
Alice Stewart (Director), Kenneth Tan, Rod Hunt, Rose Li, Emily Johnston, Samantha Tyrer

Royal Children's Hospital

(NICU & special care beds: 34)
Leah Hickey (Director), Jo Brooks

Royal Women's Hospital

(NICU & special care beds: 60)
Risha Bhatia (Director), Sue Jacobs, Carl Kuschel, Jeanie Cheong, Alison Martin, Jennifer Walsh

Tasmania

Royal Hobart Hospital

(NICU & special care beds: 26)
Tony De Paoli (Director), Peter Dargaville, Naomi Spotswood, Ruth Wilson, Charlotte Jenkins

Queensland

Gold Coast Hospital

(NICU & special care beds: 33)
Peter Schmidt (Director), Timothy Hong, Manbir Chauhan, Kobi Best, Patricia Roberts, Teena George

Mater Mothers' Hospital

(NICU & special care beds: 79)
Pita Birch (Director), Elizabeth Hurrion, Tori Oliver, Leith Poulsen

Royal Brisbane and Women's Hospital

(NICU & special care beds: 71)
Pieter Koorts (Director), Katherine White, David Cartwright, Linda McLaughlin, Melissa Lai, Zuleiga Goder

Townsville University Hospital

(NICU & special care beds: 44)
Gary Alcock (Director), Louise McIldowie, Wendy Kennedy

South Australia

Flinders Medical Centre

(NICU & special care beds: 35)
Scott Morris (Director), Vanessa Ellison, Edith van Loon, Kelly Wessell

Women's and Children's Hospital

(NICU & special care beds: 49)
Michael Stark (Director), Amy Keir, Andy McPhee, Sara Cadd, Meg Bater, Natalie Joyner

Western Australia

King Edward Memorial and Perth Children's Hospitals

(NICU & special care beds: 137)
Mary Sharp (Director), Steven Resnick, Rebecca Thomas, Rolland Kohan, Shripada Rao, Andy Gill, Jane Pillow, Damber Shrestha

Fiona Stanley Hospital

(NICU & special care beds: 22)
Mangesh Deshmukh (Director), Shailender Mehta

Northern Territory

Royal Darwin Hospital

(NICU & special care beds: 25)
Mantho Kgosiemang (Director), Dennis Bonney, Deborah Ribbon, Connie Yii

Newborn emergency transport services

Newborn & paediatric Emergency Transport Service (NETS, NSW)

Andrew Berry (Director)

Paediatric Infant Perinatal Emergency Retrieval (PIPER, Victoria)

Michael Stewart (Director)

Neonatal Retrieval Service (NeoRESQ, Queensland)

Lucy Cooke (Director)

Newborn Emergency Transport Service of Western Australia (NETS, WA)

Jonathan Davis (Director)

SAAS MedSTAR Kids (South Australia)

Bron Hennebry (Director)

New Zealand

Christchurch Women's Hospital

(NICU & special care beds: 41)
Bronwyn Dixon (Director), Nicola Austin, Adrienne Lynn, Brian Darlow (Professor of Paediatrics), Trish Graham

Dunedin Hospital

(NICU & special care beds: 16)
Jason Wister (Director), Liza Edmonds, Frances McCaffrey

Middlemore Hospital

(NICU & special care beds: 38)
Guy Bloomfield (Director), Kristin O'Connor, Kelly Roczniak, Rebecca Griffith

National Women's Health (at Auckland City Hospital)

(NICU & special care beds: 46)
Mariam Buksh (Director), Malcolm Battin, David Knight, Sabine Huth

Waikato Hospital

(NICU & special care beds: 41)
Jutta van den Boom (Director), Miranda Bailey, Christine Jones, Claire West, Vinayak Kodur

Wellington Regional Hospital

(NICU & special care beds: 40)
Helen Miller (Co-Director), Angelica Allermo-Fletcher (Co-Director), Harshad Patel, Claire Jacobs

Hong Kong*

Prince of Wales Hospital*

(NICU & special care beds: 82)
Alan So (Director), Simon Lam, Peggy Chan, Xuelian Wang

*data not included in this report

Level II nurseries:

Australia

New South Wales

Blacktown Hospital

(Special care beds: 24)
Anjali Dhawan (Director), Therese Freeman, Jessica Lagos

Campbelltown Hospital

(Special care beds: 15)
Raymond Chin (Director), Lauren Rodgers, Catherine Allgood, Fiona Kite

Gosford District Hospital

(Special care beds: 25)
Ahmed Khan (Director), Adam Buckmaster, Jane Wardle

St George Hospital

(Special care beds: 8)
Bob Fonseca (Director), Beverley Lewis

The Maitland Hospital

(Special care beds: 8)
David Rogers (Director), Jessica Crombie, Linda Bailey, Benita Botha

Tamworth Hospital

(Special care beds: 6)
Genaro Domingo (Director), Therese Madden

Wagga Wagga Base Hospital

(Special care beds: 7)
John Preddy (Director), Dianne Webb

Wollongong Hospital

(Special care beds: 20)
Susie Piper (Director), Ian Wright, Sylvia Lees, Danielle Coggan

Victoria

The Northern Hospital

(Special care beds: 15)
Wei Qi Fan (Director), Pampha Khanal, Angelica Francis

Queensland

Bundaberg Hospital

(Special care beds: 8)
Matt Wakeley (Director), Christopher Edwards

Cairns Hospital

(Special care beds: 22)
Neil Archer (Director), Sue McMahon, Marg Cuming

Logan Hospital

(Special care beds: 16)
Jan Cullen (Director), Angela Geraghty

Mackay Base Hospital

(Special care beds: 8)
Vasanthakumar Selvarajah (Director), Joanne Morganson

Redcliffe Hospital

(Special care beds: 10)
Simon Grew (Director), Meredith Shallcross, Jeanie Cooper

Redland Hospital

(Special care beds: 8)
Dougie Thomas (Director), Nicole Black, Sharon Grobler

Sunshine Coast University Hospital

(Special care beds: 27)
Lizelle Weber (Director), Janet Rowley

South Australia

Lyell McEwin Hospital

(Special care beds: 16)
Michael Hewson (Director), Penelope Miller

Northern Territory

Alice Springs Hospital

(Special care beds: 8)
James Dowler (Director), Marion Bates, Suji Thomas, Minnu Jolly

New Zealand

Gisborne Hospital

(Special care beds: 6)
Shaun Grant (Co-Director), Stanley Ng (Co-Director), Lianne Hollis, Claire Johansen

Hawkes Bay Hospital

(Special care beds: 12)
Daniel Riviere (Director), Margarette Tapgos, Emily Gallagher, Ally Bambry

Lower Hutt Hospital

(Special care beds: 12)
Sarah Mills (Director), Debbie Bashaw

Nelson Hospital

(Special care beds: 8)
Garth Smith (Director), Nathalie Robinson

North Shore Hospital

(Special care beds: 12)
Christopher Peterson (Director), Kerryn Shaw, Mary Lou Macapondag

Palmerston North Hospital

(Special care beds: 17)
Jeff Brown (Director), Alice Bigwood

Rotorua Hospital

(Special care beds: 10)
Sarka Davidkova (Director), Leanne Turvey, Taylah Ma

Southland Hospital

(Special care beds: 6)
Ian Shaw (Director), Liz Hanning-Baird

Taranaki Base Hospital

(Special care beds: 8)
Lisa Power (Director), Amanda Thompson

Tauranga Hospital

(Special care beds: 12)
Anita Lala (Director), Anna Hayns

Timaru Hospital

(Special care beds: 2)
Mick Goodwin (Director), Mark Liddy

Waitakere Hospital

(Special care beds: 15)
Christopher Peterson (Director), Stefanie Smith

Wairau Hospital

(Special care beds: 4)
Margaret Andre (Director)

Whakatane Hospital

(Special care beds: 4)
Michael Herd (Director), Kellie Butler

Whanganui Hospital

(Special care beds: 4)
David Montgomery (Director), Barbara Hammond

Whangarei Area Hospital

(Special care beds: 8)
David Barker (Director), Georgia Kidd, Sarah Middlemass

ANZNN Program and Secretariat

National Perinatal Epidemiology and Statistics Unit (NPESU)

Georgina Chambers (Director), Sharon Chow, Prudence Creighton, Evelyn Karantonis, Will Shenton

1. Organisation of the ANZNN

History

A prospective audit of high-risk infants commenced in 1994 with all level III neonatal intensive care units (NICUs) in Australia and New Zealand contributing data on babies from 1 January 1995. One of the member level II units became a level III unit in 2014, followed by another two units in 2020 and 2022, respectively. An NICU in Hong Kong also joined in 2017, bringing the total of NICU members to 32. For the purposes of this report, data submitted by NICU members outside of Australia and New Zealand have not been included.

In 1998, all the level II units in New Zealand joined the Network and began contributing data. The level II unit in Tasmania, Australia joined in 1999 and level II units within Australia continue to join with a total of 16 units contributing data in 2022.

Aims and objectives

The ANZNN clinical quality registry aims to improve the care of high-risk newborn infants and their families in Australia and New Zealand by enabling benchmarking and so collaborative audit, plus facilitating research.

This is achieved through the following objectives:

- provide a core data set that will:
  - provide information on neonatal outcomes, adjusted for case mix and disease severity, to participating neonatal units to assist with quality improvement
  - identify trends and variations in morbidity or mortality
  - assist with the identification of areas of priority for research
  - enhance the ability to carry out multicentre studies and randomised controlled trials through collaboration
- monitor the clinical indicators for perinatal care and improving clinical practice while maintaining national standards of evidence-based care
- monitor the use of new technologies, e.g. high flow/oxygen air usage by patient type and outcome
- achieve consistency in national data collections.

Each year, an annual report of the ANZNN clinical quality registry is published as part of the *Report of the Australian and New Zealand Neonatal Network* series.

Structure of the ANZNN

The ANZNN is located in the National Perinatal Epidemiology and Statistics Unit (NPESU) within the University of New South Wales (UNSW Sydney). The arrangement is managed under a memorandum of understanding (MOU) between the ANZNN and UNSW Sydney.

The governance structure of the ANZNN (Figure 1) consists of the Advisory Council, the Executive Committee, and the Data Collection and Operations Committee. The Advisory Council is the governing body of ANZNN and includes the director (or their nominee) of each participating unit, academic neonatologists and regional representatives of neonatal nurses. The Director of the NPESU, who is the data custodian for the ANZNN, is also a member of the Advisory Council. The purpose of the Advisory Council is to monitor the progress of the ANZNN, discuss current issues and agree on new variables for inclusion in the minimum data set and to approve the use of the data for research – all as recommended by the Executive Committee.

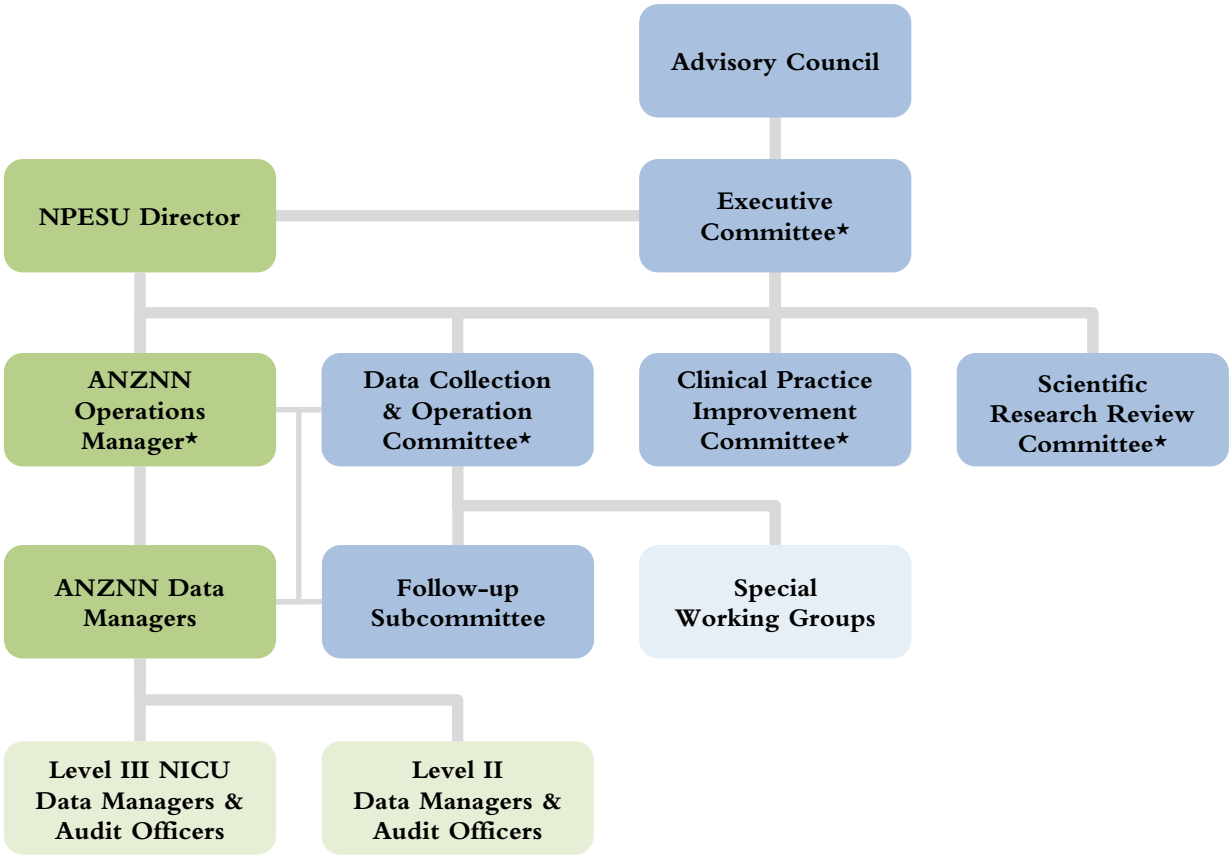
The Executive Committee is an elected committee with regional representation from unit directors, a data manager group representative and neonatal nurse representatives from across the network, and a consumer representative. It oversees the general functioning of the network, finance and decision-making, as reported by the Chairman and Operations Manager.

The Data Collection and Operation Committee coordinates the operations of the ANZNN data collection, monitors the workload and progress of the annual report and reports through the Executive Committee to the Advisory Council.

The Operations Manager deals with day-to-day business of the ANZNN and reports to the Executive Committee and Data Collection and Operation Committee.

The unit data managers and audit officers are responsible for the collection and submission of data to the ANZNN. The ANZNN Operations Manager is the point of contact for the ANZNN and liaises with the ANZNN committees, NPESU, data managers and audit officers.

FIGURE 1: Structure of the ANZNN



**ANZNN Management Group – comprised of the Chairs of these committees and the ANZNN Operations Manager.*
Note: *NICU = neonatal intensive care unit.*

Registration criteria

Babies who were admitted to a participating unit during the first 28 days of life and meet one or more of the following criteria are eligible for registration with the ANZNN clinical quality registry:

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

The hospital of registration was the first level III NICU in which the baby, aged less than 28 days, stayed for four or more hours. Babies who received their entire care in a level II hospital or who were not transferred to a level III NICU during the first 28 days were registered to the first level II centre that they remained in for

four or more hours. Data is collected until the baby's first discharge to home. Babies who were discharged home prior to admission to a participating unit were not eligible for registration in the ANZNN clinical quality registry.

Funding support

The ANZNN is primarily funded through the annual registration fees from level III units. The registration fee is determined annually by the Advisory Council. In return, individual units receive a feedback report that enables them to benchmark their unit against the combined ANZNN data set.

Chiesi Australia makes an annual contribution and the ANZNN thanks them for their generosity and support.

Data set variables

The variables used for the 2022 audit are listed in Appendix 5 and are also available on the website < **www.anznn.net** >.

2022

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AUSTRALIAN AND NEW ZEALAND NEONATAL NETWORK

Babies born in Australia

There were 9,903 babies registered to the ANZNN from the 25 level III NICUs in Australia, representing 3.3% of the 300,684 notified live births in 2022 (Australian Bureau of Statistics 2023). Of these registrants, 78.6% were born in a hospital with tertiary care facilities. There were 2,775 babies born before 32 weeks gestation representing 28.0% of Australian registrants.

Maternal ethnicity was provided for 95.2% of mothers: 70.2% of the mothers of these babies identified as Caucasian and 15.3% as Asian. One in twelve mothers (8.5%) identified as Aboriginal or Torres Strait Islander, which was higher than the proportion reported in all births in Australia in 2022 (8.1%) (Australian Bureau of Statistics 2023).

Among Australian NICU admissions registered to the ANZNN, 1,591 were from multiple births representing 16.1% of ANZNN admissions in Australia in 2022.

Male babies were over-represented among NICU admissions – 59.9% of the Australian ANZNN registrants, compared with 51.3% among live births in Australia (Australian Bureau of Statistics 2023).

Assisted ventilation (intermittent positive pressure ventilation (IPPV), continuous positive airway pressure (CPAP) or nasal high flow (NHF)) was provided for 9,661 babies (3.2% of live births) and non-invasive ventilation (CPAP or NHF) was the only form of respiratory assistance for 6,536 babies.

Babies born in New Zealand

There were 2,474 babies who met ANZNN registration criteria from the six level III NICUs in New Zealand representing 4.2% of the 58,887 live births registered in New Zealand in 2022 (Statistics New Zealand 2023). Of these registrants, 85.6% were born in a hospital with tertiary care facilities. There were 631 babies born before 32 weeks gestation representing 25.5% of New Zealand registrants.

Maternal ethnicity was reported for 97.1% of the New Zealand registrants. The percentage of Caucasian mothers was 44.8%. A higher proportion of mothers identified themselves as Māori (23.6%) compared to 11.7% of mothers identified as Pacific peoples and 16.7% as Asian.

Among New Zealand NICU admissions registered to the ANZNN, 324 were from multiple births representing 13.1% of ANZNN admissions in New Zealand in 2022.

Male babies were also over-represented among NICU admissions in New Zealand – 59.3% of the New Zealand registrants compared to 50.8% of total live births in New Zealand (Statistics New Zealand 2023).

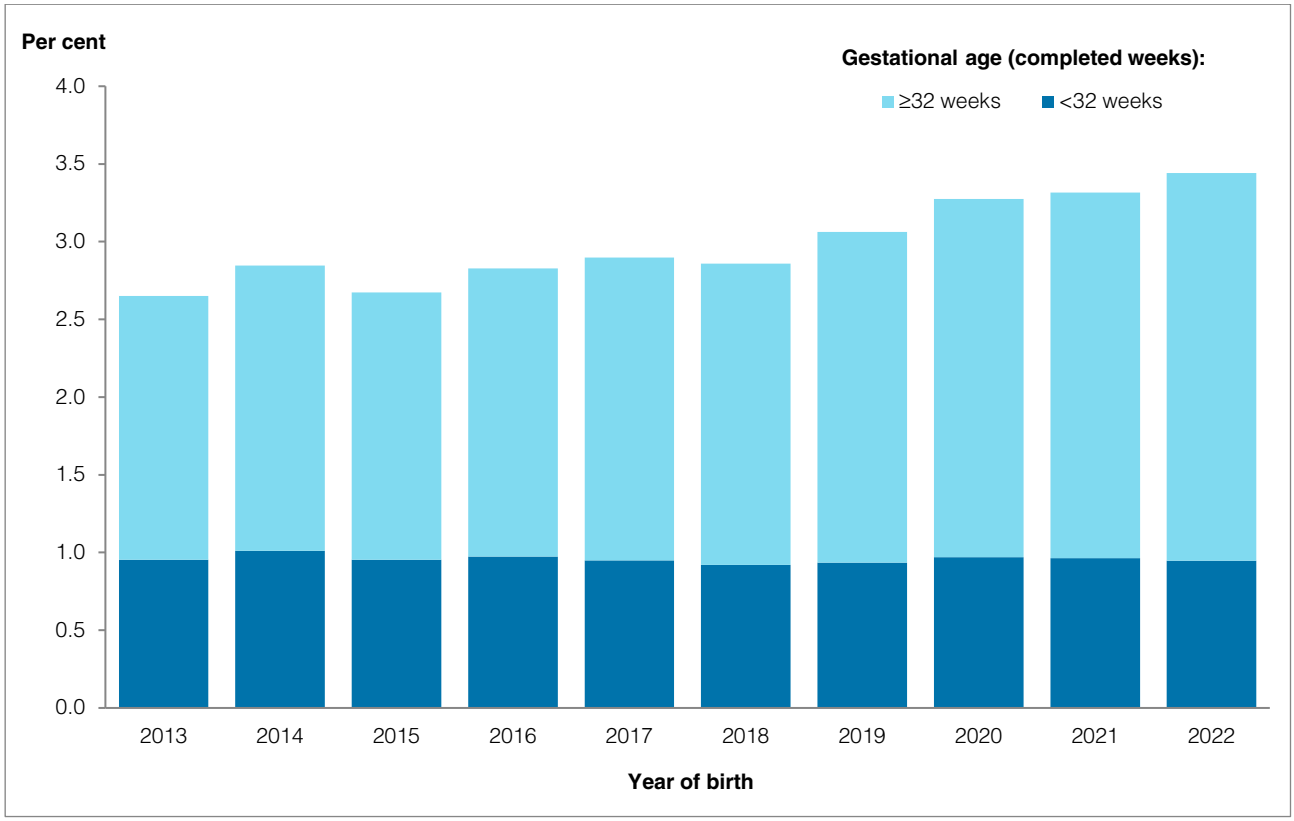
Assisted ventilation (IPPV, CPAP or NHF) was given to 2,441 babies representing 4.1% of all live births with 1,835 babies receiving non-invasive ventilation (CPAP or NHF) as the only form of respiratory assistance (3.1% of all live births).

2. Babies registered to level III units

This section includes data on the ANZNN registrants from all 31 level III NICUs in Australia and New Zealand. Registrants also include babies born in other hospitals and transferred to a level III NICU within the first 28 days of life.

Of the babies born in 2022 and admitted to an NICU in Australia and New Zealand, 12,377 fulfilled the registration criteria for inclusion in the ANZNN clinical quality registry. The population represents 3.4% of the 359,571 live births in the two countries in 2022 (Australian Bureau of Statistics 2023; Statistics New Zealand 2023) (Figure 2), compared with 3.3% in 2021. The number of registrants in 2022 was 150 more than in 2021.

FIGURE 2: Proportion of liveborn babies in Australia and New Zealand who were ANZNN level III registrants, by year of birth, ANZNN 2013–2022



Of the 12,377 ANZNN registrants born in 2022, there were 3,406 (27.5%) babies born before 32 weeks gestation and 8,971 babies born at 32 weeks or more (72.5%). Of the registrants born before 32 weeks gestation, 98.0% received assisted ventilation. The major indication for assisted ventilation in this age group was hyaline membrane disease.

The largest level III NICU in Australia and New Zealand registered over 1,100 babies in 2022, the smallest just under 40 (Figure 3). The median number of babies registered to an ANZNN unit was 380.

The gestational age at birth and birthweight for babies qualifying for inclusion in the ANZNN 2022 level III audit is set out in Tables 1 and 2 respectively. The number of babies qualifying under each registration criteria is set out in Figure 4, and the 10-year trend (2013–2022) in gestational age at birth is presented in Figure 11 in Appendix 1.

FIGURE 3: Number of level III registrants born at each neonatal intensive care unit, ANZNN 2022

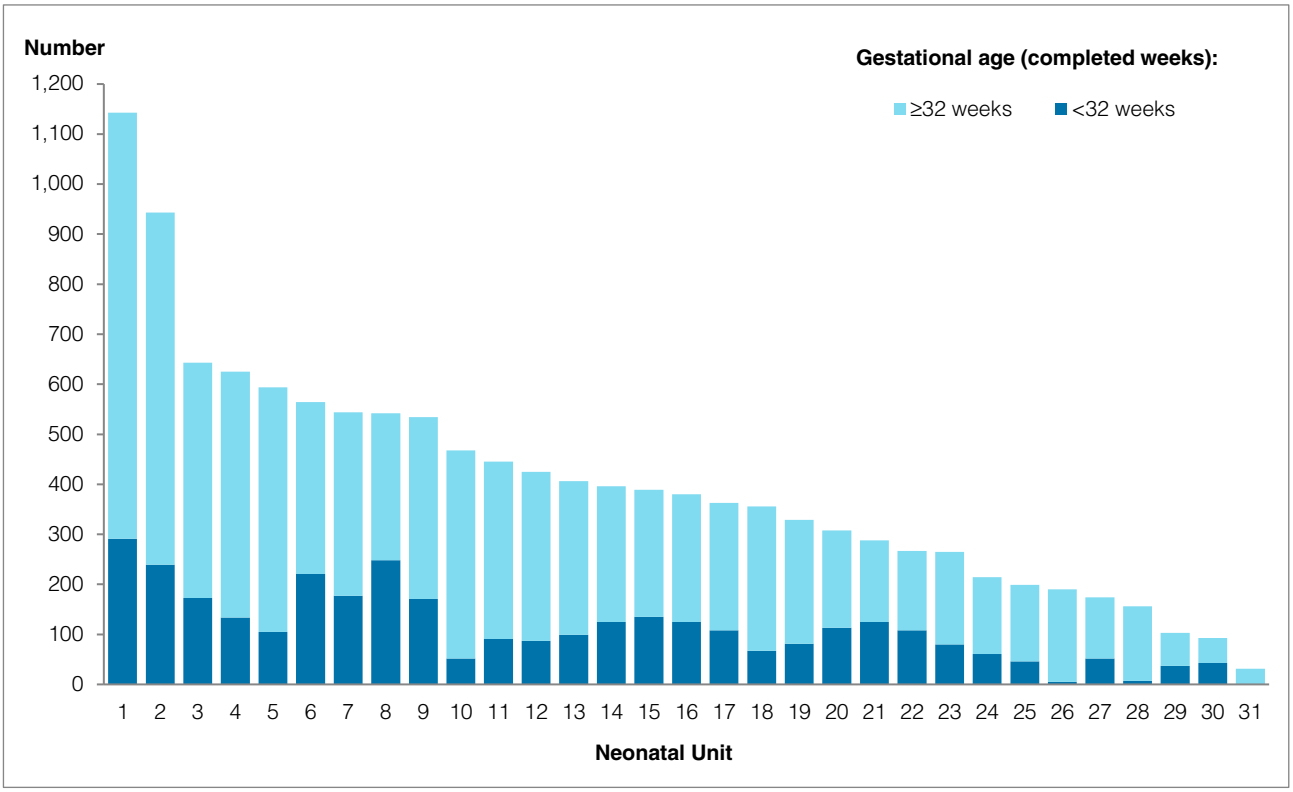


TABLE 1: Level III registrants born at each completed week of gestation, ANZNN 2022

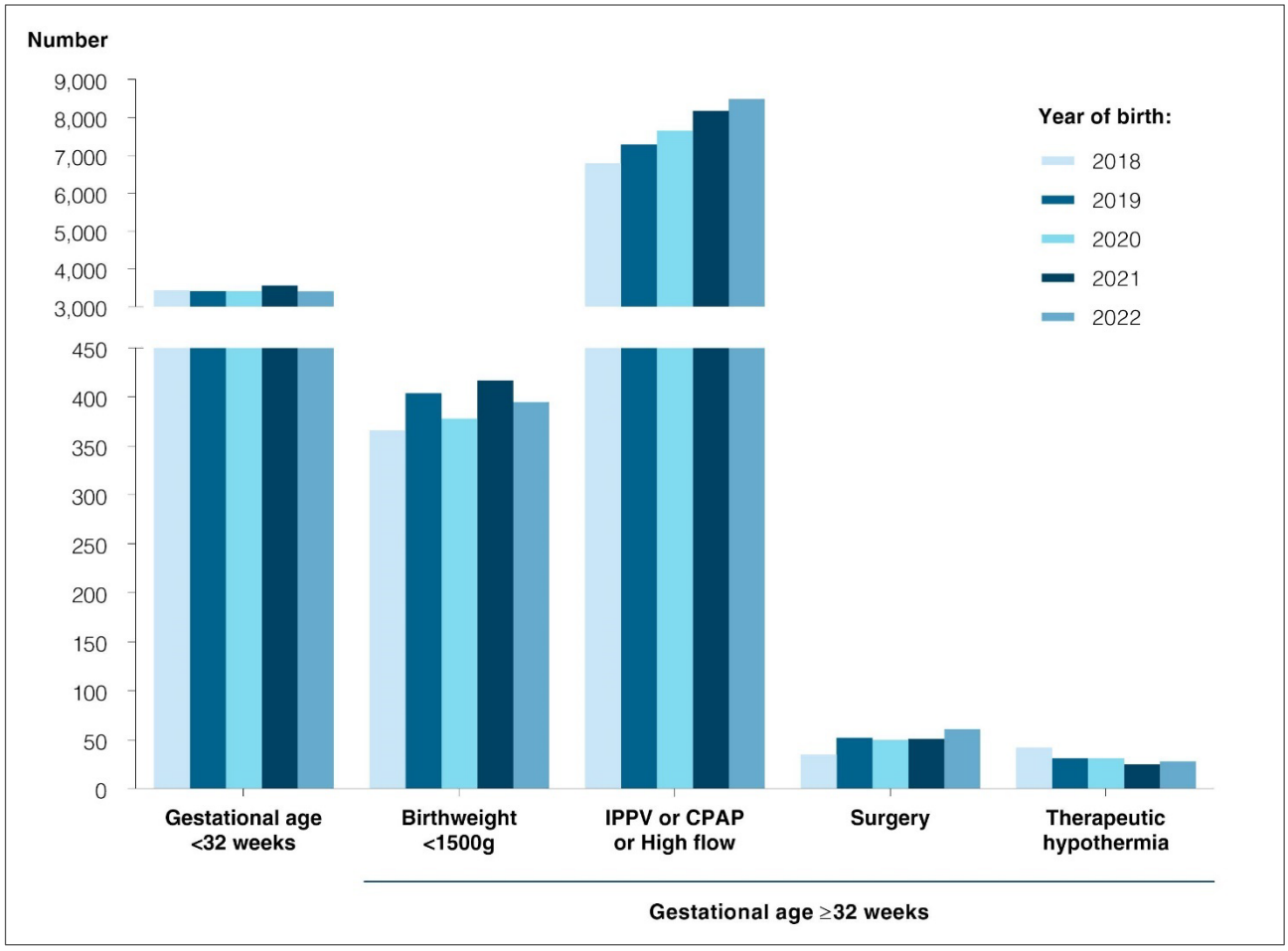
Gestational age (weeks)	Number of babies	Percent	Cumulative percent
<24	112	0.9	0.9
24	152	1.2	2.1
25	211	1.7	3.8
26	284	2.3	6.1
27	370	3.0	9.1
28	428	3.5	12.6
29	502	4.1	16.6
30	606	4.9	21.5
31	741	6.0	27.5
All babies <32 weeks	**3,406**	**27.5**	
32	748	6.0	33.6
33	733	5.9	39.5
34	828	6.7	46.2
35	739	6.0	52.1
36	863	7.0	59.1
37	1,098	8.9	68.0
38	1,207	9.8	77.7
39	1,236	10.0	87.7
40	951	7.7	95.4
41	519	4.2	99.6
≥42	49	0.4	100.0
Total	**12,377**	**100.0**	

Note: *Gestational ages ≥42 weeks have been combined to maintain confidentiality of small numbers.*

TABLE 2: Level III registrants in each birthweight group, ANZNN 2022

Birthweight (grams)	Number of babies	Percent	Cumulative percent
<500	49	0.4	0.4
500–599	119	1.0	1.4
600–699	186	1.5	2.9
700–799	217	1.8	4.6
800–899	282	2.3	6.9
900–999	300	2.4	9.3
1,000–1,099	278	2.2	11.6
1,100–1,199	312	2.5	14.1
1,200–1,299	380	3.1	17.2
1,300–1,399	402	3.2	20.4
1,400–1,499	419	3.4	23.8
All babies <1,500g birthweight	**2,944**	**23.8**	
1,500–1,999	1,685	13.6	37.4
2,000–2,499	1,552	12.5	49.9
2,500–2,999	1,710	13.8	63.8
3,000–3,499	2,062	16.7	80.4
3,500–3,999	1,589	12.8	93.3
≥4,000	835	6.7	100.0
Total	**12,377**	**100.0**	

FIGURE 4: Level III registrants by registration criteria, ANZNN 2018–2022



Note: *Babies are assigned to the first registration criteria that they meet in the following order: (i) gestational age <32 weeks, (ii) birthweight <1,500g, (iii) received 4 or more hours of IPPV, CPAP or high flow, (iv) received major surgery, (v) received therapeutic hypothermia.*

3. Mothers of level III registrants

Maternal age

While there are many determinants of perinatal outcome, an important one is maternal age. In 2022, the age of mothers of neonates registered as high-risk ranged from less than 16 years to over 50 years. The highest proportion of registrant mothers was aged 30–34 years (33.8%) followed by mothers aged 25–29 years (24.1%). Together they accounted for nearly three in five of the mothers (57.9%) of ANZNN registrants in 2022 (Table 3). In 2022, the proportion of babies born to teenage mothers decreased slightly from 2021, and those born to mothers in the 35–39 age group increased slightly, from 22.5% in 2021 to 22.7%.

Over two in five of the babies born to teenage mothers (43.9%) were born at less than 32 weeks completed gestation, while 26.0% of babies born to mothers 30–34 years were less than 32 weeks gestation at birth (Table 3).

TABLE 3: Age group of mothers of level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Maternal age (years)	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Less than 20	<5	16	24	34	42	35	n.p.	71	271
20–24	n.p.	57	78	91	156	169	n.p.	526	1,341
25–29	34	87	152	228	309	328	564	1,238	2,940
30–34	34	108	217	296	417	479	822	1,753	4,126
35–39	24	67	134	210	320	354	551	1,111	2,771
40 and over	5	25	45	59	86	99	166	285	770
Not stated	1	3	4	12	17	17	28	76	158
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Less than 20	n.p.	4.4	3.7	3.7	3.2	2.4	n.p.	1.4	2.2
20–24	n.p.	15.8	12.0	9.9	11.7	11.5	n.p.	10.6	11.0
25–29	30.6	24.2	23.4	24.8	23.2	22.4	23.5	24.8	24.1
30–34	30.6	30.0	33.4	32.2	31.4	32.7	34.2	35.2	33.8
35–39	21.6	18.6	20.6	22.9	24.1	24.2	22.9	22.3	22.7
40 and over	4.5	6.9	6.9	6.4	6.5	6.8	6.9	5.7	6.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*
Maternal data for babies of a multiple birth are presented for each registrant.

Previous antenatal history

A previous preterm delivery was reported by 1,227 (9.9%) mothers of babies registered to ANZNN in 2022 while 444 mothers (3.6%) reported a previous perinatal loss.

Assisted conception

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

There were 998 (8.1%) pregnancies resulting from assisted conception in the ANZNN 2022 cohort with most (85.8%) following IVF treatment. Of the pregnancies resulting from assisted conception, 53.9% of the mothers were more than 34 years of age at the time of giving birth, compared with 54.7% in 2021.

Presenting antenatal problem

Many mothers of ANZNN registrants were admitted to hospital with complications prior to the baby's birth. The presenting antenatal problem refers to the antenatal complication that led to the baby's birth and subsequent admission to an NICU. There may be other complications related to this pregnancy, but they are not reported here. Information about the presenting antenatal problem was available for 99.4% of 2022 ANZNN registrants. The mothers of nearly one in five registrants (18.6%) presented with preterm labour while fetal distress (14.0%) was the second highest presenting antenatal problem (Table 4).

The maternal antenatal complications for registrants born at 37–44 weeks, 32–36 weeks and less than 32 weeks gestational age are set out in Figure 5. For women who gave birth before 32 weeks gestation and women who gave birth at 34–36 weeks gestation, the most common presenting antenatal problem was preterm labour (34.8% and 26.6% respectively) followed by preterm pre-labour rupture of membranes (22.0% and 13.4% respectively).

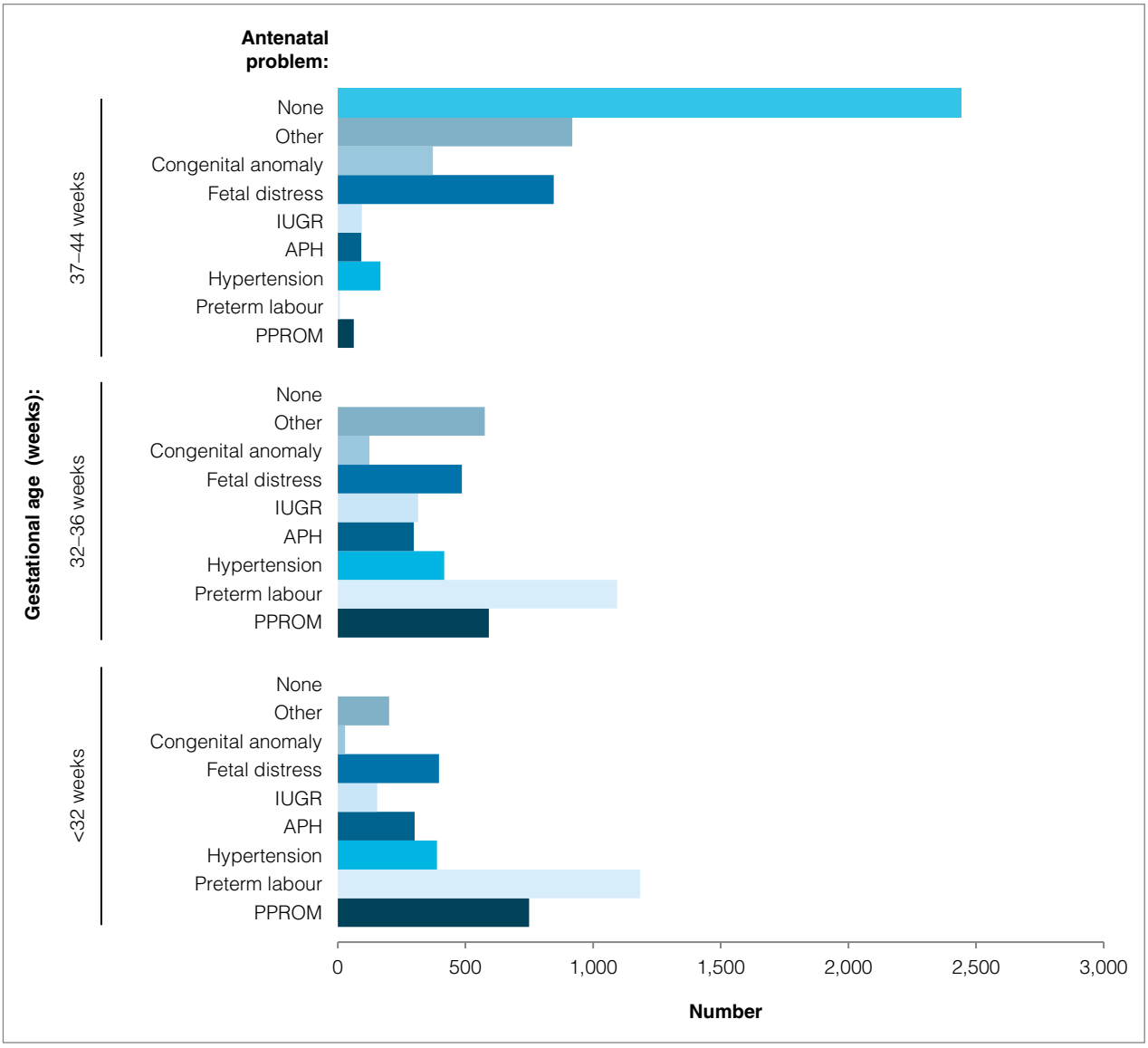
Overall 79.7% of mothers of registrants had a pregnancy complication recorded. Among women who gave birth at term, nearly half (48.2%) were recorded as having no maternal presenting antenatal problem.

TABLE 4: Mother's presenting antenatal problem for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Presenting antenatal problem	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
No antenatal problems	0	0	0	0	0	0	0	2,441	2,441
Preterm pre-labour rupture of membranes	38	81	138	195	297	268	324	62[(a)]	1,403
Preterm labour	45	188	238	300	413	448	645	8	2,285
Hypertension in pregnancy	<5	23	72	111	178	n.p.	228	167	971
Antepartum haemorrhage	16	34	47	79	125	124	173	92	690
Intrauterine growth restriction	0	5	30	56	63	115	200	94	563
Fetal distress	<5	18	n.p.	129	175	179	307	846	1,728
Other problem	6	14	54	53	74	133	443	919	1,696
Congenital anomalies	0	0	<5	6	18	n.p.	101	371	523
Not stated	1	0	0	1	4	2	9	60	77
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
No antenatal problems	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.8	19.8
Preterm pre-labour rupture of membranes	34.2	22.3	21.1	21.0	22.1	18.1	13.4	1.2	11.4
Preterm labour	40.5	51.8	36.4	32.3	30.8	30.3	26.6	0.2	18.6
Hypertension in pregnancy	n.p.	6.3	11.0	11.9	13.3	n.p.	9.4	3.3	7.9
Antepartum haemorrhage	14.4	9.4	7.2	8.5	9.3	8.4	7.1	1.8	5.6
Intrauterine growth restriction	0.0	1.4	4.6	6.0	4.7	7.8	8.3	1.9	4.6
Fetal distress	n.p.	5.0	n.p.	13.9	13.0	12.1	12.7	16.9	14.0
Other problem	5.4	3.9	8.3	5.7	5.5	9.0	18.3	18.4	13.8
Congenital anomalies	0.0	0.0	n.p.	0.6	1.3	n.p.	4.2	7.4	4.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) These mothers presented with preterm labour, then went on to deliver at term.
***Note:** Not stated data are excluded from per cent calculations.*
Maternal data for babies of a multiple birth are presented for each registrant.

FIGURE 5: Presenting antenatal problem for mothers of level III registrants by gestational age, ANZNN 2022



Note: *Maternal data for babies of a multiple birth are presented for each registrant.*
PPROM = preterm pre-labour rupture of membranes. APH = antepartum haemorrhage. IUGR = intrauterine growth restriction.

Antenatal corticosteroid use

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

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

Table 5 presents antenatal corticosteroids use for mothers of ANZNN registrants in each gestational age group. In 2022, 89.0% of mothers of ANZNN registrants born before 34 weeks of gestation received one or more doses of antenatal corticosteroids, leaving 11.0% of mothers of registrants in this group who did not report receiving any antenatal corticosteroids. Of the mothers who received antenatal corticosteroids, 13.4% received them more than seven days prior to giving birth.

For mothers of ANZNN registrants born before 32 weeks of gestation, 91.0% received one or more doses of antenatal corticosteroids and 9.0% mothers of registrants in this group were not reported as receiving any antenatal corticosteroids. Of the mothers who received antenatal corticosteroids, 13.5% received them more than seven days prior to giving birth (Table 5). The 10-year trend (2013–2022) for maternal corticosteroids is represented by Figure 12 in Appendix 1.

TABLE 5: Antenatal corticosteroid use for mothers of level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Antenatal corticosteroids	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
None	n.p.	22	48	74	138	n.p.	1,393	4,226	6,135
Incomplete course	42	107	164	229	362	386	289	15	1,594
Complete course within 7 days of birth	59	192	364	511	653	694	459	27	2,959
Given >7 days prior to birth	<5	40	75	114	186	n.p.	179	41	804
Not stated	0	2	3	2	8	9	110	751	885
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
None	n.p.	6.1	7.4	8.0	10.3	n.p.	60.0	98.1	53.4
Incomplete course	37.5	29.6	25.2	24.7	27.0	26.2	12.5	0.3	13.9
Complete course within 7 days of birth	52.7	53.2	55.9	55.1	48.8	47.1	19.8	0.6	25.7
Given >7 days prior to birth	n.p.	11.1	11.5	12.3	13.9	n.p.	7.7	1.0	7.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*
Maternal data for babies of a multiple birth are presented for each registrant.

Magnesium sulphate

Babies born at less than 32 weeks gestation are at high risk of neurologic injury during labour and immediately after birth. Antenatal administration of magnesium sulphate ($MgSO_4$) to very preterm babies has been demonstrated to provide neuroprotection (Crowther et al 2003, Rouse 2009, Conde-Agudelo and Romero 2009).

For mothers of ANZNN registrants born at less than 32 weeks of gestation, 61.3% were given antenatal $MgSO_4$ (Table 6).

TABLE 6: Magnesium sulphate use for mothers of level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)									
Magnesium sulphate	**<24**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**Total**
					Number					
None	23	20	36	45	58	75	134	342	559	1,292
Complete course	27	51	65	82	93	126	118	97	62	721
Incomplete course	49	55	75	115	160	175	186	122	84	1,021
Given but details unknown	13	24	33	35	50	43	58	36	16	308
Not stated or clinical trial	0	2	2	7	9	9	6	9	20	64
Total	**112**	**152**	**211**	**284**	**370**	**428**	**502**	**606**	**741**	**3,406**
					Per cent					
None	20.5	13.3	17.2	16.2	16.1	17.9	27.0	57.3	77.5	38.7
Complete course	24.1	34.0	31.1	29.6	25.8	30.1	23.8	16.2	8.6	21.6
Incomplete course	43.8	36.7	35.9	41.5	44.3	41.8	37.5	20.4	11.7	30.6
Given but details unknown	11.6	16.0	15.8	12.6	13.9	10.3	11.7	6.0	2.2	9.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: *Not stated and clinical trial data are excluded from per cent calculations.*
Maternal data for babies of a multiple birth are presented for each registrant.

Multiple gestation

Multiple gestation pregnancies are often associated with labour and delivery complications, an increased risk of premature birth, low birthweight infants as well as an increased risk of perinatal mortality and morbidity. In 2022, 15.5% of ANZNN registrants were reported as being from a multiple gestation pregnancy, and of these, the greatest percentage were twins (94.1%). Of the 2022 ANZNN registrants from multiple gestation pregnancies, 47.0% were born before 32 weeks gestation and 95.2% were born before 37 weeks gestation (Table 7). The 10-year trend (2013–2022) for multiple gestation pregnancies is represented by Figure 13 in Appendix 1.

TABLE 7: Plurality of level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Plurality	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Singletons	90	293	492	675	956	1,049	1,939	4,968	10,462
Twins	22	64	151	217	373	405	478	92	1,802
Triplets and higher orders	0	6	11	38	18	27	13	0	113
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Singletons	80.4	80.7	75.2	72.6	71.0	70.8	79.8	98.2	84.5
Twins	19.6	17.6	23.1	23.3	27.7	27.3	19.7	1.8	14.6
Triplets and higher orders	0.0	1.7	1.7	4.1	1.3	1.8	0.5	0.0	0.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Method of birth

Data on method of birth are presented for each baby. Method of birth can be dependent upon gestational age, presenting part of the baby and maternal factors. For three in five (61.4%) of the 2022 registrants, the method of birth was caesarean section with 64.3% of caesarean sections occurring before the onset of labour. One-third of registrants (31.5%) were non-instrumental vaginal births (Table 8). The rate of birth by caesarean section has gradually increased from 49.8%, since the first data collection in 1995, to 61.6% in 2022.

The most common method of birth for registrants born before 24 weeks gestation was non-instrumental vaginal birth (61.6%) (Table 8). The 10-year trend (2013–2022) for method of birth is represented by Figure 14 in Appendix 1.

TABLE 8: Method of birth for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Method of birth	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Vaginal birth	69	160	203	244	381	358	597	1,870	3,882
Vaginal instrumental birth	0	5	10	20	32	51	125	635	878
Caesarean section in labour	21	104	148	220	298	320	485	1,111	2,707
Caesarean section no labour	22	94	292	446	633	750	1,214	1,425	4,876
Not stated	0	0	1	0	3	2	9	19	34
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Vaginal birth	61.6	44.1	31.1	26.2	28.3	24.2	24.7	37.1	31.5
Vaginal instrumental birth	0.0	1.4	1.5	2.2	2.4	3.4	5.2	12.6	7.1
Caesarean section in labour	18.8	28.7	22.7	23.7	22.2	21.6	20.0	22.0	21.9
Caesarean section no labour	19.6	25.9	44.7	48.0	47.1	50.7	50.1	28.3	39.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Place of birth

In line with standard clinical practice guidelines, clinicians endeavour to have all births at less than 33 weeks gestation occur in a perinatal centre equipped with an NICU. In 2022, 80.1% of all babies and 88.8% of babies less than 32 weeks gestation at birth were born in a tertiary centre equipped with an NICU; 18.5% of all ANZNN registrants were born in a non-tertiary hospital; while 1.4% of registrants were not born in a hospital (Table 9).

TABLE 9: Level of hospital of birth for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Level of birth hospital	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Tertiary hospital	101	329	595	834	1,161	1,246	1,938	3,699	9,903
Non-tertiary hospital	n.p.	n.p.	47	88	165	224	472	1,251	2,288
Not born in a hospital[(a)]	<5	<5	12	7	17	9	18	103	170
Not stated	0	0	0	1	4	2	2	7	16
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Tertiary hospital	90.2	90.6	91.0	89.8	86.4	84.2	79.8	73.2	80.1
Non-tertiary hospital	n.p.	n.p.	7.2	9.5	12.3	15.1	19.4	24.8	18.5
Not born in a hospital[(a)]	n.p.	n.p.	1.8	0.8	1.3	0.6	0.7	2.0	1.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) These babies were either born before arrival to hospital or born at home.
Note: *Not stated data are excluded from per cent calculations.*

Transport after birth to a level III NICU

Transport after birth to a level III NICU is required if there is insufficient time before birth to allow the mother to be transferred to a tertiary centre, if a cot is not available in the hospital of birth or if the hospital of birth is unable to manage the degree of immaturity and/or compromise of the newborn.

In 2022, 21.3% of ANZNN registrants were transferred to an NICU after birth. Of these the greatest percentage (83.2%) were transported by a specialist team with 10.6% transported by a non-specialist team (Table 10). The 10-year trend (2013–2022) for mode of transport to a level III NICU is represented by Figure 15 and Figure 16 in Appendix 1.

TABLE 10: Mode of transport to level III NICU after birth for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Mode of Transport	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Not transported	101	326	587	825	1,156	1,235	1,878	3,589	9,697
Specialist retrieval team	8	29	48	80	143	210	462	1,204	2,184
Non-specialist team	<5	0	5	8	27	17	n.p.	166	278
Other	<5	8	14	17	19	16	n.p.	60	164
Not stated	0	0	0	0	2	3	8	41	54
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Not transported	90.2	89.8	89.8	88.7	85.9	83.6	77.5	71.5	78.7
Specialist retrieval team	7.1	8.0	7.3	8.6	10.6	14.2	19.1	24.0	17.7
Non-specialist team	n.p.	0.0	0.8	0.9	2.0	1.2	n.p.	3.3	2.3
Other	n.p.	2.2	2.1	1.8	1.4	1.1	n.p.	1.2	1.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

Breastfeeding at discharge

Data on breastfeeding at discharge were available for 97.4% of the babies born at less than 32 weeks gestation and/or less than 1,500 grams at birth who survived to discharge to home. Among registrants who provided data on breastfeeding, 75.0% were breastfed at discharge. The rate of breastfeeding at discharge of surviving extremely preterm babies (born at less than 28 weeks gestation) was 73.0% compared to 75.6% for surviving very preterm babies (born at least 28 weeks and less than 32 weeks gestation).

4. Characteristics of level III registrants

Baby gender

Male births exceeded female births in Australia and New Zealand and accounted for 51.2% of combined live births in both countries in 2022 (Australian Bureau of Statistics 2023; Statistics New Zealand 2023). The percentage was higher among ANZNN registrants with male births representing 59.8%. For registrants born at less than 32 weeks gestation, 55.0% were male; of births at term, 63.4% were male.

Resuscitation in delivery suite

The type of resuscitation given to babies immediately after birth ranges from the least severe, suction to the most severe, external cardiac massage and ventilator support. For the purpose of this audit, the ANZNN only collected data on babies on whom endotracheal intubation was performed; in 2022, 11.6% of registrants were intubated in the delivery suite to establish independent respiration and heart rate. For babies born before 32 weeks the percentage was 24.8% and for babies born at term the percentage was 7.4%.

Apgar score at birth

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

An Apgar score of less than 4 at one minute of age was recorded for 16.1% of ANZNN registrants, with 3.8% of registrants recording an Apgar score of less than 4 at five minutes of age. Among the babies who had low Apgar scores of less than 4 at one minute, 33.1% of babies were born at less than 32 weeks and 41.2% were born at term (Table 11).

TABLE 11: Apgar scores at birth for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Apgar score	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Apgar score at 1 minute				
Median	3	5	5	6	7	7	7	8	**7**
IQR	2–5	3–6	4–7	4.5–8	5–8	5–9	5–9	5–9	**5–9**
					Apgar score at 5 minutes				
Median	6	7	8	8	9	9	9	9	**8**
IQR	4–7	6–8	7–9	7–9	7–9	8–9	7–9	7–9	**7–9**

Note: *IQR = Interquartile range*

Admission temperature

The body temperature at admission to the NICU, or temperature nearest to admission to the registration unit, was reported for 93.6% of ANZNN registrants in 2022. The rectal temperature is preferred; however, if it is not available the axilla temperature is recorded.

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

The median temperature at admission to the NICU was 36.7°C; the median temperature increased slightly with increasing gestational age at birth. The lowest median temperature recorded was 36.5°C by the youngest babies, i.e. those born at less than 24 weeks gestation (Table 12).

TABLE 12: Admission body temperature for level III registrants by gestational age, ANZNN 2022

Gestational age (weeks)	Number of babies	Temperature (°C)	
		Median	Interquartile range
<24	112	36.5	35.6–37.0
24–25	363	36.8	36.3–37.3
26–27	654	36.8	36.4–37.2
28–29	930	36.8	36.4–37.1
30–31	1,347	36.7	36.4–37.0
32–33	1,481	36.6	36.3–37.0
34–36	2,430	36.6	36.3–36.9
37–44	5,060	36.7	36.4–37.1
Total	**12,377**	**36.7**	**36.4–37.0**

Indication for respiratory support

In 2022, only 2.1% of all ANZNN registrants did not receive any form of respiratory support. For the remaining registrants, non-specific respiratory distress was the most common indication for respiratory support at 38.7%. Hyaline membrane disease (HMD) accounted for 37.8% of babies, while congenital anomalies accounted for 3.9% (Table 13).

For babies born before 37 weeks gestation, HMD (58.7%) remained the most common indication for respiratory support. For babies born at term, non-specific respiratory distress (52.1%) was the most common indication followed by meconium aspiration syndrome (8.5%) (Table 13). The 10-year trend (2013–2022) for mode of assisted ventilation is represented by Figure 17 in Appendix 1.

TABLE 13: Indication for respiratory support for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Indication for respiratory support	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
No respiratory support	0	0	0	<5	65	61	n.p.	77	263
Non-specific respiratory distress	<5	7	n.p.	79	264	547	1,226	2,607	4,752
Hyaline membrane disease	104	346	616	833	947	754	696	337	4,633
Meconium aspiration syndrome	0	0	0	0	<5	0	n.p.	424	436
Pneumonia	0	0	0	0	<5	<5	17	176	196
Persistent pulmonary hypertension	<5	<5	6	6	9	6	25	155	213
Apnoea	0	<5	5	<5	16	22	45	66	158
Congenital anomaly	0	0	<5	<5	15	17	96	341	473
Other	2	0	3	3	11	35	92	330	476
Peri-surgery	0	0	<5	0	5	n.p.	79	267	371
Newborn encephalopathy	<5	<5	0	0	<5	8	59	223	295
Not stated	2	3	1	2	11	10	25	57	111
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
No respiratory support	0.0	0.0	0.0	n.p.	4.8	4.1	n.p.	1.5	2.1
Non-specific respiratory distress	n.p.	1.9	n.p.	8.5	19.8	37.2	51.0	52.1	38.7
Hyaline membrane disease	94.5	96.1	94.3	89.8	70.9	51.3	28.9	6.7	37.8
Meconium aspiration syndrome	0.0	0.0	0.0	0.0	n.p.	0.0	n.p.	8.5	3.6
Pneumonia	0.0	0.0	0.0	0.0	n.p.	n.p.	0.7	3.5	1.6
Persistent pulmonary hypertension	n.p.	n.p.	0.9	0.6	0.7	0.4	1.0	3.1	1.7
Apnoea	0.0	n.p.	0.8	n.p.	1.2	1.5	1.9	1.3	1.3
Congenital anomaly	0.0	0.0	n.p.	n.p.	1.1	1.2	4.0	6.8	3.9
Other	1.8	0.0	0.5	0.3	0.8	2.4	3.8	6.6	3.9
Peri-surgery	0.0	0.0	n.p.	0.0	0.4	n.p.	3.3	5.3	3.0
Newborn encephalopathy	n.p.	n.p.	0.0	0.0	n.p.	0.5	2.5	4.5	2.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

Exogenous surfactant

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

In 2022, nearly a quarter of ANZNN registrants (23.2%) were administered exogenous surfactant (Table 14). Of these, 55.8% received one dose and 34.1% received two doses of surfactant. There were 1,962 babies who received intermittent positive pressure ventilation for HMD in 2022. Exogenous surfactant was given to 1,794 of these babies (91.4%). There were 168 babies diagnosed with HMD who were not given exogenous surfactant.

TABLE 14: Exogenous surfactant use for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Exogenous surfactant	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
None	<5	24	142	411	934	1,189	n.p.	4,710	9,501
Surfactant given	n.p.	339	512	519	413	292	n.p.	350	2,876
▪ via endotracheal tube	101	274	375	343	266	200	260	284	2,103
▪ via catheter	n.p.	52	119	150	131	81	n.p.	37	646
▪ via other or unknown method	0	13	18	26	16	11	14	29	127
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
None	n.p.	6.6	21.7	44.2	69.3	80.3	n.p.	93.1	76.8
Surfactant given	n.p.	93.4	78.3	55.8	30.7	19.7	n.p.	6.9	23.2
▪ via endotracheal tube	90.2	75.5	57.3	36.9	19.7	13.5	10.7	5.6	17.0
▪ via catheter	n.p.	14.3	18.2	16.1	9.7	5.5	n.p.	0.7	5.2
▪ via other or unknown method	0.0	3.6	2.8	2.8	1.2	0.7	0.6	0.6	1.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

Type of assisted ventilation

Assisted ventilation requires specialised nursing, medical and paramedical care and utilises a large component of the available resources. Of the babies registered to the ANZNN in 2022, 97.8% required assisted ventilation for four or more hours.

Two major groups of assisted ventilation are used, those given via endotracheal tube (intermittent positive pressure ventilation (IPPV)) and those without endotracheal tube (continuous positive airway pressure (CPAP), nasal ventilation and nasal high flow (NHF)). For the purposes of this audit, CPAP includes nasal ventilation (CPAP with ventilator breaths). The 10-year trend (2013–2022) for assisted ventilation is represented in Figures 17 to 19 in Appendix 1.

In 2022, IPPV was given for a total of 568,609 hours to ANZNN registrants, CPAP was given for 2,079,934 hours and NHF for 1,213,771 hours. The total number of hours of ventilation equates to each baby receiving 13.0 days of assisted ventilation. The median number of hours of assisted ventilation is inversely related to the gestational age at birth in babies born preterm (Table 15).

The most common form of ventilation given to ANZNN registrants in 2022 remains CPAP with 47.6% of registrants receiving CPAP only, 4.2% receiving NHF only, 6.2% receiving IPPV only and 24.0% received both invasive (IPPV) and non-invasive (CPAP or NHF) ventilation.

In addition to IPPV, CPAP and NHF, babies may have received high frequency oscillatory ventilation (HFOV), nitric oxide or extracorporeal membrane oxygenation (ECMO). HFOV is administered via an endotracheal tube and is usually given in conjunction with IPPV. In 2022, 22.7% of registrants who received IPPV also received HFOV. The use of HFOV among individual units varied between 0.0% and 15.4% with the highest percentage of babies receiving HFOV born at less than 24 weeks (81.3%) followed by babies born at 24–25 weeks gestation (55.1%) (Table 16). The 10-year trend (2013–2022) for HFOV is represented in Figure 20 in Appendix 1.

TABLE 15: Duration of assisted ventilation use for level III registrants by gestational age, ANZNN 2022

Duration of assisted ventilation	Gestational age (weeks)								
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–44	Total
					IPPV (hours)				
Median	471	236	72	30	25	28	46	56	**52**
IQR	103–737	80–510	22–190	12–78	10–84	11–79.5	17–106.5	24–115	**19–143**
					CPAP (hours)				
Median	1,172	1,150	941	367	98	41	26	18	**39**
IQR	743–1,456	792–1,460	503–1,225	158–761	47–201	19–90	12–56	9–39	**15–129**
					NHF (hours)				
Median	502	459	460	392	195	98	64	47	**157**
IQR	246–807	290–674	289–712	218–624	97–396	58–208	26–126	23–105	**49.5–408**

Note: *IQR = Interquartile range. IPPV = intermittent positive pressure ventilation. CPAP = continuous positive airway pressure. NHF = nasal high flow.*

In 2022, 26 registrants received ECMO of whom the majority were born at term. The percentage of ANZNN registrants who received nitric oxide was 5.5%. The use of nitric oxide continues to have a U-shaped distribution with the highest percentage of babies to receive nitric oxide born at less than 24 weeks (37.5%) (Table 16). The 10-year trend (2013–2022) for nitric oxide is represented in Figure 21 in Appendix 1.

TABLE 16: Assisted ventilation for level III registrants by gestational age, ANZNN 2022

Ventilation type	Gestational age (weeks)								
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–44	Total
					Number				
Invasive ventilation	112	334	447	412	312	258	540	1,332	3,747
▪ HFOV given	91	184	137	86	49	33	63	219	862
▪ IPPV given	109	330	444	412	312	257	540	1,327	3,731
Nitric oxide given	42	80	59	48	39	30	69	312	679
CPAP given	71	317	635	911	1,232	1,329	2,046	4,027	10,568
NHF given	59	253	522	723	626	392	540	1,253	4,368
Total in each age group	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
IPPV given	97.3	90.9	67.9	44.3	23.2	17.4	22.2	26.2	30.1
CPAP given	63.4	87.3	97.1	98.0	91.5	89.7	84.2	79.6	85.4
NHF given	52.7	69.7	79.8	77.7	46.5	26.5	22.2	24.8	35.3
					Per cent of babies given invasive ventilation				
HFOV given[(a)]	81.3	55.1	30.6	20.9	15.7	12.8	11.7	16.4	23.0
Nitric oxide given[(a)]	37.5	24.0	13.2	11.7	12.5	11.6	12.8	23.4	18.1

(a) Denominator is babies given ventilation via endotracheal tube (IPPV and/or HFOV).
Note: *Groups are not mutually exclusive.*
HFOV = high frequency oscillatory ventilation. IPPV = intermittent positive pressure ventilation. CPAP = continuous positive airway pressure. NHF = nasal high flow.

Ventilation in babies born at less than 32 weeks gestation

The major indication for assisted ventilation in babies born at less than 32 weeks gestation was hyaline membrane disease. Among the 3,406 babies born before 32 weeks gestation, 98.0% were given assisted ventilation in the form of IPPV, CPAP or NHF. For registrants in this age group CPAP was the only form of ventilation for 19.6%, NHF was the only form of ventilation for 1.0% and IPPV was the only form of ventilation for 3.7% of registrants. Both invasive (IPPV) and non-invasive (CPAP or NHF) were given to 43.5% of registrants.

The total duration of IPPV for these very preterm babies was 336,746 hours, the duration of CPAP was 1,669,855 hours and the duration of NHF was 950,390 hours.

Of the babies born before 32 weeks gestational age and given IPPV in 2022, 33.4% were given HFOV while 16.7% of these babies were given nitric oxide (Table 16).

Among 2022 ANZNN registrants born at less than 32 weeks gestation, 3,206 (94.1%) survived to day 28. Of these, 59.6% of registrants received respiratory support (airway support or supplemental oxygen therapy) at 28 days of age, with 20.3% of them discharged on home oxygen (Table 17).

Ventilation in babies born at 32 to 36 weeks gestation

Among the babies born at 32–36 weeks gestation, 96.9% received assisted ventilation. Non-specific respiratory distress was the main reason for ventilation. Total duration of IPPV use by registrants in this gestational age group was 89,967 hours, CPAP use was 202,463 hours and 142,070 hours for NHF.

Of the babies born at 32–36 weeks gestation and given IPPV in 2022, 11.9% were given HFOV while 12.4% of these babies were given nitric oxide (Table 16).

Ventilation in babies born at term

The main indication for respiratory support in term babies was non-specific respiratory distress (51.5%). This group required 141,896 hours of IPPV, 207,616 hours of CPAP and 121,311 hours of NHF.

Of the babies born at term and given IPPV in 2022, 16.1% were given HFOV while 23.5% of these babies were given nitric oxide (Table 16). There were 23 babies born at term who received ECMO.

Respiratory support

Respiratory support is critical for the survival of some babies, especially those with respiratory problems and those born prematurely. Babies requiring treatment in a level III unit commonly require long-term respiratory support as part of their specialised care. The duration of respiratory support varies between babies, from as little as a few hours to several weeks or months. For the ANZNN audit, four consecutive hours in any single 24-hour period of CPAP, nasal high flow, IPPV, HFOV or supplemental oxygen therapy constitutes the use of respiratory support on that day. The continued use of respiratory support at 28 days of age is a predictor of postneonatal morbidity and the need for continued oxygen therapy after discharge.

Among the 2022 ANZNN registrants, 12,027 babies survived to day 28 and of these, 19.0% were reported as having received respiratory support on day 28 or later. Of the registrants who received respiratory support on day 28 and survived to discharge to home, 20.7% were discharged on home oxygen (Table 17).

TABLE 17: Respiratory support (airway support or supplemental oxygen therapy) for level III registrants who survived to day 28 by gestational age, ANZNN 2022

Respiratory support (airway support or oxygen)	Gestational age (weeks)								
	<24	24–25	26–27	28–29	30–31	32–33	34–36	37–44	Total
					Number				
No respiratory support on day 28	0	0	14	250	974	1,337	2,256	4,762	9,593
Respiratory support on day 28	64	297	591	660	356	122	133	206	2,429
▪ survived to discharge home	59	277	578	649	344	116	121	188	2,332
▪ died before discharge	5	20	13	11	12	6	12	18	97
Not stated	0	0	0	0	0	1	3	1	5
Total in each age group	**64**	**297**	**605**	**910**	**1,330**	**1,460**	**2,392**	**4,969**	**12,027**
					Number				
Respiratory support on day 28 and given home oxygen	30	108	136	77	41	14	23	38	467
					Per cent				
No respiratory support on day 28	0.0	0.0	2.3	27.5	73.2	91.6	94.4	95.9	79.8
Respiratory support on day 28	100.0	100.0	97.7	72.5	26.8	8.4	5.6	4.1	20.2
▪ survived to discharge home	92.2	93.3	97.8	98.3	96.6	95.1	91.0	91.3	96.0
▪ died before discharge	7.8	6.7	2.2	1.7	3.4	4.9	9.0	8.7	4.0
					Per cent				
Respiratory support on day 28 and given home oxygen[(a)]	50.8	39.0	23.5	11.9	11.9	12.1	19.0	20.2	20.0

(a) Denominator is babies who received respiratory support on day 28 and survived to discharge to home.
Note: *Not stated data are excluded from per cent calculations.*

Parenteral nutrition

Intravenous parenteral nutrition is common in very preterm babies because of the need for optimal nutrition from day one when enteral nutrition is difficult, whilst recovery from acute illness or from an intervention occurs, or due to poor weight gain. Of the 3,801 ANZNN registrants born at less than 32 weeks gestation and/or less than 1,500g at birth, 3,334 (87.9%) received parenteral nutrition during admission (Table 18). The median duration of parenteral nutrition reported was 182 hours.

Some babies are discharged home with a nasogastric tube in place to allow gavage or infusion feeding at home. Of those who received parenteral nutrition, 12.7% of babies were discharged home on gavage feeds.

TABLE 18: Parenteral nutrition for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)										
Parenteral nutrition	**<24**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**≥32[(a)]**	**Total**
						Number					
Parenteral nutrition	n.p.	n.p.	n.p.	n.p.	365	410	477	517	531	289	3,334
No parenteral nutrition	<5	<5	<5	<5	5	18	24	88	208	103	459
Not stated	1	0	0	0	0	0	1	1	2	3	8
Total	**112**	**152**	**211**	**284**	**370**	**428**	**502**	**606**	**741**	**395**	**3,801**
						Number					
Home gavage feeding	n.p.	n.p.	n.p.	n.p.	48	53	58	57	52	35	423
						Per cent					
Parenteral nutrition	n.p.	n.p.	n.p.	n.p.	98.6	95.8	95.2	85.5	71.9	73.7	87.9
No parenteral nutrition	n.p.	n.p.	n.p.	n.p.	1.4	4.2	4.8	14.5	28.1	26.3	12.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
						Per cent					
Home gavage feeding[(b)]	19.6	18.9	13.3	15.4	13.2	12.9	12.2	11.0	9.8	12.1	12.7

n.p. Data not published to maintain confidentiality of small numbers.
(a) These babies were less than 1,500g at birth.
(b) Denominator is babies who received parenteral nutrition.
***Note:** Not stated data are excluded from per cent calculations.*

Chronic lung disease

Chronic lung disease (CLD) is a complication of premature lung development and the trauma of early respiratory support (supplemental oxygen and/or assisted ventilation). CLD is currently defined by the ANZNN as a continued need for any form of respiratory support (supplemental oxygen and/or assisted ventilation) at 36 weeks post menstrual age (PMA) (post menstrual age is calculated by adding the baby's age in weeks to the gestational age at birth in weeks).

For ANZNN registrants, 9.5% of babies in 2022 were reported to have had respiratory support at 36 weeks PMA, and of these, 27 (2.3%) died prior to discharge to home. The prevalence of CLD continues to be highest in babies born less than 27 weeks gestation. The highest percentage was in those babies born at 24 weeks gestation (92.7%) who survived to 36 weeks PMA (Table 19). Not all babies survived to 36 weeks PMA and therefore CLD status could not be defined in these babies. The 10-year trend (2013-2022) for CLD is represented by Figure 22 in Appendix 1.

TABLE 19: Chronic lung disease at 36 weeks post menstrual age for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)									
Chronic lung disease (CLD)	**<24**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**Total**
					Number					
No CLD	5	8	37	66	165	227	334	465	624	1,931
CLD	55	101	129	179	186	177	143	110	91	1,171
Did not survive to 36 weeks PMA	51	40	43	36	17	14	9	12	8	230
Not stated	1	3	2	3	2	10	16	19	18	74
Total	**112**	**152**	**211**	**284**	**370**	**428**	**502**	**606**	**741**	**3,406**
					Per cent					
No CLD	8.3	7.3	22.3	26.9	47.0	56.2	70.0	80.9	87.3	62.3
CLD	91.7	92.7	77.7	73.1	53.0	43.8	30.0	19.1	12.7	37.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: *Not stated data and babies who did not survive to 36 weeks PMA are excluded from per cent calculations.*
PMA = Post menstrual age

Of the ANZNN registrants born at less than 32 weeks, 296 (8.7%) babies were treated with systemic corticosteroids. Of these, 252 were reported to have had respiratory support at 36 weeks, while 43 (14.5%) reported no CLD.

Pulmonary air leak

A pulmonary air leak is a collection of air in the space around the lungs which can cause difficulty in breathing. There are several types of pulmonary air leak and while some produce only minor symptoms, a number of them require treatment by the insertion of a drainage tube. For the purposes of this report, the presence of any form of air leak that required drainage (either transient or continuous drainage) is reported for ANZNN registrants (Table 20).

TABLE 20: Pulmonary air leak requiring drainage for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Air leak	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Air leak	13	23	29	30	36	37	78	211	457
No air leak	99	340	624	900	1,310	1,443	2,349	4,840	11,905
Not stated	0	0	1	0	1	1	3	9	15
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Air leak	11.6	6.3	4.4	3.2	2.7	2.5	3.2	4.2	3.7
No air leak	88.4	93.7	95.6	96.8	97.3	97.5	96.8	95.8	96.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Neonatal sepsis

Each episode of sepsis is recorded as either early or late onset. Early onset sepsis is defined as the presence of at least one episode of systemic sepsis where the initial symptoms occurred within the first 48 hours after birth that is, in babies aged from 0 to 47 hours. Late onset sepsis is the presence of at least one episode of systemic sepsis with the initial symptoms occurring among babies aged 48 or more hours. Episodes of sepsis involving the same organism separated by at least 14 days are considered to be new episodes of infection.

Symptomatic, blood culture positive septicaemia was reported in 4.4% of ANZNN registrants in 2022. Of these babies, 50.4% were born at less than 28 weeks gestation, 72.6% were born at less than 32 weeks gestation and 98.5% of registrants survived up to 2 days of life (Table 21). Episodes of both early and late sepsis were reported in eight babies. The 5-year trends (2018–2022) for early and late sepsis are represented by Figure 25 and Figure 26 respectively in Appendix 1.

TABLE 21: Neonatal sepsis for level III registrants by gestational age, ANZNN 2022

	Gestational age (weeks)								
Sepsis	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
No sepsis	62	251	544	864	1,294	1,453	2,390	4,979	11,837
Sepsis at <48 hrs[(a)]	6	8	15	n.p.	11	n.p.	11	41	108
Sepsis at ≥48 hrs[(a)]	46	105	97	n.p.	44	n.p.	29	40	440
Babies alive on day 2	100	349	647	n.p.	1,341	n.p.	2,424	5,042	12,308
Babies who did not survive to day 2	12	14	7	<5	6	<5	6	18	69
Total in each age group	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
No sepsis[(b)]	55.4	69.1	83.2	92.9	96.1	98.1	98.4	98.4	95.6
Sepsis at <48 hrs[(b)]	5.4	2.2	2.3	n.p.	0.8	n.p.	0.5	0.8	0.9
Sepsis at ≥48 hrs[(c)]	46.0	30.1	15.0	n.p.	3.3	n.p.	1.2	0.8	3.6

n.p. Data not published to maintain confidentiality of small numbers.
(a) Groups are not mutually exclusive.
(b) Denominator is all registrants.
(c) Denominator is registrants alive at 48 hours.

Viral infection for the purposes of this audit is defined as the presence of at least one episode of viral infection with initial symptoms occurring following 48 hours after birth. Symptomatic viral infection was reported in 265 (2.1%) of ANZNN registrants in 2022, as identified by isolation or identification of an organism by polymerase chain reaction (PCR) testing, immunofluorescence or similar technology from an appropriate body fluid.

Retinopathy of prematurity

The classification of retinopathy of prematurity (ROP) for ANZNN registrants are those recommended by the Committee for the Classification of Retinopathy of Prematurity (1984). The examination criteria for ROP vary between units within ANZNN. As in previous reports, the prevalence of ROP screening in 2022 was assessed among registrants with a gestational age of less than 31 weeks and/or a birthweight of less than 1,250 grams. Among the 2022 registrants, 23.0% were eligible for ROP examination and of these eligible registrants, 80.9% were examined and had the results of their eye examination recorded.

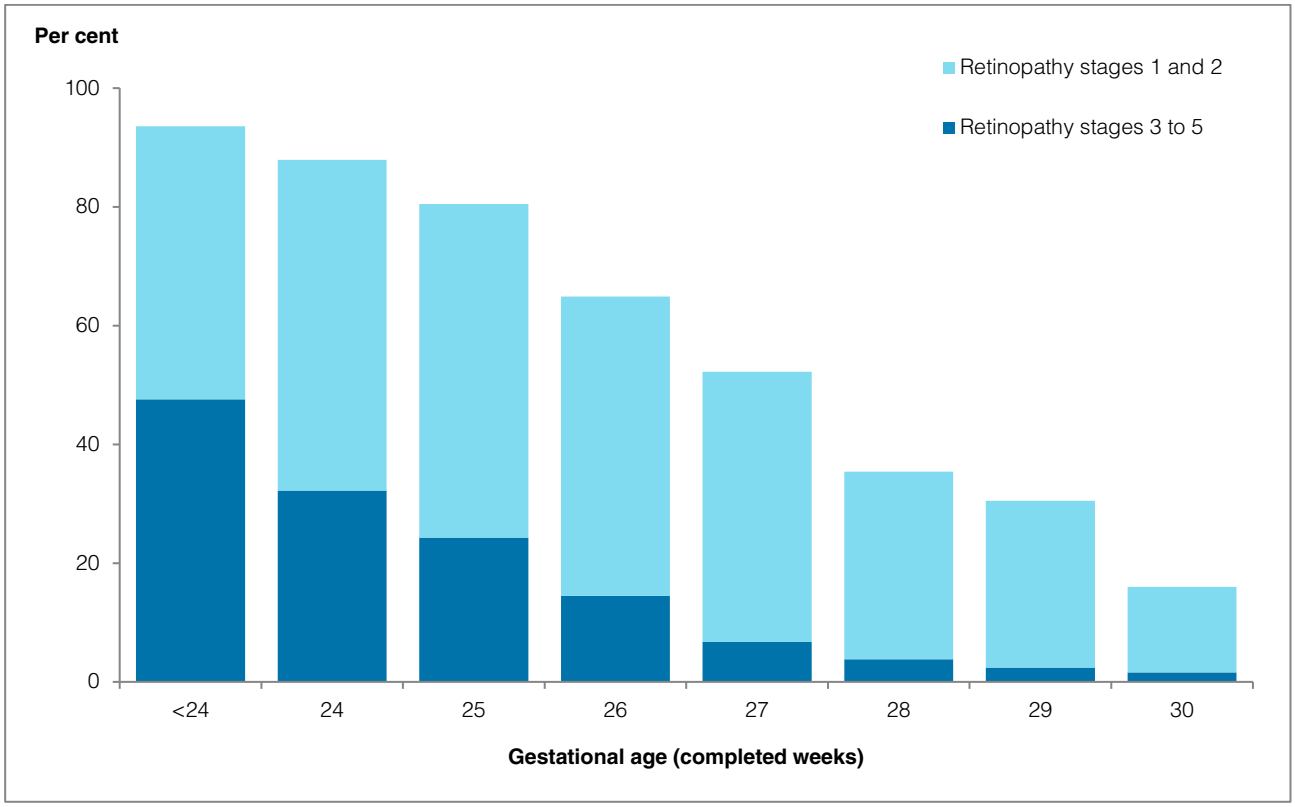
Of those ANZNN registrants who were eligible for an eye examination, 203 died before their ROP status could be determined. Of those examined, 8.7% had stage 3 to 5 ROP (Table 22, Figure 6) and of these babies, 30.5% received surgical treatment and 24.0% received anti-VEGF treatment. The 10-year trend (2013–2022) for stages 3 to 5 ROP and treatment are represented by Figure 23 in Appendix 1.

TABLE 22: Retinopathy of prematurity for level III registrants by gestational age, ANZNN 2022

Retinopathy of prematurity (ROP)	Gestational age (weeks)									
	<24	24	25	26	27	28	29	30	≥31[(a)]	Total
					Number					
No ROP	<5	14	33	85	164	256	319	316	n.p.	1,309
Stage 1	<5	14	35	n.p.	68	77	79	41	13	376
Stage 2	27	50	60	75	88	48	50	13	7	418
Stage 3	28	37	41	34	23	15	11	6	<5	n.p.
Stage 4 to 5	<5	0	0	<5	0	0	0	0	0	<5
Not examined	47	35	41	41	26	32	43	228	42	535
Not stated	2	2	1	1	1	0	0	2	0	9
Total	**112**	**152**	**211**	**284**	**370**	**428**	**502**	**606**	**182**	**2,847**
					Per cent					
No ROP	n.p.	12.2	19.5	35.1	47.8	64.6	69.5	84.0	n.p.	56.8
Stage 1	n.p.	12.2	20.7	n.p.	19.8	19.4	17.2	10.9	9.3	16.3
Stage 2	42.9	43.5	35.5	31.0	25.7	12.1	10.9	3.5	5.0	18.2
Stage 3	44.4	32.2	24.3	14.0	6.7	3.8	2.4	1.6	n.p.	n.p.
Stage 4 to 5	n.p.	0.0	0.0	n.p.	0.0	0.0	0.0	0.0	0.0	n.p.
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) These babies were less than 1,250g at birth.
Note: *Not stated and not examined data are excluded from per cent calculations.*

FIGURE 6: Retinopathy of prematurity for level III registrants by gestational age, ANZNN 2022



Intraventricular haemorrhage

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

There were 3,406 babies born at less than 32 weeks gestation eligible for a cerebral ultrasound, of which 3,338 survived to day 3 and 93.8% had an examination recorded. A normal report was recorded for 77.8% of these 2022 ANZNN registrants.

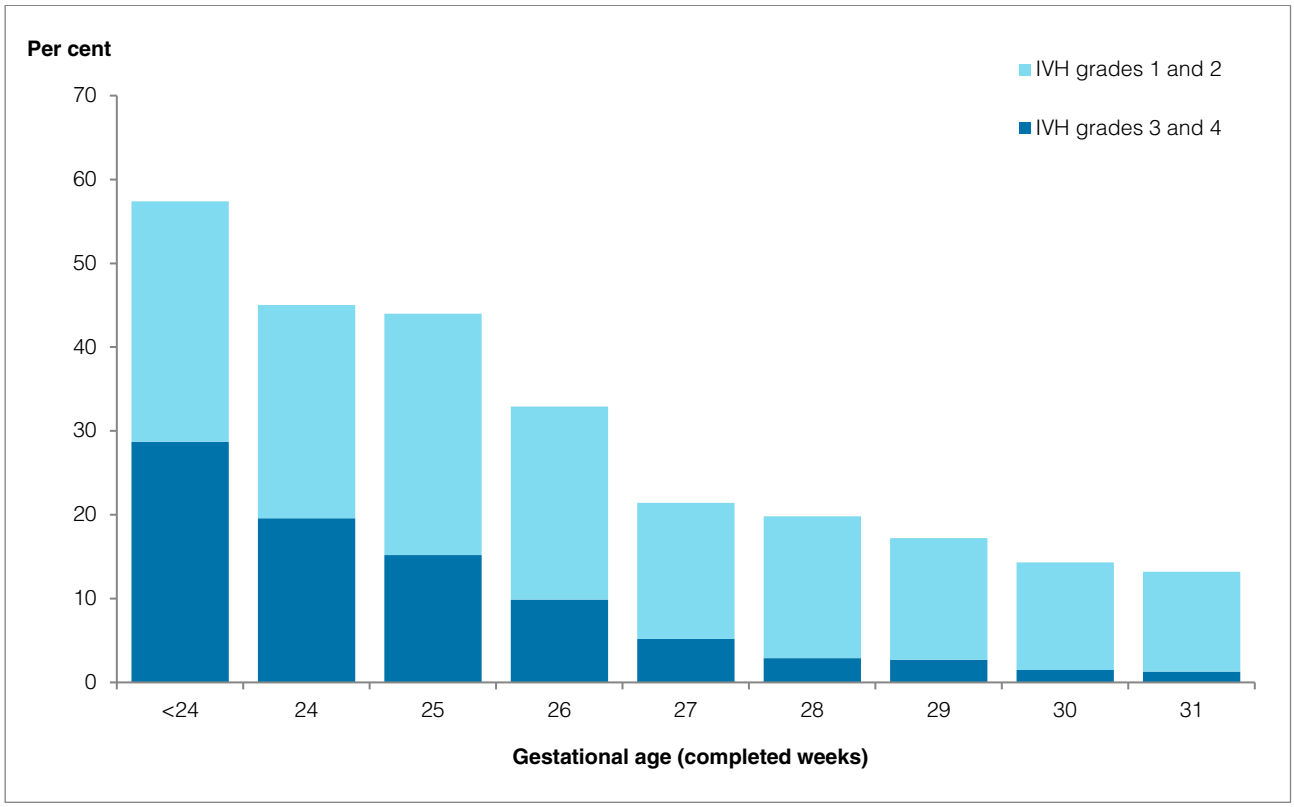
There were 171 babies reported to have grade 3 or 4 IVH representing 5.1% of the babies born before 32 weeks gestation. Of the babies who had a grade 3 IVH, 34.7% were unilateral, while 71.4% of grade 4 IVH cases were unilateral. The incidence of IVH, particularly of severe grades, is shown to be inversely related to gestation. The highest percentage of babies who had grade 4 IVH were born before 26 weeks gestational age, with the majority (65.2%) of these babies born before 25 weeks gestation (Table 23, Figure 7). The 10-year trend (2013–2022) for registrants with grades 3 and 4 IVH who survived to day 3 is represented in Figure 24 in Appendix 1.

TABLE 23: Intraventricular haemorrhage for level III registrants born before 32 weeks and survived to day 3, by gestational age, ANZNN 2022

	Gestational age (weeks)									
Intraventricular haemorrhage	**<24**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**Total**
					Number					
None	n.p.	n.p.	111	184	286	338	404	456	540	2,435
Grade 1	13	16	31	40	39	47	57	61	67	371
Grade 2	14	19	26	23	n.p.	24	14	n.p.	n.p.	154
Grade 3	<5	<5	5	7	<5	7	6	5	5	45
Grade 4	24	23	25	20	16	5	7	<5	<5	126
Not examined	0	3	1	3	2	3	10	68	117	207
Total	**94**	**141**	**199**	**277**	**366**	**424**	**498**	**600**	**739**	**3,338**
					Per cent					
None	n.p.	n.p.	56.1	67.2	78.6	80.3	82.8	85.7	86.8	77.8
Grade 1	13.8	11.6	15.7	14.6	10.7	11.2	11.7	11.5	10.8	11.8
Grade 2	14.9	13.8	13.1	8.4	n.p.	5.7	2.9	n.p.	n.p.	4.9
Grade 3	n.p.	n.p.	2.5	2.6	n.p.	1.7	1.2	0.9	0.8	1.4
Grade 4	25.5	16.7	12.6	7.3	4.4	1.2	1.4	n.p.	n.p.	4.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not examined data are excluded from per cent calculations.*

FIGURE 7: Intraventricular haemorrhage in level III registrants born at less than 32 weeks gestation and survived to day 3, by gestational age, ANZNN 2022



Late cerebral ultrasound

Late cerebral ultrasound data are based on changes seen in brain tissue at the cerebral ultrasound scan nearest to six weeks of age. As noted above there were 3,406 babies born at less than 32 weeks gestation eligible for a cerebral ultrasound, 3,338 survived until day 3 and late ultrasound results were available for 2,348 (70.3%) of these babies. A normal report of no cysts was recorded for 96.9% of these registrants, 1.3% reported porencephalic cysts and 1.8% reported periventricular leukomalacia (PVL) (Table 24). Of the 42 babies who were reported with PVL, 15 had extensive leukomalacia involving two or more of the anterior frontal, posterior frontal, parietal, temporal or occipital regions.

TABLE 24: Late cerebral ultrasound results for level III registrants born before 32 weeks by gestational age, ANZNN 2022

	Gestational age (weeks)									
Cerebral ultrasound results	**<24**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**Total**
					Number					
No cysts	55	n.p.	n.p.	214	296	350	411	382	318	2,273
Porencephalic cysts	5	<5	<5	6	5	<5	<5	<5	<5	31
Periventricular leukomalacia	0	7	7	6	8	<5	<5	<5	<5	42
Not stated	52	40	56	58	61	73	83	219	418	1,060
Total	**112**	**152**	**211**	**284**	**370**	**428**	**502**	**606**	**741**	**3,406**
					Per cent					
No cysts	91.7	n.p.	n.p.	94.7	95.8	98.6	98.1	98.7	98.5	96.9
Porencephalic cysts	8.3	n.p.	n.p.	2.7	1.6	n.p.	n.p.	n.p.	n.p.	1.3
Periventricular leukomalacia	0.0	6.3	4.5	2.7	2.6	n.p.	n.p.	n.p.	n.p.	1.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

Therapeutic hypothermia

Therapeutic hypothermia is the intentional cooling of an infant to a core temperature of less than 35°C (generally 33–34°C). The evidence in support for controlled hypothermia, initiated before 6 hours of age, as a means of limiting the reperfusion injury that follows perinatal asphyxia in term infants has been evolving over the last 10 years.

Hypothermia begins at the onset of cooling and ends at the onset of warming. Cooling is normally for 72 hours with a period of up to 6 hours of rewarming. In 2022, 376 (5.6%) of the ANZNN registrants born at more than 34 weeks gestation received therapeutic hypothermia, and of these, 90.2% were cooled for at least 72 hours. Of those babies who did not receive cooling for a full 72 hours, information on the principal reason for non-completion of the full 72 hours of therapeutic hypothermia was available for 94.9% of babies.

Necrotising enterocolitis

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

For ANZNN registrants in 2022, the percentage of babies with confirmed NEC was 1.3%. Of these babies, 60.8% were born before 28 weeks gestation with 58.4% of them undergoing surgery, and 19.9% were born between 28–31 weeks gestation with surgery required for 63.6% of them. In total, 46 registrants died from NEC. The number of registrants with confirmed NEC was more than in 2021 (Table 25).

TABLE 25: Necrotising enterocolitis in level III registrants by year of birth, ANZNN 2013–2022

	Year of birth									
Necrotising enterocolitis	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
	Number									
Babies born at <28 weeks										
▪ NEC	75	64	81	92	105	96	79	92	85	101
▪ No NEC	1,015	1,039	981	1,127	1,047	1,055	1,103	1,046	1,107	1,027
▪ Not stated	0	3	4	2	0	1	0	0	0	1
Babies born at 28-31 weeks										
▪ NEC	27	21	40	37	25	28	30	29	35	33
▪ No NEC	2,384	2,484	2,383	2,353	2,325	2,252	2,203	2,245	2,329	2,244
▪ Not stated	0	2	6	1	1	0	0	0	0	0
Babies born at ≥32 weeks										
▪ NEC	19	26	27	30	27	30	28	17	25	32
▪ No NEC	6,200	6,515	6,267	6,832	7,153	7,202	7,752	8,097	8,646	8,936
▪ Not stated	1	4	9	1	1	3	0	0	0	3
Total in each birth year	**9,721**	**10,158**	**9,798**	**10,475**	**10,684**	**10,667**	**11,195**	**11,526**	**12,227**	**12,377**
	Per cent									
NEC <28 weeks[(a)]	6.9	5.8	7.6	7.5	9.1	8.3	6.7	8.1	7.1	9.0
NEC 28-31 weeks[(b)]	1.1	0.8	1.7	1.5	1.1	1.2	1.3	1.3	1.5	1.4
NEC ≥32 weeks[(c)]	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.3	0.4

(a) Denominator is babies born at <28 weeks.
(b) Denominator is babies born at 28-31 weeks.
(c) Denominator is babies born at ≥32 weeks.
***Note:** Not stated data are excluded from per cent calculations.*

Spontaneous intestinal perforation

Spontaneous intestinal perforation is distinct from NEC and usually involves a single perforation of the intestine. In 2022, 59 (0.5%) of ANZNN registrants had a confirmed diagnosis of spontaneous intestinal perforation. Of these, two babies were also reported to have a confirmed NEC diagnosis. Of babies born before 28 weeks gestation, 26 (2.3%) had a confirmed diagnosis of spontaneous intestinal perforation.

Neonatal surgery

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

In 2022, there were 1,108 ANZNN registrants who had major surgery, of whom over half (54.6%) were born at term. Of registrants born in a hospital, 72.1% were born in a hospital with tertiary care facilities. Of registrants who had major surgery, 67.8% also had a congenital anomaly present with 64.6% of these diagnosed during the antenatal period. 8.9% had surgery for proven NEC. The median length of stay for survivors was 35 days (Table 26).

TABLE 26: Characteristics of level III registrants who underwent surgery by gestational age, ANZNN 2022

	Gestational age (weeks)								
Characteristics	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Male	12	36	31	31	27	33	121	368	659
Female	13	20	29	22	22	24	82	237	449
Congenital anomaly present	<5	6	11	n.p.	29	36	164	486	751
Congenital anomaly diagnosed antenatally	0	0	<5	5	n.p.	26	126	306	485
Proven NEC	8	27	24	10	11	6	8	5	99
Hospital of birth:									
▪ Tertiary	n.p.	50	50	47	40	37	n.p.	383	790
▪ Non-tertiary	<5	5	9	6	8	18	n.p.	220	306
Median length of stay for survivors (days)	152	139	117	90	75	61	40	23	35
Died before discharge home	6	13	10	9	6	7	8	22	81
Total in each age group	**25**	**56**	**60**	**53**	**49**	**57**	**203**	**605**	**1,108**
					Per cent				
Male	48.0	64.3	51.7	58.5	55.1	57.9	59.6	60.8	59.5
Female	52.0	35.7	48.3	41.5	44.9	42.1	40.4	39.2	40.5
Congenital anomaly present	n.p.	10.7	18.3	n.p.	59.2	63.2	80.8	80.3	67.8
Congenital anomaly diagnosed antenatally	0.0	0.0	n.p.	9.4	n.p.	45.6	62.1	50.6	43.8
Proven NEC	32.0	48.2	40.0	18.9	22.4	10.5	3.9	0.8	8.9
Hospital of birth:									
▪ Tertiary	n.p.	89.3	83.3	88.7	81.6	64.9	n.p.	63.3	71.3
▪ Non-tertiary	n.p.	8.9	15.0	11.3	16.3	31.6	n.p.	36.4	27.6
Died before discharge home	24.0	23.2	16.7	17.0	12.2	12.3	3.9	3.6	7.3

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

The median age of mothers of neonates who received major surgery was 31 years. Within the 2022 surgical cohort, 7.8% of pregnancies resulted from assisted conception, compared with 8.1% in the whole cohort. Of the 2022 ANZNN registrants who received major surgery, gastrointestinal procedures were the most commonly performed (60.2%) followed by cardiac procedures (22.7%).

There were 104 (0.9%) babies born in 2022 who received surgery to repair a gastroschisis before discharge to home. Over half of these babies were male (55.8%) and three in five were born at more than 35 weeks gestation (59.6%). In 2022, 62 babies received surgery to repair a congenital diaphragmatic hernia, of which 72.6% were male and 79.0% were born at more than 37 weeks gestation.

Congenital anomalies

In 2022, 1,387 ANZNN registrants (11.2%) had one or more major congenital anomalies. For registrants who had a major congenital anomaly, 16.2% were born before 32 weeks gestation, 27.4% were born between 32 and 36 weeks gestation and nearly three in five of registrants (56.4%) were born at term.

Of the ANZNN registrants with major congenital anomalies, half (52.8%) were diagnosed during the antenatal period with 6.8% of babies recorded as having a fatal congenital anomaly. A higher proportion of babies with congenital anomalies were male (58.8%).

Transfer from level III NICUs to other units

Once intensive care is no longer required, babies are often 'down' transferred to a level II unit, sometimes referred to as a 'special care baby unit', either within the same hospital or to another hospital for convalescence before discharge home. In 2022, nearly three in ten ANZNN registrants (28.8%) were transferred from a level III NICU to a level II unit in another hospital before discharge home. The ability to down transfer for any level III unit will depend on the availability of receiving level II hospitals and this is a limiting factor in some regions (e.g. South Australia). Over two in five registrants (41.9%) transferred from level III to level II or level I units were born at less than 32 weeks gestation compared to 17.6% born at term.

Some level III registrants required transfer to a specialist children's hospital and in 2022 these accounted for 4.3% of registrants. Overall, 64.1% of level III registrants were not transferred after registration (Table 27).

TABLE 27: Transfer after registration of level III registrants by level of destination hospital and gestational age, ANZNN 2022

	Gestational age (weeks)								
Transfer status	**<24**	**24–25**	**26–27**	**28–29**	**30–31**	**32–33**	**34–36**	**37–44**	**Total**
					Number				
Not transferred	72	181	336	385	530	709	1,585	4,132	7,930
Level III hospital	8	34	44	67	57	47	39	43	339
Level II or I hospital	16	104	232	444	719	691	725	635	3,566
Children's hospital	16	44	42	34	38	32	80	250	536
Not stated	0	0	0	0	3	2	1	0	6
Total	**112**	**363**	**654**	**930**	**1,347**	**1,481**	**2,430**	**5,060**	**12,377**
					Per cent				
Not transferred	64.3	49.9	51.4	41.4	39.4	47.9	65.3	81.7	64.1
Level III hospital	14.3	28.7	35.5	47.7	53.5	46.7	29.8	12.5	2.7
Level II or I hospital	7.1	9.4	6.7	7.2	4.2	3.2	1.6	0.8	28.8
Children's hospital	14.3	12.1	6.4	3.7	2.8	2.2	3.3	4.9	4.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

Length of stay until discharge home

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

In the ANZNN, the length of stay includes all the time the baby spends in hospital, from the first day of their first admission up to and including the day of their discharge home. The length of stay has added together the time spent in all hospitals, which includes level III and subsequent level II or I hospitals or children's hospitals. It does not include the time spent in hospital in any subsequent admissions from home, nor does it include periods spent in 'Hospital in the Home' programs. Discharge information was available for 99.2% of ANZNN registrants in 2022 who survived to discharge to home. The median length of stay was 21 days with an interquartile range of 7–47 days (Table 28). Length of stay is inversely related to gestational age, with the very preterm and extremely preterm babies having a longer stay in hospital than those babies born at or near term.

Babies born at less than 32 weeks gestation spent 230,588 days in hospital, babies born between 32 and 36 weeks spent 103,292 days and babies born at term spent 63,155 days in hospital.

TABLE 28: Length of stay for level III registrants who survived until discharge home by gestational age, ANZNN 2022

Gestational age (weeks)	Number of babies	Median length of stay (days)	Interquartile range (days)
<24	59	143	134–156
24	111	128	112–150
25	166	112	101–126
26	244	100	88–115
27	348	87	76–102
28	411	73	63–84
29	488	62	54–74
30	589	52	44–62
31	729	42	35–52
32	740	35	28–45
33	713	26	21–34
34	814	21	16–29
35	720	15	9–23
36	843	11	6–20
37	1,073	8	4–17
38	1,177	7	4–15
39	1,213	6	3–14
40	927	5	3–10
41	512	5	3–10
≥42	48	5	3–9
Total	**11,925**	**21**	**7–47**

Note: *Gestational ages ≥42 weeks have been combined to maintain confidentiality of small numbers.*

Survival

In 2022, 96.3% of ANZNN registrants survived to go home. These data include babies who were transferred to level II or level I units, those transferred to another level III unit and those babies transferred to a children's hospital. The survival rate to discharge home, as shown in Table 29, does not encompass the following: fetal deaths, neonatal deaths that occurred on a labour ward, babies born in level II hospitals, and babies not transferred to an NICU or children's hospital.

During 2022, there were 452 neonatal deaths, of which 184 occurred in the early neonatal period that is within seven days of birth (Table 29). Mortality was highest among babies born before 28 weeks gestation with a survival rate at discharge increasing week on week from 52.7% for babies born before 24 weeks to 94.1% for babies born at 27 weeks (Table 29, Figure 8). A similar pattern of increasing survival with increasing birthweight is seen in Figure 9. The 10-year trend (2013–2022) for survival to discharge to home of registrants is represented in Figure 27 in Appendix 1.

Lethal congenital anomaly was the cause of death for 0.8% of registrants, with most occurring in babies born between 35–39 weeks gestation (Table 29).

TABLE 29: Survival to discharge home for level III registrants by gestational age, ANZNN 2022

Gestational age (weeks)	Number of babies	Lethal congenital anomalies	Babies alive on day 7	Babies alive on day 28	Survived to discharge to home	Per cent survival at discharge to home
<24	112	0	86	64	59	52.7
24	152	0	133	122	111	73.0
25	211	<5	191	175	166	78.7
26	284	<5	269	251	244	85.9
27	370	<5	363	354	348	94.1
28	428	0	418	417	411	96.0
29	502	<5	497	493	488	97.2
30	606	6	598	596	589	97.2
31	741	5	738	734	729	98.4
32	748	5	746	743	740	98.9
33	733	10	726	717	713	97.3
34	828	5	823	819	814	98.3
35	739	5	729	723	720	97.4
36	863	9	859	850	843	97.7
37	1,098	8	1,089	1,077	1,073	97.7
38	1,207	14	1,191	1,182	1,177	97.5
39	1,236	13	1,228	1,220	1,213	98.1
40	951	<5	943	929	927	97.5
41	519	<5	517	513	512	98.7
≥42	49	<5	49	48	48	98.0
Total	**12,377**	**95**	**12,193**	**12,027**	**11,925**	**96.3**

Note: *Gestational ages ≥42 weeks have been combined to maintain confidentiality of small numbers*

FIGURE 8: Survival of level III registrants to discharge home (with 95% CI) by gestational age, ANZNN 2022

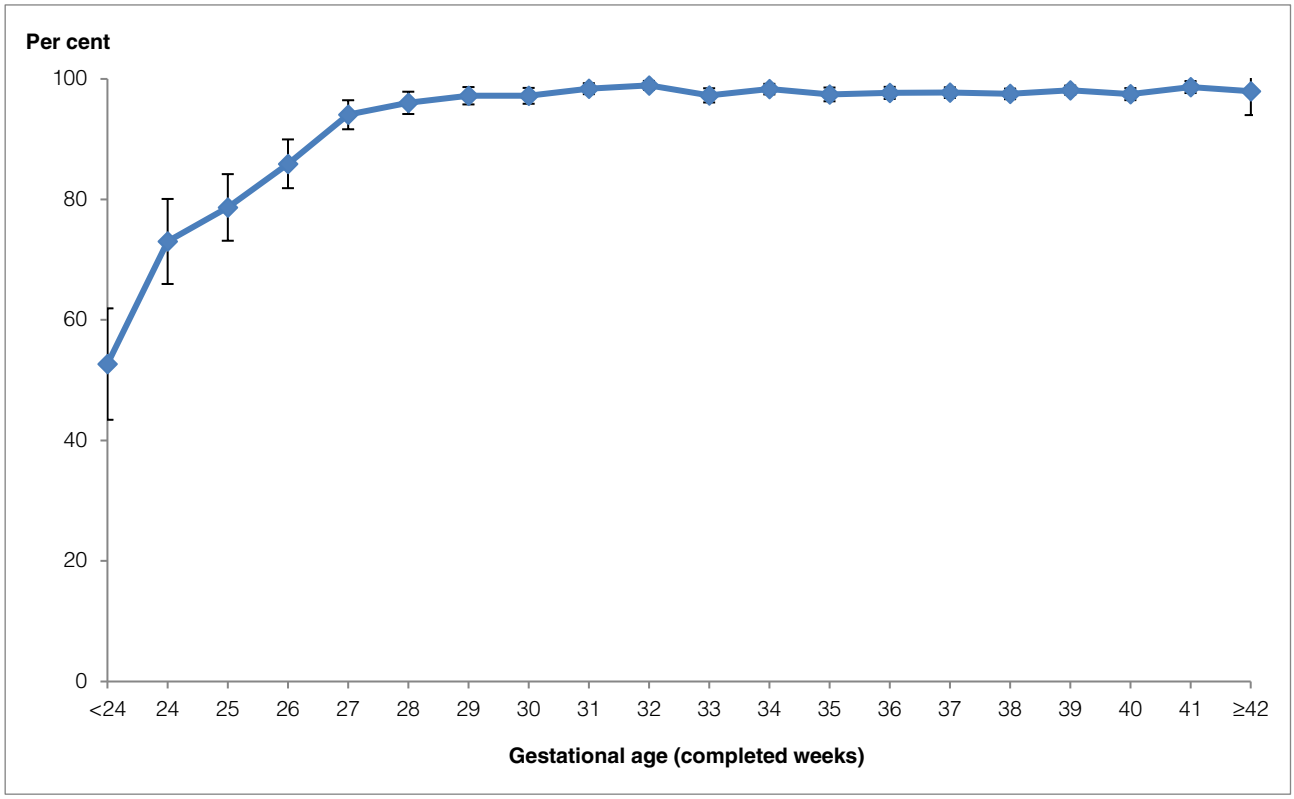
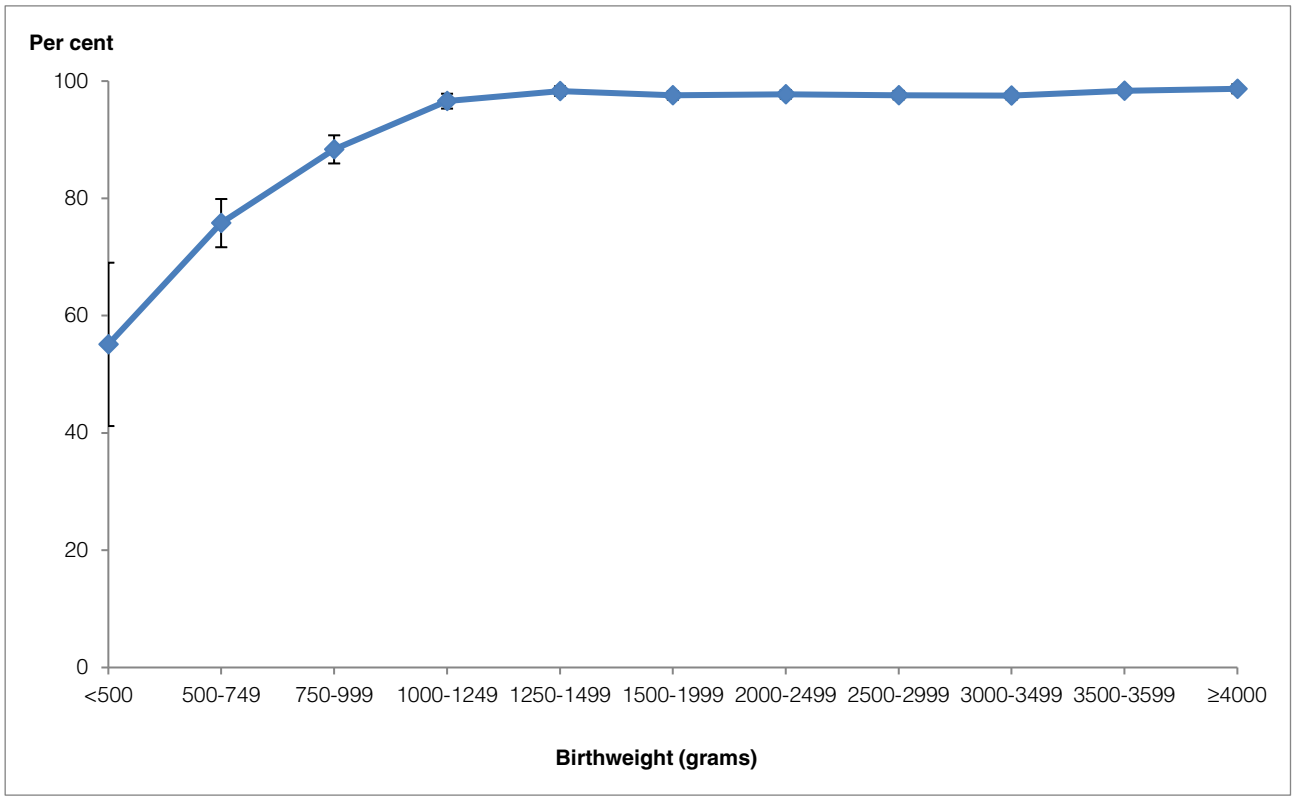


FIGURE 9: Survival of level III registrants to discharge home (with 95% CI) by birthweight group, ANZNN 2022



5. Babies registered to level II units

Overview

Neonatal units with facilities to manage mild or moderately ill babies are known as 'level II units' or 'special care baby units'. The classification of the level of care for perinatal hospitals is changing and the new classifications for 'level II' are now often 'level IV and V'. For the purposes of this report at this time, the term "level II" has been retained. Individual units may have varying levels of resources for giving special care. The ANZNN registration criteria for level II and level III units are the same. Babies born in a level II unit and transferred to a level III unit within 28 days of birth are registered to that level III unit. Babies are registered to a level II unit if their hospital stay was entirely within non-tertiary centre units, or if they were transferred to a level III NICU after 28 days, or they were transferred to a level II neonatal unit from a children's hospital without first having been admitted to a level III unit.

There are 16 level II units in New Zealand and 18 in Australia that are members of the ANZNN. Altogether, 29 level II units contributed data for this 2022 report.

In 2022, 2,136 babies fulfilled the ANZNN criteria for registration to a level II unit. Of those babies, 3.8% were born at less than 32 weeks gestation and 2.8% weighed less than 1,500 grams at birth (Table 30 and Table 31). The highest number of babies registered to a level II unit in 2022 was just over 200.

TABLE 30: Level II registrants by gestational age, ANZNN 2022

Gestational age (weeks)	Number of babies	Per cent	Cumulative per cent
<30	9	0.4	0.4
30–31	72	3.4	3.8
All babies <32 weeks gestation	**81**	**3.8**	
32–33	256	12.0	15.8
34–36	576	27.0	42.7
37–44	1,223	57.3	100.0
Total	**2,136**	**100.0**	

Note: *Gestational ages below 30 weeks have been combined to maintain confidentiality of small numbers.*

TABLE 31: Level II registrants by birthweight, ANZNN 2022

Birthweight (grams)	Number of babies	Per cent	Cumulative per cent
<1,300	16	0.7	0.7
1,300–1,399	17	0.8	1.5
1,400–1,499	27	1.3	2.8
All babies <1,500g birthweight	**60**	**2.8**	
1,500–1,999	213	10.0	12.8
2,000–2,499	356	16.7	29.5
2,500–2,999	427	20.0	49.5
3,000–3,499	460	21.6	71.0
3,500–3,999	394	18.5	89.5
≥4,000	224	10.5	100.0
Total	**2,134**	**100.0**	

Note: *Birthweight groups below 1,300g have been combined to maintain confidentiality of small numbers. Birthweight was not provided for two babies.*

Of the level II registrants in 2022, 1,234 babies (57.8%), were born to Caucasian mothers, 42.0% of whom were born preterm. The number of registrants born to Māori mothers was 243 (11.4%), and of these, 115 (47.3%) were born preterm. There were 41 babies (1.9%) born to Pacific peoples mothers.

There were 1,345 male (63.0%) and 790 female (37.0%) registrants in the audit. Sex was not recorded for one registrant. Non-specific respiratory distress was the major reason for assisted ventilation for level II registrants.

Maternal, pregnancy and birth characteristics

Of the mothers of level II registrants, 34.8% did not present with any maternal complications. Among babies born before 37 weeks, 31.5% of mothers had presented with preterm labour (Table 32).

TABLE 32: Mothers of level II registrants presenting antenatal problem by gestational age, ANZNN 2022

	Gestational age (weeks)				
Presenting antenatal problem	**<32**	**32–33**	**34–36**	**37–44**	**Total**
No antenatal problems	0	0	0	738	738
Preterm pre-labour rupture of membranes	21	70	161	11	263
Preterm labour	41	74	168	5	288
Hypertension in pregnancy	<5	36	n.p.	44	134
Antepartum haemorrhage	8	37	38	26	109
Intrauterine growth restriction	0	9	48	51	108
Fetal distress	<5	17	45	n.p.	225
Other problem	7	13	58	170	248
Congenital anomalies	0	0	<5	<5	6
Not stated	0	0	4	13	17
Total	**81**	**256**	**576**	**1,223**	**2,136**
			Per cent		
No antenatal problems	0.0	0.0	0.0	61.0	34.8
Preterm pre-labour rupture of membranes	25.9	27.3	28.1	0.9	12.4
Preterm labour	50.6	28.9	29.4	0.4	13.6
Hypertension in pregnancy	n.p.	14.1	n.p.	3.6	6.3
Antepartum haemorrhage	9.9	14.5	6.6	2.1	5.1
Intrauterine growth restriction	0.0	3.5	8.4	4.2	5.1
Fetal distress	n.p.	6.6	7.9	n.p.	10.6
Other problem	8.6	5.1	10.1	14.0	11.7
Congenital anomalies	0.0	0.0	n.p.	n.p.	0.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*
Maternal data for babies of a multiple birth are presented for each registrant.

Previous preterm births were reported by 172 (8.1%) mothers of level II registrants and 38 (1.8%) mothers had had a previous perinatal death(s).

Most mothers (91.5%) of level II registrants had booked into a level II hospital for delivery. Of the level II registrants born before 34 weeks gestation, 66.8% of the mothers were given antenatal corticosteroids within seven days prior to the birth (Table 33).

TABLE 33: Antenatal corticosteroid use by mothers of level II registrants by gestational age, ANZNN 2022

	Gestational age (weeks)				
Antenatal corticosteroids	**<32**	**32–33**	**34–36**	**37–44**	**Total**
None	15	55	334	1,188	1,592
Incomplete course	27	68	84	8	187
Complete course within 7 days of birth	29	101	106	7	243
Given >7 days prior to birth	10	24	45	6	85
Not stated	0	8	7	14	29
Total	**81**	**256**	**576**	**1,223**	**2,136**
			Per cent		
None	18.5	22.2	58.7	98.3	75.6
Incomplete course	33.3	27.4	14.8	0.7	8.9
Complete course within 7 days of birth	35.8	40.7	18.6	0.6	11.5
Given >7 days prior to birth	12.3	9.7	7.9	0.5	4.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: *Not stated data are excluded from per cent calculations.*
Maternal data for babies of a multiple birth are presented for each registrant.

Caesarean section was the most common method of birth (53.1%) for level II registrants (Table 34). Of those who were delivered by caesarean section, over half (56.2%) occurred before the onset of labour.

TABLE 34: Method of delivery for level II registrants by gestational age, ANZNN 2022

	Gestational age (weeks)				
Method of delivery	**<32**	**32–33**	**34–36**	**37–44**	**Total**
Vaginal birth[(a)]	40	74	229	656	999
Caesarean section[(b)]	41	182	344	565	1132
Not stated	0	0	3	2	5
Total	**81**	**256**	**576**	**1223**	**2,136**
			Per cent		
Vaginal birth	49.4	28.9	40.0	53.7	46.9
Caesarean section	50.6	71.1	60.0	46.3	53.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Vaginal and instrumental vaginal births have been combined to maintain confidentiality of small numbers.
(b) Caesarean section deliveries in labour and no labour have been combined to maintain confidentiality of small numbers.

Characteristics of level II babies

Among the 2,136 babies registered to level II units, 228 were from multiple gestation pregnancies (10.7%). There were 1,345 (63.0%) male births and one baby whose gender was not recorded.

A low Apgar score of less than 4 at one minute of age was recorded for 16.0% of babies and 4.1% of them required endotracheal intubation in the labour ward to assist in their adaptation to extrauterine life.

Non-specific respiratory distress (81.0%) was the major reason for assisted ventilation for level II registrants, followed by hyaline membrane disease (8.3%) (Table 35).

For level II registrants, the median duration of assisted ventilation by intermittent positive pressure ventilation (IPPV) was 23 hours, 365 hours by continuous positive airway pressure (CPAP) and 44 hours by nasal high flow (NHF) (Table 36).

TABLE 35: Indication for respiratory support for level II registrants by gestational age, ANZNN 2022

	Gestational age (weeks)				
Indication for respiratory support	**<32**	**32–33**	**34–36**	**37–44**	**Total**
No respiratory support	n.p.	<5	8	<5	22
Non-specific respiratory distress	35	180	479	1,027	1,721
Hyaline membrane disease	34	61	60	21	176
Meconium aspiration syndrome	0	0	<5	n.p.	73
Pneumonia	0	6	5	38	49
Persistent pulmonary hypertension	<5	0	<5	11	15
Apnoea	0	<5	6	<5	9
Congenital anomaly	0	0	0	<5	<5
Other	1	2	8	40	51
Peri-surgery	0	0	0	<5	<5
Newborn encephalopathy	0	<5	<5	<5	5
Not stated	1	1	4	6	12
Total	**81**	**256**	**576**	**1,223**	**2,135**
			Per cent		
No respiratory support	n.p.	n.p.	1.4	n.p.	1.0
Non-specific respiratory distress	43.8	70.6	83.7	84.4	81.0
Hyaline membrane disease	42.5	23.9	10.5	1.7	8.3
Meconium aspiration syndrome	0.0	0.0	n.p.	n.p.	3.4
Pneumonia	0.0	2.4	0.9	3.1	2.3
Persistent pulmonary hypertension	n.p.	0.0	n.p.	0.9	0.7
Apnoea	0.0	n.p.	1.0	n.p.	0.4
Congenital anomaly	0.0	0.0	0.0	n.p.	n.p.
Other	1.3	0.8	1.4	3.3	2.4
Peri-surgery	0.0	0.0	0.0	n.p.	n.p.
Newborn encephalopathy	0.0	n.p.	n.p.	n.p.	0.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 36: Duration of assisted ventilation use for level II registrants by gestational age, ANZNN 2022

	Gestational age (weeks)				
Duration of assisted ventilation	**<32**	**32–33**	**34–36**	**37–44**	**Total**
			IPPV (hours)		
Median	32.5	49	23	16	**23**
IQR	23–67	9–86	11.5–39	7–23	**12.5–39**
			CPAP (hours)		
Median	66	24	18	14	**16**
IQR	30–116	13–51	10–34	7–25	**9–32**
			NHF (hours)		
Median	208	74	50	28	**44**
IQR	82–336	34–112	21–73	16–58	**19–87.5**

Note: *IQR = Interquartile range. IPPV = intermittent positive pressure ventilation. CPAP = continuous positive airway pressure. NHF = nasal high flow.*

Eye examination

Screening for retinopathy of prematurity (ROP) was reported for only 25 of the 36 eligible babies born at less than 31 weeks gestational age and/or weighing less than 1,250 grams at birth (69.4% compared to 80.9% of eligible level III registrants). All were reported as normal except for two babies who had stage 1 ROP.

Cerebral ultrasound

Of the 81 babies born at less than 32 weeks, 62 (76.5%) had a cerebral ultrasound in the first week after birth. 52 of them were reported as normal, that is, no intraventricular haemorrhage (IVH), eight reported a grade 1 IVH and the remaining two reported a grade 2 IVH. Most babies who did not have an early cerebral ultrasound reported at this time were born at 31 weeks gestation. A late cerebral ultrasound nearest to six weeks of age was reported for 47 babies, all of whom had normal reports of no cysts.

Other morbidities

Septicaemia was proven in 14 babies, including ten before day two, that is, less than 48 hours of age. There was one case of necrotising enterocolitis. Major congenital anomalies were reported for 24 babies, of which none required major surgery.

Level II transfers

In total, 92 level II registrants were transferred to other units, 62 were transferred to a level I or another level II unit, 17 were transferred to a level III unit and the remaining 13 to a children's hospital.

Survival

There were 2,130 level II registrants who survived to discharge to home (99.7%). Five babies died within the first seven days of birth (Table 37). No babies were reported to have had a lethal congenital anomaly. Survival was unknown for one baby.

TABLE 37: Survival to discharge home for level II registrants by gestational age, ANZNN 2022

Gestational age (weeks)	All babies	Babies alive on day 7	Babies alive on day 28	Survived to discharge to home	Per cent survival at discharge to home
<32	81	79	79	79	97.5
32–33	256	255	255	255	99.6
34–36	576	576	576	576	100.0
37–44	1,223	1,221	1,221	1,220	99.8
All babies	**2,136**	**2,131**	**2,131**	**2,130**	**99.7**

Note: *Survival status was not provided for one baby.*

6. Extremely preterm follow-up, 2016–2019 births

Introduction

Neurological and developmental problems are common among surviving extremely preterm and/or extremely low birthweight babies. Impairments can include cerebral palsy, blindness, deafness and developmental delay.

This chapter includes 2–3 year outcome data on extremely preterm and/or extremely low birthweight ANZNN registrants for 2016 to 2019 births. All infants born from 2016 to 2019 at less than 28 weeks gestation or less than 1,000 grams at birth and admitted to one of the 29 level III NICUs in Australia and New Zealand, who survived to discharge to home were eligible for inclusion in the ANZNN 2–3 year follow-up data collection. There were 4,908 infants who fulfilled the criteria for 2–3 year follow-up.

Care should be taken with interpretation of these data as some NICUs were unable to supply follow-up data, totalling 82 (1.7%) eligible ANZNN registrants born from 2016 to 2019. In addition, for NICUs supplying follow-up data, the follow-up rate (as detailed below) should be taken into consideration when interpreting developmental outcome data.

Follow-up rate

From 2016 to 2019, 5,685 extremely preterm and/or extremely low birthweight babies were registered to the ANZNN, with 4,908 (86.3%) surviving to discharge to home. For the babies who survived to discharge, not all NICUs were able to submit post-discharge data. It should be noted that one NICU was unable to submit post-discharge data for 2017 births and another NICU was unable to submit post-discharge data for 2016, 2017, 2018 and 2019 births before the publication of this report. The 79 eligible survivors registered to these two NICUs and born during these years were excluded from further outcome analysis.

Post-discharge data were requested for infants who were assessed at 2-3 years of age, corrected for prematurity. Age corrected for prematurity is the age the infant would have been if they had been born on their due date. The target range requested was for assessments at 24-36 months corrected age, with an acceptable range of 18-42 months corrected age. Some outcomes were available for infants who were assessed at less than 18 months corrected age and subsequently lost to follow-up, or whose age at assessment was not recorded. For the purposes of this report, assessments at 18-42 months corrected age are considered informative for 2-3 year follow-up outcomes, and outcomes for infants who were not 18-42 months corrected age at assessment are reported separately.

Of the 4,829 eligible survivors registered to NICUs that were able to submit data, 36 (0.7%) infants died after discharge to home and prior to the 2-3 year follow-up, 3,751 (77.7%) infants had a follow-up assessment at 18-42 months corrected age and four had unknown age at follow-up assessment. In addition, there was data submitted for 39 (0.8%) infants who were followed-up earlier than 18 months corrected age and eight (0.2%) infants who were followed-up at 43 months corrected age or older. The remaining 991 (20.5%) infants were lost to follow-up, and of these, 657 (66.3%) infants were known to have survived to 2-3 years of age but were not followed-up, 331 (33.4%) infants had unknown survival status at 2-3 years of age and three (0.3%) infants had no post-discharge data retrieved from the NICU (Figure 10). Overall, the rate of follow-up at 2-3 years among surviving eligible infants was 78.3% (3,751 of 4,793), excluding deaths after discharge. The follow-up rate was highest for infants born at less than 25 weeks gestation or who weighed less than 500 grams at birth (Table 38 & Table 39).

Of the 3,751 infants who were followed-up at 18-42 months corrected age, 3,046 (81.2%) had a formal developmental assessment. For the remaining 705 (18.8%) infants, some follow-up information was obtained but a formal developmental assessment was not completed.

Of the 51 infants whose age at assessment was unknown or was outside of the range 18-42 months corrected age, ten of 39 (25.6%) infants had a formal developmental assessment at less than 18 months corrected age, one of eight (12.5%) infants had a formal developmental assessment at 43 months corrected age or older, and none had a formal developmental assessment at unknown age.

FIGURE 10: ANZNN 2–3 year follow-up cohort of extremely preterm infants, 2016–2019 births

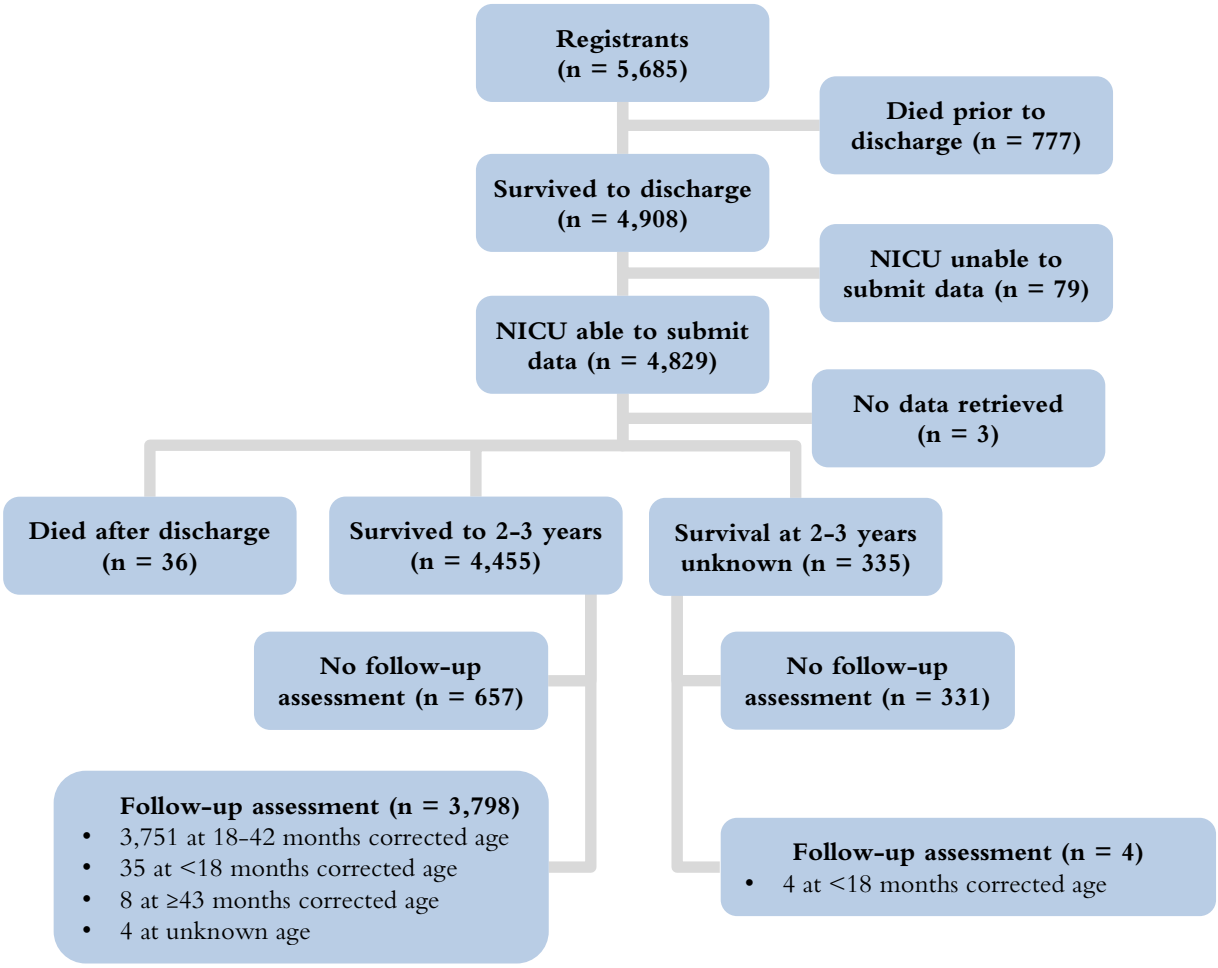


TABLE 38: Births, survival and 2–3 year follow-up of extremely preterm and/or extremely low birthweight infants by gestational age, ANZNN 2016–2019 births

	Gestational age (weeks)						
	<24	24	25	26	27	≥28[a]	Total
				Number			
Registrants	388	775	910	1,173	1,461	978	5,685
Survived to discharge	207	546	763	1,078	1,379	935	4,908
				Per cent			
Survived to discharge[b]	53.4	70.5	83.8	91.9	94.4	95.6	86.3
				Number			
NICU not included	1	11	12	16	16	23	79
Follow-up cohort[c]	206	535	751	1,061	1,363	912	4,828
▪ Died post-discharge	<5	<5	<5	8	12	7	36
▪ Follow-up assessment[d]	168	448	596	842	1,038	659	3,751
▪ No outcome data	n.p.	n.p.	n.p.	211	313	246	1,041
				Per cent			
Follow-up rate[e]	82.0	84.4	79.8	80.0	76.8	72.8	78.3

n.p. Data not published to maintain confidentiality of small numbers.
(a) These infants were <1,000 grams at birth.
(b) Denominator is all registrants.
(c) Registrants who survived to discharge from NICUs able to submit data.
(d) Infants assessed at 18-42 months corrected age, excluding infants with unknown age at assessment.
(e) Denominator is registrants who survived to discharge from NICUs able to submit data minus registrants who died post-discharge.

TABLE 39: Births, survival and 2–3 year follow-up of extremely preterm and/or extremely low birthweight infants by birthweight, ANZNN 2016–2019 births

	Birthweight (grams)							
	<500	500-599	600-699	700-799	800-899	900-999	≥1000[a]	Total
				Number				
Registrants	156	410	802	942	1,079	1,227	1,069	5,685
Survived to discharge	84	262	610	796	988	1,160	1,008	4,908
				Per cent				
Survived to discharge[b]	53.8	63.9	76.1	84.5	91.6	94.5	94.3	86.3
				Number				
NICU not included	0	2	9	9	21	20	18	79
Follow-up cohort[c]	84	260	601	787	966	1,140	990	4,828
▪ Died post-discharge	<5	<5	5	5	5	9	9	36
▪ Follow-up assessment[d]	73	214	486	629	755	841	753	3,751
▪ No outcome data	n.p.	n.p.	110	153	206	290	228	1,041
				Per cent				
Follow-up rate[e]	88.0	82.9	81.5	80.4	78.6	74.4	76.8	78.3

n.p. Data not published to maintain confidentiality of small numbers.
(a) These infants were <28 weeks at birth.
(b) Denominator is all registrants.
(c) Registrants who survived to discharge from NICUs able to submit data.
(d) Infants assessed at 18-42 months corrected age, excluding infants with unknown age at assessment.
(e) Denominator is registrants who survived to discharge from NICUs able to submit data minus registrants who died post-discharge.

The follow-up rate varied by birth year, with rates of follow-up of infants born in 2017-2019 lower than infants born in 2016 (Figure 28 in Appendix 1). Infants born in 2018-2019 were scheduled for follow up assessments in 2020-2021 and during this period many follow-up clinics were closed for some time due to COVID-19 lockdowns. Some clinics were able to catch up on missed appointments, but others prioritised infants who were identified as having greater risk of developmental delays.

Infants born in 2018 had approximately twice the annual rate of informal assessments as those born in 2016 and 2017, with many clinics using screening questionnaires and/or a video assessment when it was not possible to offer face-to-face appointments during COVID-19 lockdowns; formal developmental follow-up assessments were offered to infants identified as most at risk of delay. Other clinics prioritised appointments based on risk factors for developmental delay, such as gestational age at birth, for example offering face-to-face appointments to those born at gestations less than 26 weeks. Infants born in 2019 also had higher rates of informal assessments, with COVID-19 lockdowns continuing to alter routine clinic operations. Formal assessment of infants born in 2018, and to a lesser extent 2017 and 2019, may be skewed towards infants with developmental delays.

Assessment and tools

Children were assessed by the developmental assessment team at the level III hospital in which they received their neonatal care or the closest level III hospital to their current place of residence. If the parents were unable to travel to a level III hospital, a local paediatrician or general practitioner may have examined the child. The median age of assessment was 25.3 months with an interquartile range of 24.2-29.5 months, corrected for prematurity.

A formal developmental assessment comprised neurological examination by a developmental paediatrician or physiotherapist, and a developmental test using the Bayley Scales of Infant Development-III, Griffiths Mental Developmental Scales or another developmental test performed by a psychologist, developmental paediatrician, physiotherapist, or other qualified person.

Neurological outcome

Cerebral palsy is characterised by abnormal muscle tone and impaired motor function and control. It is a well-recognised neurological outcome among extremely preterm and/or extremely low birthweight babies. Cerebral palsy outcomes were included for infants assessed at 18-42 months corrected age as mild cerebral palsy may be difficult to diagnose prior to this age. It is important to note that infants affected by cerebral palsy are sometimes not diagnosed until after 2-3 years of age and the severity of diagnosis may change with age.

Cerebral palsy was graded using the Gross Motor Function Classification System (GMFCS). For the purposes of this report, mild was defined by GMFCS level 1, moderate by GMFCS level 2 or level 3, and severe by GMFCS level 4 or level 5. It should be noted that the definition of mild, moderate and severe cerebral palsy used in this report may be at variance with other reporting definitions.

Of the 3,751 infants with a follow-up assessment at 18-42 months corrected age, information about cerebral palsy was available for 3,658 (97.5%) and of these, 275 (7.5%) had a diagnosis of cerebral palsy. The movement ability of 269 (97.8%) infants with cerebral palsy was graded by the GMFCS. Of the infants with a GMFCS classification, 148 (55.0%) infants were graded as level 1, 49 (18.2%) as level 2, 38 (14.1%) as level 3, 16 (5.9%) as level 4 and 18 (6.7%) as level 5 (Table 40).

Of the 39 infants who were assessed at less than 18 months corrected age, there was one case of mild cerebral palsy, three cases of moderate cerebral palsy, four cases of severe cerebral palsy, and one case of cerebral palsy of unknown severity. Of the 12 infants who were assessed at older than 42 months corrected age or whose age at assessment was unknown, there were two cases of mild cerebral palsy.

TABLE 40: Cerebral palsy at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births

	Gestational age (weeks)						
Cerebral palsy	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
No cerebral palsy	138	387	523	755	967	613	3,383
Cerebral palsy	28	54	58	67	45	23	275
▪ Mild (Level 1)	13	30	30	31	28	16	148
▪ Moderate (Level 2–3)	n.p.	n.p.	n.p.	n.p.	12	n.p.	87
▪ Severe (Level 4–5)	<5	10	7	9	<5	0	34
▪ Level unknown	0	<5	<5	<5	<5	<5	6
Not stated	2	7	15	20	26	23	93
Total[(a)]	**168**	**448**	**596**	**842**	**1,038**	**659**	**3,751**
				Per cent			
No cerebral palsy	83.1	87.8	90.0	91.8	95.6	96.4	92.5
Cerebral palsy	16.9	12.2	10.0	8.2	4.4	3.6	7.5
▪ Mild (Level 1)	7.8	6.8	5.2	3.8	2.8	2.5	4.0
▪ Moderate (Level 2–3)	n.p.	n.p.	n.p.	n.p.	1.2	n.p.	2.4
▪ Severe (Level 4–5)	n.p.	2.3	1.2	1.1	n.p.	0.0	0.9
▪ Level unknown	0.0	n.p.	n.p.	n.p.	n.p.	n.p.	0.2

n.p. Data not published to maintain confidentiality of small numbers.
(a) Infants assessed at 18-42 months corrected age.
Note: *Not stated data are excluded from per cent calculations.*

Vision and hearing

Extremely preterm and/or extremely low birthweight babies are at increased risk of retinopathy of prematurity (ROP) which may result in substantial long term retinal morbidity. Of the 3,751 infants with a follow-up assessment at 18-42 months corrected age, 3,544 (94.5%) had data on blindness available and of these, 20 (0.6%) were recorded as being blind (<6/60 in the better eye). Ten (50.0%) of the infants with blindness were born at 24 weeks gestational age or younger.

Of the 51 infants who were followed up at less than 18 months or older than 42 months corrected age or whose corrected age at assessment was unknown, two infants were recorded as being blind.

Permanent congenital, delayed-onset, or progressive hearing loss is also known to be an adverse outcome of extreme prematurity. Additional risk factors for hearing loss include prolonged oxygen supplementation and hyperbilirubinemia.

Information about the use of hearing devices was available for 3,705 (98.8%) of infants with a follow-up assessment at 18-42 months corrected age. Of these, seven (0.2%) infants were fitted with a unilateral hearing aid, 24 (0.6%) infants with bilateral hearing aids, six (0.2%) infants with a cochlear implant and two (0.1%) infants with a cochlear implant and hearing aids. The proportion of infants with hearing devices was greatest among those born at 24 weeks gestational age or younger (1.7%) compared with any other gestational age group (0.6–1.1%).

Of the 46 infants who were followed up at less than 18 months or older than 42 months corrected age or whose corrected age at assessment was unknown, three infants were recorded as being fitted with hearing devices.

Congenital anomalies

Information on congenital anomalies reported for infants with a follow-up assessment was reviewed by the ANZNN Follow-up Subcommittee to identify central nervous system malformations and chromosomal anomalies known to directly cause central nervous system dysfunction and hence delayed cognitive, language and motor development. Congenital anomalies or conditions that were identified by the ANZNN Follow-up Subcommittee as being common side-effects of prematurity were not excluded from cognitive, language and motor delay analyses and functional impairment analyses.

Of the 3,751 infants assessed at 18-42 months corrected age, there were 44 infants who were identified as having a congenital anomaly that could cause developmental delay. These infants were excluded from cognitive, language and motor delay analyses and functional impairment analyses (Table 41 to Table 47). Of those excluded, there were nine infants with congenital central nervous system malformations, including encephalomalacia, holoprosencephaly, hydrocephalus, lissencephaly, microcephaly, Moyamoya disease, neurofibromatosis, Pelizaeus-Merzbacher disease and septo-optic dysplasia. Also excluded were 30 infants with genetic disorders or chromosomal anomalies, including branchio-oculo-facial syndrome, chromosomal deletion, chromosomal duplication, Cockayne syndrome, hereditary spastic paraparesis, HUWE1 mutation, KBG syndrome, Koolen-de Vries syndrome, Noonan syndrome, spondyloepiphyseal dysplasia, and trisomy 21. The remaining five infants were excluded due to other congenital anomalies or conditions affecting development.

Developmental testing

Cognitive and language delay is the most prevalent impairment in extremely preterm and/or extremely low birthweight babies. Cognitive, language and motor delay was graded for those infants formally assessed at 18-42 months corrected age only, as mild delays are unlikely to be reliably diagnosed prior to 18 months corrected age or without formal developmental assessment. Results were included for 2,134 infants assessed by the Bayley Scales of Infant and Toddler Development-III, 823 infants assessed by the Bayley Scales of Infant and Toddler Development 4 (A&NZ), 47 infants assessed by the Griffiths Mental Developmental Scales, and two infants assessed by the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). It should be noted that motor and language subscale scores were not available for the infants who were assessed by WPPSI alone.

Results were not included for infants assessed using other developmental assessments including screening assessments such as the Bayley Screening Test, Ages and Stages Questionnaires, or based on clinical assessments by healthcare professionals.

For the purposes of this report, cognitive, language and motor delay were graded as mild, moderate or severe. Severe delay was defined as scores <-3 standard deviations (SD), moderate delay as scores -3 SD to <-2 SD, and mild delay as scores -2 SD to <-1 SD relative to the mean. For a typical scale with a mean of 100 (SD 15), these cut-points were defined as follows: severe <55, moderate 55–69, and mild 70–84. As 55 is the lowest composite score that can be assigned on the Bayley cognitive scale, cut-points for severe and moderate cognitive delay were adjusted to ≤55 and 56–69 respectively for infants assessed on this scale. In a general population, approximately 12% of infants would be -2 SD to <-1 SD and approximately 2% would be <-2 SD relative to the mean. It should be noted that the definition of mild, moderate and severe delay used in this report may be at variance with other reporting definitions.

Additionally, there were 30 infants who were reported as unable to be assessed due to severe developmental delay and were therefore included in the severe category for cognitive, language and motor delay unless indicated otherwise. While an additional 13 infants without formal developmental assessment had a severe impairment recorded (four with blindness, six with severe cerebral palsy and three with blindness and severe cerebral palsy), severe cognitive, language or motor delay could not be reliably assigned to these infants.

Overall, there were 735 (24.4%) infants with mild to severe cognitive delay, 999 (34.7%) with mild to severe language delay and 761 (26.1%) with mild to severe motor delay (Table 41 to Table 43). It should be noted that language delays are difficult to assess in infants at two years of age, especially for infants who speak a language other than English. Furthermore, language delays detected in this age group may not reflect a problem or disability at later ages. Of the 167 infants with moderate motor delay, 43 (25.7%) were diagnosed with cerebral palsy, and of the 104 infants with severe motor delay, 48 (46.2%) were diagnosed with cerebral palsy.

In the 2018 birth cohort, and to a lesser extent, the 2017 and 2019 birth cohorts, the population of infants who were formally assessed may be skewed towards infants with developmental delays due to developmental follow-up clinic closures during COVID-19 lockdown periods in 2020 and 2021. Some clinics were only able to offer catch-up assessments to infants most at risk of delays.

It should also be noted that the Bayley 4 (A&NZ) may detect different rates of delay than the Bayley-III. Of the 823 infants assessed by the Bayley 4 (A&NZ), 605 of these were born in 2019 and 213 were born in 2018.

TABLE 41: Cognitive delay at 2–3 year follow-up by gestational age for Bayley-III, Bayley 4 (A&NZ), Griffiths and WPPSI assessments, ANZNN 2016–2019 births[(a)]

	Gestational age (weeks)						
Cognitive delay	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
None	90	250	336	521	692	390	2,279
Mild	22	66	92	94	97	72	443
Moderate	11	22	24	30	31	20	138
Severe	17	29	24	35	27	22	154
Not stated[(b)]	1	2	5	4	7	3	22
Total[(c)]	**141**	**369**	**481**	**684**	**854**	**507**	**3,036**
				Per cent			
None	64.3	68.1	70.6	76.6	81.7	77.4	75.6
Mild	15.7	18.0	19.3	13.8	11.5	14.3	14.7
Moderate	7.9	6.0	5.0	4.4	3.7	4.0	4.6
Severe	12.1	7.9	5.0	5.1	3.2	4.4	5.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) The cohort of infants born in 2018 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) Infants assessed by Bayley-III, Bayley 4A&NZ, Griffiths or WPPSI but with no Bayley cognitive subscale composite score, Griffiths performance subscale quotient or WPPSI full scale intelligence quotient recorded.
(c) Infants assessed by Bayley-III, Bayley 4A&NZ, Griffiths or WPPSI at 18-42 months corrected age or unable to be assessed due to severe delay. Excludes 44 infants with a congenital anomaly known to impair development.
***Note:** Not stated data (assessments with no cognitive subscale score) are excluded from per cent calculations.*

TABLE 42: Language delay at 2–3 year follow-up by gestational age for Bayley-III, Bayley 4 (A&NZ) and Griffiths assessments, ANZNN 2016–2019 births[(a)]

	Gestational age (weeks)						
Language delay	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
None	69	199	267	432	585	331	1,883
Mild	39	72	113	123	139	94	580
Moderate	13	48	47	57	45	36	246
Severe	17	26	27	36	45	22	173
Not stated[(b)]	3	23	26	36	40	24	152
Total[(c)]	**141**	**368**	**480**	**684**	**854**	**507**	**3,034**
				Per cent			
None	50.0	57.7	58.8	66.7	71.9	68.5	65.3
Mild	28.3	20.9	24.9	19.0	17.1	19.5	20.1
Moderate	9.4	13.9	10.4	8.8	5.5	7.5	8.5
Severe	12.3	7.5	5.9	5.6	5.5	4.6	6.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) The cohort of infants born in 2018 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) Infants assessed by Bayley-III, Bayley 4A&NZ or Griffiths but with no Bayley language subscale composite score or Griffiths language subscale quotient recorded.
(c) Infants assessed by Bayley-III, Bayley 4A&NZ or Griffiths at 18-42 months corrected age or unable to be assessed due to severe delay. Excludes 44 infants with a congenital anomaly known to impair development.
***Note:** Not stated data (assessments with no language subscale score) are excluded from per cent calculations.*

TABLE 43: Motor delay at 2–3 year follow-up by gestational age for Bayley-III, Bayley 4 (A&NZ) and Griffiths assessments, ANZNN 2016–2019 births[(a)]

	Gestational age (weeks)						
Motor delay	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
None	76	230	308	493	667	385	2,159
Mild	32	66	98	114	108	72	490
Moderate	9	32	32	32	40	22	167
Severe	16	24	18	21	13	12	104
Not stated[(b)]	8	16	24	24	26	16	114
Total[(c)]	**141**	**368**	**480**	**684**	**854**	**507**	**3,034**
				Per cent			
None	57.1	65.3	67.5	74.7	80.6	78.4	73.9
Mild	24.1	18.8	21.5	17.3	13.0	14.7	16.8
Moderate	6.8	9.1	7.0	4.8	4.8	4.5	5.7
Severe	12.0	6.8	3.9	3.2	1.6	2.4	3.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) The cohort of infants born in 2018 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) Infants assessed by Bayley-III, Bayley 4A&NZ or Griffiths but with no Bayley motor subscale composite score or Griffiths locomotor/gross motor subscale quotient recorded.
(c) Infants assessed by Bayley-III, Bayley 4A&NZ or Griffiths at 18-42 months corrected age or unable to be assessed due to severe delay. Excludes 44 infants with a congenital anomaly known to impair development.
***Note:** Not stated data (assessments with no motor subscale score) are excluded from per cent calculations.*

Functional impairment

Functional impairment was analysed for 2,562 infants assessed at 18-42 months corrected age, with cognitive, language and motor subscale scores from Bayley or Griffiths assessments, and with data on blindness, hearing device use, and cerebral palsy. Functional impairment was defined by physical or neurodevelopmental impairment and graded as mild, moderate or severe according to the following classification: mild (GMFCS level 1 cerebral palsy, mild language, cognitive or motor delay); moderate (GMFCS level 2 to 3 cerebral palsy, deafness requiring amplification, moderate language, cognitive or motor delay); severe (GMFCS level 4 to 5 cerebral palsy, blindness or severe language, cognitive or motor delay). It should be noted that the definition of mild, moderate and severe delay used in this report may be at variance with other reporting definitions.

Additionally, 46 infants who met at least one of the criteria for severe impairment but had missing data for one or more outcomes, and 30 infants who were unable to be assessed or were unable to complete assessment due to severe developmental delay were included in the severe category for functional impairment. Of these infants, eight were less than 24 weeks, 16 were 24 weeks, 16 were 25 weeks, 14 were 26 weeks, 15 were 27 weeks and seven were 28 weeks gestational age or older at birth.

Of the 2,638 infants where functional impairment could be graded, there were 1,234 (46.8%) infants with any degree of functional impairment, including 693 (26.3%) with a mild impairment, 281 (10.7%) with a moderate impairment and 260 (9.9%) with a severe impairment. Functional impairment was most prevalent and most severe among infants who were born at younger gestational ages (Table 44). Of the 1,234 infants with any degree of functional impairment, 254 (20.6%) were classified based on language delays alone.

TABLE 44: Severity of functional impairment at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births[(a)]

	Gestational age (weeks)						
Functional impairment	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
None	44	131	193	322	469	245	1,404
Mild	42	92	126	155	159	119	693
Moderate	13	50	61	62	59	36	281
Severe	24	42	40	59	60	35	260
Incomplete formal test[(b)]	21	57	64	90	111	73	416
Other formal test	0	4	4	3	4	3	18
No formal test	23	66	100	147	166	133	635
Total[(c)]	**167**	**442**	**588**	**838**	**1,028**	**644**	**3,707**
				Per cent			
None	35.8	41.6	46.0	53.8	62.8	56.3	53.2
Mild	34.1	29.2	30.0	25.9	21.3	27.4	26.3
Moderate	10.6	15.9	14.5	10.4	7.9	8.3	10.7
Severe	19.5	13.3	9.5	9.9	8.0	8.0	9.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) The cohort of infants born in 2018 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) Infants with Bayley or Griffiths assessments but with missing data for one or more outcomes.
(c) Infants assessed at 18-42 months corrected age or unable to be assessed due to severe delay. Excludes 44 infants with a congenital anomaly known to impair development.
***Note:** Infants with incomplete, other or no formal developmental assessment are excluded from per cent calculations. This table includes 254 infants with a mild, moderate or severe functional impairment classification based on language delay alone.*

Moderate to severe functional impairment

In addition to the above infants where functional impairment could be graded, infants assessed by Bayley or Griffiths but with missing data for one or more outcomes, infants assessed by other formal developmental assessments, and infants without formal developmental assessments, were reviewed by the ANZNN Follow-up Subcommittee to determine if there was sufficient information to be classified as with or without moderate to severe functional impairment. In some cases, further information was requested from the NICU for clarification of outcomes.

A classification of 'with moderate to severe impairment' was assigned to infants who were assessed at 18-42 months corrected age who had any recorded formal assessment of moderate or severe impairment or developmental delay, or any clinical assessment of severe developmental delay.

A classification of 'without moderate to severe impairment' was assigned to infants where moderate to severe impairment could be reasonably excluded based on the following criteria:

- Infants who did not have moderate or severe functional impairment based on formal developmental assessment conducted at 18-42 months corrected age.
- Infants who did not have moderate or severe functional impairment based on assessment by a health care professional at 18-42 months corrected age. Of these, infants with missing or unknown results for cerebral palsy, hearing or vision were presumed likely to be without moderate or severe impairment. Where infants had a partially completed formal assessment and no clinical assessment was recorded, they were also presumed likely to be without moderate or severe impairment.

Any remaining infants who had a recorded clinical assessment of moderate developmental delay or delays of uncertain severity in at least one domain were reviewed and classified on a case by case basis.

Functional impairment was classified as 'not stated' for infants with no moderate or severe impairment reported who did not meet the above criteria. Moderate or severe impairment may be present among these infants, but for the purposes of this report they are excluded from the calculation of moderate to severe impairment due to insufficient information.

Upon review, 807 infants with incomplete or other formal developmental assessments, or without formal developmental assessments, had sufficient information to be classified as with or without moderate to severe functional impairment. Of these 807 infants, together with the 2,638 infants graded in Table 44, there were 688 (20.0%) infants with moderate to severe functional impairment. Moderate to severe functional impairment decreased with increasing gestational age (Table 45). Of these 688 infants with moderate to severe functional impairment, there were 184 (26.7%) infants classified with moderate to severe functional impairment based on language delay alone.

TABLE 45: Infants with or without moderate to severe functional impairment at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births

	Gestational age (weeks)						
Functional impairment	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
Without moderate-severe impairment	110	285	428	623	809	502	2,757
Moderate-severe impairment	49	128	119	151	153	88	688
Not stated[(a)]	8	29	41	64	66	54	262
Total[(b)]	**167**	**442**	**588**	**838**	**1,028**	**644**	**3,707**
				Per cent			
Without moderate-severe impairment	69.2	69.0	78.2	80.5	84.1	85.1	80.0
Moderate-severe impairment	30.8	31.0	21.8	19.5	15.9	14.9	20.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Infants where moderate to severe functional impairment could not be excluded based on the available data.
(b) Infants assessed at 18-42 months corrected age or unable to be assessed due to severe delay. Excludes 44 infants with a congenital anomaly known to impair development.
***Note:** Not stated data are excluded from per cent calculations. This table includes 184 infants with a moderate-severe functional impairment classification based on language delay alone.*

Neonatal intraventricular haemorrhage and moderate to severe functional impairment

Babies diagnosed with intraventricular haemorrhage (IVH) are at increased risk of long term neurodevelopmental impairment, particularly those with severe grades of IVH. IVH can occur on one or both sides of the brain, with worse long term outcomes associated with bilateral IVH.

There were 4,461 babies born in 2016 to 2019 at less than 28 weeks gestation and who survived to day 3 and were registered to NICUs able to submit post-discharge data. Of these, 4,444 were examined for IVH. Table 46 presents 2-3 year outcomes for this cohort by IVH diagnosis and by gestational age in weeks. Outcomes at 2-3 year follow-up include death from day 4 onwards (including post-discharge), and functional impairment classification at 2-3 year follow-up. Outcome is tabled as unknown for infants lost to follow up or otherwise unable to be classified as with or without functional impairment.

Care should be taken when interpreting outcomes of babies diagnosed with IVH, considering that the diagnosis may influence decisions around continuing intensive care or transitioning to palliative care. In addition, only 2,886 of the 3,882 babies not known to have died before 2-3 years of age were followed up and were able to be classified as with or without moderate to severe functional impairment, leaving 996 (25.7%) with outcome at 2-3 years unknown (Table 46).

There were 4,110 babies born in 2016 to 2019 between 24 to 27 weeks gestation who survived to day 3 and were registered to NICUs able to submit post-discharge data. Of these, 355 were diagnosed with severe (Grade 3 or Grade 4) IVH. Mortality was higher for bilateral severe IVH compared with unilateral severe IVH (Table 47).

TABLE 46: Functional impairment at 2–3 year follow-up for level III registrants born before 28 weeks gestation surviving to day 3 and examined for neonatal intraventricular haemorrhage by gestational age, ANZNN 2016–2019 births

IVH	Gestational age (weeks)					
Outcome	**<24**	**24**	**25**	**26**	**27**	**Total**
			Number			
None						
Died[(a)]	39	66	49	44	47	245
Moderate-severe impairment	18	66	71	106	117	378
Without moderate-severe impairment	56	171	281	478	651	1,637
Unknown	21	63	121	194	304	703
Total[(b)]	**134**	**366**	**522**	**822**	**1,119**	**2,963**
Grade 1 or 2						
Died[(a)]	26	38	16	17	12	109
Moderate-severe impairment	18	39	32	23	29	141
Without moderate-severe impairment	40	91	124	125	139	519
Unknown	15	26	54	69	55	219
Total[(b)]	**99**	**194**	**226**	**234**	**235**	**988**
Grade 3 or 4						
Died[(a)]	64	52	49	13	17	195
Moderate-severe impairment	14	25	19	22	9	89
Without moderate-severe impairment	14	24	23	19	17	97
Unknown	8	20	14	11	15	68
Total[(b)]	**100**	**121**	**105**	**65**	**58**	**449**
			Per cent			
None						
Died[(a)]	34.5	21.8	12.2	7.0	5.8	10.8
Moderate-severe impairment	15.9	21.8	17.7	16.9	14.4	16.7
Without moderate-severe impairment	49.6	56.4	70.1	76.1	79.9	72.4
Grade 1 or 2						
Died[(a)]	31.0	22.6	9.3	10.3	6.7	14.2
Moderate-severe impairment	21.4	23.2	18.6	13.9	16.1	18.3
Without moderate-severe impairment	47.6	54.2	72.1	75.8	77.2	67.5
Grade 3 or 4						
Died[(a)]	69.6	51.5	53.8	24.1	39.5	51.2
Moderate-severe impairment	15.2	24.8	20.9	40.7	20.9	23.4
Without moderate-severe impairment	15.2	23.8	25.3	35.2	39.5	25.5

(a) Includes deaths occurring from day 4 onwards (including post-discharge) until follow up at 2-3 years, excluding 13 infants whose death before discharge to home was directly attributable to a congenital anomaly.
(b) Excludes 31 infants surviving to discharge to home with a congenital anomaly known to impair development.
Note: *Unknown outcome data are excluded from per cent calculations.*
IVH = intraventricular haemorrhage.

TABLE 47: Functional impairment at 2–3 year follow-up for level III registrants born at 24 to 27 weeks gestation surviving to day 3 and diagnosed with Grade 3 or Grade 4 neonatal intraventricular haemorrhage, ANZNN 2016–2019 births

	Outcome				
IVH	Died[(a)]	Moderate-severe impairment	Without moderate-severe impairment	Unknown	Total[(b)]
			Number		
Grade 3 or Grade 4 unilateral					
▪ Grade 2 or less on other side	48	28	56	35	**167**
Grade 3 or Grade 4 bilateral					
▪ Grade 3 or Grade 4 on both sides	83	47	27	25	**182**
			Per cent		
Grade 3 or Grade 4 unilateral					
▪ Grade 2 or less on other side	36.4	21.2	42.4		**100.0**
Grade 3 or Grade 4 bilateral					
▪ Grade 3 or Grade 4 on both sides	52.9	29.9	17.2		**100.0**

(a) Includes deaths occurring from day 4 onwards (including post-discharge) until follow up at 2-3 years, excluding three infants whose death before discharge to home was directly attributable to a congenital anomaly.
(b) Excludes three infants surviving to discharge to home with a congenital anomaly known to impair development.
Note: *Unknown outcome data are excluded from per cent calculations.*
IVH = intraventricular haemorrhage.

Growth – weight, height and head circumference

For the purposes of this report, growth standards published by the World Health Organization, 2006 were used to determine weight, height and head circumference for age percentiles, and weight for length/height percentiles.

Growth measurements were analysed for 3,732 infants assessed at 18-42 months corrected age. Of these infants, 9.3% fell below the 3rd percentile for weight for age, 12.9% for length/height for age, 7.9% for head circumference for age and 6.2% for weight for length/height, after excluding missing measurements. For weight and length/height for age and weight for length/height, the proportion of infants below the 3rd percentile was highest among those 28 weeks gestational age or older who weighed less than 1,000 grams at birth (Table 48 to Table 51). It is highly likely these infants were intrauterine growth restricted (IUGR) and may continue to show a pattern of slower growth.

TABLE 48: Weight for age at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births

	Gestational age (weeks)						
Weight for age centile[(a)]	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
<3	15	30	26	34	47	80	232
3–9	13	38	33	46	62	71	263
10–90	n.p.	223	290	398	475	n.p.	1,711
>90	<5	23	20	51	98	n.p.	223
Not stated	65	134	224	303	352	225	1,303
Total[(b)]	**167**	**448**	**593**	**832**	**1,034**	**658**	**3,732**
				Per cent			
<3	14.7	9.6	7.0	6.4	6.9	18.5	9.6
3–9	12.7	12.1	8.9	8.7	9.1	16.4	10.8
10–90	n.p.	71.0	78.6	75.2	69.6	n.p.	70.4
>90	n.p.	7.3	5.4	9.6	14.4	n.p.	9.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) Centiles derived from WHO child growth standards, World Health Organization, 2006.
(b) Infants assessed at 18-42 months corrected age.
***Note:** Not stated data are excluded from per cent calculations.*

TABLE 49: Length/height for age at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births

	Gestational age (weeks)						
Length/height for age centile[(a)]	**<24**	**24**	**25**	**26**	**27**	**≥28**	**Total**
				Number			
<3	20	37	41	47	57	92	294
3–9	20	48	38	57	70	58	291
10–90	55	192	255	352	456	239	1,549
>90	5	19	20	47	68	15	174
Not stated	67	152	239	329	383	254	1,424
Total[(b)]	**167**	**448**	**593**	**832**	**1,034**	**658**	**3,732**
				Per cent			
<3	20.0	12.5	11.6	9.3	8.8	22.8	12.7
3–9	20.0	16.2	10.7	11.3	10.8	14.4	12.6
10–90	55.0	64.9	72.0	70.0	70.0	59.2	67.1
>90	5.0	6.4	5.6	9.3	10.4	3.7	7.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Centiles derived from WHO child growth standards, World Health Organization, 2006.
(b) Infants assessed at 18-42 months corrected age.
***Note**: Not stated data are excluded from per cent calculations.*

TABLE 50: Head circumference for age at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births

Head circumference for age centile[(a)]	Gestational age (weeks)						
	<24	24	25	26	27	≥28	Total
				Number			
<3	18	32	26	32	23	42	173
3–9	15	37	27	32	34	41	186
10–90	56	184	232	335	412	260	1,479
>90	7	23	41	55	121	20	267
Not stated	71	172	267	378	444	295	1,627
Total[(b)]	**167**	**448**	**593**	**832**	**1,034**	**658**	**3,732**
				Per cent			
<3	18.8	11.6	8.0	7.0	3.9	11.6	8.2
3–9	15.6	13.4	8.3	7.0	5.8	11.3	8.8
10–90	58.3	66.7	71.2	73.8	69.8	71.6	70.3
>90	7.3	8.3	12.6	12.1	20.5	5.5	12.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Centiles derived from WHO child growth standards, World Health Organization, 2006.
(b) Infants assessed at 18-42 months corrected age.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 51: Weight for length/height at 2–3 year follow-up by gestational age, ANZNN 2016–2019 births

Weight for length/height centile[(a)]	Gestational age (weeks)						
	<24	24	25	26	27	≥28	Total
				Number			
<3	10	19	20	37	28	76	190
3–9	12	32	42	47	65	76	274
10–90	102	287	368	498	635	357	2,247
>90	9	36	48	84	126	34	337
Not stated	34	74	115	166	180	115	684
Total[(b)]	**167**	**448**	**593**	**832**	**1,034**	**658**	**3,732**
				Per cent			
<3	7.5	5.1	4.2	5.6	3.3	14.0	6.2
3–9	9.0	8.6	8.8	7.1	7.6	14.0	9.0
10–90	76.7	76.7	77.0	74.8	74.4	65.7	73.7
>90	6.8	9.6	10.0	12.6	14.8	6.3	11.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Centiles derived from WHO child growth standards, World Health Organization, 2006.
(b) Infants assessed at 18-42 months corrected age.
Note: *Not stated data are excluded from per cent calculations.*

Respiratory and gastrointestinal tract

Respiratory and gastrointestinal tract complications, such as respiratory distress syndrome and necrotising enterocolitis, commonly affect extremely premature babies and can lead to ongoing disease. Of the 3,668 infants with data available on the use of respiratory support at 18-42 months corrected age, six (0.2%) were supported by tracheostomy and 28 (0.8%) were supported by supplemental oxygen. One in three (35.3%) infants receiving respiratory support were born at less than 25 weeks gestational age. Of the 35 infants with data only available at less than 18 months corrected age or unknown corrected age, none were supported by tracheostomy or supplemental oxygen. None of the eight infants assessed at greater than 42 months corrected age were still receiving respiratory support.

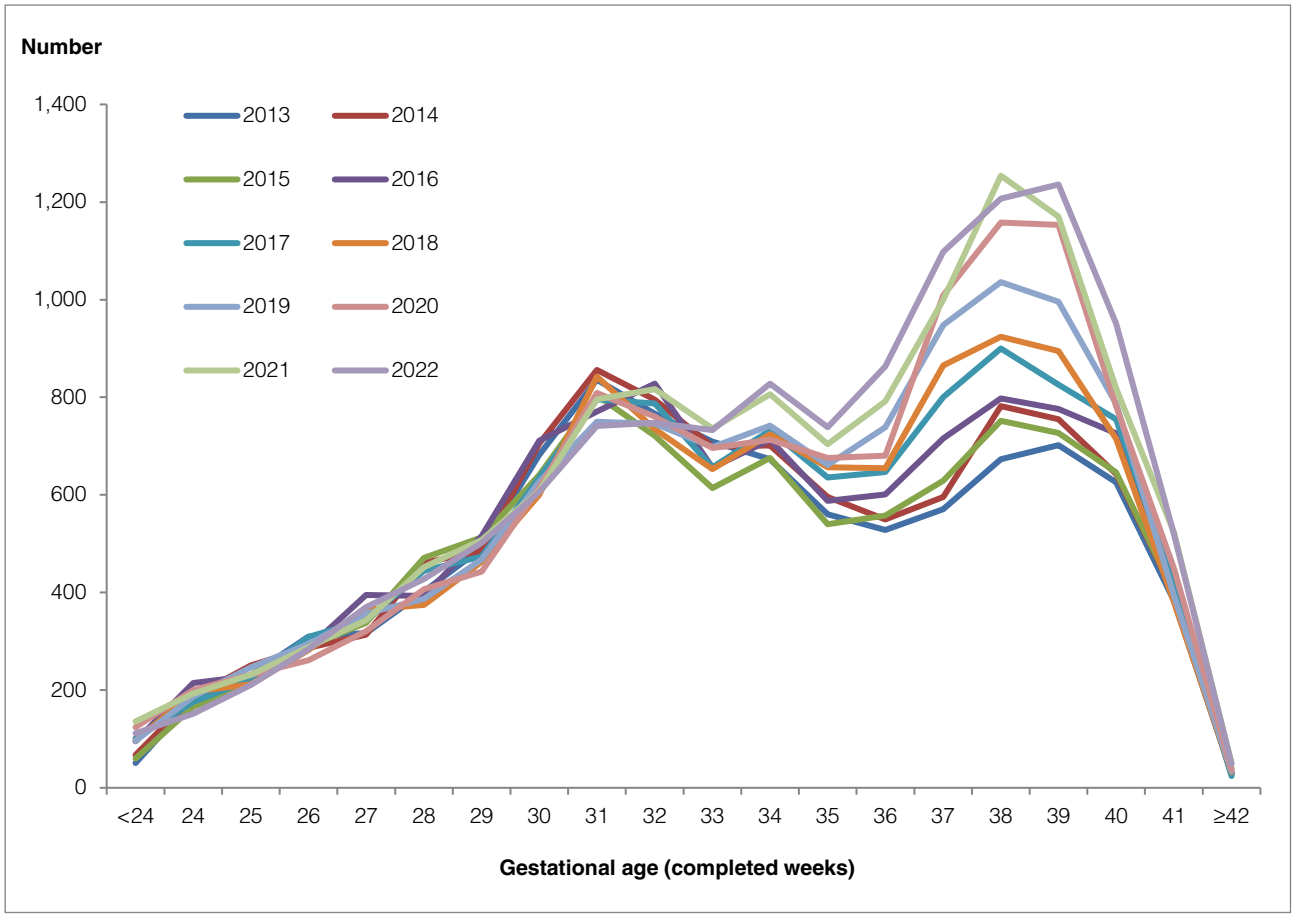
Of the 3,653 infants with nutritional support data at 18-42 months corrected age, one infant was reported as receiving parenteral nutrition and 98 (2.7%) infants were reported as feeding via a percutaneous endoscopic gastronomy tube or nasogastric tube. The prevalence of nutritional support in each gestational age group (completed weeks) ranged from 1.9–3.5%. Of the 35 infants with data only available at less than 18 months corrected age or unknown corrected age, none were receiving nutritional support. None of the ten infants assessed at greater than 42 months corrected age were still receiving nutritional support.

APPENDICES

Appendix 1: Trends

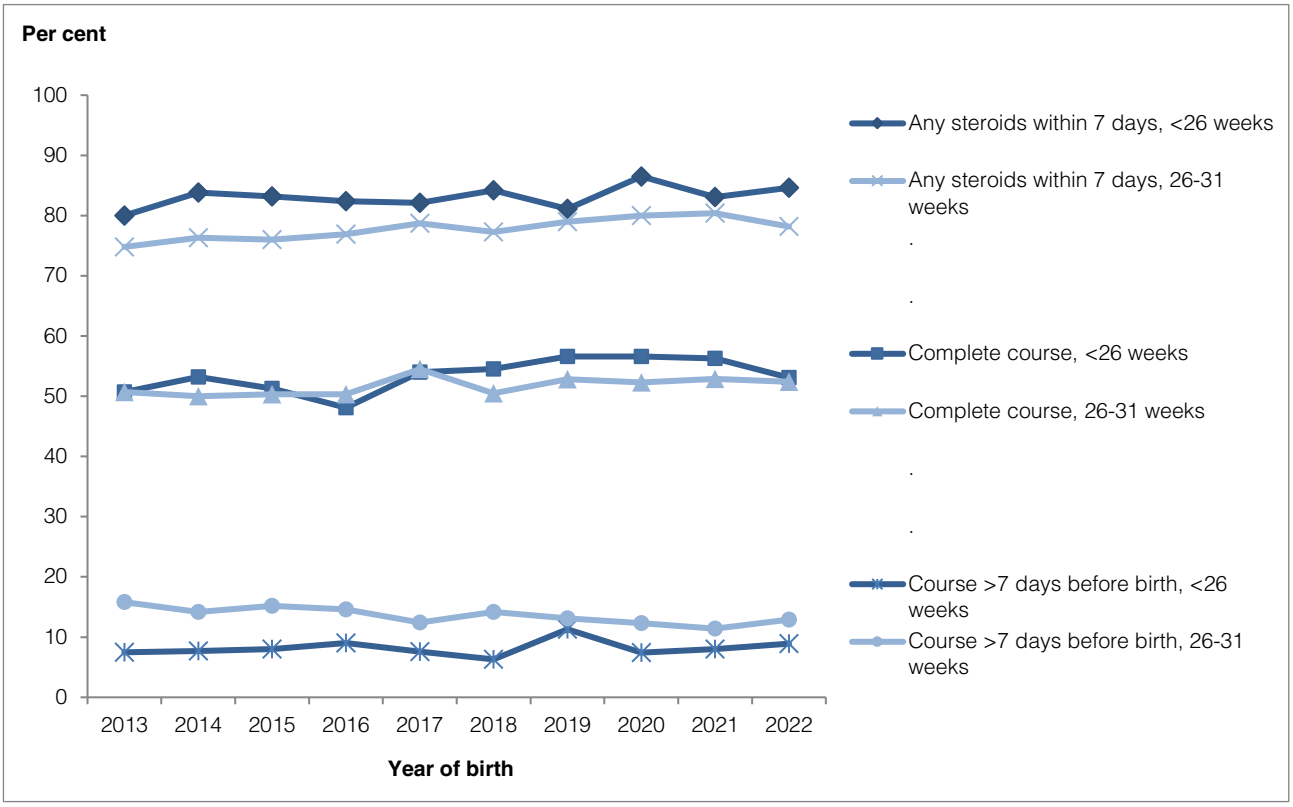
Babies registered to level III units

FIGURE 11: Trends in gestational age at birth of level III registrants, ANZNN 2013–2022



Please refer to www.anznn.net for colour version.

FIGURE 12: Trends in the use of corticosteroids for mothers of babies less than 32 weeks gestation, ANZNN 2013–2022



Note: *Corticosteroid treatment to enhance fetal lung maturation is considered 'complete' when two doses are given, the first dose more than 24 hours and less than 8 days before the baby's birth.*
'Any steroids within 7 days' includes babies who received a 'complete course' as well as babies who received their first dose of corticosteroids at less than 24 hours prior to birth.

FIGURE 13: Trends in multiple births of level III registrants by gestational age, ANZNN 2013–2022

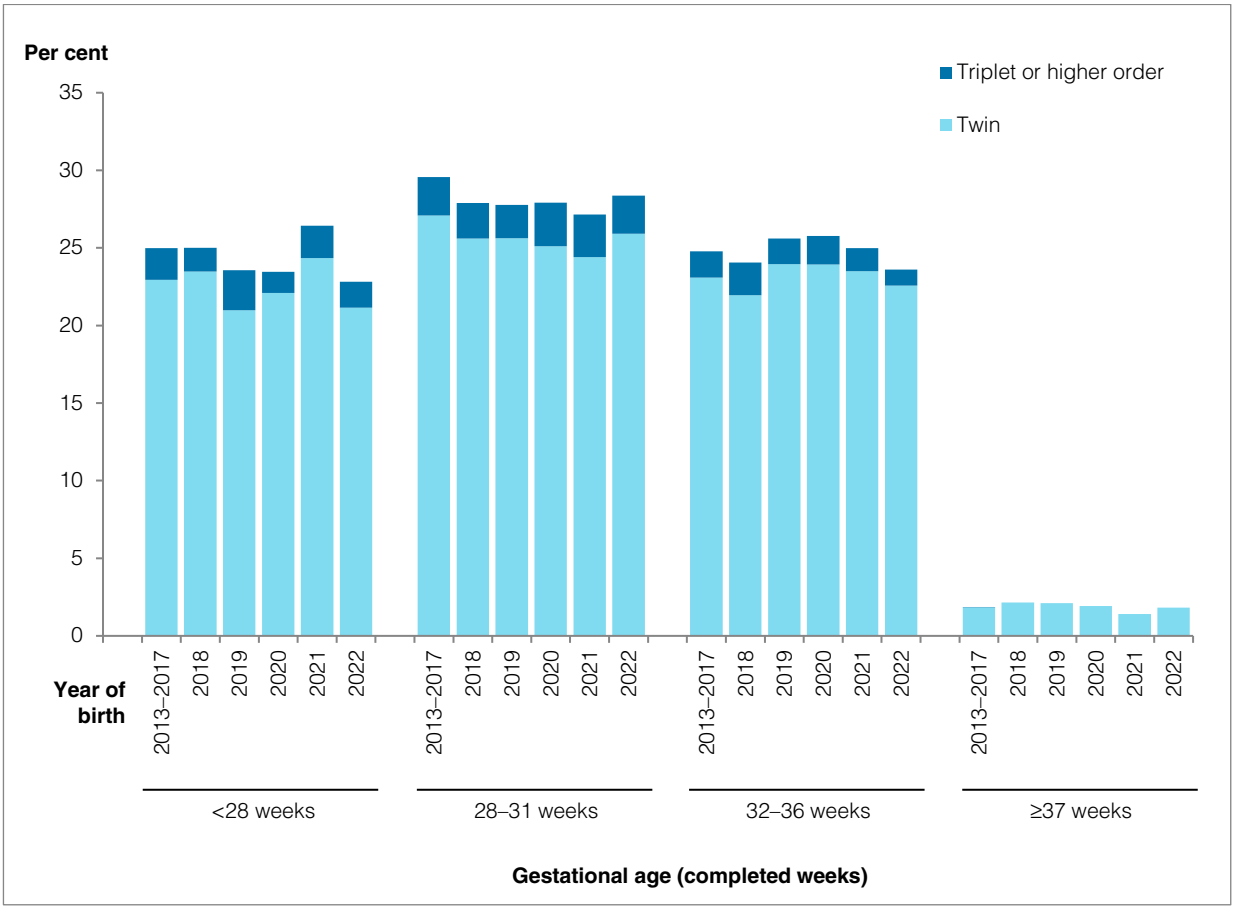


FIGURE 14: Trends in method of birth for level III registrants by year of birth, ANZNN 2013–2022

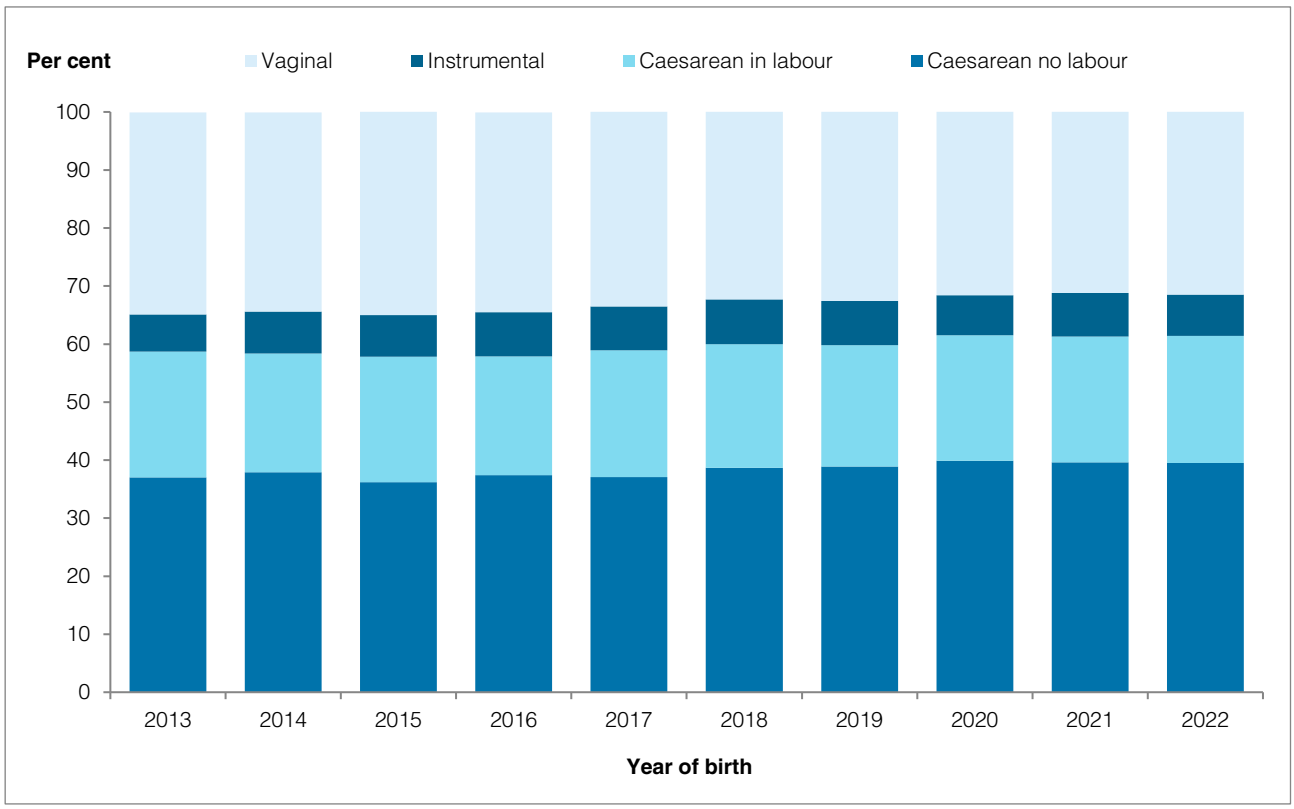


FIGURE 15: Trends in referral source to level III NICU by year of birth, ANZNN 2013–2022

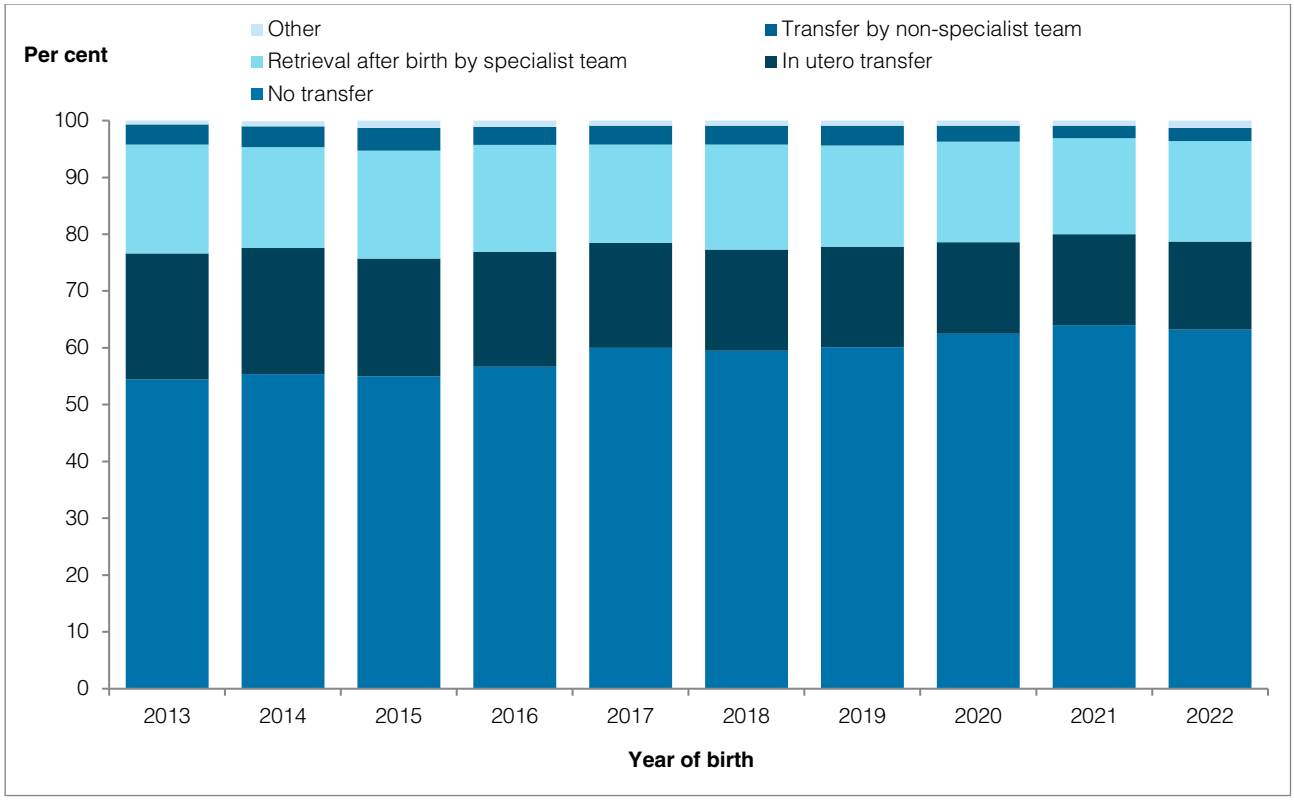


FIGURE 16: Trends in mode of transport to level III NICU, ANZNN 2013–2022

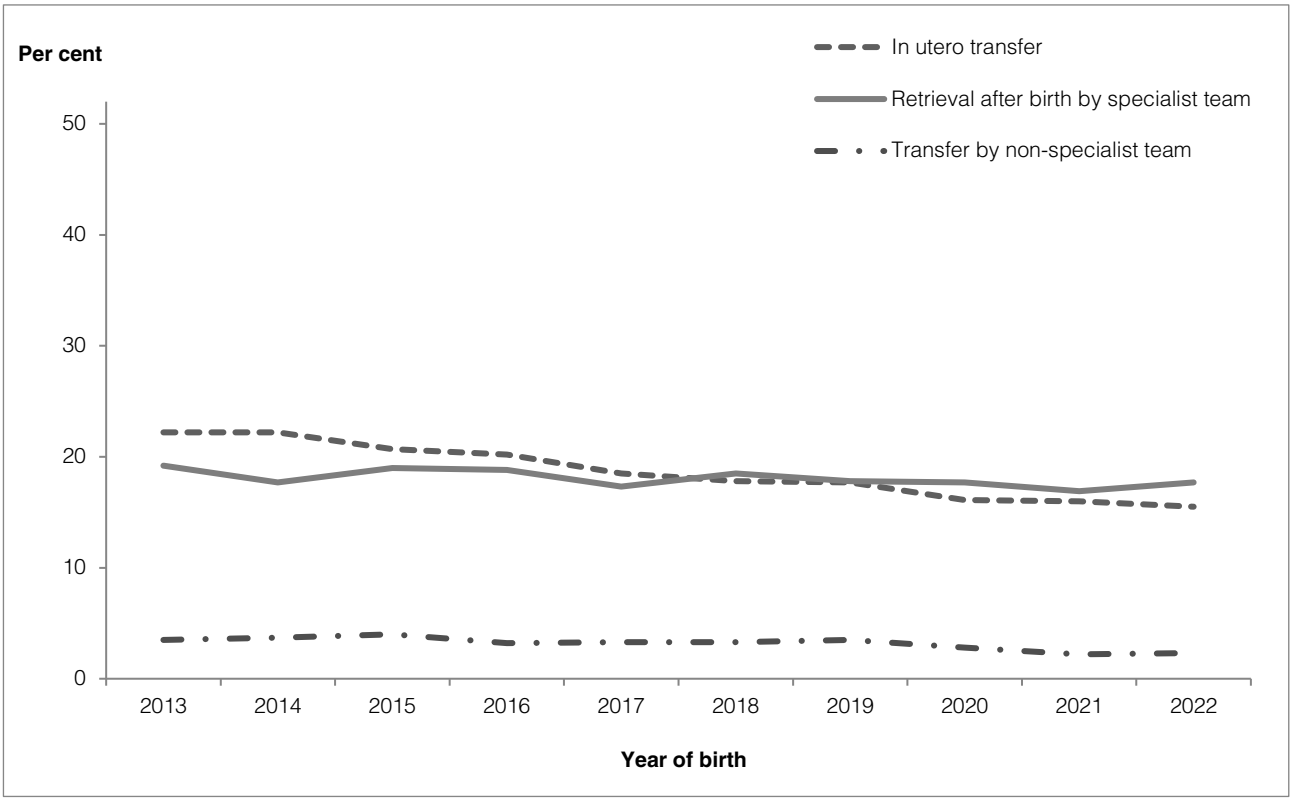
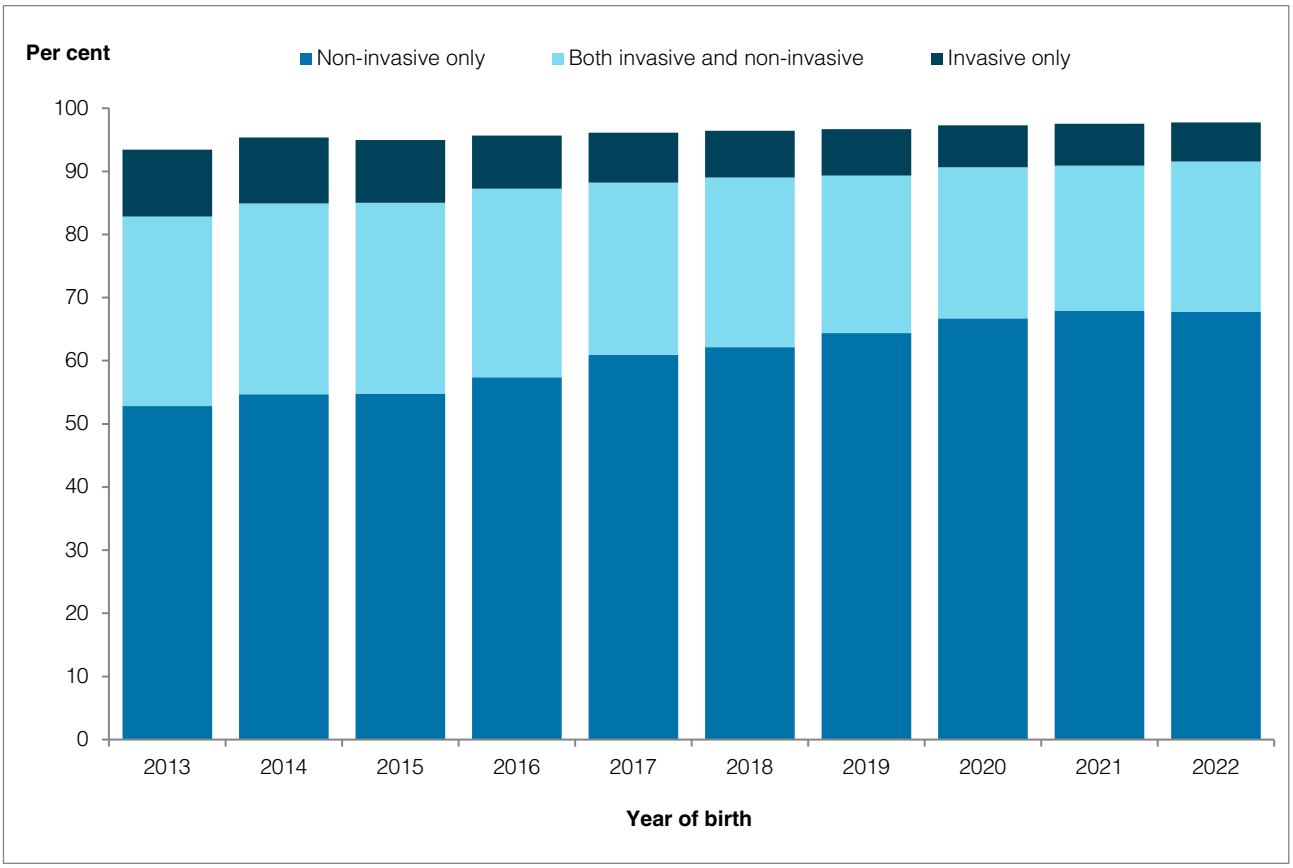
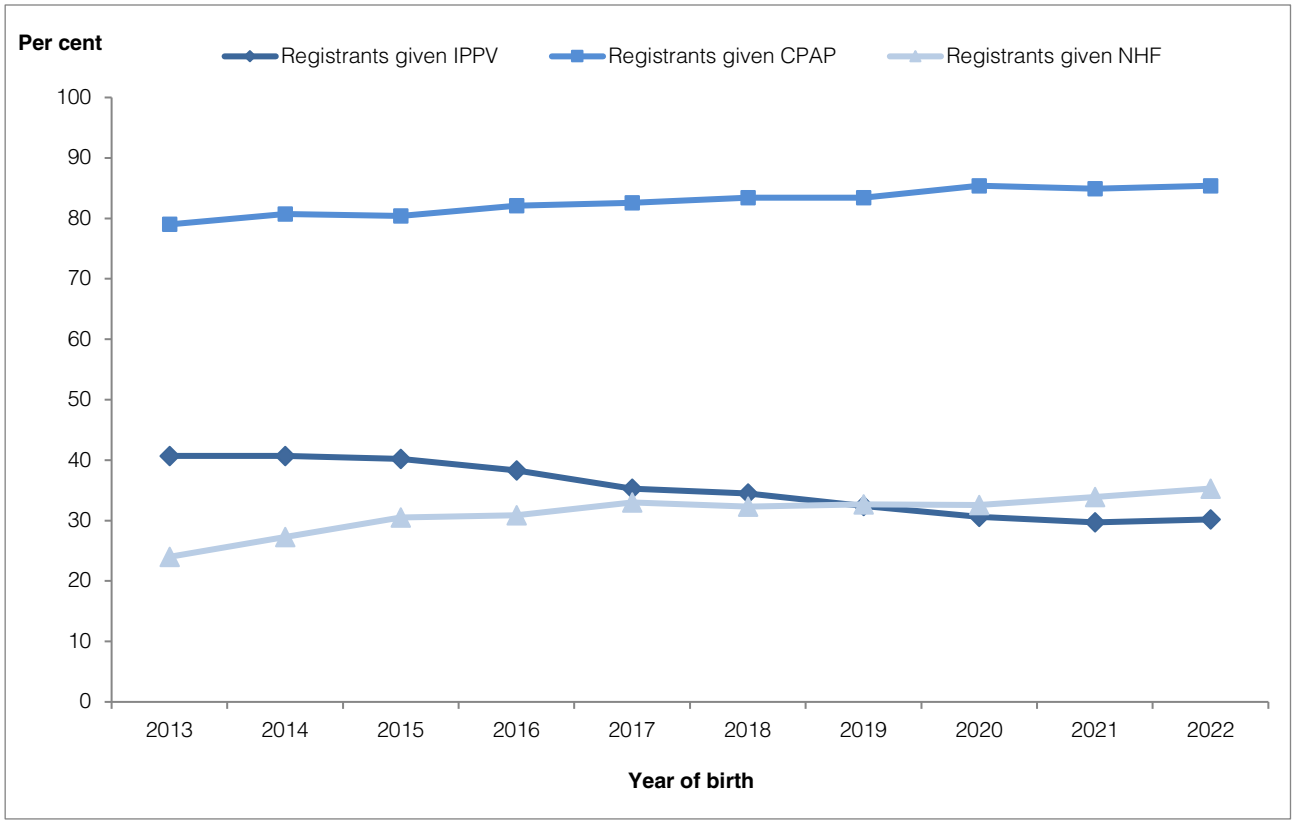


FIGURE 17: Trends in mode of assisted ventilation for level III registrants, ANZNN 2013–2022



Note: *Non-invasive ventilation = continuous positive airway pressure (CPAP) or nasal high flow (NHF).*
Invasive ventilation = intermittent positive pressure ventilation (IPPV).

FIGURE 18: Trends in provision of intermittent positive pressure ventilation, continuous positive airway pressure and nasal high flow by year of birth for level III registrants ventilated, ANZNN 2013–2022



Note: *Groups are not mutually exclusive.*
IPPV = intermittent positive pressure ventilation. CPAP = continuous positive airway pressure. NHF = nasal high flow.

FIGURE 19: Trends in the use of ventilation not requiring endotracheal tube (continuous positive airway pressure or nasal high flow) as the only form of ventilation by gestational age for level III registrants, ANZNN 2013, 2016, 2019–2022

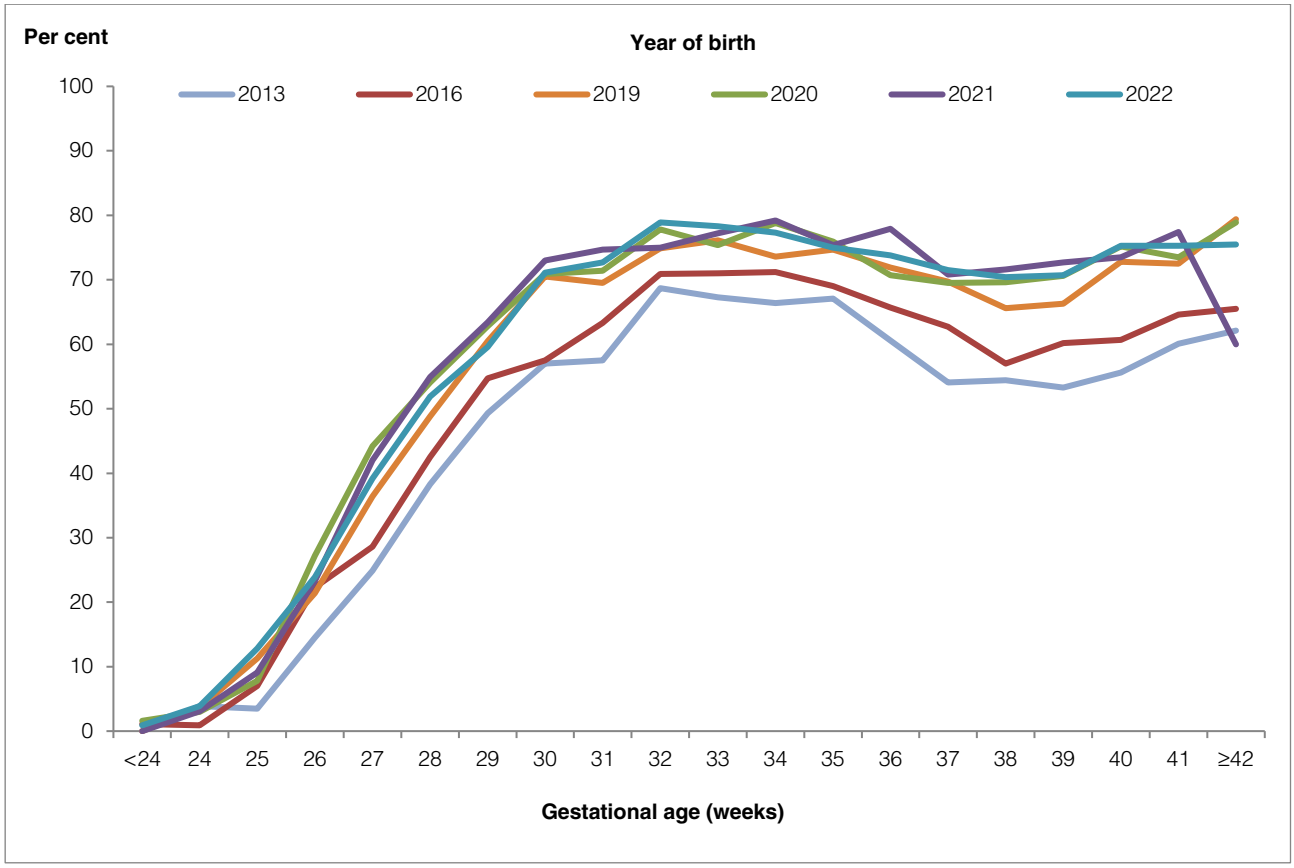
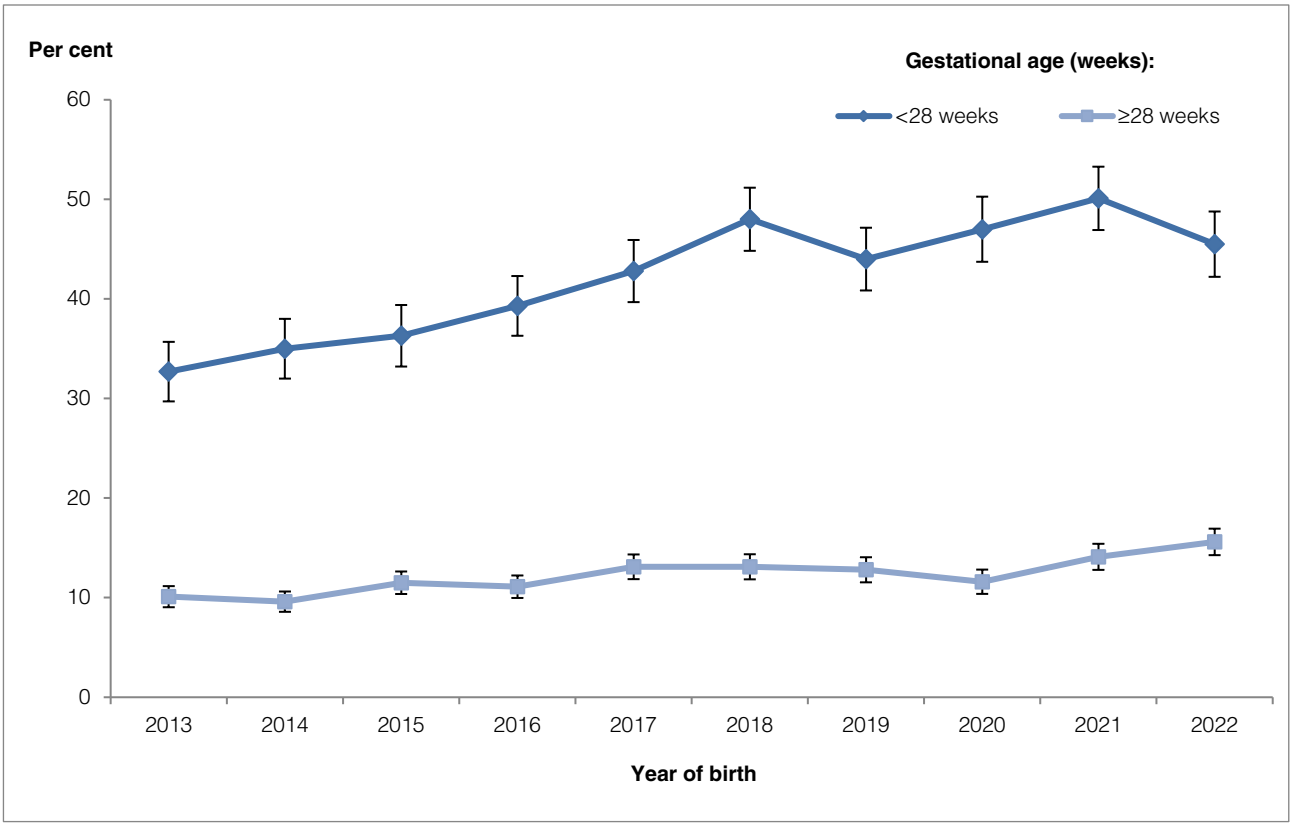
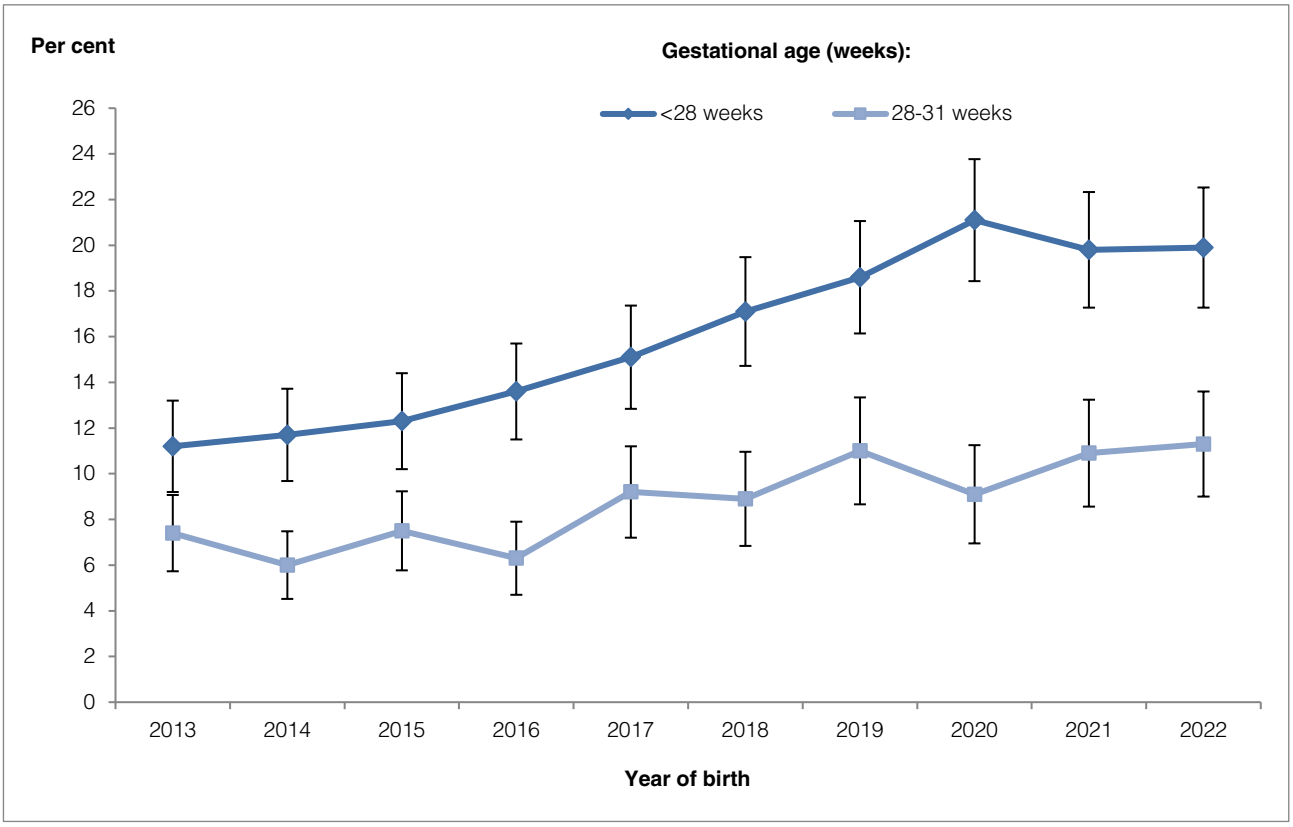


FIGURE 20: Trends in provision of high frequency oscillatory ventilation (with 95% CI) for level III registrants born before 28 weeks and at 28 or more weeks gestation, ANZNN 2013–2022



Note: *Results are given as the percentage of babies given intermittent positive pressure ventilation.*

FIGURE 21: Trends in nitric oxide (with 95% CI) provision for level III registrants born before 28 weeks and 28-31 weeks gestation, ANZNN 2013–2022



Note: *Results are given as the percentage of babies given intermittent positive pressure ventilation.*

FIGURE 22: Trends in chronic lung disease (with 95% CI) for level III registrants who survived to 36 weeks post menstrual age, ANZNN 2013–2022

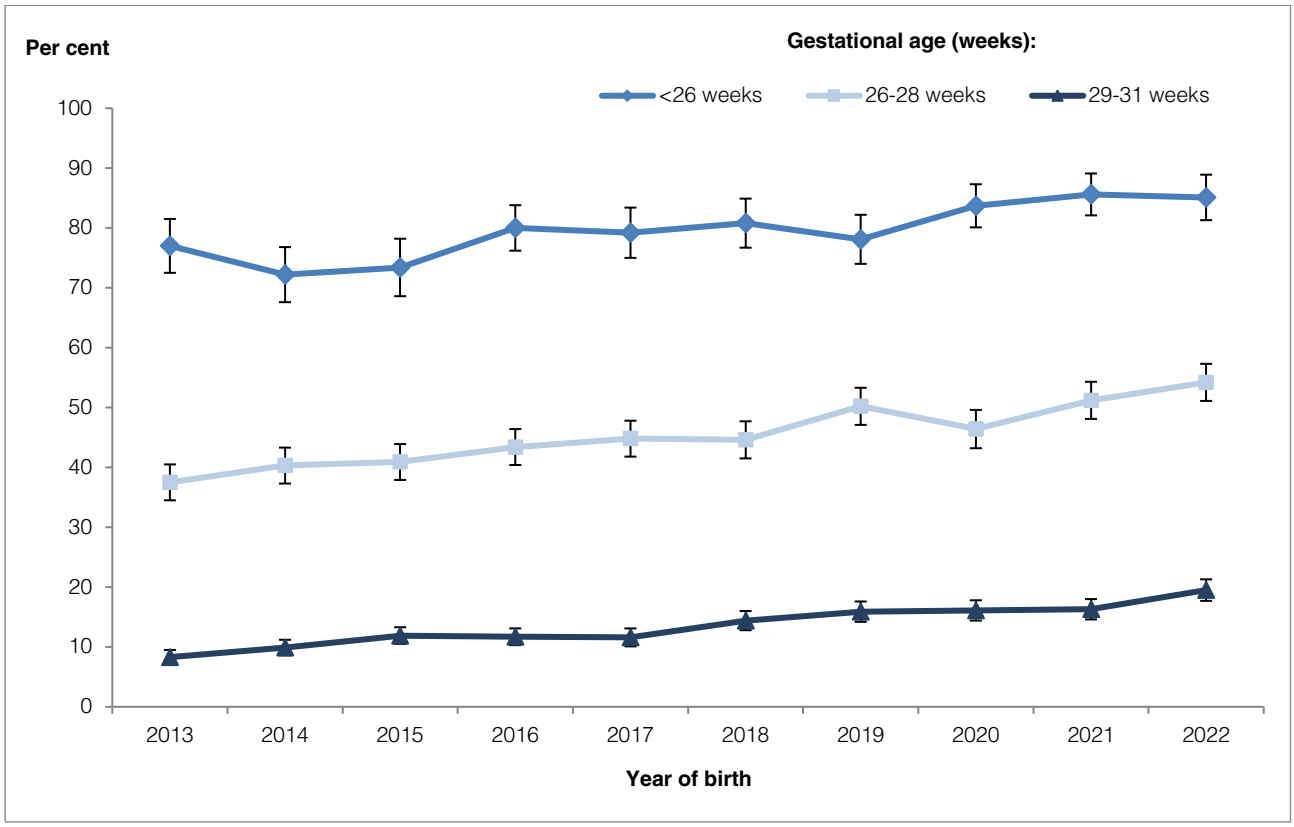


FIGURE 23: Trends in stage 3 to 5 retinopathy of prematurity and surgically treated retinopathy among babies born before 31 weeks gestation and/or birthweight of less than 1,250 grams who survived to 36 weeks post menstrual age for level III registrants, ANZNN 2013–2022

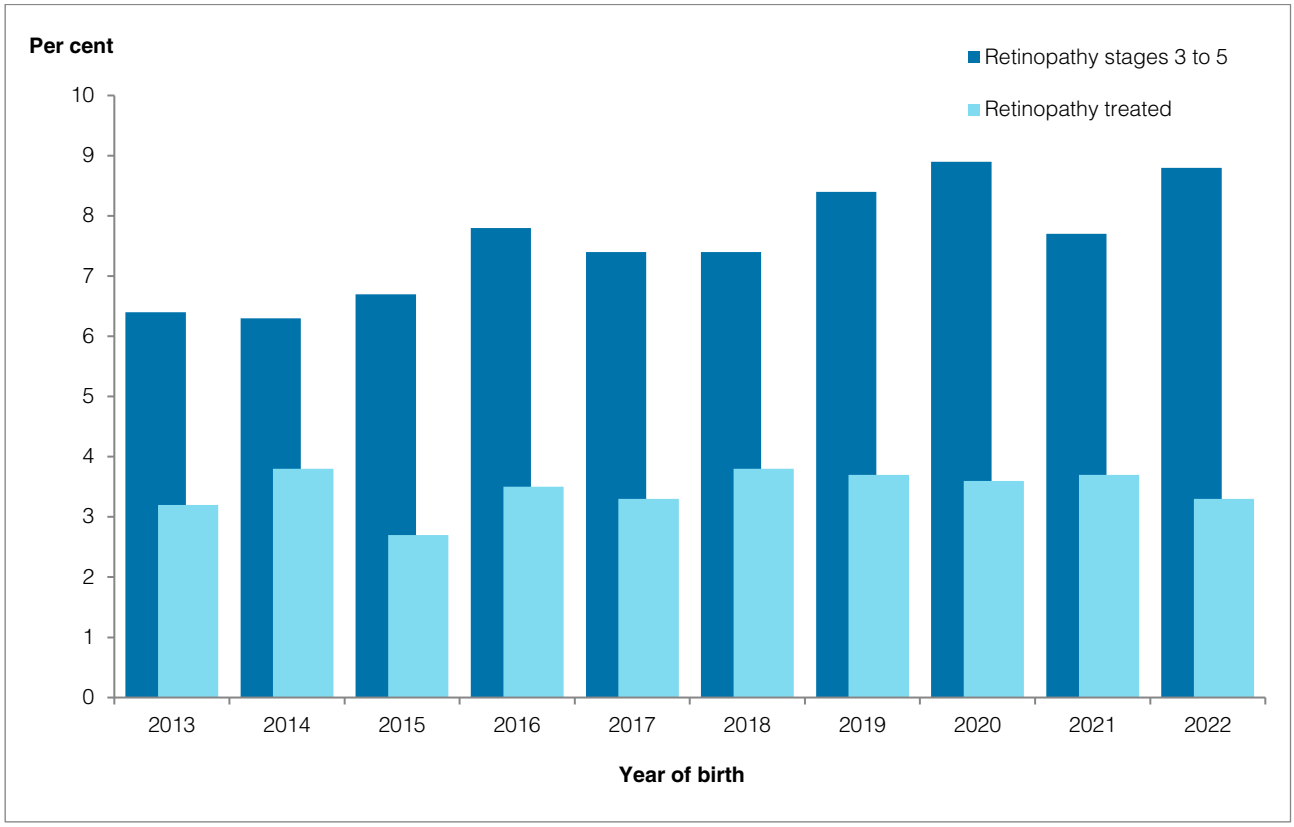


FIGURE 24: Trends in grade 3 or 4 intraventricular haemorrhage (with 95% CI) in babies born at less than 32 weeks gestation who survived to day 3 for level III registrants, ANZNN 2013–2022

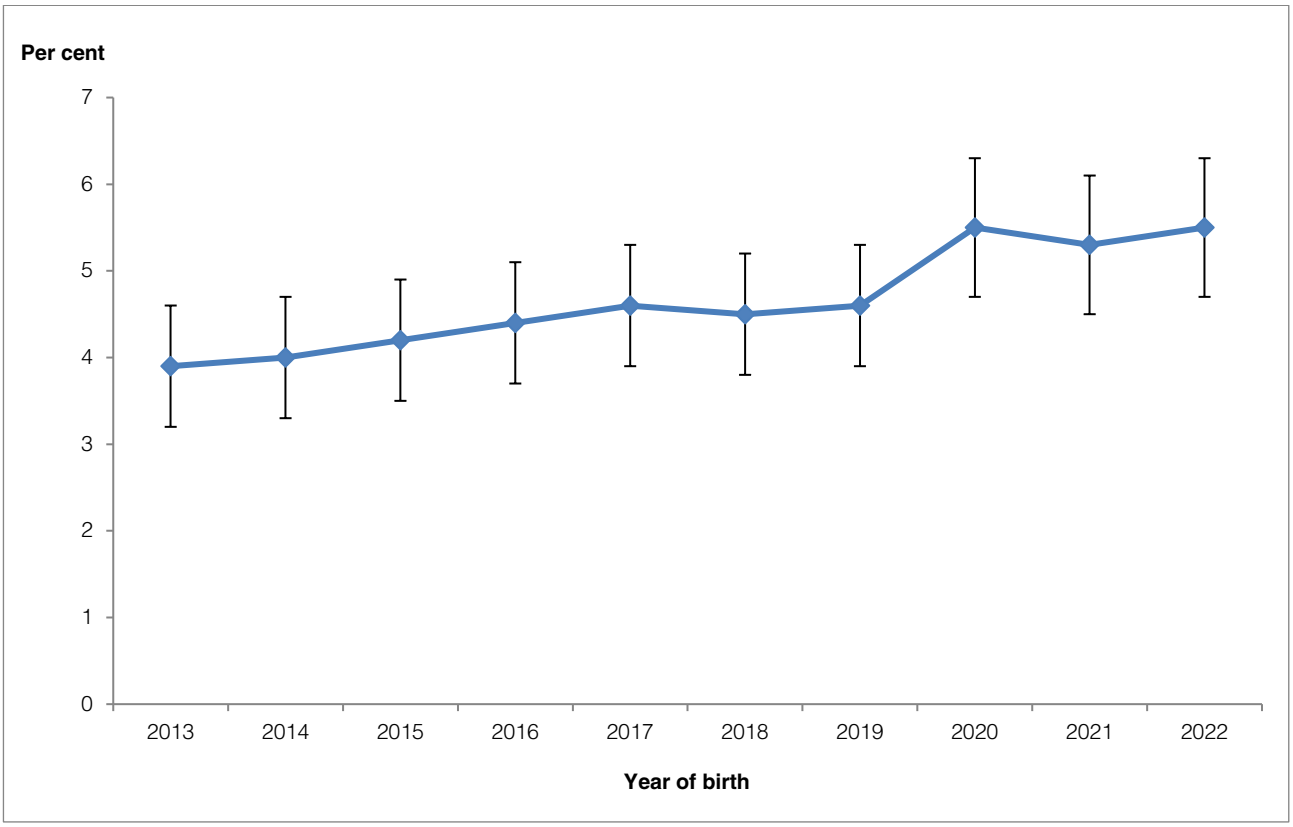


FIGURE 25: Trends in incidence of early sepsis for level III registrants by gestational age, ANZNN 2018–2022

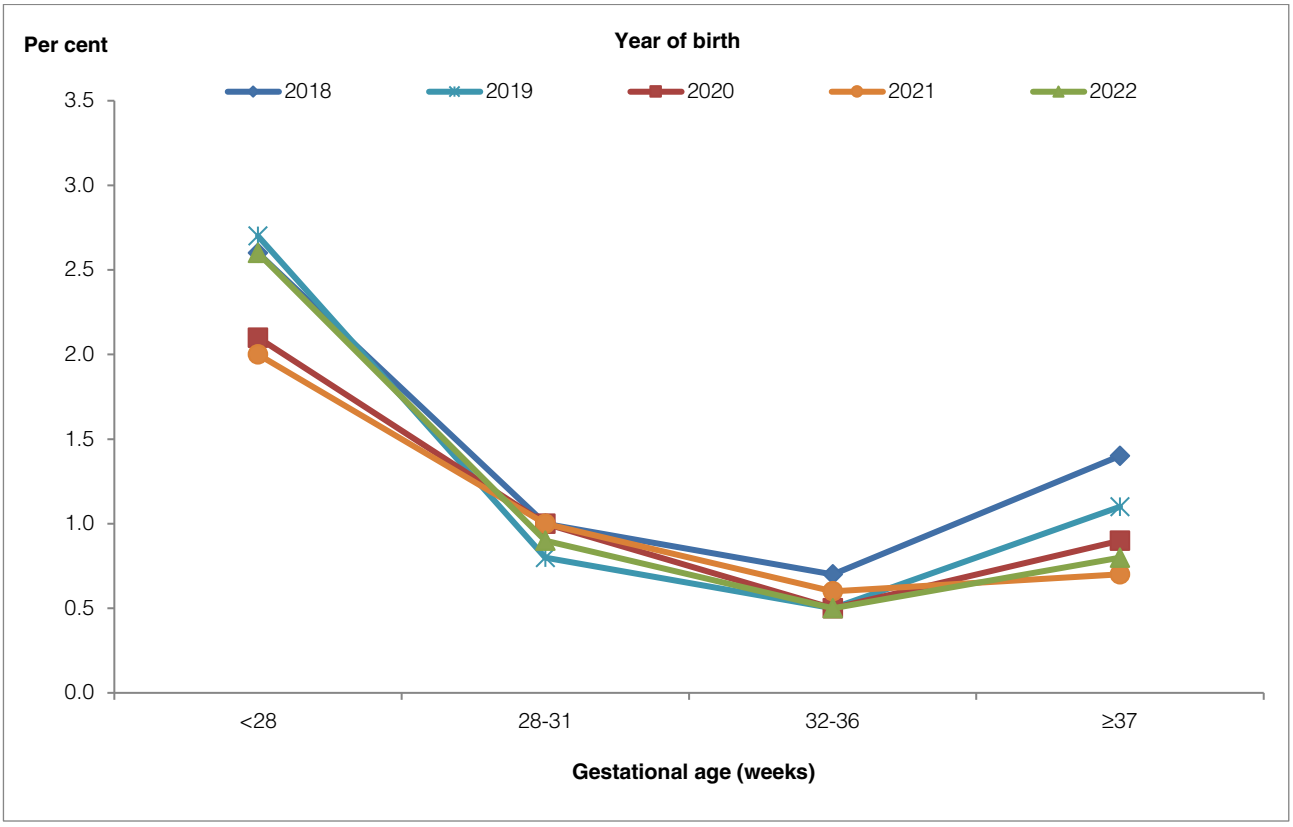


FIGURE 26: Trends in incidence of late sepsis for level III registrants by gestational age, ANZNN 2018–2022

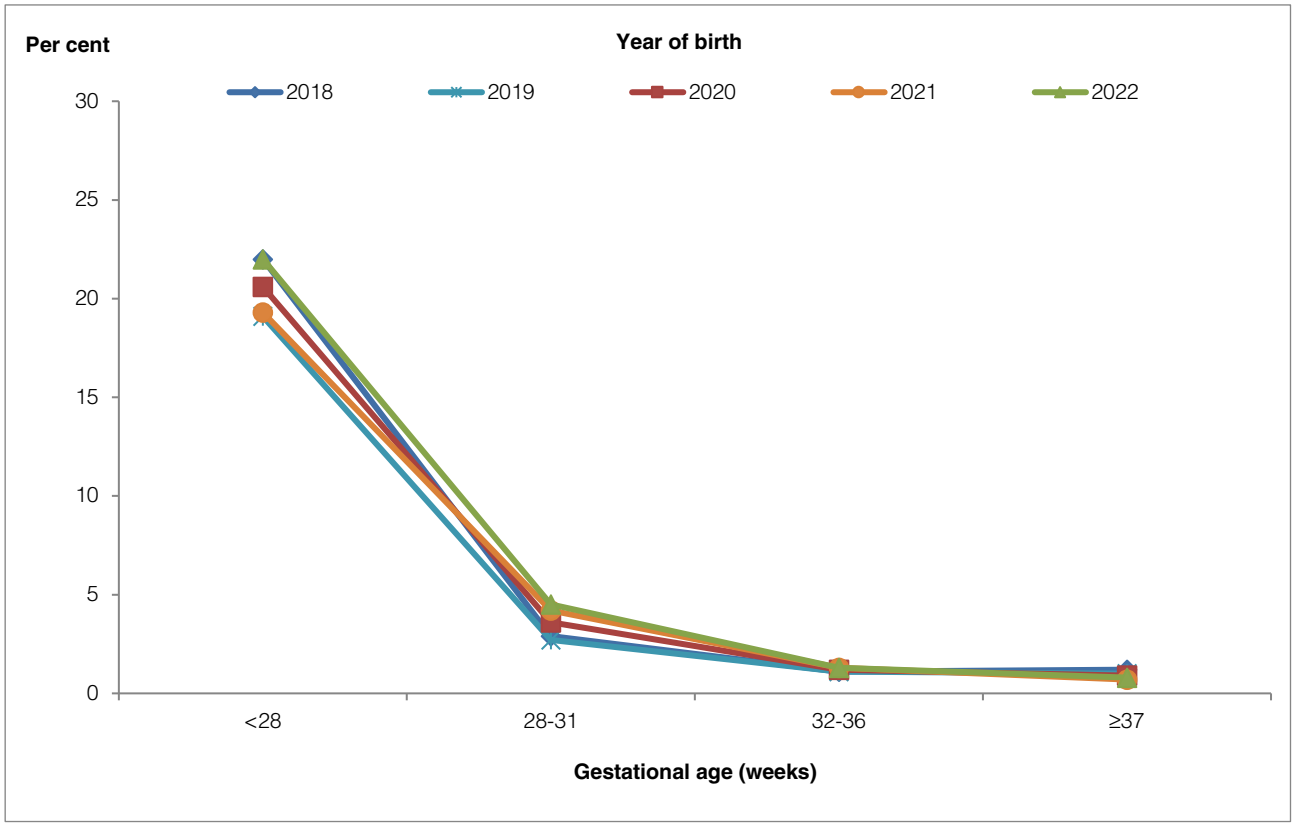
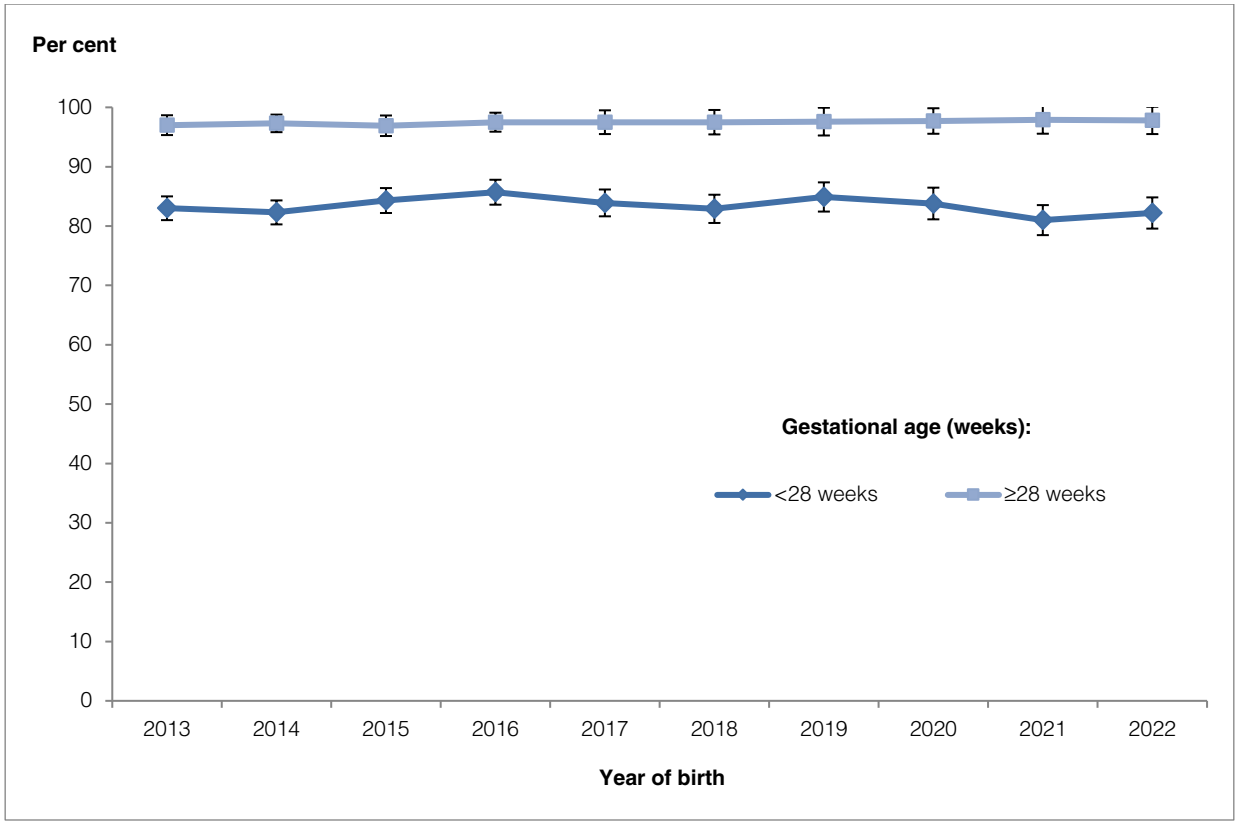


FIGURE 27: Trends in survival to discharge to home for level III registrants, ANZNN 2013–2022



Extremely Preterm Follow-up

FIGURE 28: Trends in follow-up at 18-42 months corrected age of extremely preterm or extremely low birth weight infants who survived to discharge to home, by year of birth, ANZNN 2010–2019 births

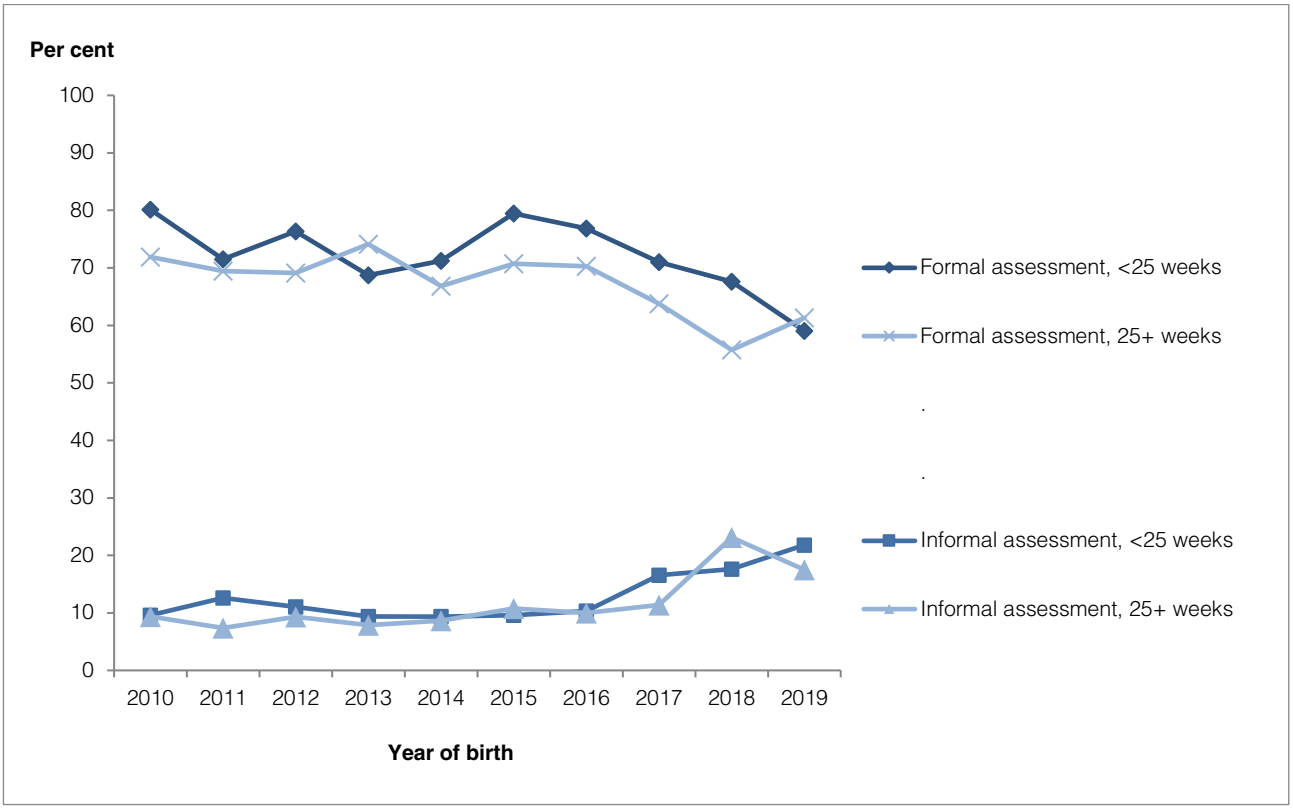
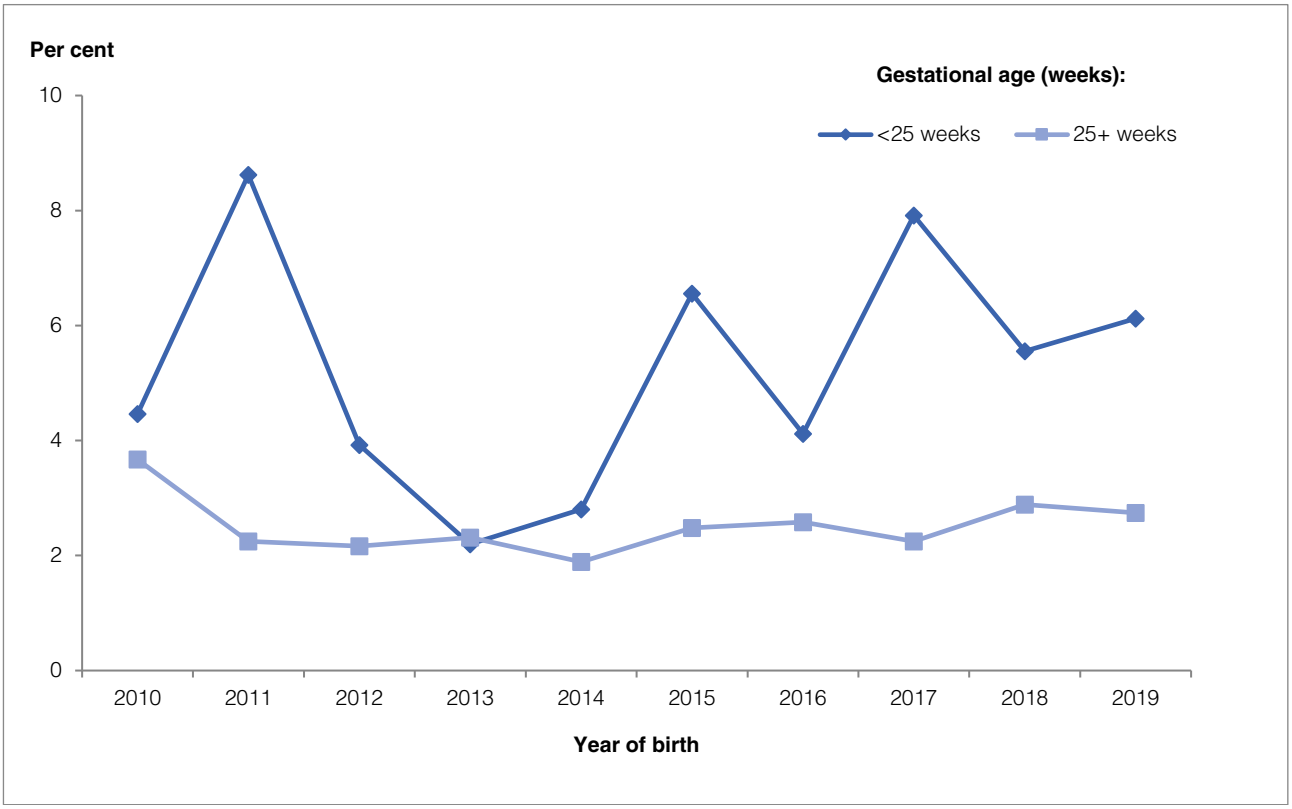
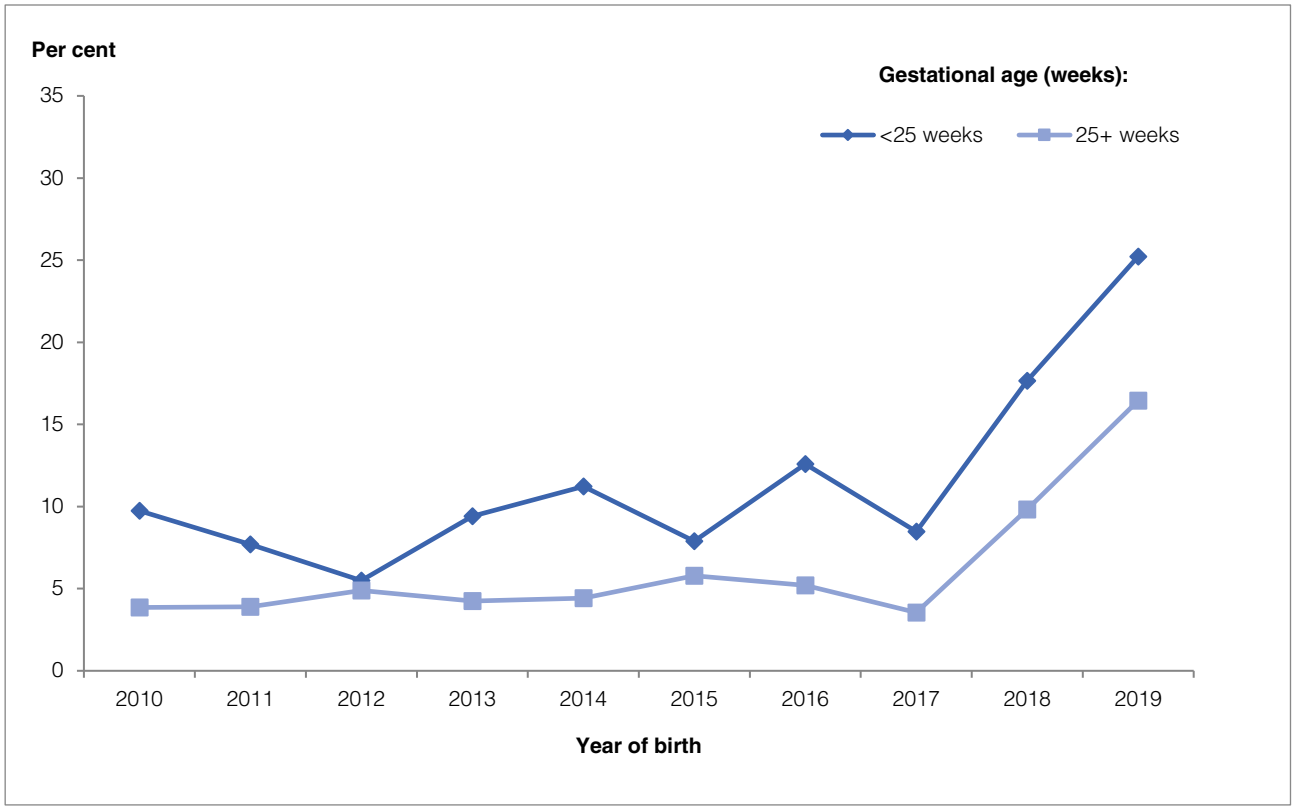


FIGURE 29: Trends in moderate to severe cerebral palsy[(a)] at 18-42 months corrected age for extremely preterm or extremely low birth weight infants,[(b)] by year of birth, ANZNN 2010–2019



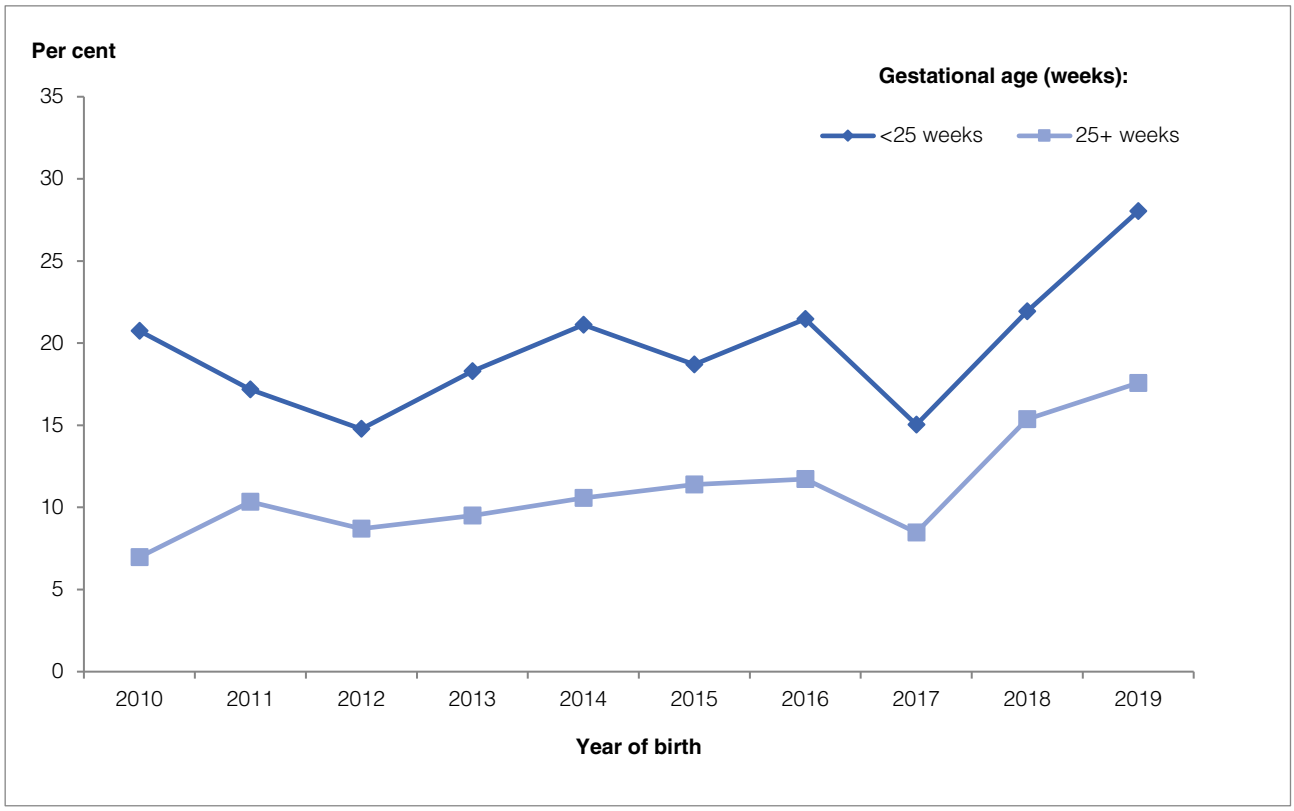
(a) Cerebral palsy graded as Level 2 to Level 5 by the Gross Motor Function Classification System. Excludes cerebral palsy graded as Level 1 by the Gross Motor Function Classification System and cerebral palsy of unknown severity.
(b) The denominator excludes infants who were lost to follow-up.

FIGURE 30: Trends in moderate to severe cognitive developmental delay at 18-42 months corrected age for extremely preterm or extremely low birth weight infants who were formally assessed, by year of birth, ANZNN 2010–2019[(a)(b)]



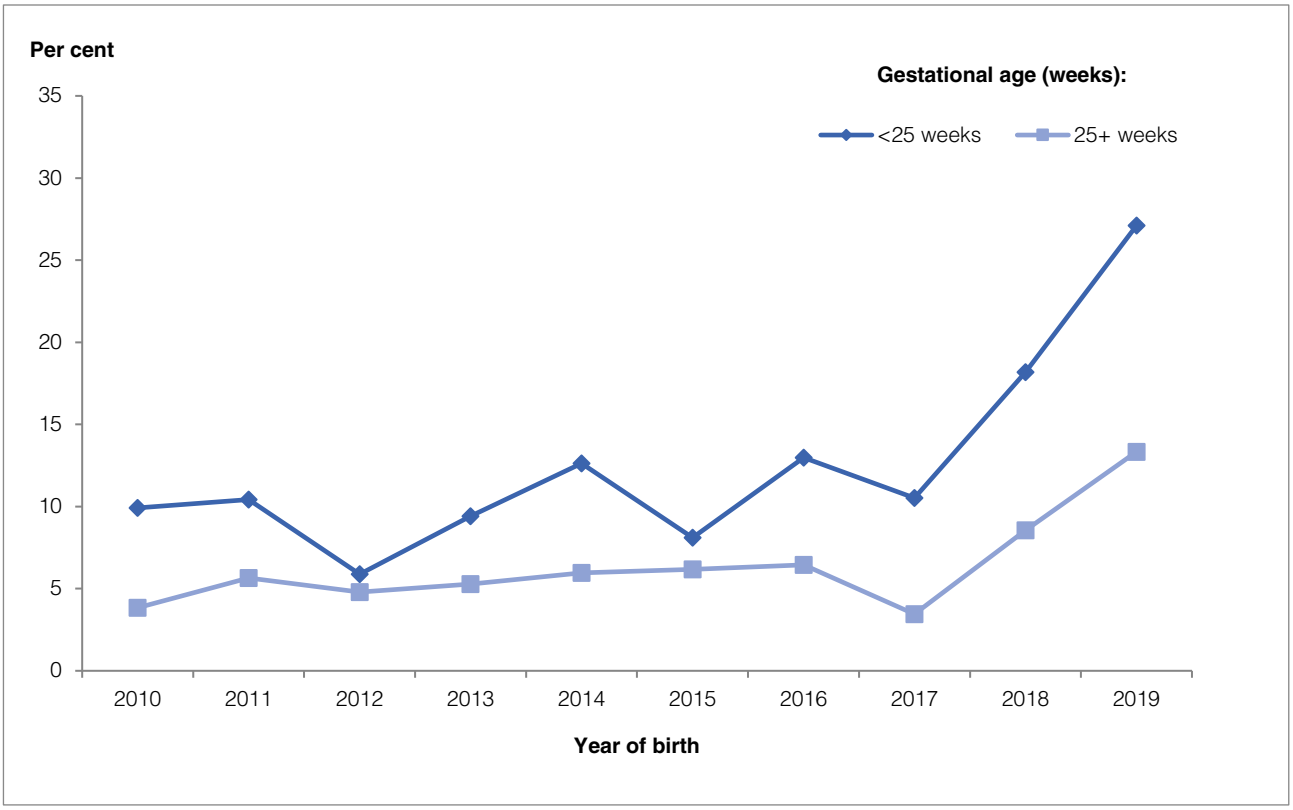
(a) The cohort of infants born in 2018-2019 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) The predominant developmental assessment administered to cohorts born prior to 2019 was the Bayley-III. The Bayley-4 (A&NZ) was the predominant developmental assessment administered to the cohort of infants born in 2019, after partial adoption for the 2018 cohort.

FIGURE 31: Trends in moderate to severe language developmental delay at 18-42 months corrected age for extremely preterm or extremely low birth weight infants who were formally assessed, by year of birth, ANZNN 2010–2019[(a)(b)]



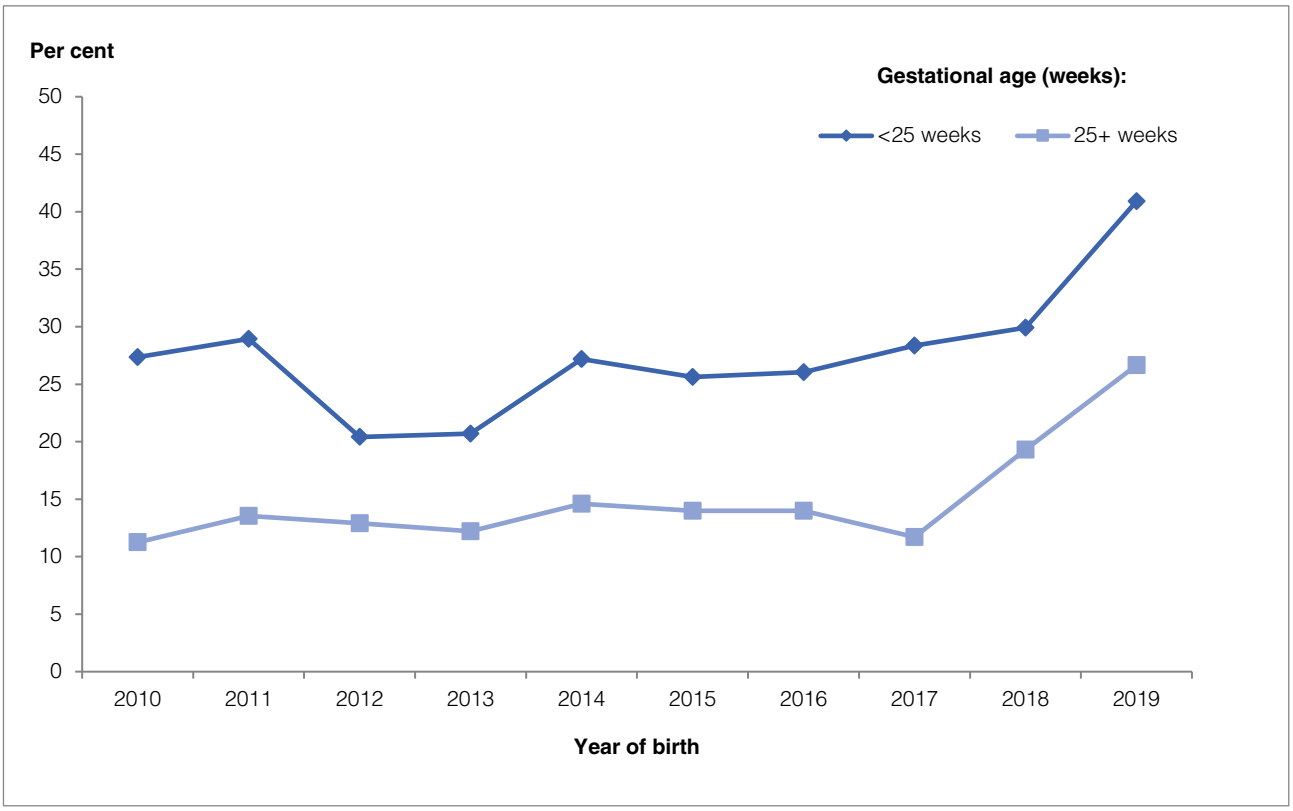
(a) The cohort of infants born in 2018 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) The predominant developmental assessment administered to cohorts born prior to 2019 was the Bayley-III. The Bayley-4 (A&NZ) was the predominant developmental assessment administered to the cohort of infants born in 2019, after partial adoption for the 2018 cohort.

FIGURE 32: Trends in moderate to severe motor developmental delay at 18-42 months corrected age for extremely preterm or extremely low birth weight infants who were formally assessed, by year of birth, ANZNN 2010–2019[(a)(b)]



(a) The cohort of infants born in 2018 and assessed formally may be skewed towards those at greater risk of developmental delay.
(b) The predominant developmental assessment administered to cohorts born prior to 2019 was the Bayley-III. The Bayley-4 (A&NZ) was the predominant developmental assessment administered to the cohort of infants born in 2019, after partial adoption for the 2018 cohort.

FIGURE 33: Trends in moderate to severe impairment at 18-42 months corrected age for extremely preterm or extremely low birth weight infants who were able to be assessed, by year of birth, ANZNN 2010–2019[(a)]



(a) The predominant developmental assessment administered to cohorts born prior to 2019 was the Bayley-III. The Bayley-4 (A&NZ) was the predominant developmental assessment administered to the cohort of infants born in 2019, after partial adoption for the 2018 cohort.

Appendix 2: Data tables by birthweight

TABLE 52: Antenatal corticosteroid use for level III registrants by birthweight, ANZNN 2022

	Birthweight (grams)											
Antenatal corticosteroids	**<500**	**500-749**	**750-999**	**1000-1249**	**1250-1499**	**1500-1999**	**2000-2499**	**2500-2999**	**3000-3499**	**3500-3999**	**≥4000**	**Total**
						Number						
None	<5	19	60	59	111	308	685	1,234	1,632	1,312	n.p.	6,135
Incomplete course	12	105	151	198	216	440	290	127	36	13	6	1,594
Complete course within 7 days of birth	31	247	387	432	562	692	395	129	59	16	9	2,959
Given >7 days prior to birth	<5	44	86	95	110	226	119	69	38	10	<5	804
Not stated	0	2	3	5	3	19	63	151	297	238	104	885
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
None	n.p.	4.6	8.8	7.5	11.1	18.5	46.0	79.2	92.5	97.1	n.p.	53.4
Incomplete course	24.5	25.3	22.1	25.3	21.6	26.4	19.5	8.1	2.0	1.0	0.8	13.9
Complete course within 7 days of birth	63.3	59.5	56.6	55.1	56.3	41.5	26.5	8.3	3.3	1.2	1.2	25.7
Given >7 days prior to birth	n.p.	10.6	12.6	12.1	11.0	13.6	8.0	4.4	2.2	0.7	n.p.	7.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 53: Plurality of level III registrants by birthweight, ANZNN 2022

	Birthweight (grams)											
Plurality	**<500**	**500-749**	**750-999**	**1000-1249**	**1250-1499**	**1500-1999**	**2000-2499**	**2500-2999**	**3000-3499**	**3500-3999**	**≥4000**	**Total**
						Number						
Singleton	43	326	521	563	688	1,167	1,183	1,537	2,015	n.p.	n.p.	10,462
Twins	6	85	156	192	290	491	357	173	47	<5	<5	1,802
Triplets and higher orders	0	6	10	34	24	27	12	0	0	0	0	113
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
Singleton	87.8	78.2	75.8	71.4	68.7	69.3	76.2	89.9	97.7	n.p.	n.p.	84.5
Twins	12.2	20.4	22.7	24.3	28.9	29.1	23.0	10.1	2.3	n.p.	n.p.	14.6
Triplets and higher orders	0.0	1.4	1.5	4.3	2.4	1.6	0.8	0.0	0.0	0.0	0.0	0.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

TABLE 54: Method of birth for level III registrants by birthweight, ANZNN 2022

	Birthweight (grams)											
Method of birth	**<500**	**500-749**	**750-999**	**1000-1249**	**1250-1499**	**1500-1999**	**2000-2499**	**2500-2999**	**3000-3499**	**3500-3999**	**≥4000**	**Total**
						Number						
Vaginal birth	12	n.p.	209	189	224	511	467	552	n.p.	602	289	3,882
Vaginal instrumental birth	0	<5	7	15	24	40	96	154	n.p.	224	66	878
Caesarean section in labour	5	82	152	175	200	373	330	399	460	339	192	2,707
Caesarean section no labour	32	210	318	410	554	755	654	597	643	420	283	4,876
Not stated	0	0	1	0	0	6	5	8	5	4	5	34
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
Vaginal birth	24.5	n.p.	30.5	24.0	22.4	30.4	30.2	32.4	n.p.	38.0	34.8	31.5
Vaginal instrumental birth	0.0	n.p.	1.0	1.9	2.4	2.4	6.2	9.0	n.p.	14.1	8.0	7.1
Caesarean section in labour	10.2	19.7	22.2	22.2	20.0	22.2	21.3	23.4	22.4	21.4	23.1	21.9
Caesarean section no labour	65.3	50.4	46.4	52.0	55.3	45.0	42.3	35.1	31.3	26.5	34.1	39.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 55: Level of hospital of birth for level III registrants by birthweight, ANZNN 2022

	Birthweight (grams)											
Level of birth hospital	**<500**	**500-749**	**750-999**	**1000-1249**	**1250-1499**	**1500-1999**	**2000-2499**	**2500-2999**	**3000-3499**	**3500-3999**	**≥4000**	**Total**
						Number						
Tertiary	n.p.	397	623	709	891	1,452	1,228	n.p.	1,484	1,175	618	9,903
Non-tertiary	<5	n.p.	55	70	98	210	309	409	539	389	190	2,288
Not born in a hospital[(a)]	0	<5	9	9	11	19	13	n.p.	36	24	26	170
Not stated	0	0	0	1	2	4	2	2	3	1	1	16
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
Tertiary	n.p.	95.2	90.7	90.0	89.1	86.4	79.2	n.p.	72.1	74.0	74.1	80.1
Non-tertiary	n.p.	n.p.	8.0	8.9	9.8	12.5	19.9	23.9	26.2	24.5	22.8	18.5
Not born in a hospital[(a)]	0.0	n.p.	1.3	1.1	1.1	1.1	0.8	n.p.	1.7	1.5	3.1	1.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) These babies were either born before arrival to hospital or born at home.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 56: Mode of transport for level III registrants to level III unit after birth by birthweight, ANZNN 2022

	Birthweight (grams)											
Mode of transport	**<500**	**500-749**	**750-999**	**1000-1249**	**1250-1499**	**1500-1999**	**2000-2499**	**2500-2999**	**3000-3499**	**3500-3999**	**≥4000**	**Total**
						Number						
Not transported	n.p.	395	n.p.	704	887	1,430	1,182	1,227	1,441	1,148	622	9,697
Specialist retrieval team	<5	n.p.	55	61	88	201	304	394	518	369	178	2,184
Non-specialist team	<5	<5	<5	10	15	27	41	55	63	43	19	278
Other	1	6	14	14	11	25	21	23	22	15	12	164
Not stated	0	0	0	0	1	2	4	11	18	14	4	54
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
Not transported	n.p.	94.7	n.p.	89.2	88.6	85.0	76.4	72.2	70.5	72.9	74.8	78.7
Specialist retrieval team	n.p.	n.p.	8.0	7.7	8.8	11.9	19.6	23.2	25.3	23.4	21.4	17.7
Non-specialist team	n.p.	n.p.	n.p.	1.3	1.5	1.6	2.6	3.2	3.1	2.7	2.3	2.3
Other	2.0	1.4	2.0	1.8	1.1	1.5	1.4	1.4	1.1	1.0	1.4	1.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 57: Exogenous surfactant use for level III registrants by birthweight, ANZNN 2022

	Birthweight (grams)											
Exogenous surfactant	**<500**	**500-749**	**750-999**	**1000-1249**	**1250-1499**	**1500-1999**	**2000-2499**	**2500-2999**	**3000-3499**	**3500-3999**	**≥4000**	**Total**
						Number						
None	<5	53	182	415	687	1,256	1,288	1,518	n.p.	1,452	774	9,501
Surfactant given	n.p.	364	505	374	315	429	264	192	n.p.	137	61	2,876
▪ via endotracheal tube	39	296	363	249	215	292	196	144	150	110	49	2,103
▪ via catheter	n.p.	59	123	105	87	123	61	36	n.p.	17	7	646
▪ via other or unknown method	<5	9	19	20	13	14	7	12	n.p.	10	5	127
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
None	n.p.	12.7	26.5	52.6	68.6	74.5	83.0	88.8	n.p.	91.4	92.7	76.8
Surfactant given	n.p.	87.3	73.5	47.4	31.4	25.5	17.0	11.2	n.p.	8.6	7.3	23.2
▪ via endotracheal tube	79.6	71.0	52.8	31.6	21.5	17.3	12.6	8.4	7.3	6.9	5.9	17.0
▪ via catheter	n.p.	14.1	17.9	13.3	8.7	7.3	3.9	2.1	n.p.	1.1	0.8	5.2
▪ via other or unknown method	n.p.	2.2	2.8	2.5	1.3	0.8	0.5	0.7	n.p.	0.6	0.6	1.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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

TABLE 58: Assisted ventilation for level III registrants by birthweight, ANZNN 2022

Ventilation type	Birthweight (grams)											
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
	Number											
Invasive ventilation	34	356	656	750	851	1,533	1,355	1,395	1,662	1,286	690	10,568
▪ HFOV given	23	300	532	578	496	584	353	388	471	388	255	4,368
▪ IPPV given	47	357	455	302	260	372	379	456	583	379	157	3,747
Nitric oxide given	47	351	451	302	259	372	379	455	582	377	156	3,731
CPAP given	40	219	160	59	45	49	34	51	102	74	29	862
NHF given	17	92	72	33	31	42	40	76	134	95	47	679
Total in each birthweight group	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
	Per cent											
IPPV given	95.9	85.6	66.2	38.3	25.9	22.1	24.4	26.7	28.3	23.9	18.8	30.3
CPAP given	81.6	52.5	23.3	7.5	4.5	2.9	2.2	3.0	4.9	4.7	3.5	7.0
NHF given	34.7	22.1	10.5	4.2	3.1	2.5	2.6	4.4	6.5	6.0	5.6	5.5
	Per cent of babies given invasive ventilation											
HFOV given[(a)]	67.6	84.3	81.1	77.1	58.3	38.1	26.1	27.8	28.3	30.2	37.0	41.3
Nitric oxide given[(a)]	138.2	98.6	68.8	40.3	30.4	24.3	28.0	32.6	35.0	29.3	22.6	35.3

(a) Denominator is babies given ventilation via endotracheal tube (IPPV and/or HFOV).
Note: *Groups are not mutually exclusive.*
HFOV = high frequency oscillatory ventilation. IPPV = intermittent positive pressure ventilation. CPAP = continuous positive airway pressure. NHF = nasal high flow.

TABLE 59: Duration of assisted ventilation use for level III registrants by birthweight, ANZNN 2022

Duration of assisted ventilation	Birthweight (grams)											
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
	IPPV (hours)											
Median	218	246	103	30	22	26	40	55	52.5	48	59	**52**
IQR	50–770	82–650	31–276	14–85	10–68	10–83	16–102	19–118	24–108	22–111	26–103.5	**19–143**
	CPAP (hours)											
Median	1,050	1,071.5	942.5	356.5	135	56	28	23	20	18	19	**39**
IQR	545–1,382	740–1,472	358.5–1,252	128–810	58–304	22–123	13–63	10–52	10–46	8–39	9–36	**15–129**
	NHF (hours)											
Median	606	497.5	411	401.5	259.5	139	78.5	52	47	46	48	**157**
IQR	314–934	312–769	265.5–646.5	213–651	121–490	66–288	36–150	24–119.5	22–110	22–95	24–96	**49.5–408**

Note: *IQR = Interquartile range. IPPV = intermittent positive pressure ventilation. CPAP = continuous positive airway pressure. NHF = nasal high flow.*

TABLE 60: Chronic lung disease at 36 weeks post menstrual age for level III registrants by birthweight, ANZNN 2022

Chronic lung disease (CLD)	Birthweight (grams)							
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	≥2000	Total
				Number				
No CLD	<5	42	195	418	546	n.p.	72	1,931
CLD	n.p.	281	391	255	126	n.p.	5	1,171
Not stated	0	3	12	12	22	23	2	74
Ineligible[(a)]	20	91	89	104	308	920	7,669	9,201
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**7,748**	**12,377**
				Per cent				
No CLD	n.p.	13.0	33.3	62.1	81.3	n.p.	93.5	62.3
CLD	n.p.	87.0	66.7	37.9	18.8	n.p.	6.5	37.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) Includes babies who did not survive to 36 weeks post menstrual age and babies born at 32 or more weeks gestational age.
***Note:** Not stated and ineligible data are excluded from per cent calculations.*

TABLE 61: Respiratory support (airway support or supplemental oxygen therapy) for level III registrants who survived to day 28 by birthweight, ANZNN 2022

Respiratory support (airway support or oxygen)	Birthweight (grams)											
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
						Number						
No respiratory support on day 28	0	<5	45	235	656	1,387	n.p.	1,582	1,934	1,513	810	9,593
Respiratory support on day 28	33	n.p.	577	532	336	270	n.p.	91	89	53	14	2,429
▪ survived to discharge home	27	313	562	527	329	257	89	n.p.	77	n.p.	14	2,332
▪ died before discharge	6	n.p.	15	5	7	13	n.p.	<5	12	<5	0	97
Not stated	0	0	0	0	0	1	2	1	0	1	0	5
Total in each birthweight group	**33**	**338**	**622**	**767**	**992**	**1,658**	**1,529**	**1,674**	**2,023**	**1,567**	**824**	**12,027**
						Number						
Respiratory support on day 28 and given home oxygen	11	121	148	66	35	19	20	n.p.	13	n.p.	5	467
						Per cent						
No respiratory support on day 28	0.0	n.p.	7.2	30.6	66.1	83.7	n.p.	94.6	95.6	96.6	98.3	79.8
Respiratory support on day 28	100.0	n.p.	92.8	69.4	33.9	16.3	n.p.	5.4	4.4	3.4	1.7	20.2
▪ survived to discharge home	81.8	93.4	97.4	99.1	97.9	95.2	89.9	n.p.	86.5	n.p.	100.0	96.0
▪ died before discharge	18.2	n.p.	2.6	0.9	2.1	4.8	n.p.	n.p.	13.5	n.p.	0.0	4.0
						Per cent						
Respiratory support on day 28 and given home oxygen[(a)]	40.7	38.7	26.3	12.5	10.6	7.4	22.5	21.8	16.9	20.0	35.7	20.0

n.p. Data not published to maintain confidentiality of small numbers.
(a) Denominator is babies who received respiratory support on day 28 and survived to discharge to home.
***Note:** Not stated data are excluded from per cent calculations.*

TABLE 62: Transfer after registration of level III registrants by level of destination hospital by birthweight, ANZNN 2022

Transfer status	Birthweight (grams)											
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
	Number											
Not transferred	33	227	326	323	427	796	927	1,227	1,641	1,309	694	7,930
Level III hospital	5	34	47	44	50	68	37	24	11	11	8	339
Level II or I hospital	5	100	267	391	495	771	540	376	312	202	107	3,566
Children's hospital	6	56	47	31	29	47	46	83	98	67	26	536
Not stated	0	0	0	0	1	3	2	0	0	0	0	6
Total	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
	Per cent											
Not transferred	67.3	54.4	47.5	40.9	42.7	47.3	59.8	71.8	79.6	82.4	83.1	64.1
Level III hospital	10.2	8.2	6.8	5.6	5.0	4.0	2.4	1.4	0.5	0.7	1.0	2.7
Level II or I hospital	10.2	24.0	38.9	49.6	49.5	45.8	34.8	22.0	15.1	12.7	12.8	28.8
Children's hospital	12.2	13.4	6.8	3.9	2.9	2.8	3.0	4.9	4.8	4.2	3.1	4.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Not stated data are excluded from per cent calculations.*

TABLE 63: Retinopathy of prematurity for level III registrants by birthweight, ANZNN 2022

Retinopathy of prematurity (ROP)	Birthweight (grams)						
	<500	500-749	750-999	1000-1249	1250-1499	≥1500	Total
	Number						
No ROP	n.p.	56	242	479	416	n.p.	1,583
Stage 1 ROP	<5	n.p.	141	107	57	24	378
Stage 2 ROP	11	134	143	92	36	8	424
Stage 3 ROP	12	90	62	22	11	<5	n.p.
Stage 4 to 5 ROP	<5	<5	0	0	0	0	<5
Not examined	16	83	97	89	479	8,736	9,500
Not stated	1	4	2	0	3	281	291
Total	**49**	**417**	**687**	**789**	**1,002**	**9,433**	**12,377**
	Per cent						
No ROP	n.p.	17.0	41.2	68.4	80.0	n.p.	61.2
Stage 1 ROP	n.p.	n.p.	24.0	15.3	11.0	5.8	14.6
Stage 2 ROP	34.4	40.6	24.3	13.1	6.9	1.9	16.4
Stage 3 ROP	37.5	27.3	10.5	3.1	2.1	n.p.	n.p.
Stage 4 to 5 ROP	n.p.	n.p.	0.0	0.0	0.0	0.0	n.p.
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
Note: *Weight criterion less than 1,250 grams for ANZNN but 1,500 grams for some individual units.*
Not stated and not examined data are excluded from per cent calculations.

TABLE 64: Intraventricular haemorrhage for level III registrants who survived to day 3 by birthweight, ANZNN 2022[(a)]

Intraventricular haemorrhage	Birthweight (grams)						
	<500	500-749	750-999	1000-1249	1250-1499	≥1500	Total
				Number			
None	27	236	490	609	721	1,609	3,692
Grade 1	<5	56	75	82	90	n.p.	459
Grade 2	5	32	50	36	17	26	166
Grade 3	0	11	11	9	5	15	51
Grade 4	n.p.	52	37	18	5	n.p.	139
Not examined	0	2	8	28	156	6,754	6,948
Not stated	0	0	0	0	0	814	814
Total	**42**	**389**	**671**	**782**	**994**	**9,391**	**12,269**
				Per cent			
None	64.3	61.0	73.9	80.8	86.0	88.3	81.9
Grade 1	n.p.	14.5	11.3	10.9	10.7	n.p.	10.2
Grade 2	11.9	8.3	7.5	4.8	2.0	1.4	3.7
Grade 3	0.0	2.8	1.7	1.2	0.6	0.8	1.1
Grade 4	n.p.	13.4	5.6	2.4	0.6	n.p.	3.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Data not published to maintain confidentiality of small numbers.
(a) Weight criterion for IVH is a birthweight of less than 1,500 grams.
Note: *Not stated and not examined data are excluded from per cent calculations.*

TABLE 65: Neonatal sepsis for level III registrants by birthweight, ANZNN 2022

Sepsis	Birthweight (grams)											
	<500	500-749	750-999	1000-1249	1250-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	≥4000	Total
						Number						
No sepsis	28	308	560	724	963	1,629	1,526	1,683	2,031	1,562	823	11,837
Sepsis at <48 hrs[(a)]	<5	9	7	14	5	n.p.	9	7	20	13	6	108
Sepsis at ≥48 hrs[(a)]	19	103	122	52	35	41	17	20	11	n.p.	n.p.	440
Babies alive on day 2	44	401	677	785	998	1,681	1,548	1,704	2,052	n.p.	n.p.	12,308
Babies who did not survive to day 2	5	16	10	4	4	4	4	6	10	<5	<5	69
Total in each birthweight group	**49**	**417**	**687**	**789**	**1,002**	**1,685**	**1,552**	**1,710**	**2,062**	**1,589**	**835**	**12,377**
						Per cent						
No sepsis[(b)]	57.1	73.9	81.5	91.8	96.1	96.7	98.3	98.4	98.5	98.3	98.6	95.6
Sepsis at <48 hrs[(b)]	n.p.	2.2	1.0	1.8	0.5	n.p.	0.6	0.4	1.0	0.8	0.7	0.9
Sepsis at ≥48 hrs[(c)]	43.2	25.7	18.0	6.6	3.5	2.4	1.1	1.2	0.5	n.p.	n.p.	3.6

n.p. Data not published to maintain confidentiality of small numbers.
(a) Groups are not mutually exclusive.
(b) Denominator is all registrants.
(c) Denominator is registrants alive at 48 hours.

TABLE 66: Length of stay for level III registrants who survived until discharge home by birthweight, ANZNN 2022

Birthweight (grams)	Number of babies	Median length of stay (days)	Interquartile range (days)
<500	27	134	116–156
500-749	316	120	101–141
750-999	607	94	79–110
1,000-1,249	762	68	55–83
1,250-1,499	985	51	39–64
1,500-1,999	1,644	36	27–48
2,000-2,499	1,517	21	14–29
2,500-2,999	1,669	12	6–21
3,000-3,499	2,011	7	4–14
3,500-3,999	1,563	5	3–12
≥4,000	824	6	4–12
Total	**11,925**	**21**	**7–47**

TABLE 67: Survival to discharge home for level III registrants by birthweight, ANZNN 2022

Birthweight (grams)	Number of babies	Lethal congenital anomalies	Babies alive on day 7	Babies alive on day 28	Survived to discharge to home	Percent survival at discharge home
<500	49	0	37	33	27	55.1
500-749	417	<5	371	338	316	75.8
750-999	687	6	659	622	607	88.4
1,000-1,249	789	5	774	767	762	96.6
1,250-1,499	1,002	<5	994	992	985	98.3
1,500-1,999	1,685	20	1,674	1,658	1,644	97.6
2,000-2,499	1,552	13	1,542	1,529	1,517	97.7
2,500-2,999	1,710	17	1,694	1,674	1,669	97.6
3,000-3,499	2,062	19	2,042	2,023	2,011	97.5
3,500-3,999	1,589	10	1,577	1,567	1,563	98.4
≥4,000	835	0	829	824	824	98.7
Total	**12,377**	**95**	**12,193**	**12,027**	**11,925**	**96.3**

Appendix 3: Methods used in this report

The ANZNN data collection was moved to the then-named Perinatal & Reproductive Epidemiology Research Unit, School of Women's & Children's Health, University of New South Wales in June 2008. The historical ANZNN data were received as a Microsoft Access database and archived as a Microsoft SQL Server database.

Data for the ANZNN audit of babies born in 2022 who qualified as high-risk neonates were requested from each participating unit in May 2023 with a deadline of July 2023. The data was submitted to the ANZNN by each participating unit through an online Data Capture System (DCS), which uses a series of queries to ensure quality, consistency and completeness of data. Units are unable to submit data if mandatory data items are missing or contain non-compliant data values. For all other data items, outliers flagged by the program may only be submitted by designated supervisors at each unit.

An extract from the database was made in May 2024. Apart from grouping, the data presented in the report reflect the database at that time with one exception: a series of derived data items were generated. These are listed below.

Derived data items:

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

All data manipulations and analysis for the 2022 report were carried out using Microsoft SQL Server software, and tabulations and figures were produced using Microsoft Excel.

Appendix 4: Confidentiality guidelines

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

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

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

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

Principles of ownership and maintenance of data

- The National Perinatal Epidemiology and Statistics Unit (NPESU) agrees to house and maintain the ANZNN Data Collection through electronic data submission from neonatal intensive care units and special care nurseries during the period 1 January 2008 to 31 December 2018. A renewed agreement extends this period to 31 December 2025.
- The ANZNN Data Collection will be housed at NPESU. It will be managed according to existing data security procedures as for other data collections at NPESU. The Data Custodian is the Director of NPESU.

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

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

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

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

Conditions for data collection

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

Conditions for data security

ANZNN data is maintained in a secure partition by the University of New South Wales. Access to the server is restricted to designated ports within the NPESU office and access is limited to authorised named staff and further protected by the use of high-level passwords. Access to the server is managed by UNSW IT department. Attempted security breaches are monitored and investigated. The NPESU is located in a restricted access UNSW managed building with all internal doors to the NPESU office accessible only via swipe card by authorised staff and students.

Small numbers

Cell values of less than five in tables have not been published, in accordance with ethical guidelines for protecting the privacy of individuals. Exceptions to this are small numbers in 'Other' and 'Not stated' categories. The cell with small numbers and at least one other cell in the same row and column are suppressed to prevent back calculation. Where n.p. (not published) has been used to protect confidentiality, the suppressed numbers are included in the totals.

Appendix 5: Minimum Data Set variables

Neonatal Minimum Data Set

Registration hospital

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

Coding: Numeric code representing registration hospital

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

Maternal age

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

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

Previous preterm birth

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

Coding:

99: unknown.

0: no previous preterm birth.

-1: yes, there was a previous preterm birth.

Previous perinatal death

Definition: Mother has had a previous perinatal loss.

Coding:

99: unknown.

0: no previous perinatal death.

-1: yes, has had a previous perinatal death.

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

Assisted conception in this pregnancy

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

Coding:

0: unknown.

1: none – no infertility treatment used for this pregnancy.

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

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

4: other – infertility treatment used that is not mentioned above, including artificial insemination.

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

Ethnicity of mother

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

Coding:

0: Unknown.

1: Aboriginal or Torres Strait Islander – is a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community with which she is associated.

2: Asian – all whose ethnic background originates from countries of Asia, South East Asia and Indian subcontinent (e.g. Fijian Indian).

3: Caucasian – all Caucasoid heritage, including, European, Russian, Middle Eastern and Arabic.

4: Other – includes Indigenous Africans, Inuit, African Americans, Native Americans, Melanesian.

5: Pacific peoples – all from Pacific peoples background, including Samoan, Cook Islands Māori, Niuean, Tokelauan, and other Pacific Islands groups (e.g. Hawaiian, Tahitian). Excludes Māori.

6: Māori – a person of New Zealand Māori descent who identifies as Māori.

Source of referral

Definition: Source of referral to registration unit.

Coding:

0: unknown.

1: booked at tertiary obstetric hospital – mother booked into a hospital with an NICU and was not transferred during the most recent admission.

2: in utero transfer from obstetric hospital – mother transferred during most recent admission, baby in utero.

3: ex utero retrieval – baby transferred from any hospital by a specialist retrieval team.

4: ex utero transfer – baby transferred from any hospital by non-specialist team, includes transport by ambulance.

5: other – born in transit or not booked.

6: booked at this level II unit – mother booked into this hospital, no NICU.

7: in utero transfer to this level II unit – mother transferred, baby in utero.

8: ex utero retrieval to this level II unit – baby 'retrieved' from any other hospital.

9: ex utero transfer to this level II unit.

Guide for use: Use most recent referral.

Presenting antenatal problem

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

Coding:

0: unknown.

1: preterm pre-labour rupture of membranes – confirmed spontaneous rupture of membranes occurring prior to the onset of labour and before 37 weeks gestation.

2: preterm labour.

3: hypertension in pregnancy.

4: antepartum haemorrhage.

5: suspected intrauterine growth restriction.

6: fetal distress.

7: other.

8: none – no presenting problem. Born at term.

9: antenatal diagnosis of fetal malformation.

Sex

Definition: The sex of the patient.

Coding:

0: unknown.

1: male.

2: female.

3: ambiguous or indeterminate.

Infant weight

Definition: The first weight of the baby after birth.

Coding: A 4-digit number representing birthweight in grams.

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

Gestational age

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

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

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

Place of birth

Definition: Place of baby's birth.

Coding:

0: unknown.

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

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

3: homebirth – planned.

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

Presentation at birth

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

Coding:

0: unknown.

1: cephalic – including face and brow.

2: breech – legs or feet were facing the cervix.

3: other – includes transverse.

Mode of birth

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

Coding:

0: unknown.

1: vaginal – vaginal birth, includes breech.

2: instrument – vaginal birth using an instrument – forceps, rotations, vacuum extraction.

3: Caesarean section in labour – caesarean performed after the commencement of labour.

4: Caesarean section, no labour – caesarean section performed prior to labour commencing.

Antenatal corticosteroids

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

Coding:

0: unknown.

1: none – steroids not given.

2: less than 24 hours – first dose given less than 24 hours prior to this baby's birth.

3: complete – more than 1 dose of steroids given, and 1st dose at more than 24 hours and less than 8 days before birth.

4: given at more than 7 days before baby's birth.

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

Magnesium sulphate

Definition: Magnesium sulphate ($MgSO_4$) provided to the mother during the 24 hours immediately before birth, either because of maternal preeclampsia or specifically for fetal neuro-protection.

Coding:

0: unknown – information not available.

1: $MgSO_4$ not given at all.

2: $MgSO_4$ course stopped > 24 hours before birth.

3: $MgSO_4$ commenced > 24 hours before birth and stopped < 24 hours before birth.

4: $MgSO_4$ commenced between 4 to 24 hours before birth.

5: $MgSO_4$ commenced within 4 hours of birth.

6: $MgSO_4$ given but details not known.

7: $MgSO_4$/placebo given for randomised trial.

Guide for use: In the case of planned birth, $MgSO_4$ is recommended to be commenced as close to four hours before birth as possible, however if birth is planned or expected to occur sooner than four hours, administration is recommended, as there is still advantage likely from administration within this time.

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 grams are taken into account. Fetuses aborted at < 20 weeks or fetuses compressed in the placenta at or more than 20 weeks are excluded.

Birth order

Definition: Order of each baby of a multiple birth.

Coding: Single-digit number representing birth order.

0: singleton.

1: first of a multiple birth.

2: second of a multiple birth.

3: third of a multiple birth etc.

4: other.

Date of birth

Definition: Date of birth of the patient.

Coding: DD / MM / YYYY

Admission date

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

Coding: DD / MM / YYYY

Apgar score (1 minute)

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

Coding: 2-digit number representing Apgar score.

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

Apgar score (5 minute)

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

Coding: 2-digit number.

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

Intubated at resuscitation

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

Coding:

99: unknown.

0: no, intubation was not necessary in labour ward.

-1: yes, intubation necessary in labour ward.

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

Congenital anomalies

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

Coding:

99: unknown.

0: no major congenital malformations noted.

-1: yes, major congenital malformation noted.

Specified congenital anomalies

Definition: Detail of the major congenital malformation.

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

Temperature on admission

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

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

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

Worst base excess

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

Coding: 3 digit numbered field representing base excess measured in mmol per litre. 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 in an infant requiring respiratory support (combines previous items transient tachypnoea of newborn and immature lung).

3: hyaline membrane disease – increasing respiratory distress or oxygen (O_2) requirements, or the need for ventilator support from the first six hours of life with a chest x-ray showing generalised reticulogranular pattern, plus or minus air bronchogram.

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

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

6: persistent pulmonary hypertension – echocardiac (shunting) or clinical evidence – O_2 need unexplained by chest x-ray or loud P2, or differential pre/post ductal $TCPO_2$.

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

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

10: other – unspecified other respiratory distress.

11: peri surgical – no respiratory distress, 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: A dose of any type of exogenous surfactant was used to treat this baby.

Coding:

99: unknown.

0: no exogenous surfactant given to this baby.

-1: yes, exogenous surfactant given to this baby.

Guide for use: Includes incomplete administration.

Method of administration of first dose of surfactant

Definition: Method used to administer the first dose of surfactant.

Coding:

0: unknown.

1: endotracheal tube.

2: catheter (eg. MIST).

3: Other – eg. laryngeal mask, aerosolisation.

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 airway pressure (CPAP)

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

Coding: 4-digit number – CPAP hours

Guide for use: The number of hours of any form of CPAP is summed for all instances of this therapy.

Hours of nasal high flow

Definition: Total number of hours of air and oxygen mix delivered through a high flow device in hours.

Coding: 4-digit number – nasal high flow hours

Guide for use: The number of hours of any form of CPAP is summed for all instances of this therapy.

Hours of high frequency oscillatory ventilation (HFOV)

Definition: Total number of hours of high frequency oscillatory ventilation given via an endotracheal tube, at > 4Hz

Coding: 4-digit number – HFOV hours

Guide for use: The number of hours of any form of HFOV is summed for all instances of this therapy.

Hours of nitric oxide

Definition: Total number of hours of nitric oxide therapy in any form or dose for respiratory support of the baby.

Coding: 4-digit number – nitric oxide hours

Guide for use: The number of hours of any form of nitric oxide is summed for all instances of this therapy.

Extracorporeal membrane oxygenation

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

Coding:

99: unknown.

0: no ECMO initiated.

-1: yes, ECMO initiated.

Date of final added respiratory support

Definition: Date supplemental oxygen (O_2), high flow, CPAP or mechanical ventilation ceased appropriately.

Coding: DD / MM / YYYY

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

Respiratory support at 36 weeks post menstrual age

Definition: Status of respiratory support at 36 weeks and 0 days / post menstrual age 252 days.

Coding:

0: unknown.

1: no respiratory support.

2: low flow air +/- oxygen with feeds (≤1L/min).

3: low flow oxygen (≤1L/min).

4: oxygen via head box or incubator.

5: high flow >1L/min.

6: nasal CPAP.

7: nasal ventilation (includes nasal high frequency).

8: endotracheal CPAP or ventilation (includes high frequency).

9: endotracheal tube alone.

10: tracheostomy CPAP or ventilation (includes high frequency).

11: tracheostomy alone.

Guide for use: Supersedes "Chronic lung disease".

Post-natal steroids for chronic lung disease

Definition: The infant was treated with systemic corticosteroids by any route for chronic lung disease.

Coding:

99: unknown.

0: no systemic post-natal steroids for chronic lung disease.

-1: yes, the baby did have post-natal steroids for chronic lung disease.

Guide for use: Record if corticosteroids used with the objective of treating evolving CLD at any stage or to prevent development of CLD. It must not include corticosteroid use for the treatment of conditions such as post-extubation subglottic oedema or in the use for hypotension or any forms of corticosteroid deficiency.

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: This baby had surgery which involved opening a body cavity during this admission.

Coding:

99: unknown.

0: no major neonatal surgery.

-1: yes, major surgery took place during this admission.

Parenteral nutrition

Definition: Intravenous infusion of a nutria solution consisting of a minimum of dextrose and protein but generally providing a complete nutrient infusion including electrolytes, calcium, phosphorus, zinc, trace elements, vitamins and fat.

Coding:

99: unknown.

0: parenteral nutrition never initiated.

-1: yes, parenteral nutrition initiated.

Home gavage feeding

Definition: The baby was discharged home with a nasogastric tube in place to allow gavage / infusion feeding at home.

Coding:

99: unknown.

0: no, not discharged with gavage tube.

-1: yes, discharged to home with a gavage tube.

Guide for use: Must have required gavage feeding in hospital.

Proven necrotising enterocolitis

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

Coding:

99: unknown.

0: no necrotising enterocolitis proven.

-1: yes, necrotising enterocolitis proven.

Guide for use: Has at least one of the following symptoms:

1. Diagnosis at surgery or post mortem.
2. Radiological diagnosis, a clinical history plus:
   - pneumatosis intestinalis, or
   - portal vein gas, or
   - a persistent dilated loop on serial X-rays.
3. Clinical diagnosis, a clinical history plus abdominal wall cellulitis and palpable abdominal mass.

Spontaneous intestinal perforation

Definition: Intestinal perforation not associated with NEC nor with any bowel obstruction/atresia, nor with any mechanical trauma.

Coding:

99: unknown.

0: no, the baby did not have spontaneous intestinal perforation.

-1: yes, the baby did have spontaneous intestinal perforation.

Guide for use: Record if SIP has occurred, without any radiological signs of NEC and/or without surgical diagnosis of NEC.

Therapeutic hypothermia

Definition: Intentional cooling of an infant of any gestational age to a core temperature <35.0°C (generally 33-34°C).

Coding:

99: unknown.

0: no.

-1: yes.

Guide for use: Record if therapeutic hypothermia has occurred.

Principal reason for non-completion of full 72 hours of hypothermia

Definition: The principal reason why therapeutic hypothermia was terminated early / before 72 hours of treatment had been completed.

Coding:

0: not ceased before 72 hours

1: palliation.

2: recognised as not fulfilling standard criteria for cooling.

3: fulfilled standard criteria for cooling but clinical improvement suggests no need.

4: qualification equivocal with change of clinical decision making.

5: severe coagulopathy not responding to blood products.

6: hypotension not responding to inotrope.

7: severe PPHN refractory to iNO.

8: arrhythmia.

9: reason for early cessation not known.

Guide for use: Hypothermia begins at the onset of cooling and ends at the onset of warming.

Bacterial, fungal or viral infection present

Definition: The presence of proven systemic bacterial or fungal sepsis or late onset nosocomial viral infection for this baby.

Coding:

99: unknown.

0: no, the baby did not have a proven bacterial, fungal or viral infection noted.

-1: yes, the baby did have a proven bacterial, fungal or viral infection noted.

Guide for use: Systemic sepsis is defined as a clinical picture consistent with sepsis, and either a positive bacterial or fungal culture of blood and/or cerebrospinal fluid (CSF). For each episode of sepsis, the following conditions must apply:

- Isolation of an organism from at least one blood or CSF culture or identification via polymerase chain reaction in CSF and,
- After consideration of clinical and laboratory evidence, a decision is made to give the patient antibiotics with therapeutic intent against this organism.

For each episode of infection, the following conditions must not apply:

- Mixed coagulase negative staphylococcus or other skin flora contaminant episode.

Viral infection should only be considered if initial symptoms occurred after 48 hours of birth.

- Clinical features consistent with viral infection
- Isolation or identification of an organism by PCR, immunofluorescence or similar technology from an appropriate body fluid eg mouth swab/saliva, rectal swab/faeces, nasopharyngeal aspirate, endotracheal aspirate, CSF, or other relevant tissues eg skin lesion
- Asymptomatic colonisation with rotavirus should be excluded.

Type of infection

Definition: The type of the proven systemic bacterial or fungal infection or nosocomial viral infection present.

Coding:

-1: early infection (bacterial or fungal infection) – the presence of systemic bacterial or fungal sepsis with initial symptoms occurring prior to 48 hours after birth.

0: late infection (bacterial or fungal infection) – the presence of blood or CSF infection with initial symptoms occurring from 48 hours after birth.

2: viral infection – the presence of at least one episode of viral infection with initial symptoms occurring following 48 hours after birth.

Guide for use: As for Bacterial, fungal or viral infection present. The same organism isolated from blood or CSF during previous 14 days-repeat isolate should not be included.

Date of collection of positive blood or CSF culture for systemic sepsis or date of onset of nosocomial viral infection occurring after 48 hours of birth

Definition: The date of the collection of blood or CSF culture for each episode of systemic sepsis, or the date of the onset of clinical illness caused by each episode of viral infection, with initial symptoms occurring after 48 hours of birth.

Coding: DD / MM / YYYY

Guide for use: Must be coded as "yes" for 'Bacterial, fungal or viral infection present'. The same organism isolated from blood or CSF during previous 14 days-repeat isolate should not be included. Leave blank when corresponding 'Type of infection' is coded as "Early infection".

Maximum grade of left sided periventricular haemorrhage

Definition: Worst level of periventricular haemorrhage seen on the left side of the head by imaging or post mortem examination during the first 14 days of life.

Coding:

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

1: grade 1 – subependymal germinal matrix haemorrhage.

2: grade 2 – intraventricular haemorrhage.

3: grade 3 – intraventricular haemorrhage with ventricle distended with blood.

4: grade 4 – localised intraparenchymal haemorrhage.

5: grade 4 – extensive intraparenchymal haemorrhage.

9: not examined – by ultrasound or by post mortem examination.

Guide for use: Early ventricular dilatation may occur with or without haemorrhages. Mild ventricular dilatation without intraventricular blood distension is excluded (not grade 3). Localised intraparenchymal haemorrhage/ haemorrhagic infarction is defined as being solitary and mainly confined to one of the following territories: anterior frontal, posterior frontal, parietal, occipital, temporal, thalamus. Extensive intraparenchymal haemorrhage/haemorrhagic infarction is defined as involving two or more of the territories. Note: exclude echodensity which resolves within 10 days.

Maximum grade of right sided periventricular haemorrhage

Definition: Worst level of periventricular haemorrhage seen on the right side of the head by imaging or post mortem examination during the first 14 days of life.

Coding:

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

1: grade 1 – subependymal germinal matrix haemorrhage.

2: grade 2 – intraventricular haemorrhage.

3: grade 3 – intraventricular haemorrhage with ventricle distended with blood.

4: grade 4 – localised intraparenchymal haemorrhage.

5: grade 4 – extensive intraparenchymal haemorrhage.

9: not examined- by ultrasound or by post mortem examination.

Guide for use: As for Maximum grade of left sided periventricular haemorrhage.

Cerebellar haemorrhage

Definition: Most extensive cerebellar haemorrhage noted by imaging or post mortem examination during the first 14 days of life.

Coding:

0: no cerebellar haemorrhage – mastoid ultrasound views undertaken and no cerebellar haemorrhage / post mortem shows no cerebellar haemorrhage.

1: left hemisphere haemorrhage only.

2: right hemisphere haemorrhage only.

3: haemorrhage in vermis only.

4: bilateral hemisphere haemorrhage.

5: haemorrhage in either or both hemispheres AND vermis.

9: not examined- by ultrasound or by post mortem examination.

Guide for use: Mastoid view is required for this detection.

Date of late head ultrasound

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

Coding: DD / MM / YYYY

Guide for use: Data is confined to ultrasounds performed between four and eight weeks of age. Accept finding if transferred to Level II units between three and four weeks of age.

Ventricle size

Definition: Ventricular size measured by the ultrasound scan closest to six weeks (four to eight weeks) of age, as the largest measurement from either ventricle.

Coding: 4-digit number correct to one decimal place.

Guide for use: Record if the measurement for the largest ventricle. The lateral ventricle measurement is taken at the mid body in the coronal view at the foramen of Munroe.

Cerebral cysts (left)

Definition: Cystic change in left cerebral hemisphere measured by the ultrasound scan closest to six weeks of age. Record worst cystic periventricular leukomalacia severity (extensive or localised) if more cystic changes seen in four to eight week scans.

Coding:

0: no cysts – no cystic lesions seen on ultrasound.

1: porencephalic cyst(s).

2: periventricular leukomalacia primarily confined to one of the regions: anterior

frontal, posterior frontal, parietal, temporal or occipital region (same as defined for periventricular haemorrhage).

3: extensive leukomalacia involving two or more of the above regions.

4: unknown – information not available, includes not scanned.

Guide for use: Ependymal cysts, cysts of the choroid plexus and conatal cysts are considered normal variants and are excluded. If any of these are present score as no cysts.

Cerebral cysts (right)

Definition: Cystic change in right cerebral hemisphere measured by the ultrasound scan closest to six weeks of age. Record worst cystic periventricular leukomalacia severity (extensive or localised) if more cystic changes seen in four to eight week scans.

Coding:

0: no cysts – no cystic lesions seen on ultrasound.

1: porencephalic cyst(s).

2: periventricular leukomalacia primarily confined to one of the regions: anterior frontal, posterior frontal, parietal, temporal or occipital region (same as defined for periventricular haemorrhage).

3: extensive leukomalacia involving two or more of the above regions.

4: unknown – information not available, includes not scanned.

Guide for use: As for Cerebral cysts (left)

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.

Surgical therapy for retinopathy of prematurity

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

Coding:

99: unknown.

0: no surgical therapy for ROP received.

-1: yes, surgical therapy given for ROP.

Died

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

Coding:

99: unknown.

0: no, survived to discharge to home.

-1: yes, died.

Date of death

Definition: Date of death of the baby.

Coding: DD / MM / YYYY

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

Post mortem

Definition: Post mortem examination performed.

Coding:

99: unknown.

0: no post mortem performed.

-1: yes, a post mortem was performed.

Immediate cause of death

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

Coding: unspecified free text field

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

Death due to congenital anomaly

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

Coding:

99: unknown.

0: no.

-1: yes.

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

Transferred to another hospital

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

Coding:

99: unknown.

0: no, never transferred.

-1: yes, transferred.

Date of transfer

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

Coding: DD / MM / YYYY

Guide for use: Use the most significant date.

Discharge date

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

Coding: DD / MM / YYYY

Comment: All data collection ceases on this date.

Extremely Preterm Follow-up Minimum Data Set

Date assessed

Definition: Date on which the two to three year follow-up developmental assessment was performed.

Coding: DD / MM / YYYY

Corrected age in months

Definition: Age in months corrected for prematurity based on the age the child would be if the pregnancy had gone to term (40 weeks).

Coding: Number representing the number of months to one decimal place

Guide for use: The age when performance is no longer influenced by prematurity and the need to use corrected age is controversial. However objective evidence supports the need to make this allowance up to approximately 8 years of age. To calculate corrected age in months, use the formula: (Date assessed – Estimated date of confinement) / (365.25 / 12)

Outcome for children at two to three years

Definition: Survival of the child at two to three years corrected age.

Coding:

99: unknown.

0: no, child died after discharge from hospital to home and prior to the two to three year follow-up.

-1: yes, survived to the two to three year follow-up.

Outcome for follow-up at two to three years

Definition: Outcome of the child for follow-up at two to three years of age.

Coding:

1: formal developmental assessment (e.g. Bayley III or Griffiths).

2: information obtained but formal assessment not done.

3: child is unable to be assessed due to severe developmental delay.

4: child is unable to be assessed due to behavioural disorder.

5: child is unable to be assessed due to non-compliance.

6: lost- the child is lost to follow-up.

Guide for use: If the child attended assessment but was uncooperative, child is recorded as "Child is unable to be assessed due to non-compliance (5)". If no contact with the child's parent(s)/guardian(s) could be made or if the child's parent(s)/guardian(s) were unwilling or unable to bring the child in for assessment, child is recorded as "Lost- the child has been lost to follow-up (6)".

Reason for lost to follow-up

Definition: Main reason child was lost to follow-up at two to three years corrected age.

Coding:

0: unknown.

1: could not be contacted.

2: refused/did not attend appointment.

3: moved from area – referral to another hospital for follow-up assessment unknown.

4: referred to another hospital for follow-up assessment – the registration hospital could not obtain follow-up outcomes from the referral hospital.

5: did not meet local criteria for follow-up assessment.

6: other.

7: COVID-19 impact – includes not attending appointment or appointment not offered due to COVD-19-related restrictions.

Guide for use: Only one outcome to be used. If child is referred to another hospital for follow-up assessment, the registration hospital should request any two to three year follow-up outcomes from the referral hospital. If the referral hospital fails to provide any follow-up outcomes, record as "Referred to another hospital for follow-up assessment - the registration hospital could not obtain follow-up outcomes from the referral hospital (4)".

Place of follow-up assessment

Definition: Place of two to three year follow-up assessment.

Coding:

0: unknown.

1: follow-up clinic at registration hospital.

2: follow-up clinic at another hospital.

3: paediatrician.

4: general practitioner.

5: outreach clinic.

6: other.

Guide for use: Only one outcome to be used.

Weight

Definition: The weight (body mass) of a child measured in kilograms.

Coding: A 2-4 digit number representing weight in kilograms.

Guide for use: If the weight of the child was measured either side of one month of the date of assessment then an extrapolated value should be provided as determined by the z-score.

Type of stature measurement

Definition: The type of stature measurement used at the two to three year follow-up assessment.

Coding:

99: unknown.

1: standing height.

2: recumbent length.

Stature

Definition: The stature of a child measured in centimetres.

Coding: A 2-4 digit number representing stature in centimetres.

Guide for use: If the stature of the child was measured either side of one month of the date of assessment then an extrapolated value should be provided as determined by the z-score.

Head circumference

Definition: The head circumference of a child aged between two and three years measured in centimetres.

Coding: A 2-4 digit number representing head circumference in centimetres.

Guide for use: If the head circumference of the child was measured either side of one month of the date of assessment then an extrapolated value should be provided as determined by the z-score.

Hearing aid

Definition: Hearing aid has been prescribed or not. Information as provided by parent or carer at the two to three year follow-up assessment.

Coding:

99: unknown.

0: no hearing aid prescribed.

1: unilateral hearing aid prescribed.

2: bilateral hearing aid prescribed.

Cochlear implant

Definition: Cochlear Implant has been inserted or not. Information as provided by parent or carer at the two to three year follow-up assessment.

Coding:

99: unknown.

0: no cochlear implant.

-1: yes, cochlear implant.

Blind

Definition: Ophthalmologist assessment has demonstrated that the child has blindness (<6/60 in better eye). This information may be provided by the parent or carer at the two to three year follow-up assessment.

Coding:

99: unknown.

0: no blindness.

-1: yes, blindness (<6/60 in better eye).

Respiratory support

Definition: At the time of the two to three year follow-up assessment, the type of therapy the child is receiving for respiratory disease.

Coding:

99: unknown.

0: no respiratory support.

1: continued ventilator support.

2: oxygen.

3: tracheostomy.

Gastrointestinal feeding

Definition: At the time of the two to three year follow-up assessment, the therapy the child requires for gastrointestinal disease, represented by a code.

Coding:

99: unknown.

0: no therapy.

1: nasogastric tube.

2: parenteral nutrition.

3: percutaneous endoscopic gastrostomy (PEG) feeding.

Cerebral palsy

Definition: Cerebral palsy diagnosed.

Coding:

99: unknown.

0: no cerebral palsy.

-1: yes, cerebral palsy.

Gross motor function classification system for cerebral palsy (GMFCS) (2-4 years)

Definition: The Gross Motor Function Classification System (GMFCS) classifies the movement ability of children with cerebral palsy. The Gross Motor Function Classification System (GMFCS) for cerebral palsy is based on self-initiated movement, with emphasis on sitting, transfers, and mobility, as represented by a code.

Coding:

1: Level I

2: Level II

3: Level III

4: Level IV

5: Level V

Bayley edition

Definition: The edition of the Bayley Scales of Infant and Toddler Development assessment used.

Coding:

0: unknown.

1: Bayley-III assessment.

2: Bayley 4 (A&NZ) assessment.

Cognitive composite score

Definition: The cognitive scale of the Bayley-III / Bayley 4 (A&NZ) assesses the sensory motor development, exploration and manipulation, object relatedness, concept formation, memory and other aspects of cognitive processing.

Coding: A 2-3 digit number representing the composite score from the cognitive scale.

Receptive communication scaled score

Definition: The receptive communication scale of the Bayley-III / Bayley 4 (A&NZ) includes items that assess preverbal behaviours, vocabulary development, such as being able to identify objects and pictures that are referenced; vocabulary related to morphological development, such as pronouns and prepositions; and understanding of morphological markers, such as plural –s, tense markings (-ing, -ed) and the possessive –'s.

Coding: A 1-2 digit number representing the scaled score from the receptive communication scale.

Expressive communication scaled score

Definition: The expressive communication scale of the Bayley-III / Bayley 4 (A&NZ) includes items that assess preverbal communication, such as babbling, gesturing, joint referencing, and turn taking, vocabulary development such as naming objects, pictures and attributes (e.g. colour and size); and morpho-syntactic development, such as using two-word utterances, plurals and verb tense.

Coding: A 1-2 digit number representing the scaled score from the expressive communication scale.

Language composite score

Definition: The language scale of the Bayley-III / Bayley 4 (A&NZ) is the sum of the receptive communication score and the expressive communication score. This sum is then used to calculate the composite score for the language scale.

Coding: A 2-3 digit number representing the composite score from the language scale.

Fine motor scaled score

Definition: The fine motor scale of the Bayley-III / Bayley 4 (A&NZ) includes skills associated with prehension, perceptual-motor integration, motor planning, and motor speed. Items measure young children's skills related to visual tracking, reaching, object manipulation and grasping. Children's

functional hand skills and responses to tactile information are also measured.

Coding: A 1-2 digit number representing the scaled score from the fine motor scale.

Gross motor scaled score

Definition: The gross motor scale of the Bayley-III / Bayley 4 (A&NZ) primarily measures the movement of the limbs and torso. Items assess static positioning (e.g., sitting, standing); dynamic movement, including locomotion and coordination; balance; and motor planning.

Coding: A 1-2 digit number representing the scaled score from the gross motor scale.

Motor composite score

Definition: The motor scale of the Bayley-III / Bayley 4 (A&NZ) is the sum of the fine motor score and the gross motor score. This sum is then used to calculate the composite score for the motor scale.

Coding: A 2-3 digit number representing the composite score from the motor scale.

Name of test administered

Definition: The name of the other development tests administered.

Coding: Free text field representing developmental test name.

Subscales of other developmental tests

Definition: Total number of the subscales for other developmental tests administered.

Coding: Number representing the total subscales of other developmental tests administered.

Score of other developmental tests

Definition: Score of other developmental tests administered.

Coding: Number representing the score of other developmental tests administered.

Level of development (months)

Definition: Level of development in months determined by other developmental tests administered.

Coding: Number representing level of development in months from the other developmental tests administered.

Reason for incomplete or no formal assessment

Definition: Main reason for incomplete or no formal developmental assessment at two to three years corrected age.

Coding:

0: unknown.

1: child too severely delayed.

2: child had a behavioural disorder.

3: child had a neurosensory impairment.

4: child was unwell.

5: child was uncooperative.

6: first language of child was not English.

7: formal assessment not offered at place of follow-up assessment.

8: other.

Guide for use: only one outcome to be used.

Clinical assessment of cognitive development

Definition: Assessment of cognitive development by a health care professional at two to three years corrected age for infants whose cognitive development was not assessed by a formal developmental test.

Coding:

0: unknown.

1: normal cognitive development or mild cognitive delay.

2: moderate cognitive delay.

3: severe cognitive delay.

4: cognitive delay but severity of delay unknown.

5: cognitive development not clinically assessed.

Clinical assessment of language development

Definition: Assessment of language development by a health care professional at two to three years corrected age for infants whose language development was not assessed by a formal developmental test.

Coding:

0: unknown.

1: normal language development or mild cognitive delay.

2: moderate language delay.

3: severe language delay.

4: language delay but severity of delay unknown.

5: language development not clinically assessed.

Clinical assessment of motor development

Definition: Assessment of motor development by a health care professional at two to three years corrected age for infants whose motor development was not assessed by a formal developmental test.

Coding:

0: unknown.

1: normal motor development or mild cognitive delay.

2: moderate motor delay.

3: severe motor delay.

4: motor delay but severity of delay unknown.

5: motor development not clinically assessed.

Other disability

Definition: Other disabilities.

Coding:

99: unknown.

0: no other disabilities.

-1: yes, other disabilities.

Description of other disabilities

Definition: Description of other disabilities. Include ICD-10 code if known.

Coding: Free text field representing description of other disabilities and ICD-10 codes if known.

Glossary

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

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

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

Bayley Scales of Infant and Toddler Development: assesses the motor (fine and gross), language (receptive and expressive), and cognitive development of infants and toddlers.

Birth status: status of the baby immediately after birth.

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

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

Cerebral palsy: a developmental disability that results from damage to or dysfunction of the developing brain.

Clinical assessment of development: professional opinion of a healthcare professional regarding the presence and severity of developmental delays for specific domains (cognitive, language and motor development), made in the absence of formal developmental testing.

Corrected age: the age a preterm baby would be if they had been born on their due date.

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

Extremely low birthweight: birthweight of less than 1,000 grams.

Extremely preterm birth: birth before 28 weeks of gestation.

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

Forceps: assisted birth using a metallic obstetric instrument.

Formal developmental assessment: includes neurological examination by a developmental paediatrician or physiotherapist, vision by an ophthalmologist or optometrist, hearing by an audiologist, and a developmental test using the Bayley Scales of Infant Development, Griffiths Mental Developmental Scales or another developmental test performed by a psychologist, developmental paediatrician, physiotherapist, or other qualified person.

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

Griffiths Mental Development Scales: assesses the mental development of young children across five subscales; locomotor, personal-social, language, eye and hand co-ordination, performance and practical reasoning.

Gross Motor Function Classification System (GMFCS): classifies the movement ability of children with cerebral palsy.

Hyaline membrane disease: a disorder of the respiratory system.

Instrumental delivery: vaginal delivery using forceps or vacuum extraction.

Intrapartum fetal death: fetal death occurring during labour.

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

Late neonatal death: death of a liveborn baby after seven completed days and before 28 completed days.

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

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

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

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

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

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

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

Neonatal death: death of a liveborn baby within 28 days of birth.

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

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

Plurality: the number of births resulting from a pregnancy.

Post menstrual age is calculated by taking the gestational age plus postnatal age – e.g. when a baby born at 25 weeks gestation is 15 weeks old, they are 40 weeks PMA (also known as term equivalent age).

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

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

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

Preterm birth: birth before 37 weeks of gestation.

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

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

Sex ratio: number of male liveborn babies per 100 female liveborn babies.

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

Stillbirth: see Fetal death (stillbirth).

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

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

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

Very low birthweight: birthweight of less than 1,500 grams.

Very preterm birth: birth before 32 weeks of gestation.

Wechsler Preschool and Primary Scale of Intelligence: assesses the cognitive development of young children across five subscales; verbal comprehension, visual spatial, fluid reasoning, working memory, and processing speed.

References

Australian Bureau of Statistics 2023. *Births, Australia, 2022*. Canberra: ABS.

Chow SSW, Creighton P, Holberton JM, Chambers GM, Lui K 2023. *Report of the Australian and New Zealand Neonatal Network 2021*. Sydney: ANZNN < www.anznn.net >.

The Committee for the Classification of Retinopathy of Prematurity 1984. An international classification of retinopathy of prematurity. *Archives of Opthalmology* 102(8):1130-1134.

Conde-Agudelo A & Romero R 2009. Antenatal magnesium sulfate for the prevention of cerebral palsy in preterm infants less than 34 weeks' gestation: a systematic review and metaanalysis. *American Journal of Obstetrics & Gynecology* 200(6):595–609.

Crowther CA, Hiller JE, Doyle LW, Haslam RR for the Australasian Collaborative Trial of Magnesium Sulphate (ACTO $MgSO_4$) Collaborative Group 2003. Effect of magnesium sulphate given for neuroprotection before preterm birth: a randomised controlled trial. *JAMA: The Journal of the American Medical Association* 290(20):2669–2676.

Papile LA, Burstein J, Burstein R & Hoffler H 1978. Incidence and evolution of subependymal and intraventricular hemorrhage: a study of infants with birth weights less than 1500gm. *Journal of Paediatrics* 92(4):529–534.

Rouse DJ 2009. Magnesium sulfate for the prevention of cerebral palsy. *American Journal of Obstetrics & Gynecology*. 200(6):610–612.

Statistics New Zealand 2023. *Births and deaths: year ended December 2022*. Wellington: Statistics New Zealand < www.stats.govt.nz >.

WHO Multicentre Growth Reference Study Group. *WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development*. Geneva: World Health Organization, 2006.

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