



Associate Professor Nicola Austin

Neonatologist
Christchurch

Saturday, August 13, 2016

(Plenary)

8:00 - 8:30 Survival and Outcome Consequences of the Very Preterm Infant

Survival, Outcome and Consequences for the Very Preterm Infant



Associate Professor Nicola Austin
Christchurch Women's Hospital
CDHB

August 2016

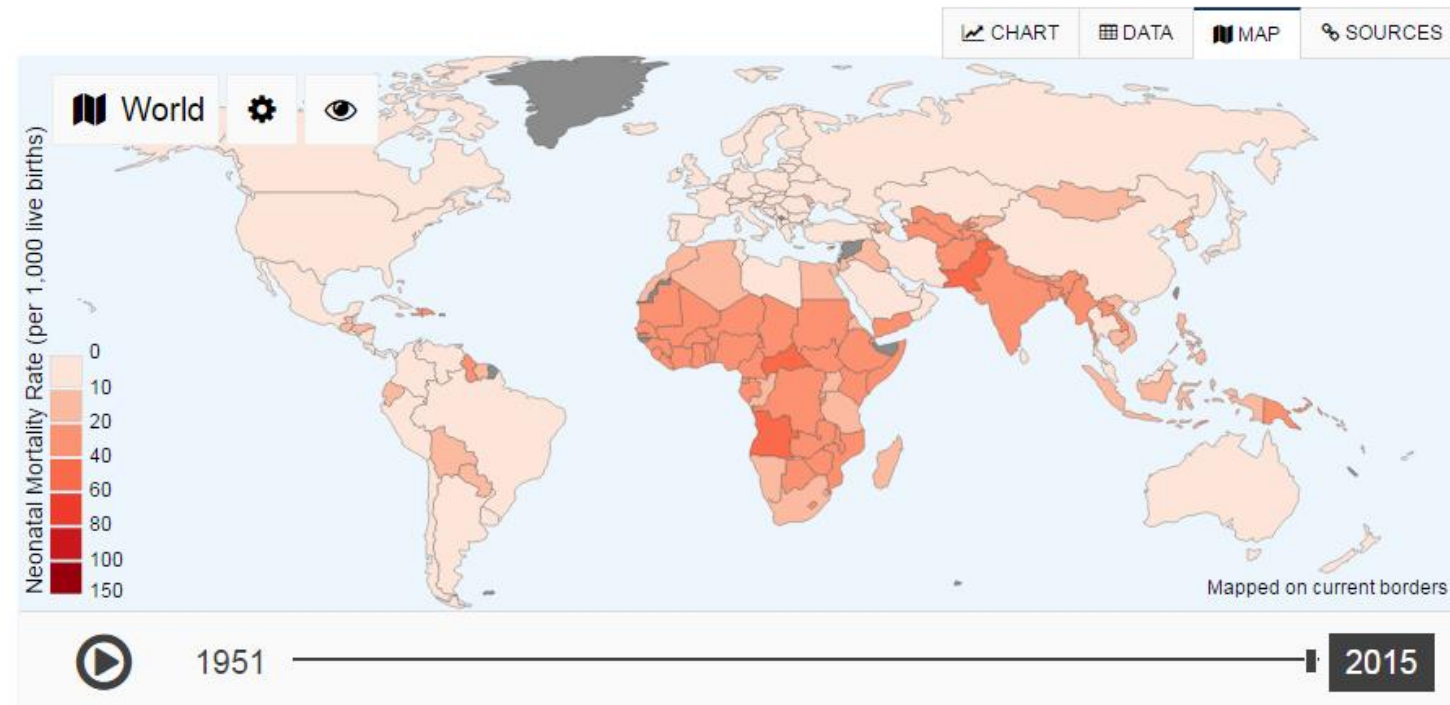
Outline

- International comparisons
- Change in survival
- Preterm birth causes
- Neonatal Morbidity and Nutrition
- Neurodevelopmental outcomes
- Predicting progress – early childhood and early school years
- Impact on parents

International comparisons

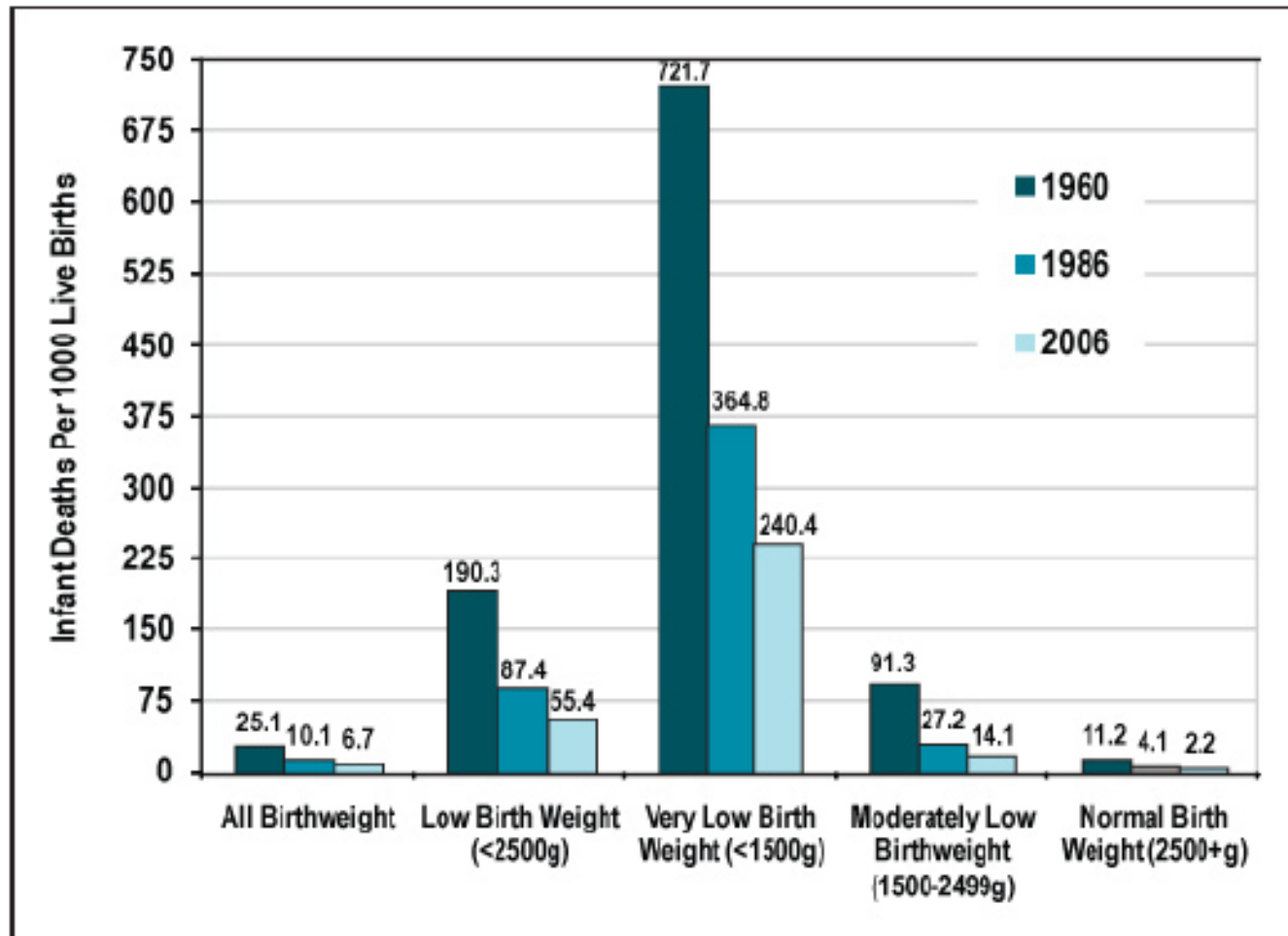
Neonatal mortality rate (per 1,000 live births), 2015

The neonatal mortality rate is defined as the probability of dying before 28 days per 1,000 live births.

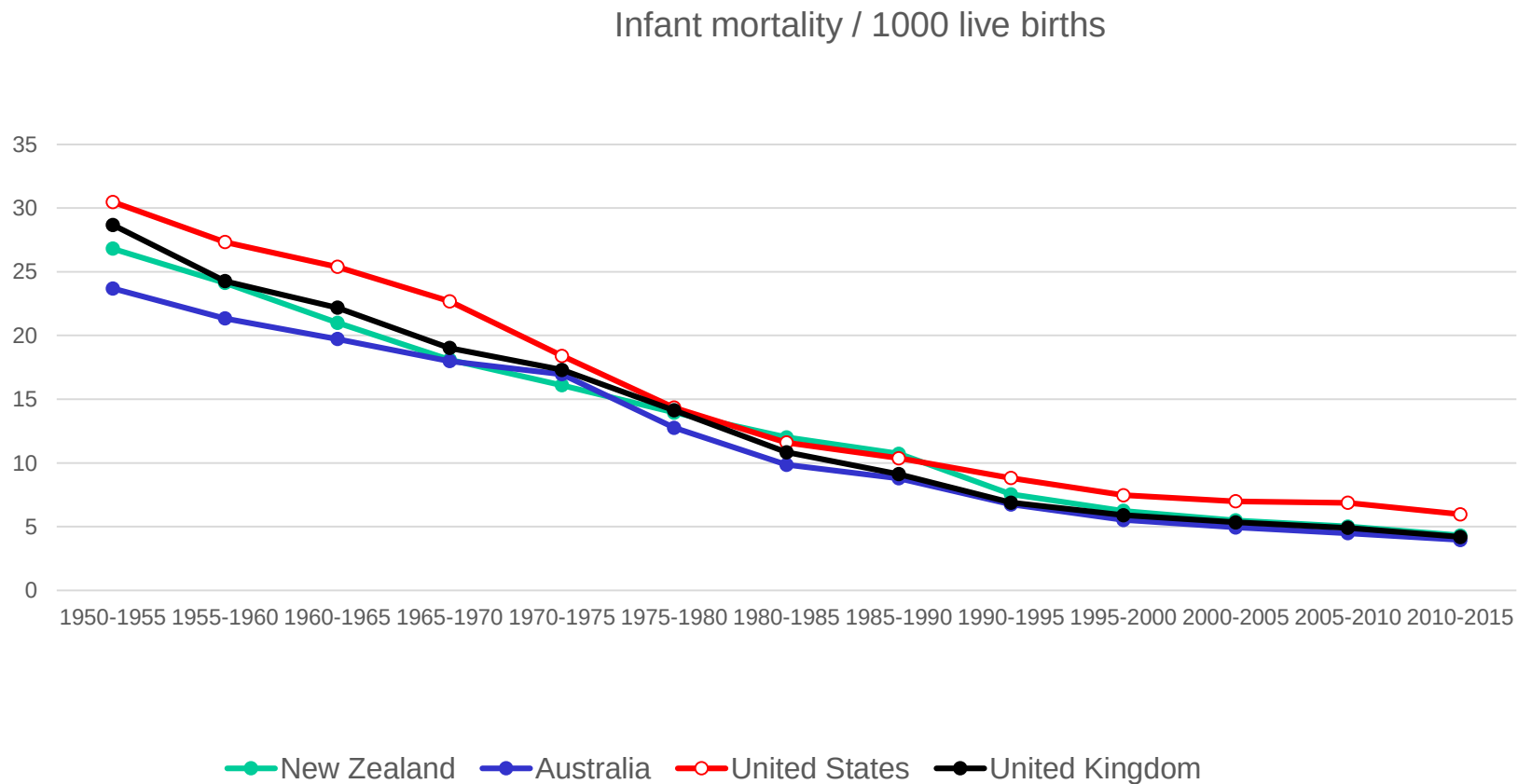


Source: Neonatal Mortality Rate (via Childmortality.org)

Figure 5: Infant Mortality Rate by Birthweight, United States, 1960-2006



Survival in the first year

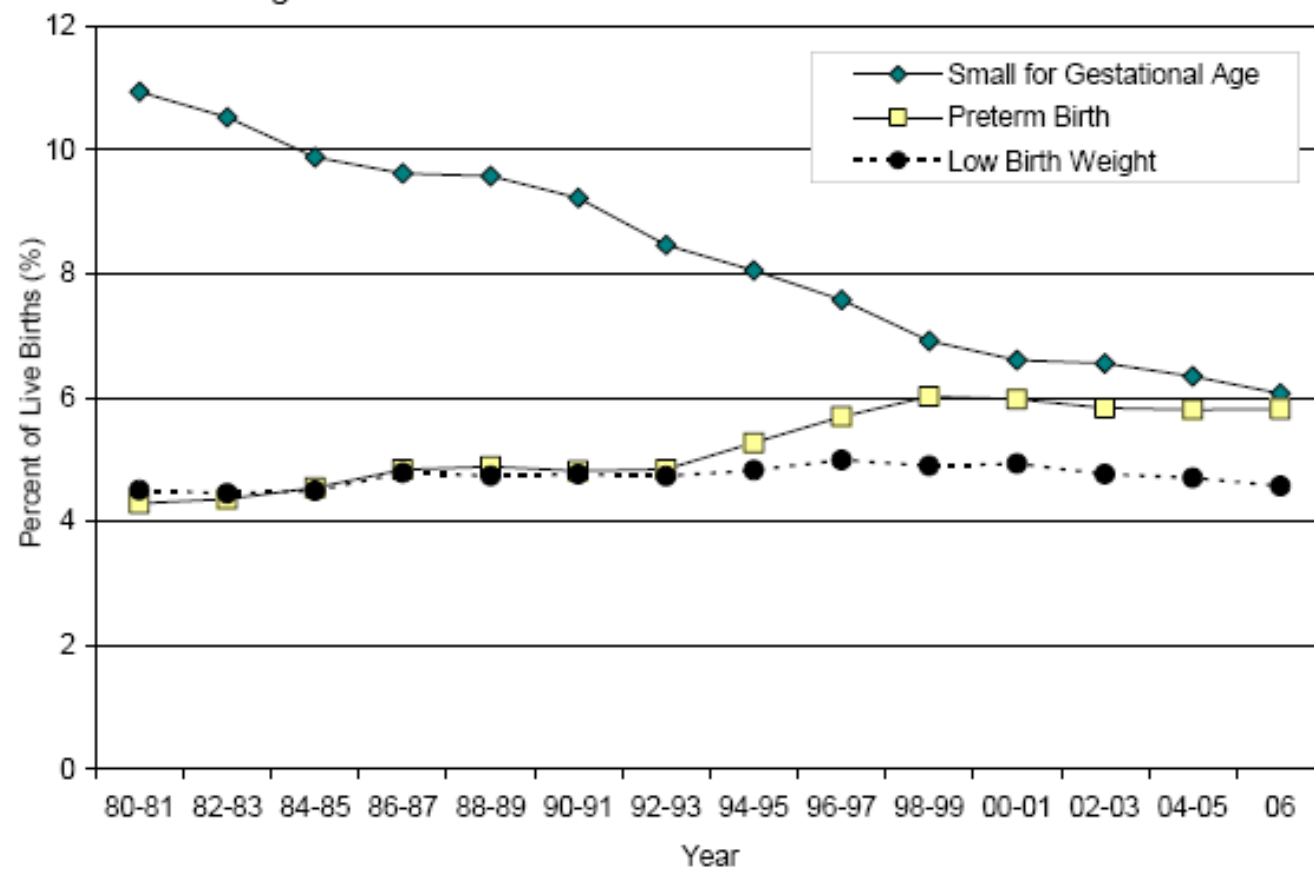


Very preterm

- Improved survival
 - Antenatal steroids – Cochrane
 - Surfactant
- Improved outcomes
 - Term= 37 weeks or more
 - Near term 34-36 weeks
 - Preterm < 37 weeks
 - Very Preterm < 32 weeks
 - Extremely preterm < 28 weeks

NZ data

Figure 82. Rates of Small for Gestational Age, Preterm Birth and Low Birth Weight, New Zealand Singleton Live Births 1980-2006



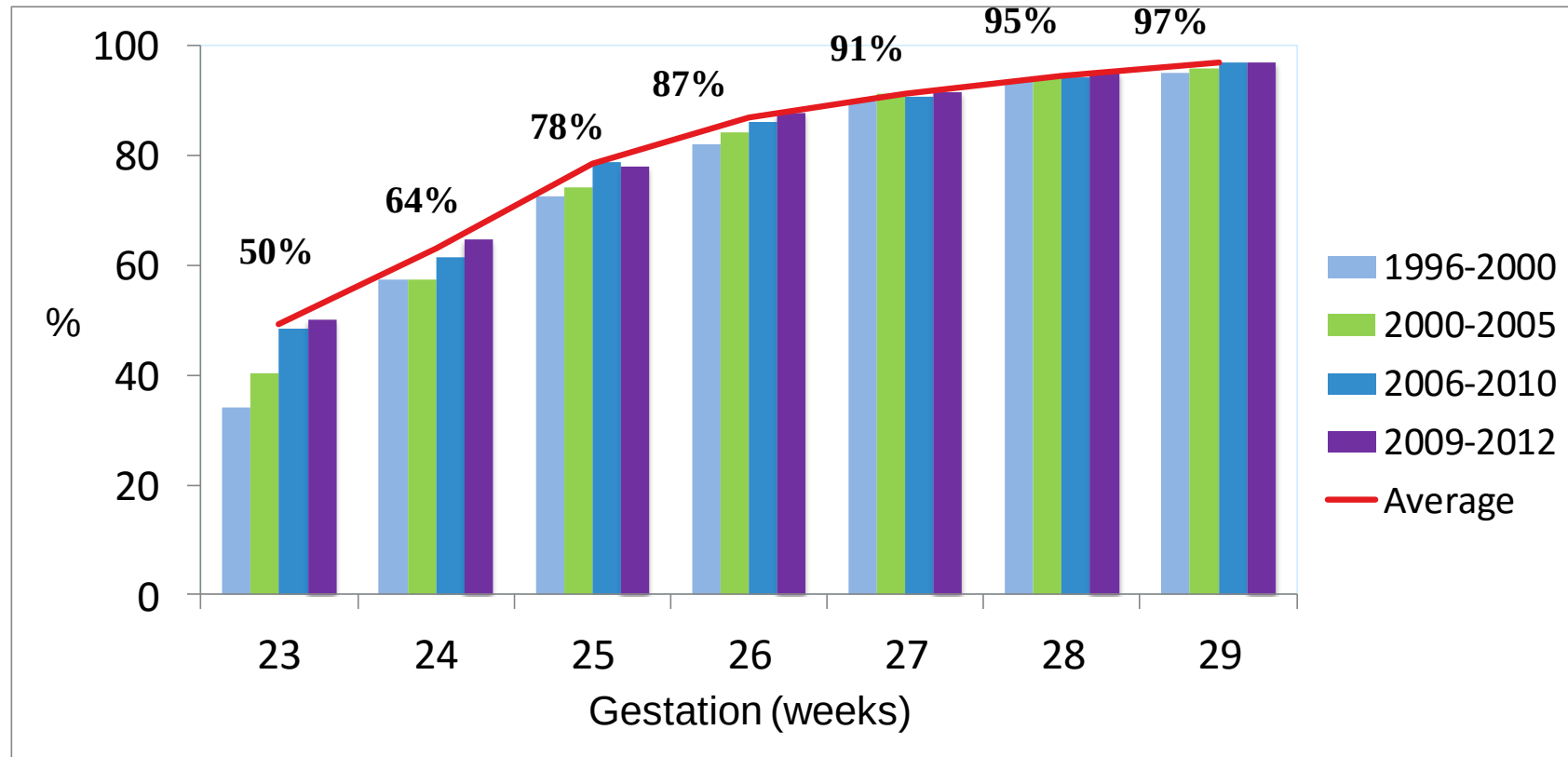
ANZNN

Australia and New Zealand Neonatal Network



ANZNN – Individual unit feedback for babies born in 2013

Survival to discharge of preterm baby's born alive ANZNN data from 1996- 2012



Why has survival improved?

- Antenatal steroids
 - NZ lead the way
 - 2 doses 24 hours before delivery
 - Less RDS, improved survival, less IVH
- Surfactant
 - Artificial to animal derived
 - Given earlier
 - Higher initial dose

Randomised trials

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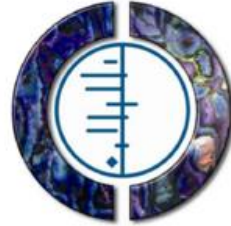


Cochrane New Zealand

Cochrane New Zealand is a branch of the Australasian Cochrane Centre and was established on the 23rd February 2004. The Branch is an entity of the Cochrane Collaboration and its aim is to promote and support Cochrane Collaboration activities throughout New Zealand.

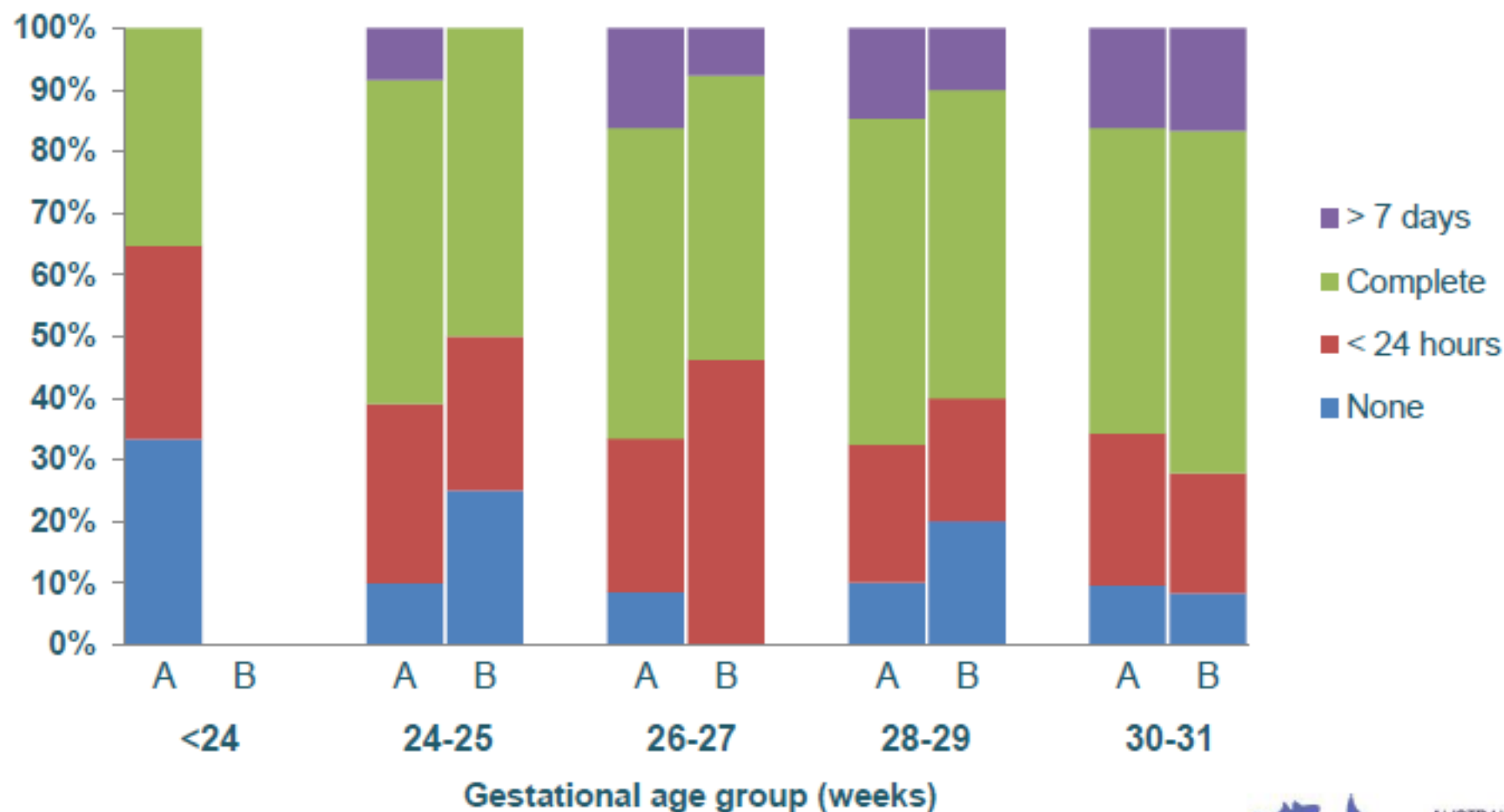
Related Resources

Symposium



Antenatal corticosteroid use

Babies born at <32 weeks gestation



A: ANZNN
B: Your unit

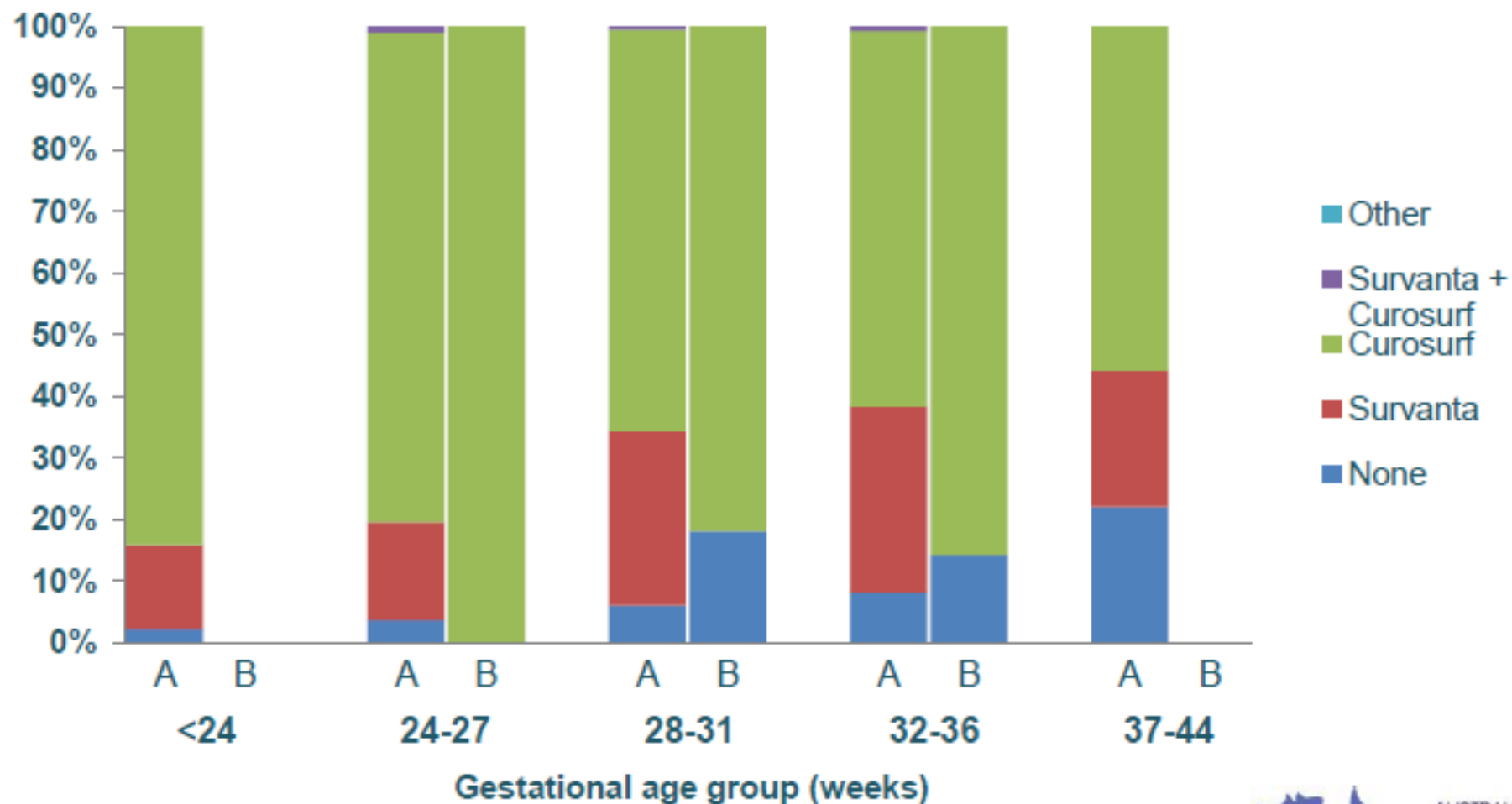
ANZNN Individual unit feedback for babies born in 2013



Why has survival improved?

- Antenatal steroids
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Exogenous surfactant use for HMD – for registrants given IPPV

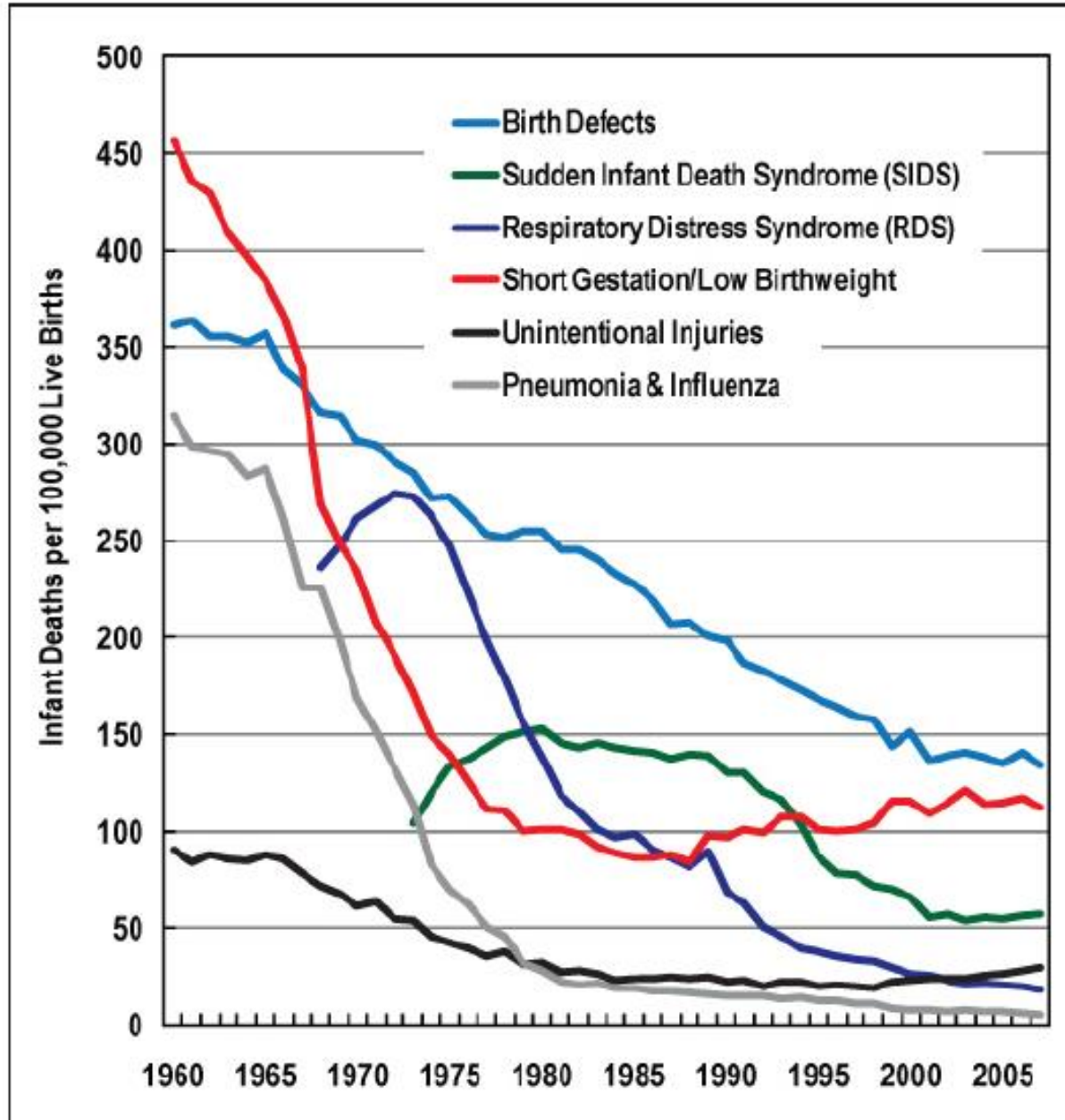


A: ANZNN
B: Your unit

ANZNN – Individual unit feedback for babies born in 2013



Figure 11: Trends in Infant Mortality from Major Causes of Death, United States, 1960-2007



Obstetric care



How will my patients present ?

- 2 sets of scenarios at the periviable gestations of 22-24 weeks are common.
- The one where there is warning usually of a small sized baby, ruptured membranes without labour, incompetent cervix, occasionally hypertension.
- The rapid progression to imminent delivery, with the baby delivering often in the breech position.

Reasons for preterm birth

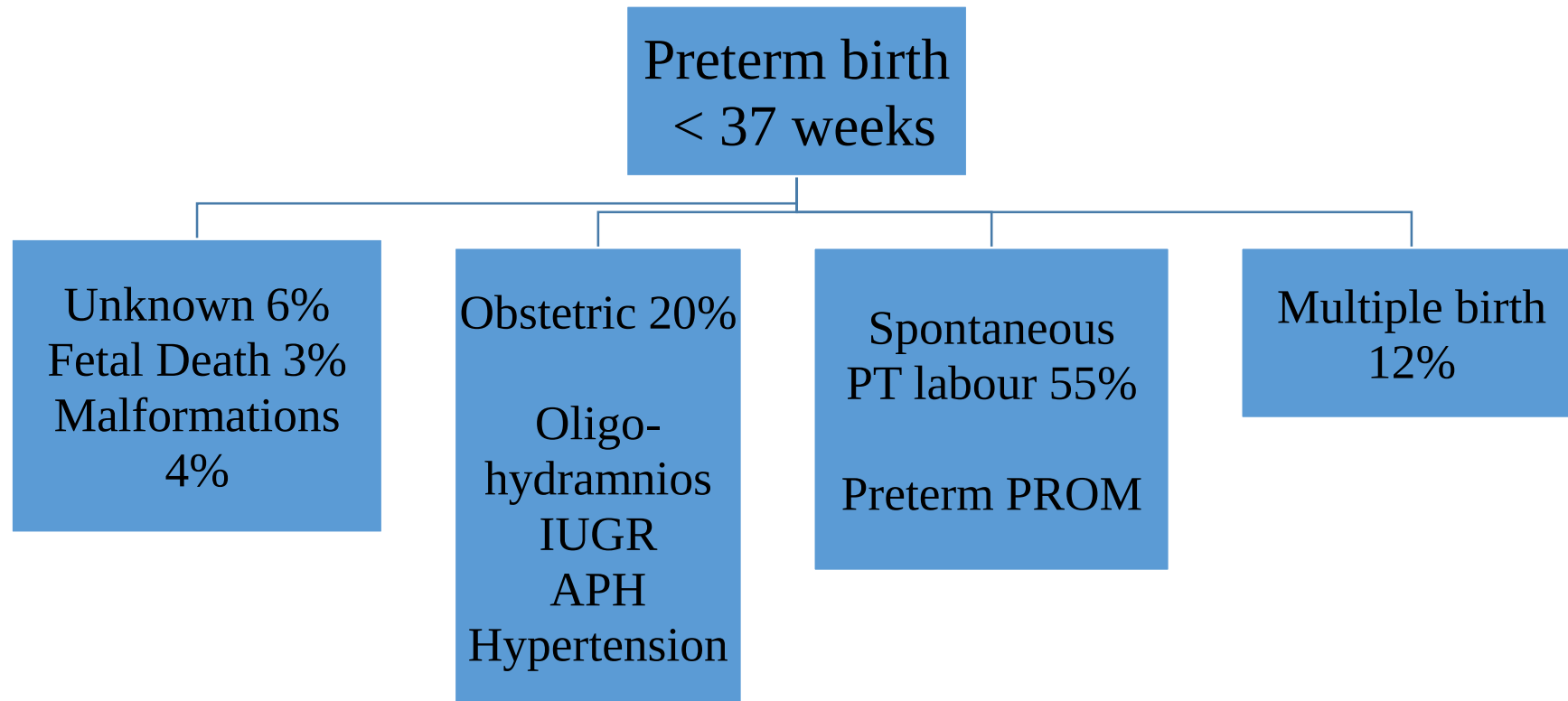
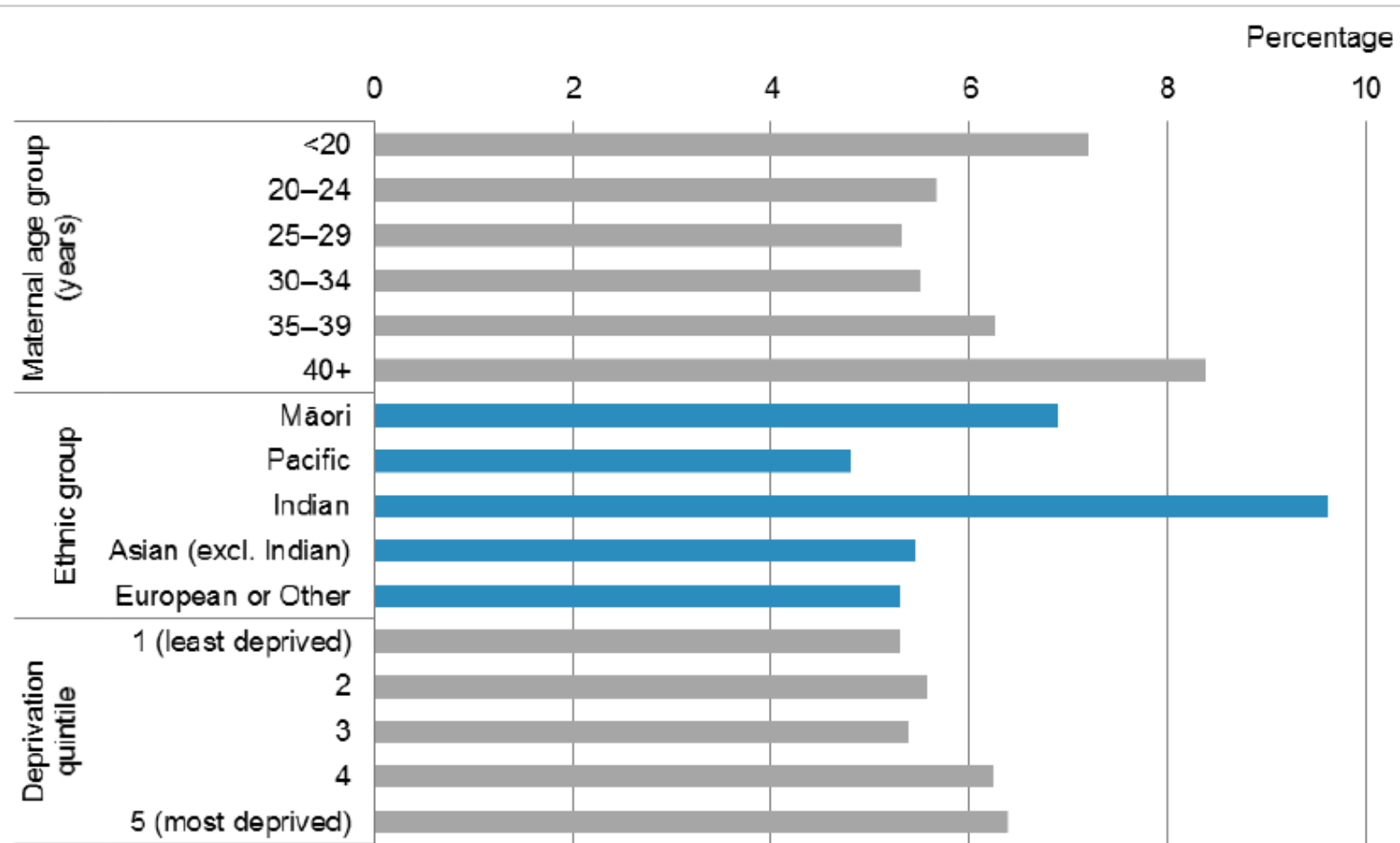


Figure 51: Percentage of babies born with a low birthweight, by maternal age group, ethnic group and baby neighbourhood deprivation quintile, 2014

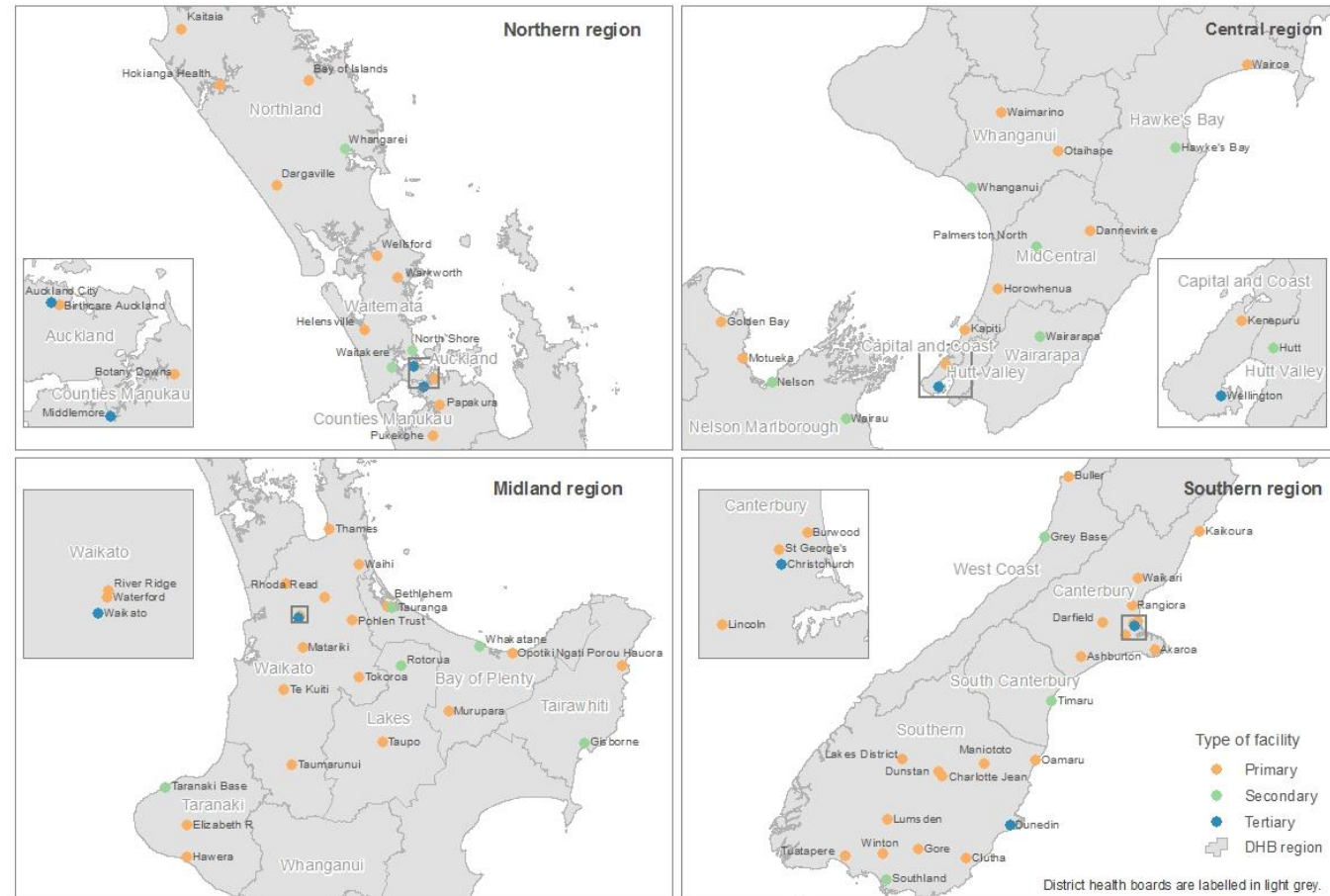


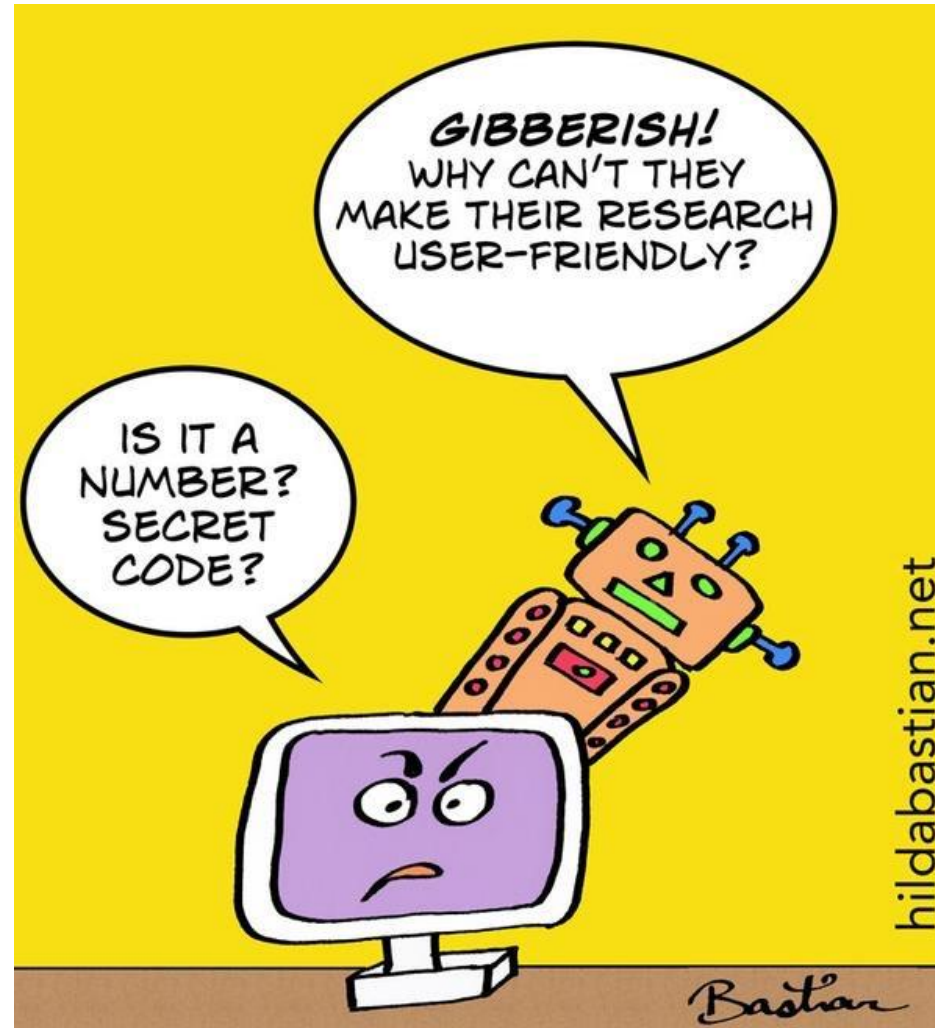
Note: The denominator used for calculating percentages is number of live-born babies, excluding those with unknown birthweight.

Practice points

- If signs of threatened preterm labour or pregnancy complications REFER
- Antenatal steroids given 48 hours before delivery improve survival, reduce respiratory complications and Intraventricular haemorrhage
- Birth at a level 3 centre always < 28 weeks – Auckland (2), Hamilton, Wellington, Christchurch, Dunedin

Distribution of Hospitals and Birthing units



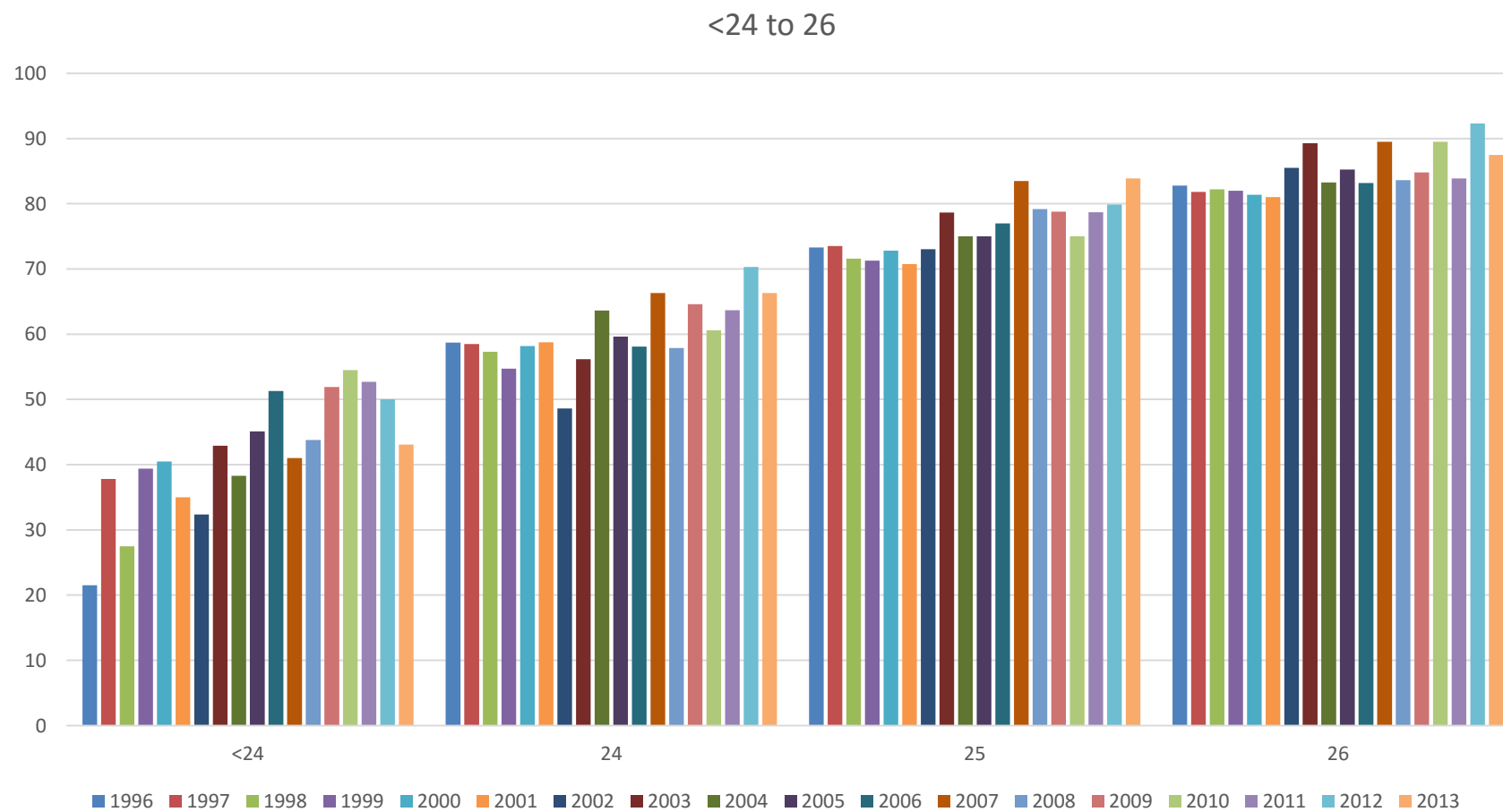


The limits of viability.

- My scan has shown a small baby with not much liquor and I'm only 23 weeks.
 - What if my baby is too small to survive.
 - I want everything done.....
 - I might not have the chance to have another baby.
 - I just want a healthy baby.
- Counselling has to include our current survival rates and information on neurodevelopmental outcomes.

Gradual improvement < 24, 24 and 25 weeks

– ANZNN



Survival is not just about gestation

The individual, biological limit of viability is not easily assessable in clinical practice

Gender,

Ethnicity,

Socioeconomics ...

Inter-individual variation

Inexact pregnancy dating

Reason for the preterm birth

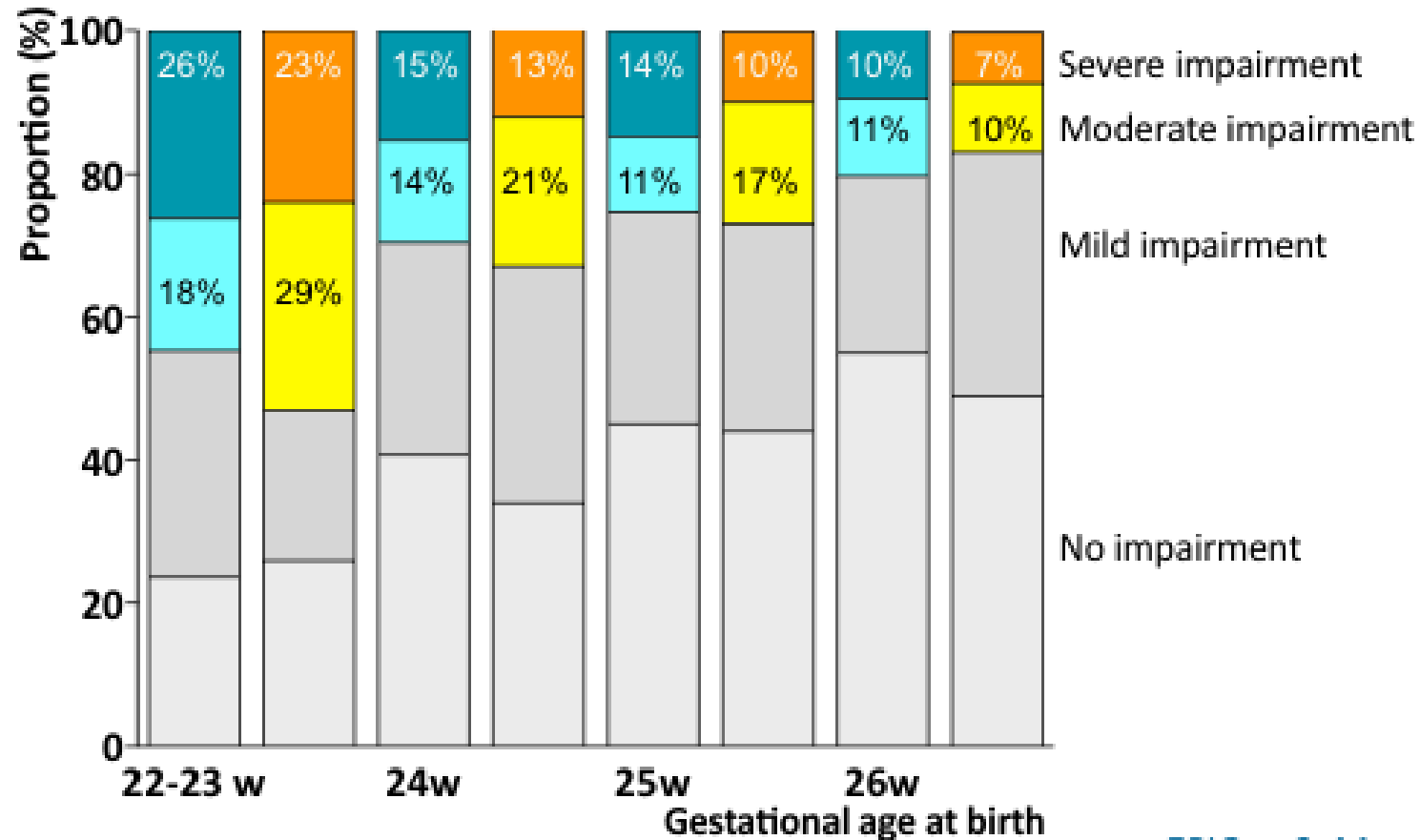
Antenatal steroids

Magnesium Sulphate - neuroprotection

What does severe disability mean to parents?

- Difficult to engage with the environment
 - Blind
 - In a wheelchair
 - IQ below 3 SD below the mean
-
- We need to ask parents – What is important to you?
What are your worries?

Outcomes



EPIcure2 data reclassified to meet EXPRESS definitions

EPIcure2: Moore et al BMJ 2012

EXPRESS: Serenius et al JAMA 2013

When is it ethical to withhold treatment?

- What does treatment being futile mean to
 - The care providers
 - The parents
- The treatment of 23 weekers is cost effective using standard approaches for health resource decisions

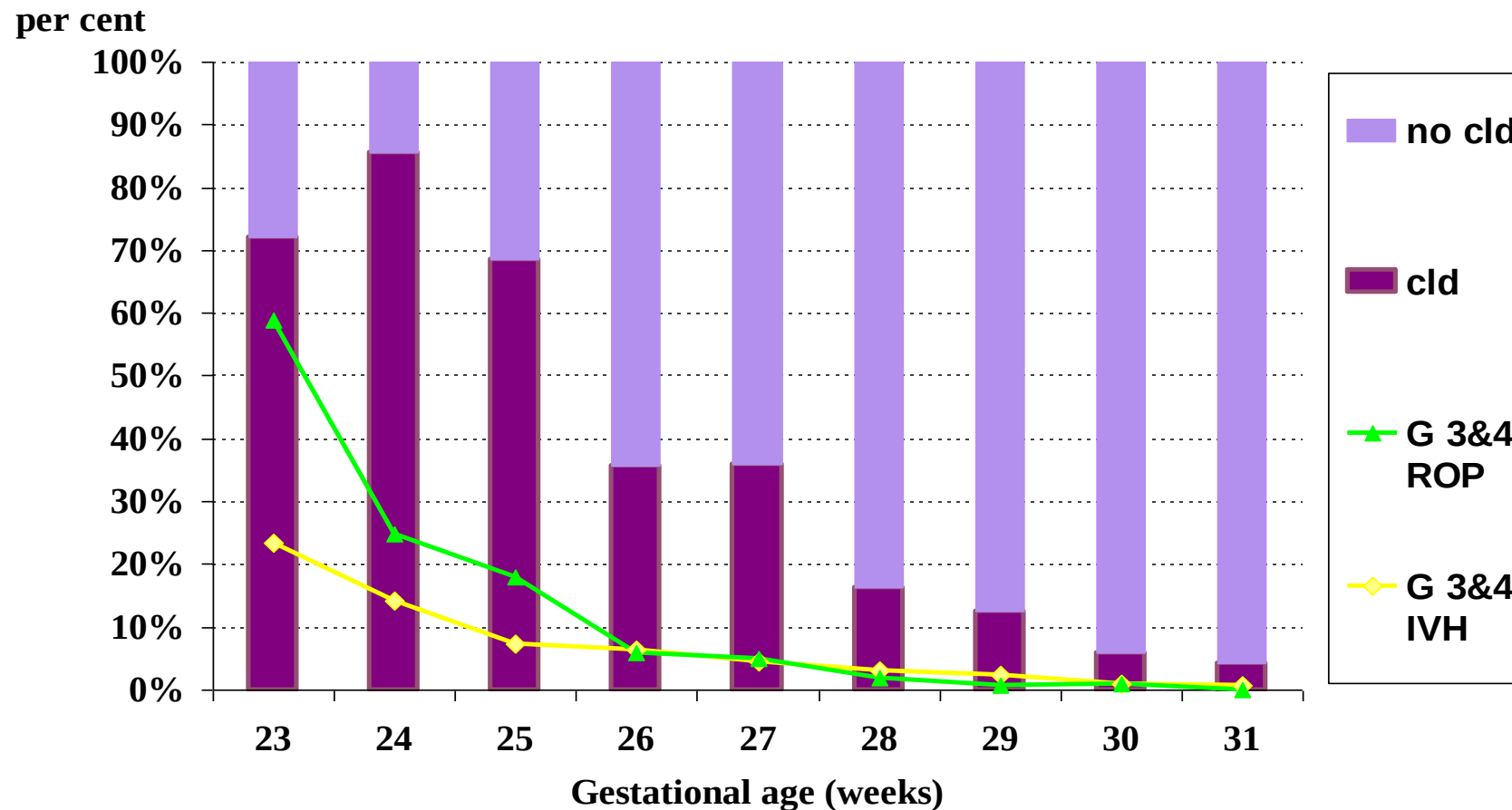
What outcomes do we measure?

Major Morbidities during the NICU stay

- Respiratory - hyaline membrane disease
 - Pulmonary hypoplasia – poor lung growth
 - Chronic lung disease – still needing Oxygen at 36 weeks
- Neurologic - Intraventricular haemorrhage
 - Periventricular leukomalacia or white matter injury
 - Ischaemic / asphyxial injury
- Infection - Group B Strep and Ecoli
 - Candida, - Necrotising enterocolitis
- Eyes - Retinopathy of prematurity and Hearing - Sensorineural deafness 3%

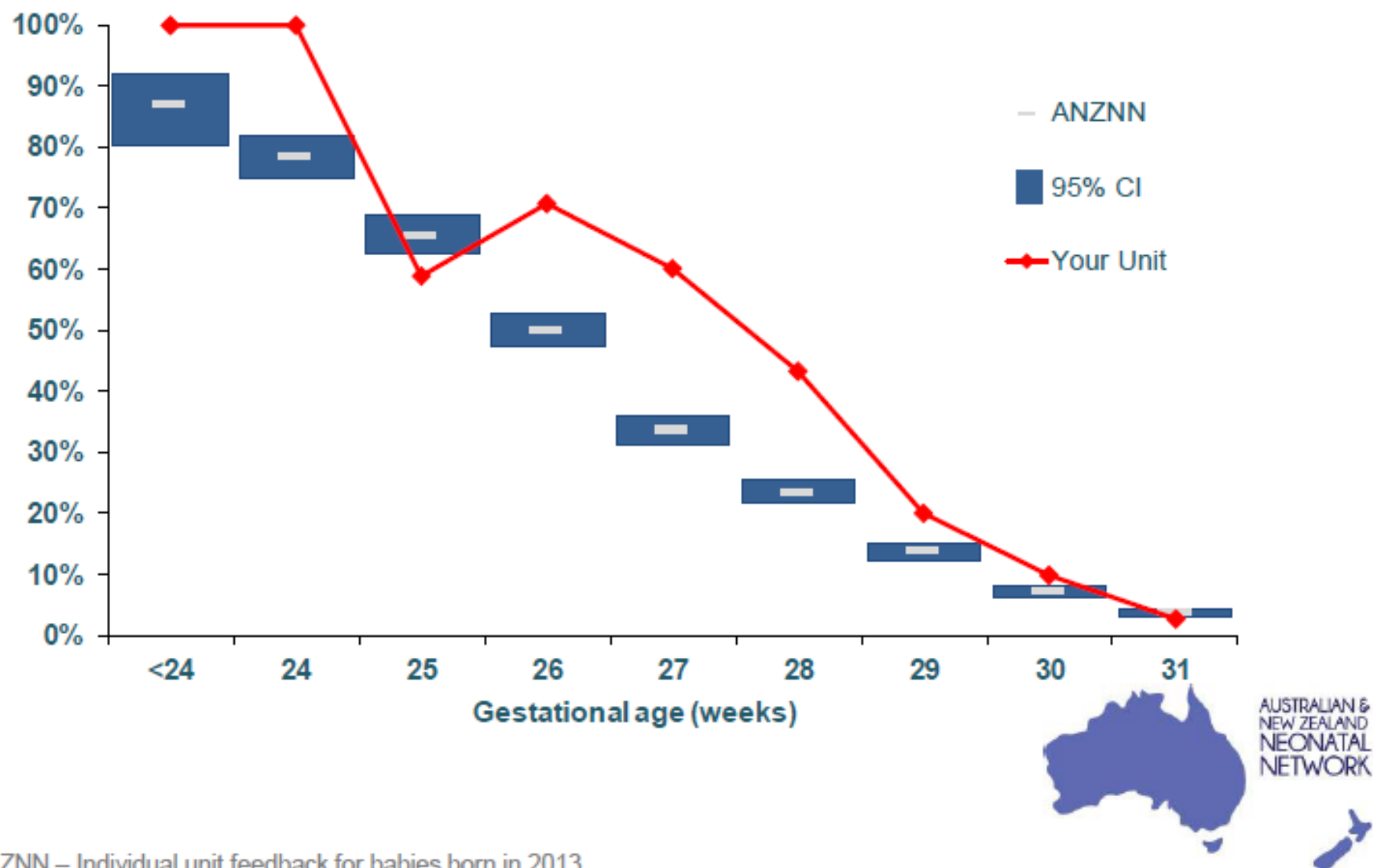
Morbidity among babies survived to go home

Babies <32weeks GA 2004

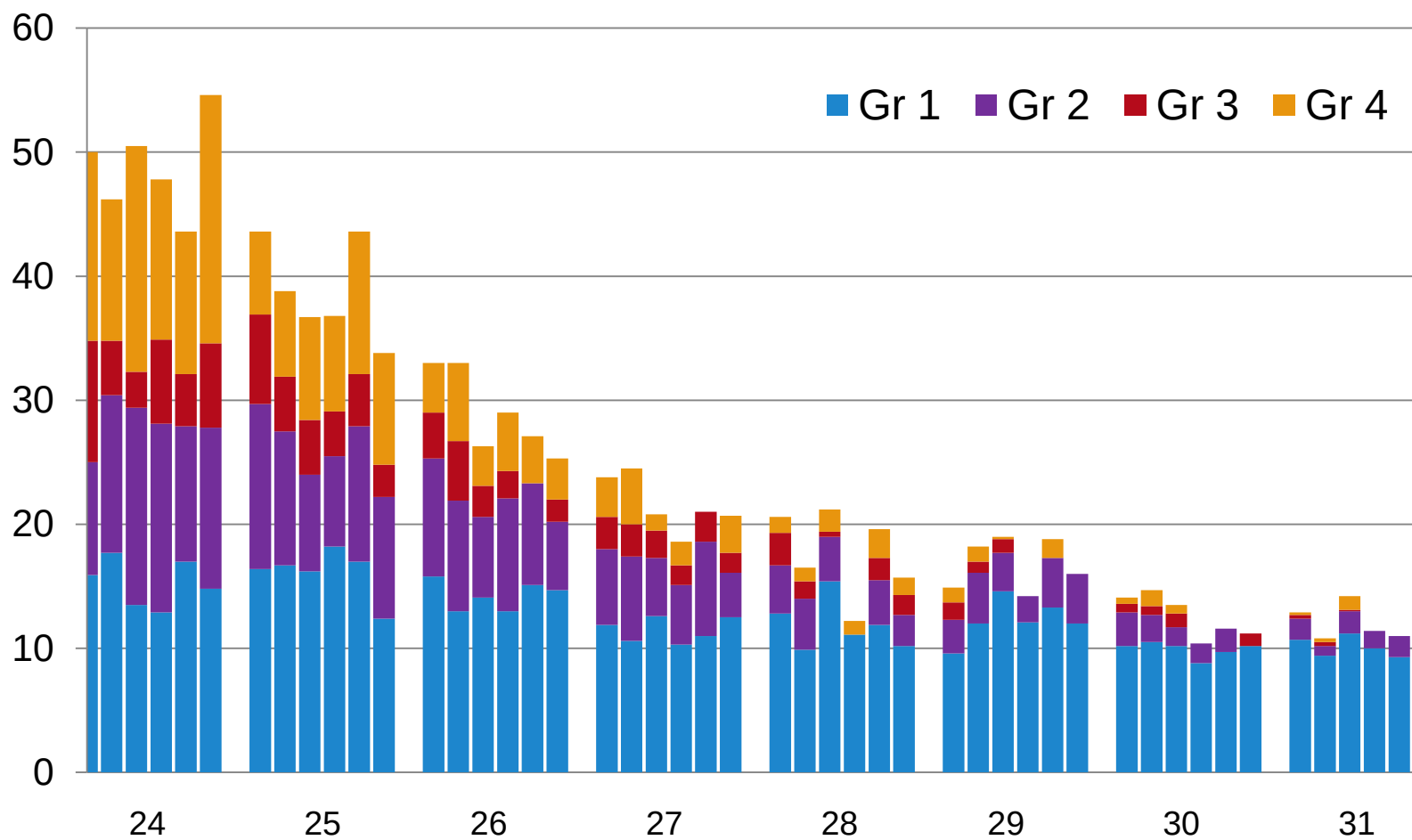


Chronic lung disease by gestational age, 2009-2013

Babies who survived to 36 weeks PMA

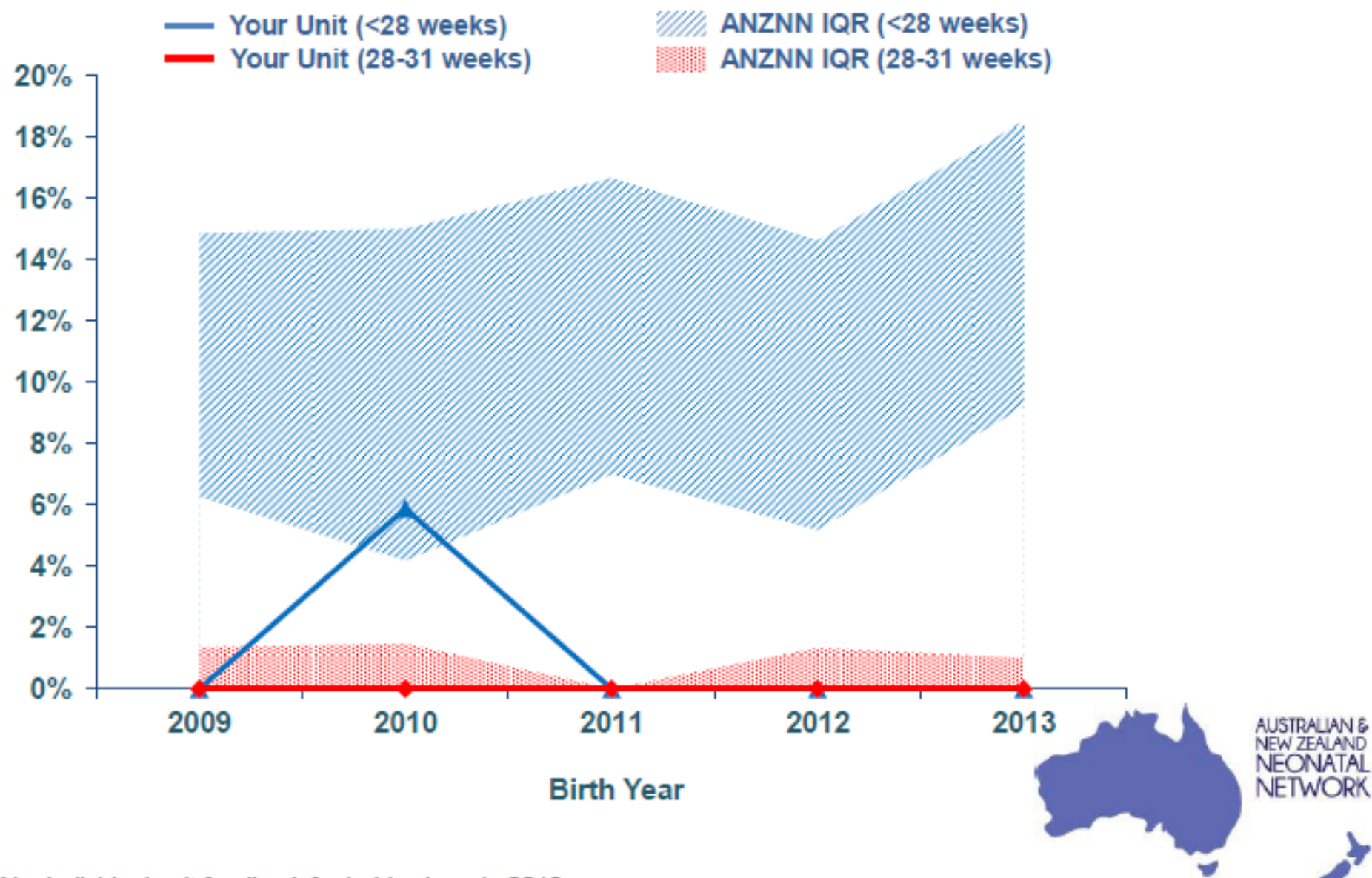


ANZNN - IVH



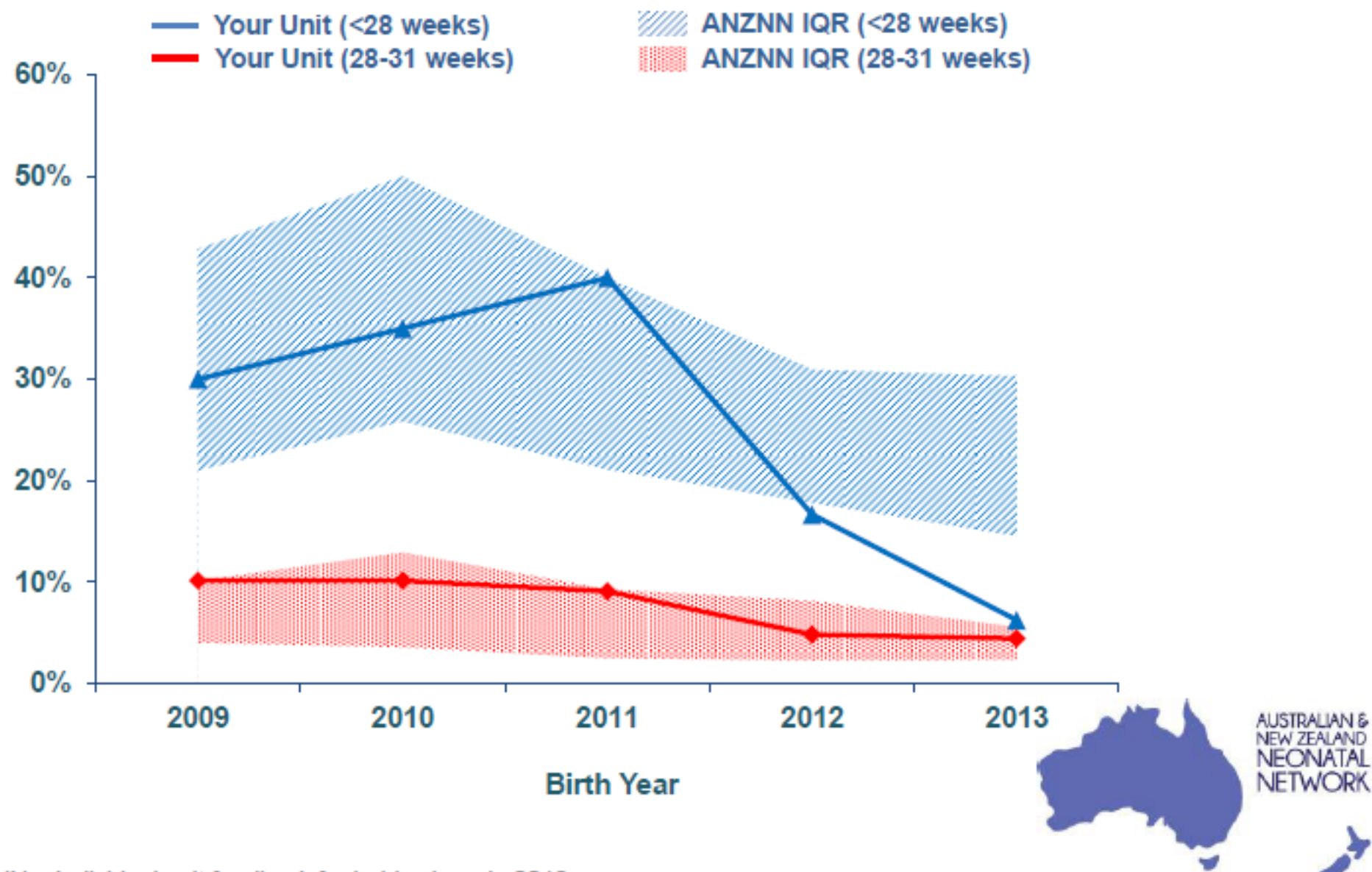
Severe retinopathy of prematurity, 2009-2013

Babies born at <32 weeks and tested for ROP



Late-onset Sepsis, 2009-2013

Babies born at <32 weeks and survived to day 2



Clinical Practice Improvement

Finally, detailed mapping of management practices in different units and childhood follow-up of these infants will provide important insights into the impact of neonatal outcome variation on later life. ■

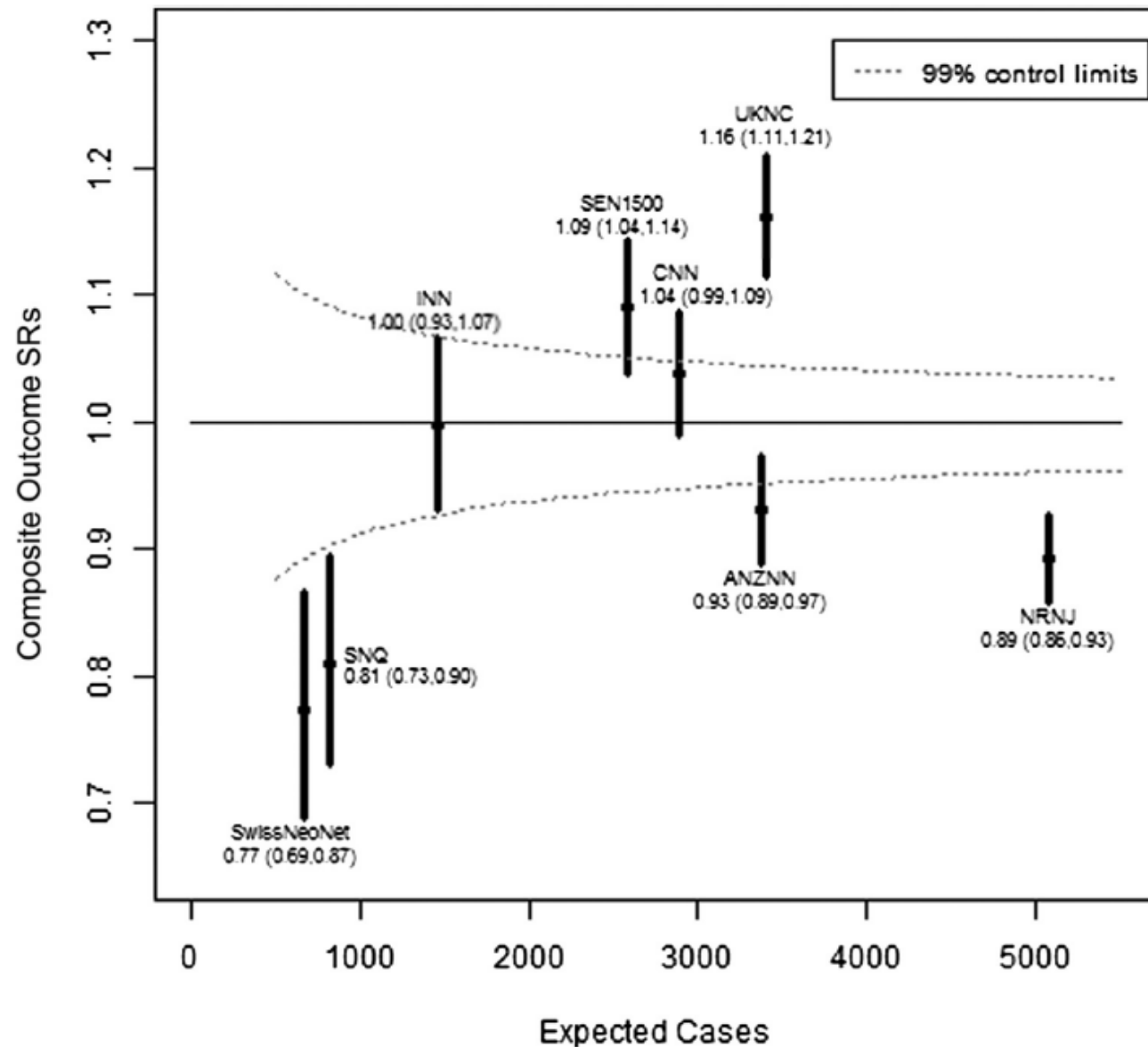
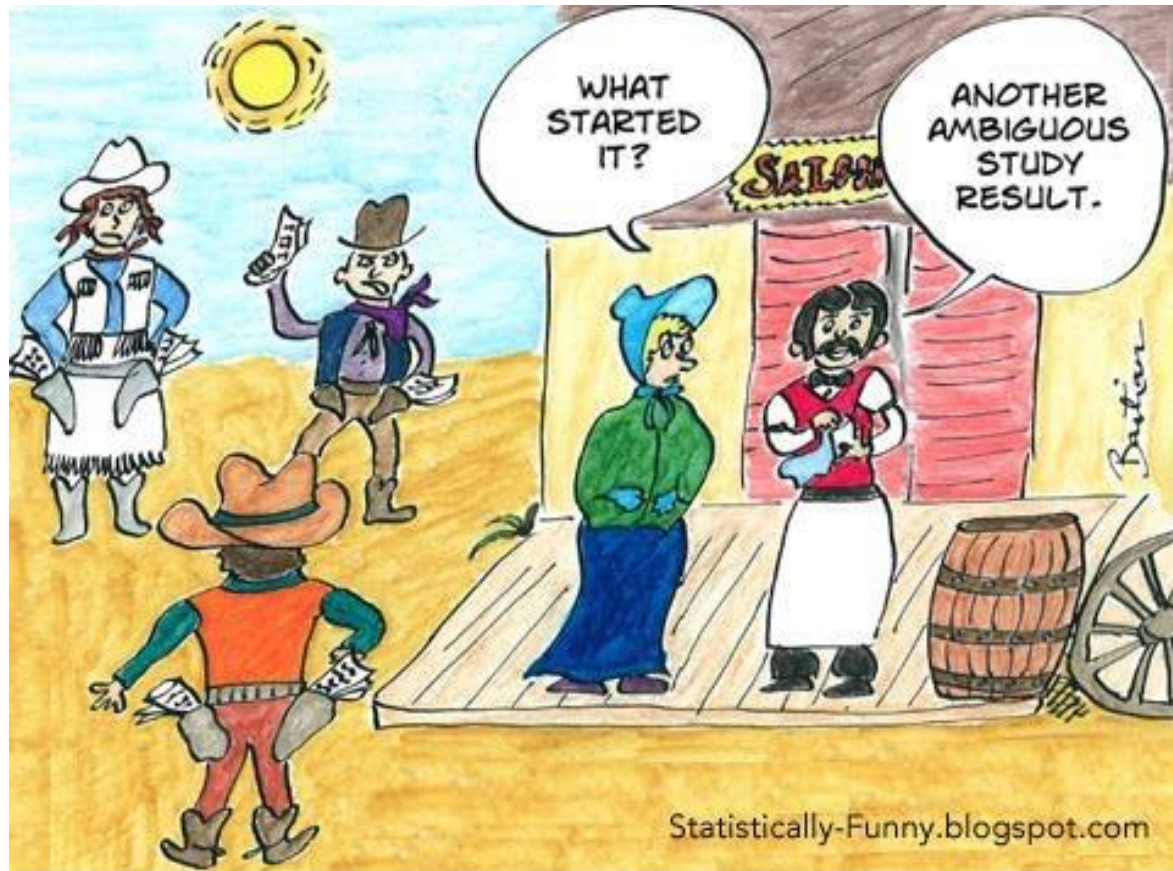


Figure. SRs comparing the composite outcome of each network to all other networks combined. *Vertical bars* are the estimated 99% CIs of the SR. The *dotted curves* represent the 99% control limits expected under the null hypothesis of similar outcome rates (SR = 1). ANZNN, Australian and New Zealand Neonatal Network; CNN, Canadian Neonatal Network; INN, Israel Neonatal Network; NRNJ, Neonatal Research Network of Japan; SEN1500, Spanish Neonatal Network; SNQ, Swedish Neonatal Quality Register; SwissNeoNet, Swiss Neonatal Network.



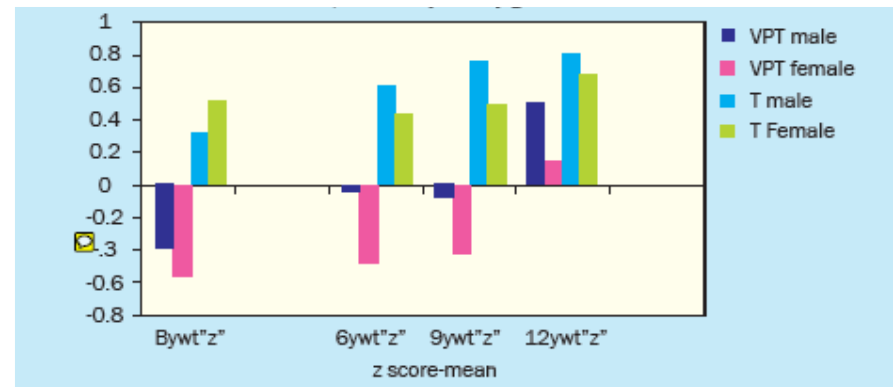
THINGS GOT TENSE FOR THE TOWNSFOLK
WHEN THE THIRD META-ANALYST GANG
RODE INTO TOWN.

Nutrition

- Nutrition is an important modifiable component of care on the neonatal unit
- Optimal growth reduces
 - CLD
 - Postnatal growth deficiency
 - Improves brain growth

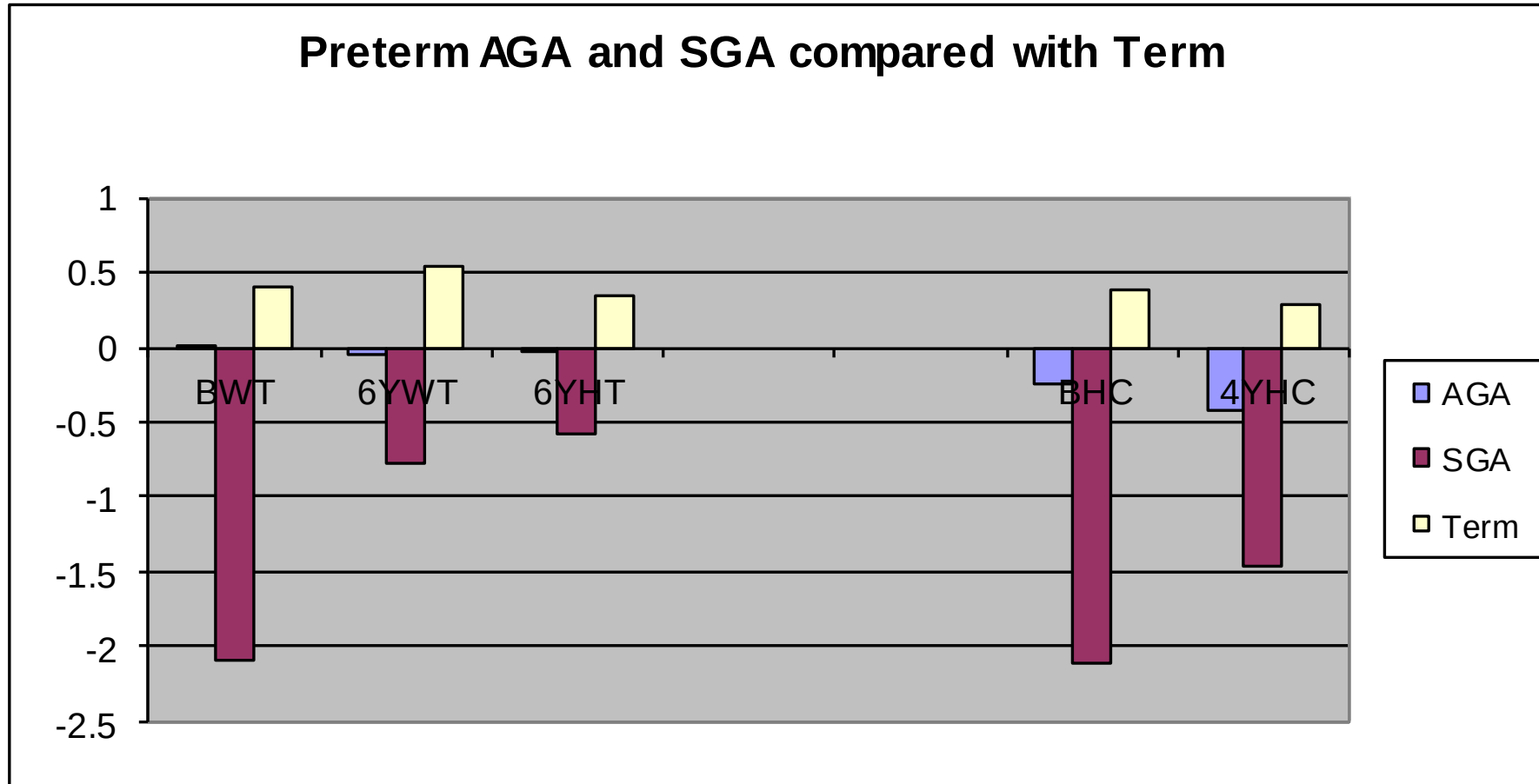


Growth Birth compared with 6, 9, 12 years, by gender.



Very preterm cohort born July 1998-March 2000

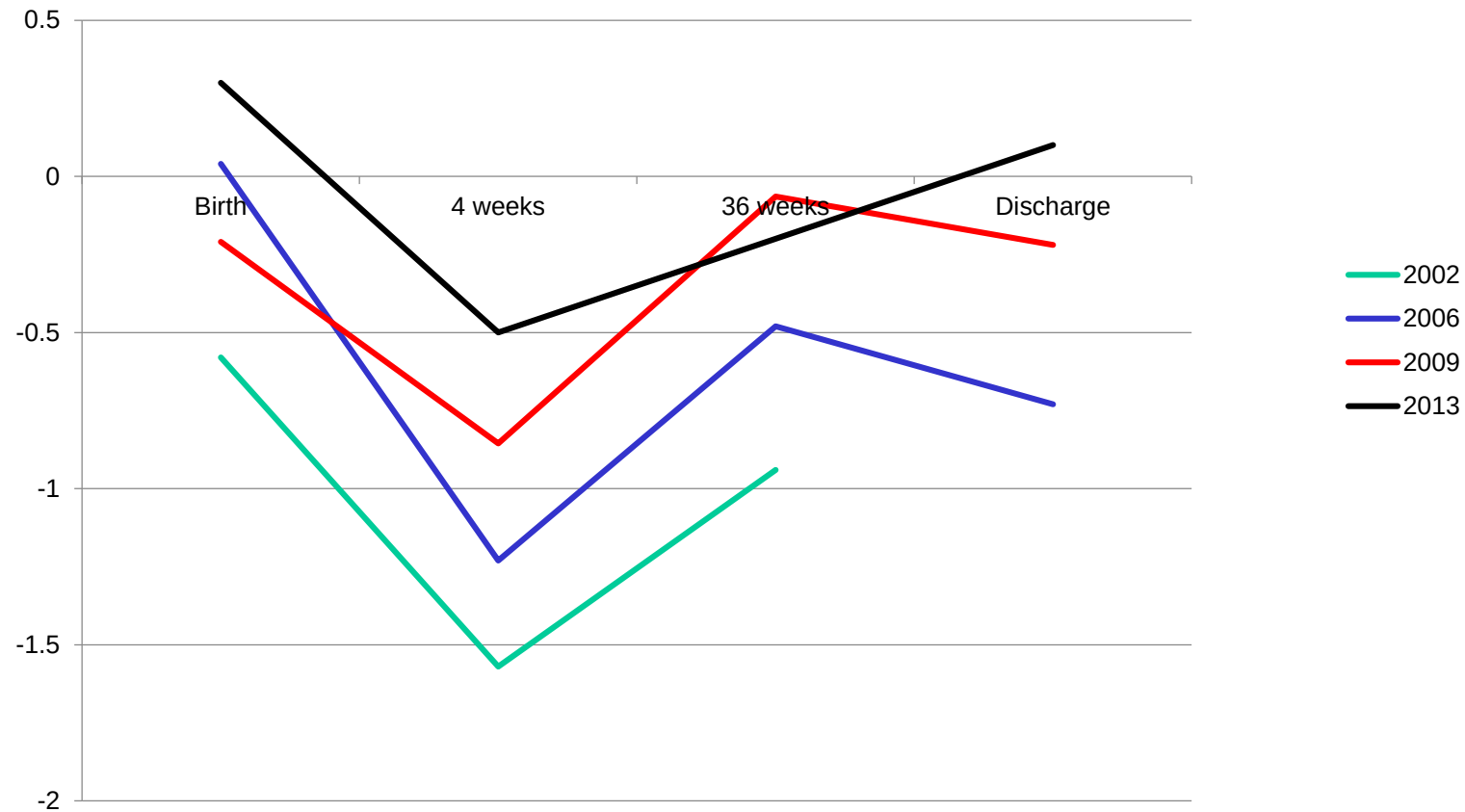
The growth in utero matters



Nutrition improvements

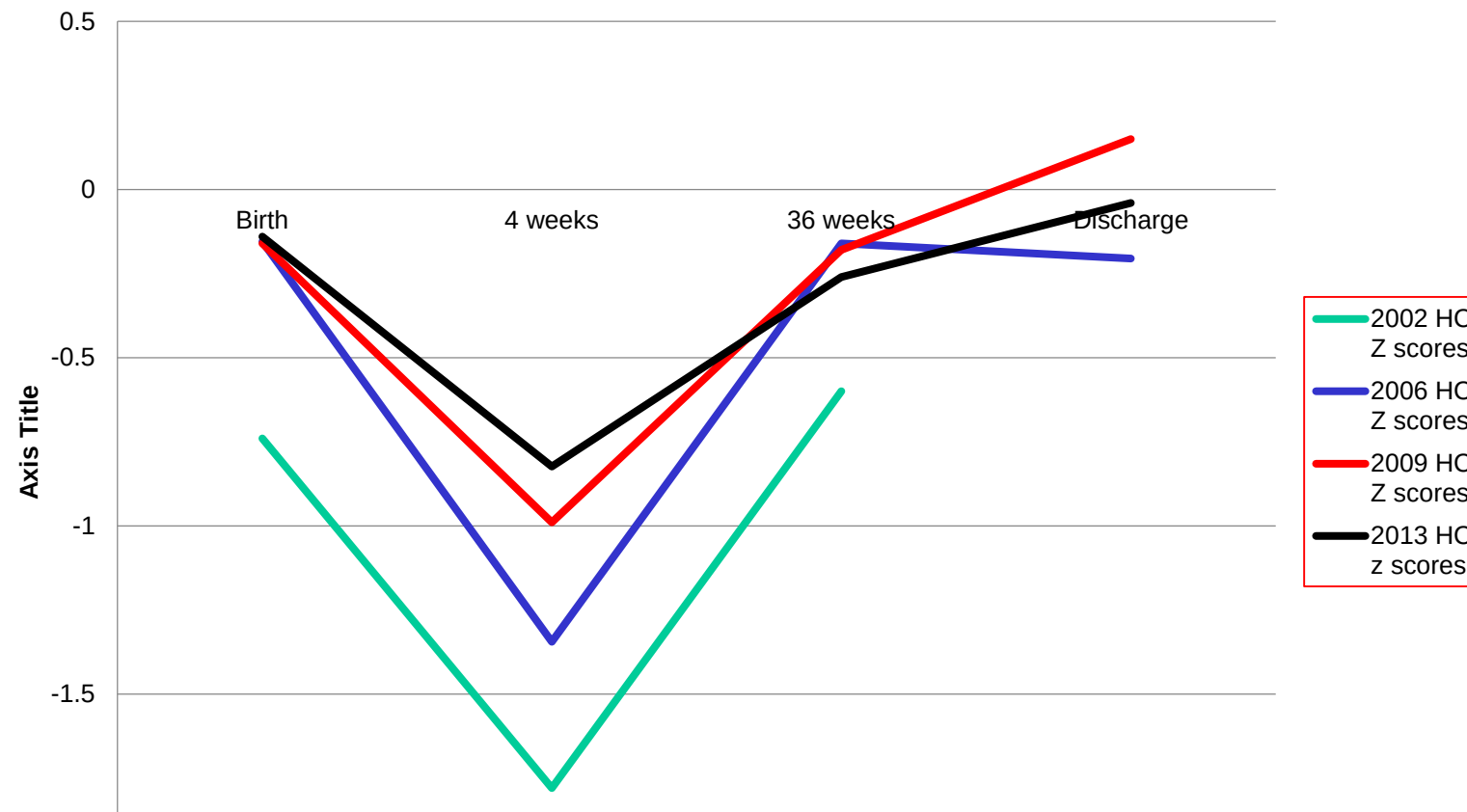


Median Z scores for weight 2002-2013





Median Z score HC 2002-2013





Nutrition: Summary

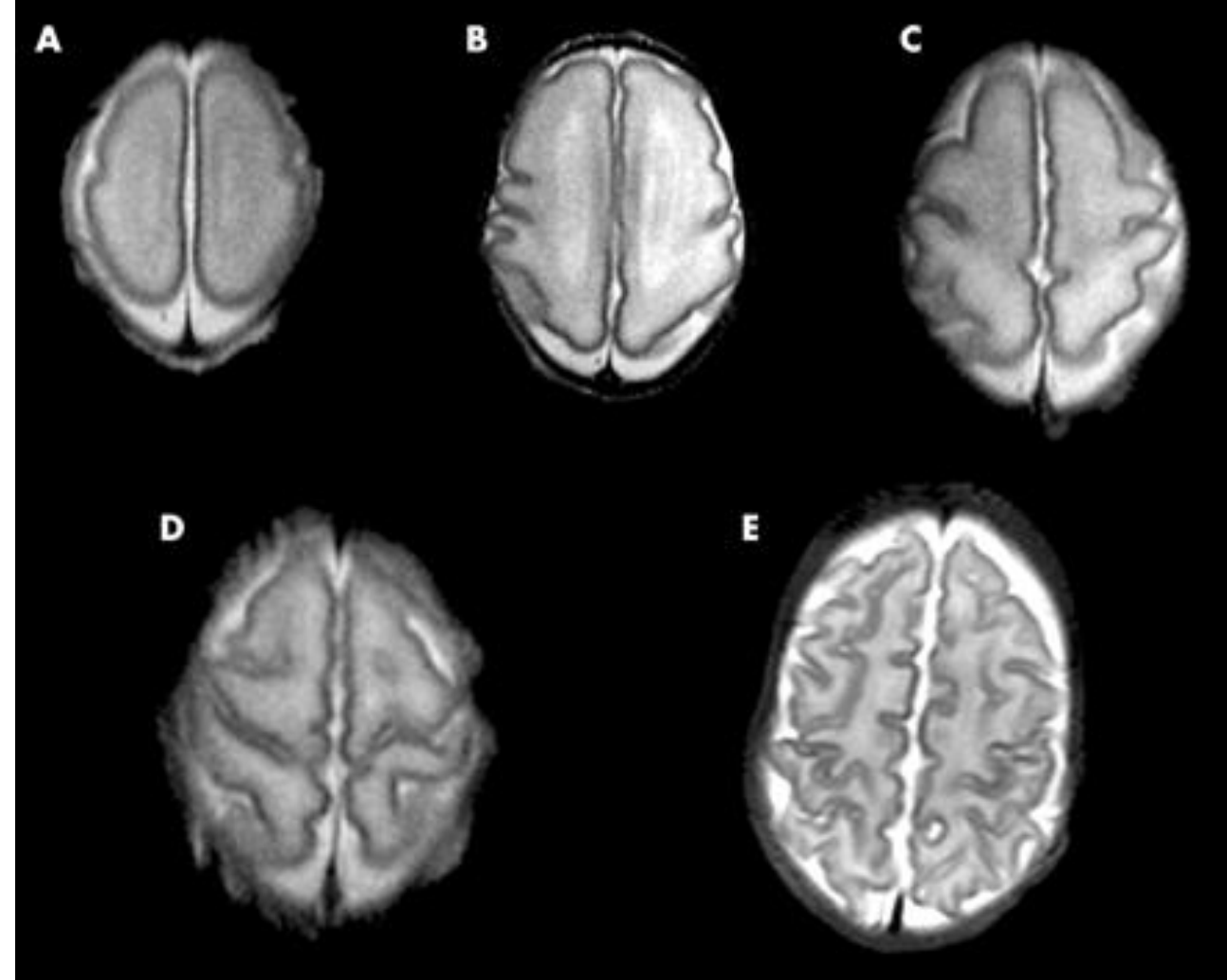
- We can reduce under-nutrition by optimising TPN and standardising approach
- Optimising EBM feeding with additives improves body, brain and bone growth
- **A multidisciplinary approach** has been successful in meeting aims and bringing about change
- Long-term review and **further audit** will assist in identifying future ways to improve.
- Postnatal growth and later health outcomes

Longer term Neurodevelopmental outcomes

- MRI studies
- Longitudinal outcome studies
- 1,2,4,6,9,12, and now 17 year FU
 - Cognitive, learning, executive function
 - Motor, Co-ordination
 - Health – Respiratory, Cardiac, GP visits and hospitalisations
 - Psychosocial,
 - Friends and family
 - Teacher feedback and education achievements

Development of sulcation

A) 25 (B) 28 (C) 30 (D) 33 (E) 39 weeks GA



2 year outcomes

- CHCH and Melbourne

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

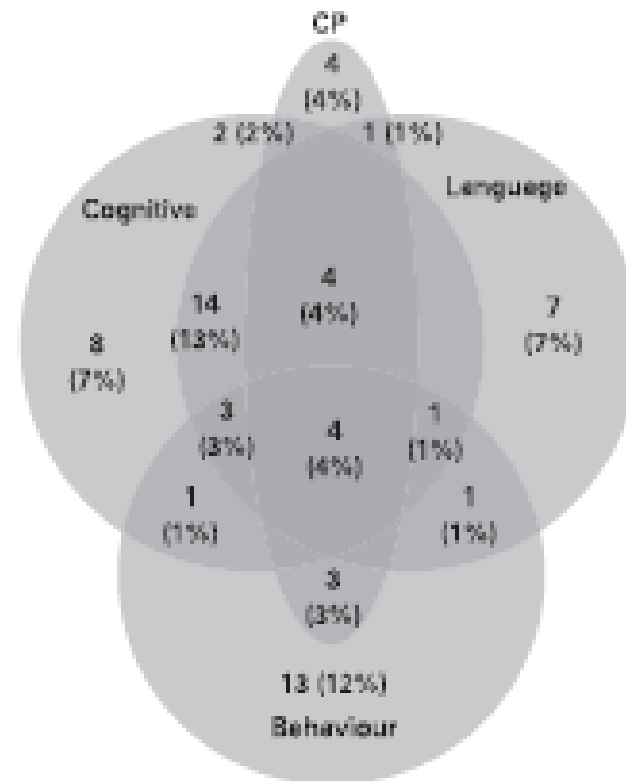
Use of Neonatal Magnetic Resonance Imaging to Predict Neurodevelopmental Outcomes in Preterm Infants

Lianne J. Woodward, Ph.D., Peter J. Anderson, Ph.D., Nicola C. Austin, M.D.,
Kelly Howard, B.Sc., and Terrie E. Inder, M.D.

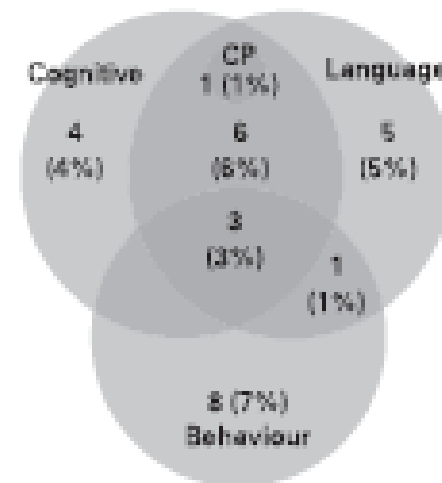
Moderately severe MRI findings had the greatest prediction for low scores on the BAYLEY at age 2.

4 year outcomes

B Very preterm (n = 105)



Full term (n = 107)



School readiness framework

47% of VPT and 16% of Term

TABLE 2 School Readiness Outcomes of VPT and FT Children at Age 4 Years

Outcome	Very Preterm (<i>N</i> = 105)	Full-Term (<i>N</i> = 107)	OR (95% CI)	<i>P</i>
Physical well-being and motor development				
Total number of primary care visits in past year, <i>M</i> ± <i>SD</i>	7 ± 7	4 ± 5	—	.001
Frequent health care visits, %	22	12	2.1 (0.97–4.6)	.06
Cerebral palsy, %	16	1	20.5 (2.7–156.9)	<.001
Developmental coordination disorder, %	7	2	3.8 (0.8–18.5)	.10
Any problem, %	38	15	3.5 (1.8–7.0)	<.001
Social and emotional development				
SDQ overall behavioral adjustment score, <i>M</i> ± <i>SD</i>	10 ± 6	8 ± 5	—	.001
Any problem, %	24	11	2.5 (1.2–5.4)	.01
Approaches to learning				
BRIEF-P global executive composite T-score, <i>M</i> ± <i>SD</i>	59 ± 11	55 ± 9	—	.001
Any problem, %	30	11	3.4 (1.6–7.1)	.001
Language development				
CELF-P total language score, <i>M</i> ± <i>SD</i>	91 ± 14	98 ± 13	—	<.001
Any problem, %	31	15	2.5 (1.3–4.9)	.008
General knowledge and cognition				
WPPSI-R total IQ score, <i>M</i> ± <i>SD</i>	95 ± 16	105 ± 13	—	<.001
Any problem, %	34	13	3.5 (1.7–6.9)	<.001

BRIEF-P, Behavior Rating Inventory of Executive Function, Preschool Version; SDQ, Strengths and Difficulties Questionnaire; WPPSI-R, Wechsler Preschool and Primary Scale of Intelligence PEDIATRICS Volume 134, Number 3, September 2014

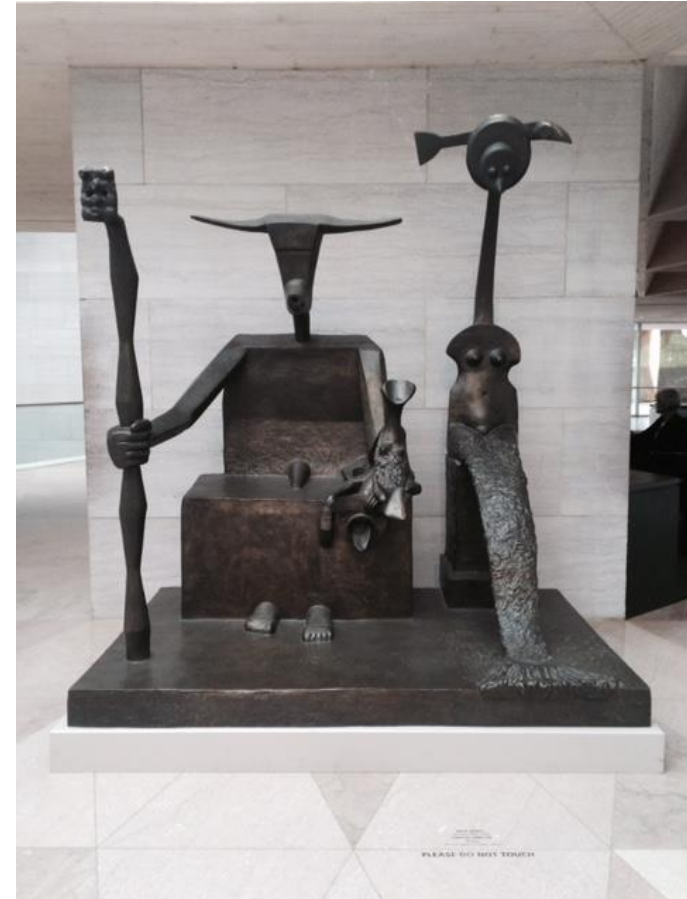
Predicting educational achievement at 9 VPT 2x delay

TABLE 4 Educational Outcomes of VPT and FT Children at Age 6 and 9 Years

Educational Outcome	Very Preterm (<i>N</i> = 102)	Full-Term (<i>N</i> = 108)	OR (95% CI)
Age 6 y (1-y post school entry)			
Math delay, %	51	18	4.7 (2.5–8.8)
Reading delay, %	27	16	1.9 (0.98–3.8)
Language delay, %	30	15	2.4 (1.2–4.8)
Any educational delay, %	60	31	3.4 (1.9–6.0)
Remedial support, %	43	20	3.0 (1.6–5.6)
Age 9 y (4-y post school entry)			
Math delay, %	33	14	3.1 (1.6–6.1)
Reading delay, %	34	13	3.5 (1.7–7.0)
Language delay, %	45	16	4.4 (2.3–8.4)
Any educational delay, %	64	29	4.4 (2.4–7.8)
Remedial support, %	39	20	2.5 (1.3–7.8)

Sociodemographic influences

- Interact with biological factors
- Parental education and SES
- Family structure, style of parental care and home environment.
- Mothers > fathers > term report high levels of psychological distress including depression and anxiety.
- High levels of parent stress – perceive their children to be more demanding.



Capricorn, Max Ernst

Parent reports of NICU experience

Journal of Perinatology (2014) 34, 555–561

- **Parental stress scale** – infant appearance and behaviour, Parental relationship and communication with staff, parental role alteration, sights and sounds of NICU.
- Maternal and family social background
- Infant – composite neonatal illness score 0-6
- Mother and baby scales
- Edinburgh Postnatal Depression Scale
- Stressful life events
- Family Socioeconomic status
- Child Development at 4 years.

Results:

Journal of Perinatology (2014) 34, 555–561

- Highest stress from “being separated from my baby” and loss of parental role.
- Mothers in the highest stress group had babies at term who they judged as having more unsettled-irregular behaviour at term.
- Maternal NICU-related stress higher if more stressful events in the last year, lower maternal education, higher PNDepression and higher levels of infant unsettled behaviour.

Results:

Journal of Perinatology (2014) 34, 555–561

- At 4 years maternal stress and altered parental role was associated with
- Lower receptive and total language and
- Higher emotional symptom scores on the SDQ.

Parental involvement

- Kangaroo care
- Cue Based care
- Developmentally supportive care
- Family integrated care



Conclusion

- Neonatology and Perinatal medicine has evolved in the last 20 years and multiple components of clinical practice have changed
- Clinical Practice improvements are leading to improved short and long term outcomes