

Predicting outcome in extremely preterm outborn versus inborn infants

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Background

- Babies less than 28 weeks' gestation are at greatest risk of death or serious neurodevelopmental impairment.
- Perinatal healthcare providers need accurate data to counsel parents.

Why is it clinically important?

- Inaccurate perceptions of rates of mortality or serious morbidity may lead to misguided decisions to provide or withhold neonatal intensive care,

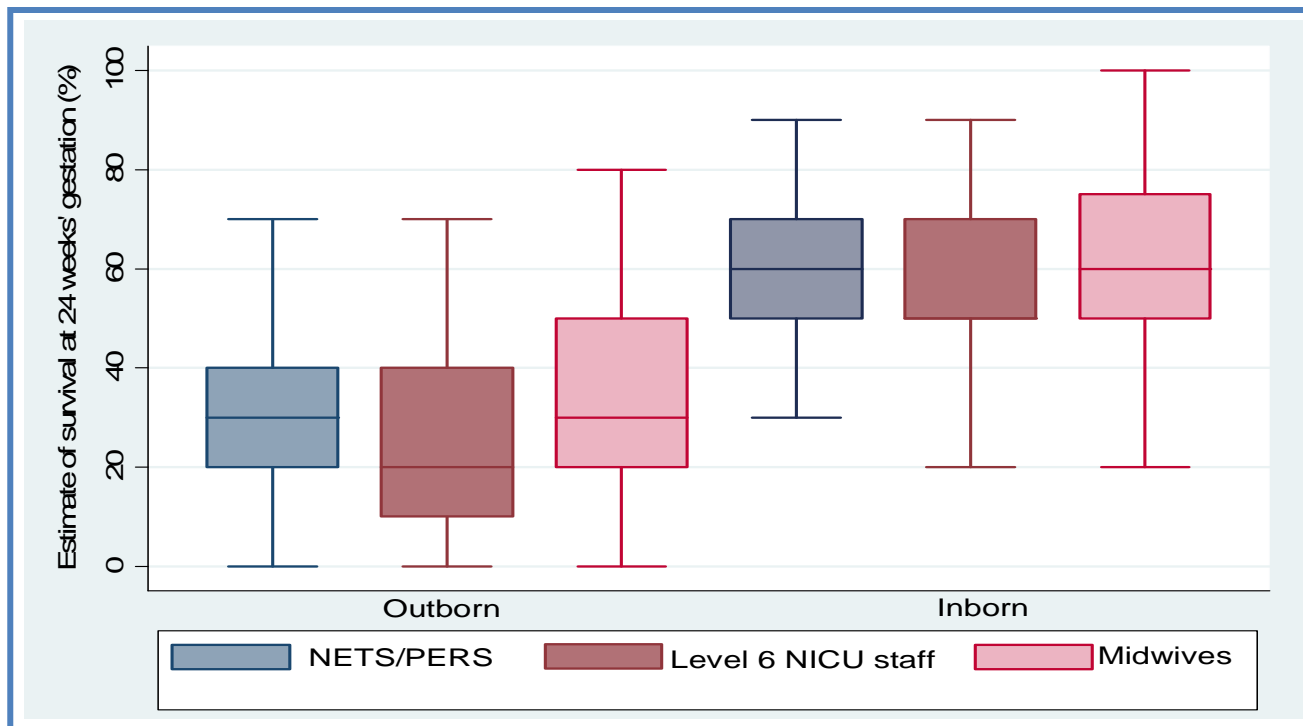
AND

- May influence the decision to transfer a mother to a perinatal centre before birth.

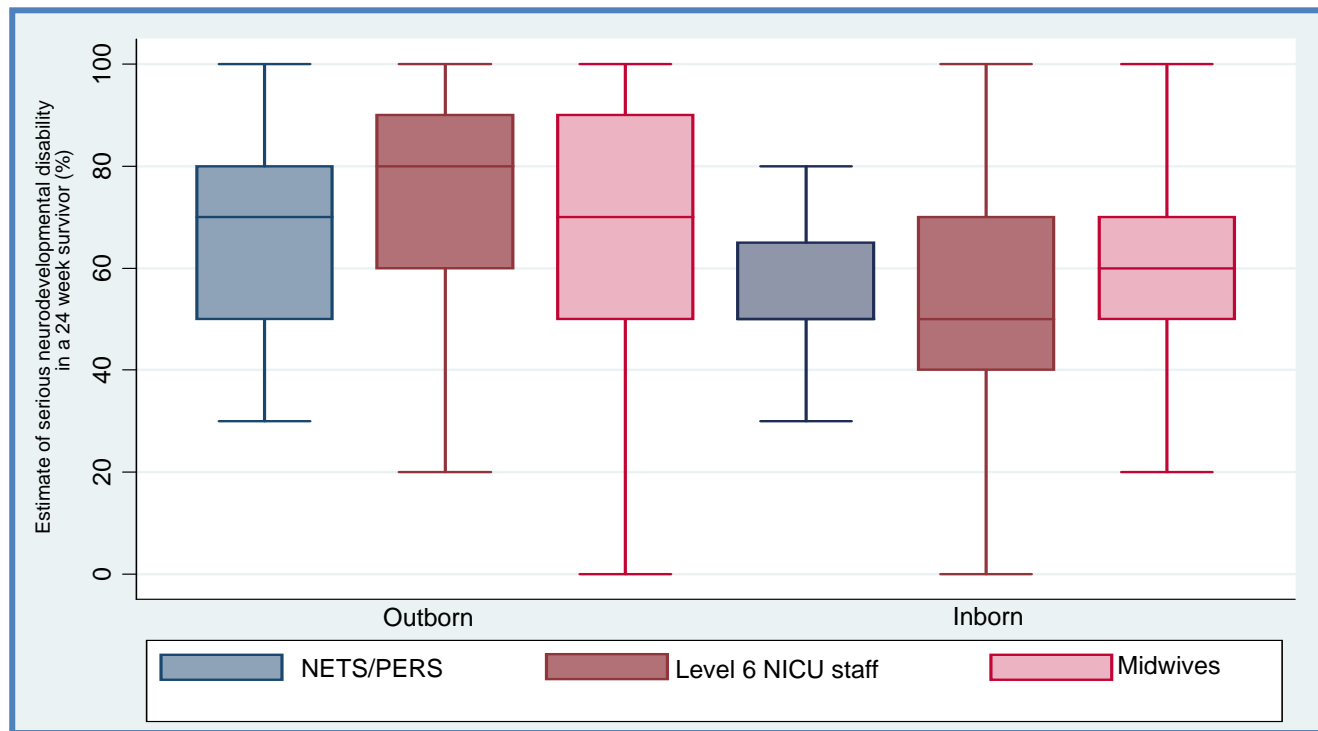
Perceptions of survival rates

- Perceptions of survival rates of babies born before 28 weeks' gestation vary widely.
- We have shown that medical, nursing & midwifery staff across all levels of care:
 - Under-estimate survival rates
 - Over-estimate disability rates

Perceptions of survival: Babies born alive at 24 weeks' gestation



Perceptions of serious impairment in 24 week gestation survivors

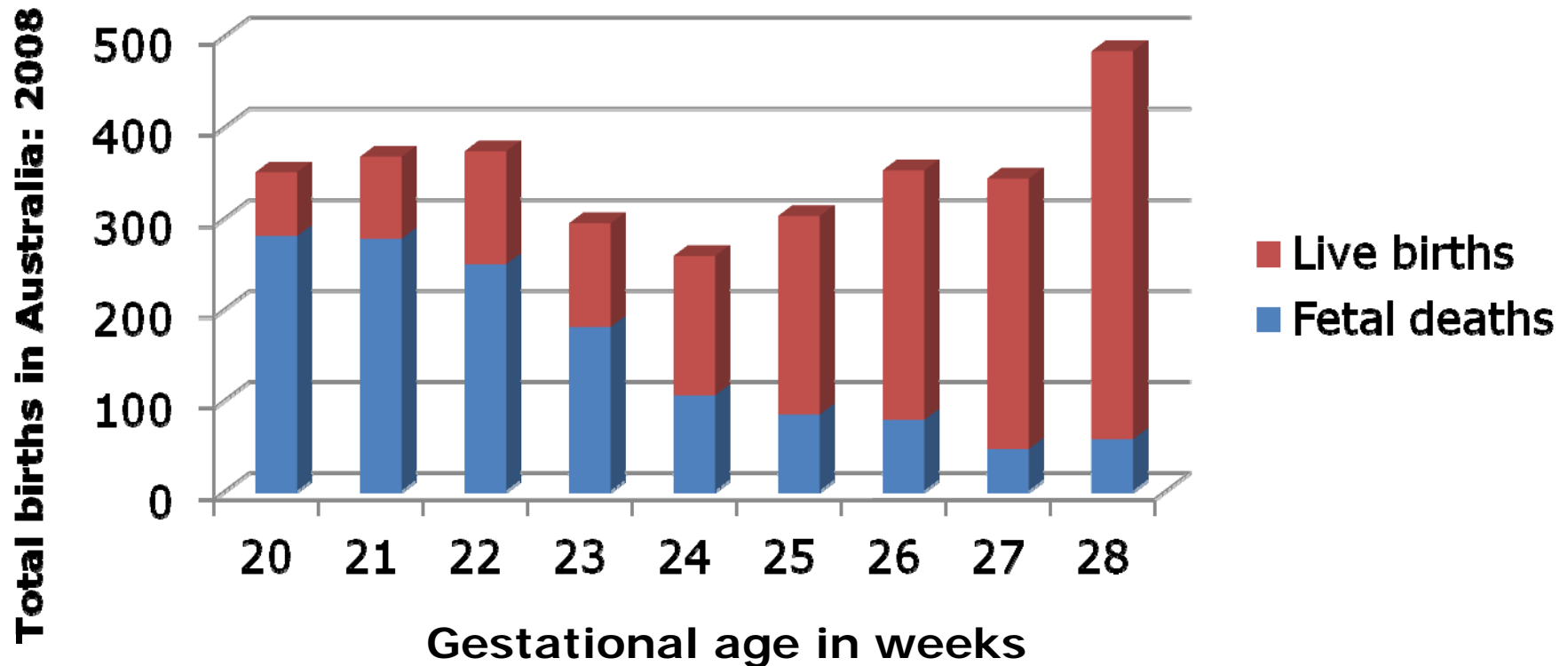


Predicting survival before birth

- Gestational age has traditionally been the major determinant in predicting an extremely preterm baby's chance of survival.
- Gestational age is a major factor influencing the decision whether or not to:
 - Transfer to a perinatal centre in-utero
 - Provide neonatal intensive care

Live births versus fetal deaths

AIHW, 2010, *Australia's mothers and babies, 2008*

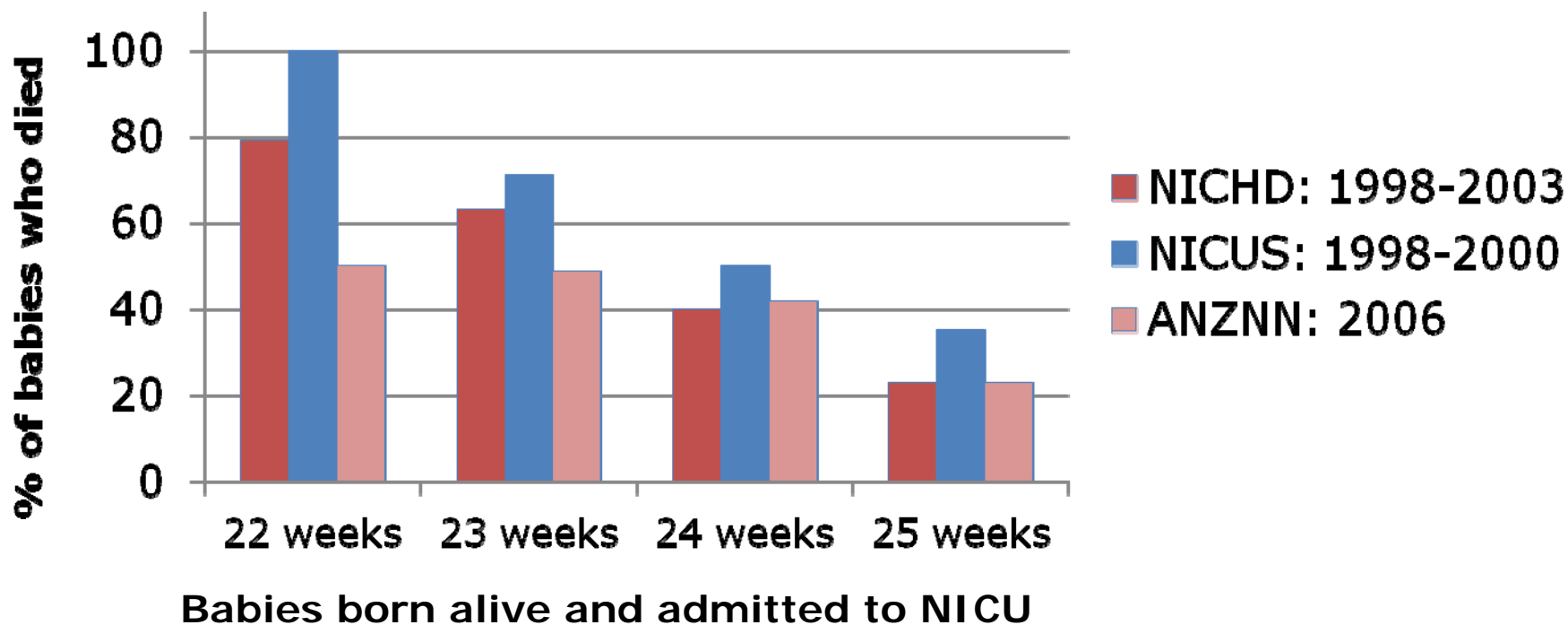


Predicting survival at birth

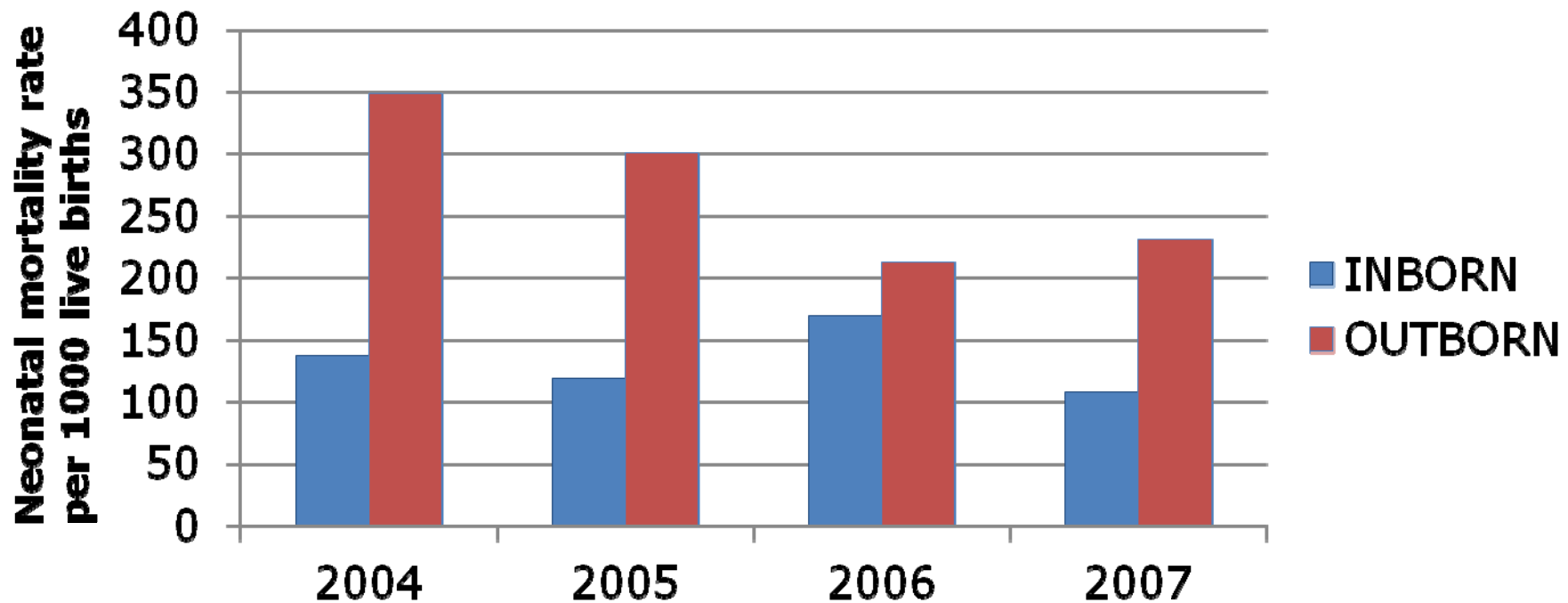
Typically based on assessment of:

- Gestational age
- Birth weight
- 1 and 5 minute Apgar scores
- The need for chest compressions & adrenaline in the delivery room
- Based on 'how the baby looks'

Comparison of mortality rates before discharge from NICU



Comparison of neonatal mortality rates by place of birth: Inborn versus outborn



 Pooled data from the CCOPMM Annual Reports from 2004 - 2007

We questioned....

Is there a more accurate way of
'predicting' or estimating outcome?

Predicting outcome at birth

NICHD Study:  Tyson, et al., 2008, *NEJM*, 358(16).

- Aim of the NICHD study: To relate risk factors assessable at or before birth to the likelihood of:
 - Survival
 - Survival with or without neurodevelopmental impairment at 18 – 22 months corrected age




Predicting outcome at birth

NICHD Study :  Tyson, et al., 2008, *NEJM*, 358(16).

- Data collected on 4446 preterm babies
- Inclusion criteria:
 - 22 to 25 completed weeks' gestation
 - Birth weight of 401 g to 1000 g
 - No major congenital anomaly
- Researchers found that a combination of 5 factors was more accurate in estimating outcome than using gestational age alone

NICHD: 5 factor combination

1. Gestational age
 - 22 to 25 weeks' gestation
2. Birth weight
 - 401 g to 1000 g
3. Sex
4. Singleton or multiple birth
5. Antenatal corticosteroid exposure

 Tyson, et al., (2008), *NEJM*, 358(16).

The NICHD outcome estimator

NICHD Neonatal Research Network (NRN): Extremely Preterm Birth Outcome Data

Can I use the data to determine individual outcomes?

These data are not intended to be predictive of individual infant outcomes. Instead, the data provide a range of possible outcomes based on specific characteristics.

If you choose to use these data to determine possible outcomes, please remember that the information provided is not intended to be the sole basis for care decisions, nor is it intended to be a definitive prediction of outcomes if intensive care is provided. Users should keep in mind that every infant is an individual, and that factors beyond those used to formulate these standardized assessments may influence an infant's outcomes.

Enter the characteristics below.

Gestational Age (*Best Obstetric Estimate in Completed Weeks*):

Birth Weight (*401 Grams to 1,000 Grams*): grams

Sex: Female Male

Singleton Birth: Yes No

Antenatal Corticosteroids (*Within Seven Days Before Delivery*): Yes No

About NICHD

- [Donations & Partnering](#)
- [Institute overview](#)
- [Looking for an NICHD staff person?](#)
- Organization**
 - [Organization Chart](#)
 - [Office of the Director \(OD\)](#)
 - [Obesity Research Strategic Core \(ORSC\)](#)
 - [Center for Developmental Biology & Perinatal Medicine \(CDBPM\)](#)
 - [Developmental Biology, Genetics & Teratology \(DBGT\) Branch](#)
 - [Intellectual & Developmental Disabilities \(IDD\) Branch](#)

Comparing outcomes using the NICHD online outcome estimator

Characteristic	Baby A	Baby B
Gestational age	24 weeks	24 weeks
Birth weight	550g	550g
Sex	Female	Male
Singleton birth	Yes	Yes
Antenatal corticosteroids	Yes	No

Results for the two babies

OUTCOMES:	FEMALE	MALE
Survival	56%	31%
Survival without profound neurodevelopmental impairment	43%	18%
Survival without moderate to severe neurodevelopmental impairment	28%	9%
Death	44%	69%
Death or profound neurodevelopmental impairment	57%	82%
Death or moderate to severe neurodevelopmental impairment	72%	91%

Aim of this research

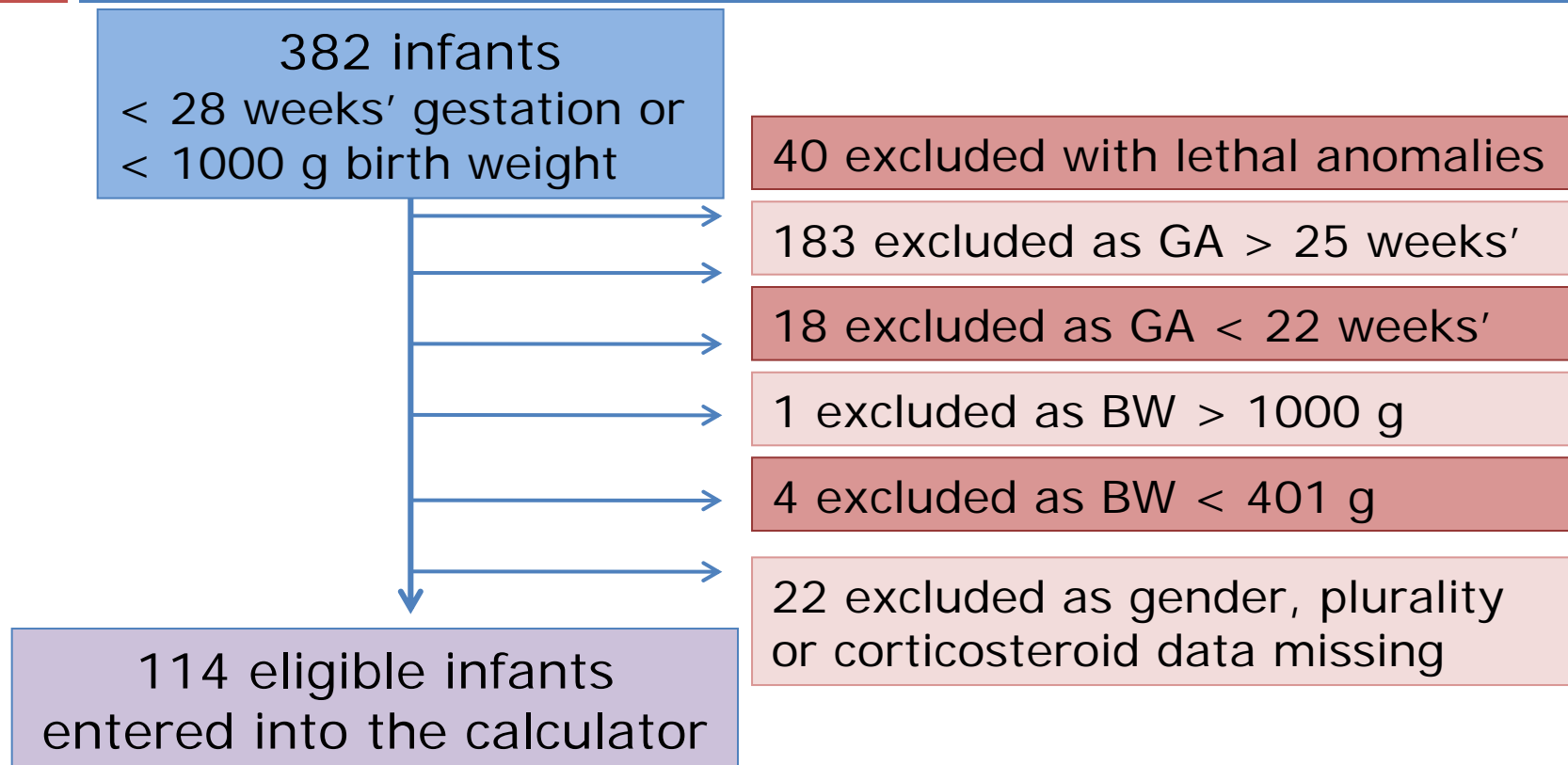
To determine if the NICHD calculator is a valid tool for predicting death and/or severe neurodevelopmental impairment in contemporary Victorian babies.



Methodology

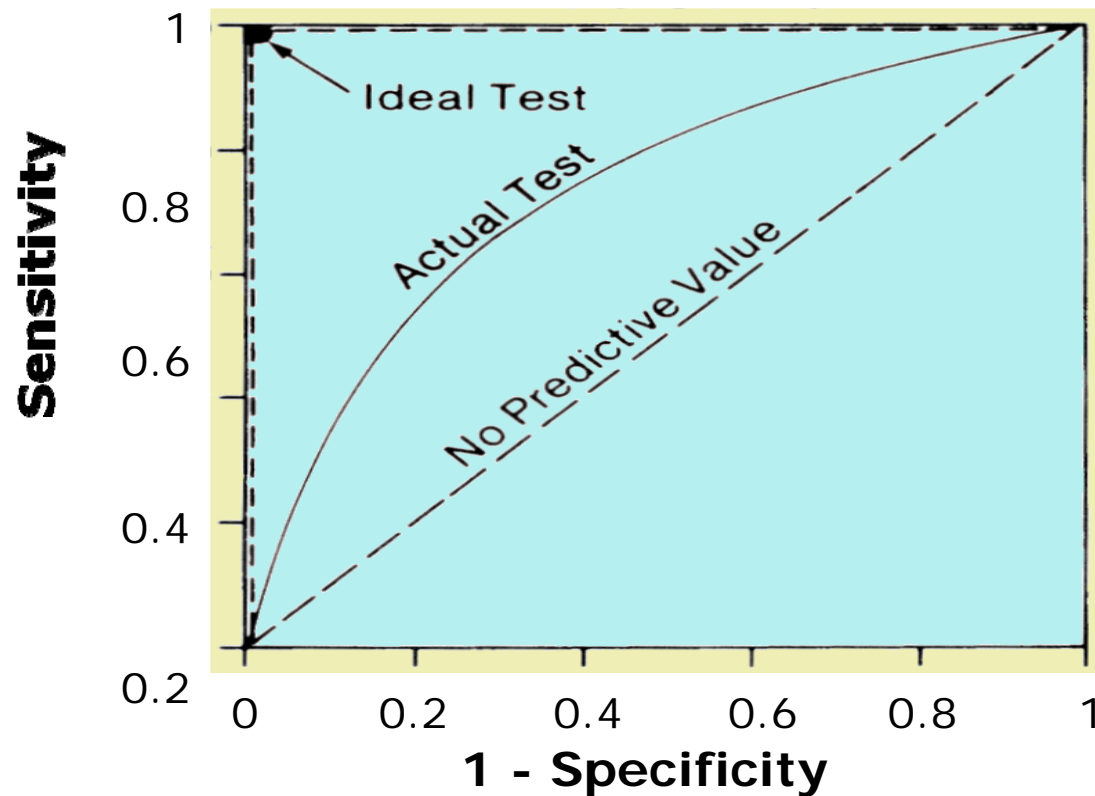
- Data was sourced from the Victorian Infant Collaborative Study Group (VICS).
- VICS is a study examining the long term health problems of babies who were:
 - < 28 weeks' gestation at birth or,
 - < 1000 g birth weight
- VICS provided the 2 year outcome data on 382 infants in the 2005 cohort.

VICS Cohort 2005

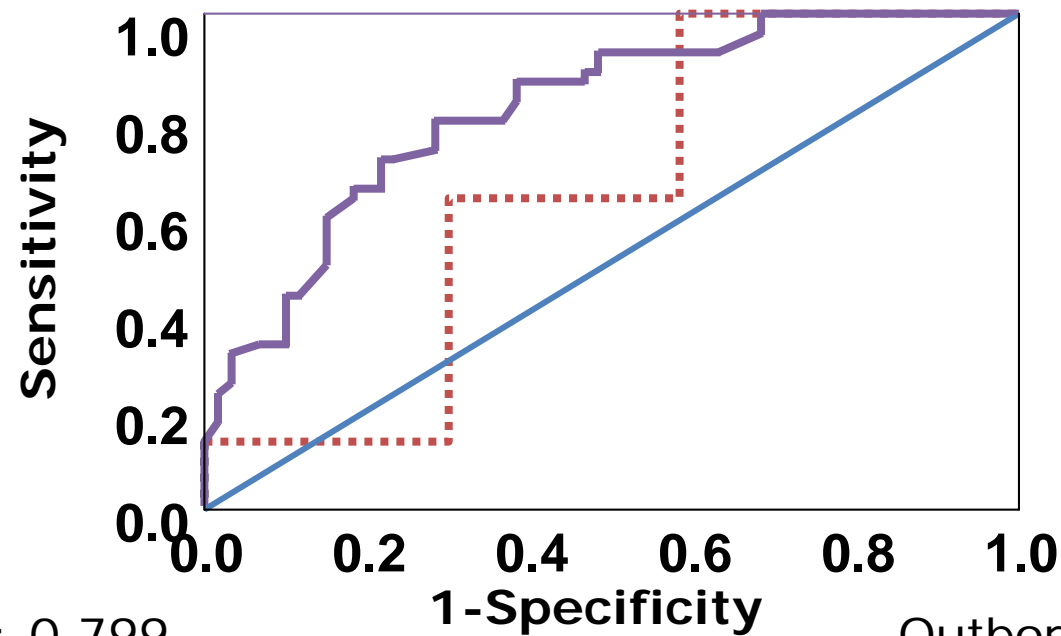


Interpreting the ROC curve

Receiver operating characteristic (ROC)



ROC curve for mortality



Inborn: AUC: 0.799
CI 0.712, 0.885,
 $P = < 0.001$

Outborn: AUC: 0.643
CI 0.337, 0.949,
 $P = 0.36$

Predicting mortality: inborn babies

- The calculator was accurate for predicting mortality for inborn babies to 2 years of age.
- The predictive value was 47.1% compared with an actual mortality rate of 50.5%.

Predicting mortality: outborn babies

- The calculator was not as accurate for predicting mortality for outborn babies.
- However, our sample size was very small: 15 (10.5%) of babies being outborn.

Predicting death or survival with major disability

- The calculator over-estimated the combined outcome of death or survival with major disability.
- The predicted rate was 72% compared with an actual rate of 60.6% in Victorian inborn babies.

Limitations of the calculator

- Outcome data is not from a population based cohort: all the babies were inborn.
- No data on the babies who were stillborn or died before NICU admission.

Conclusion

- The NICHD outcome estimator:
 - Is helpful at predicting mortality in inborn babies, 22 -25 weeks' gestation
 - Less useful for outborn babies
 - Over-estimates major disability rates
- This needs to be taken into account if using the outcome estimations to counsel parents in non-tertiary settings.

Future directions

- My goal is to refine the NICHD tool.

How?

- Using the data I collect as part of the PREDICTION study & adding 'outborn' as a criteria.

The PREDICTION Study

Prevalence and Risks for Ex-utero
Death in a Cohort of pre-Term Inborn
and Outborn Neonates

The PREDICTION Study

- Study of all babies born in Victoria between 22⁺⁰ and 31⁺⁶ weeks' gestation.
- Study aims: To identify potentially avoidable or treatable risk factors that may increase mortality and morbidity in outborn babies.



Conference presentation

I hope to present the PREDICTION study results at a future meeting



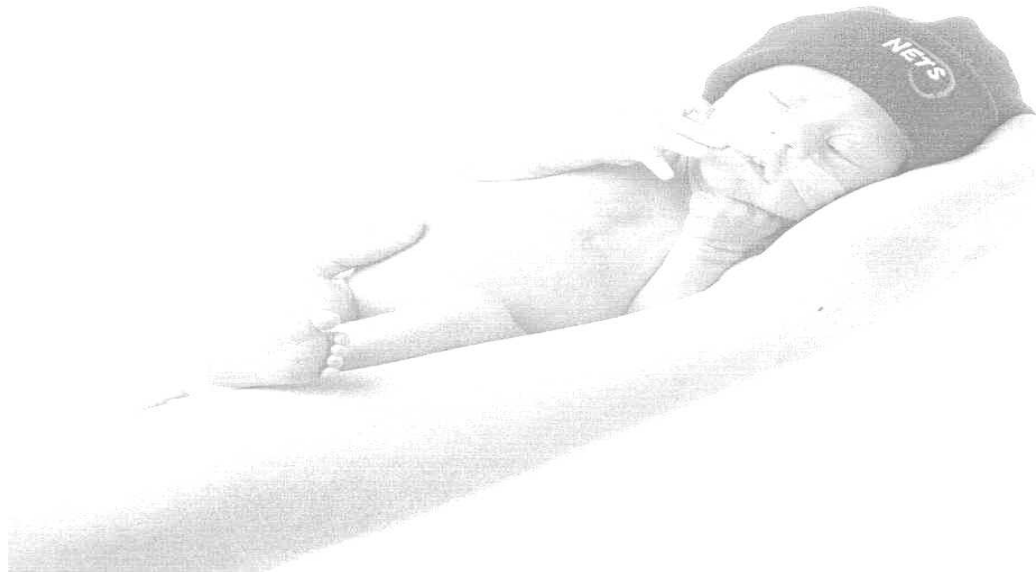
Acknowledgements

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- Newborn Emergency Transport Service, (Victoria).
- Professor Peter Davis, Professor Lex Doyle & Dr Jennifer Dawson.



Thank you. Any questions?

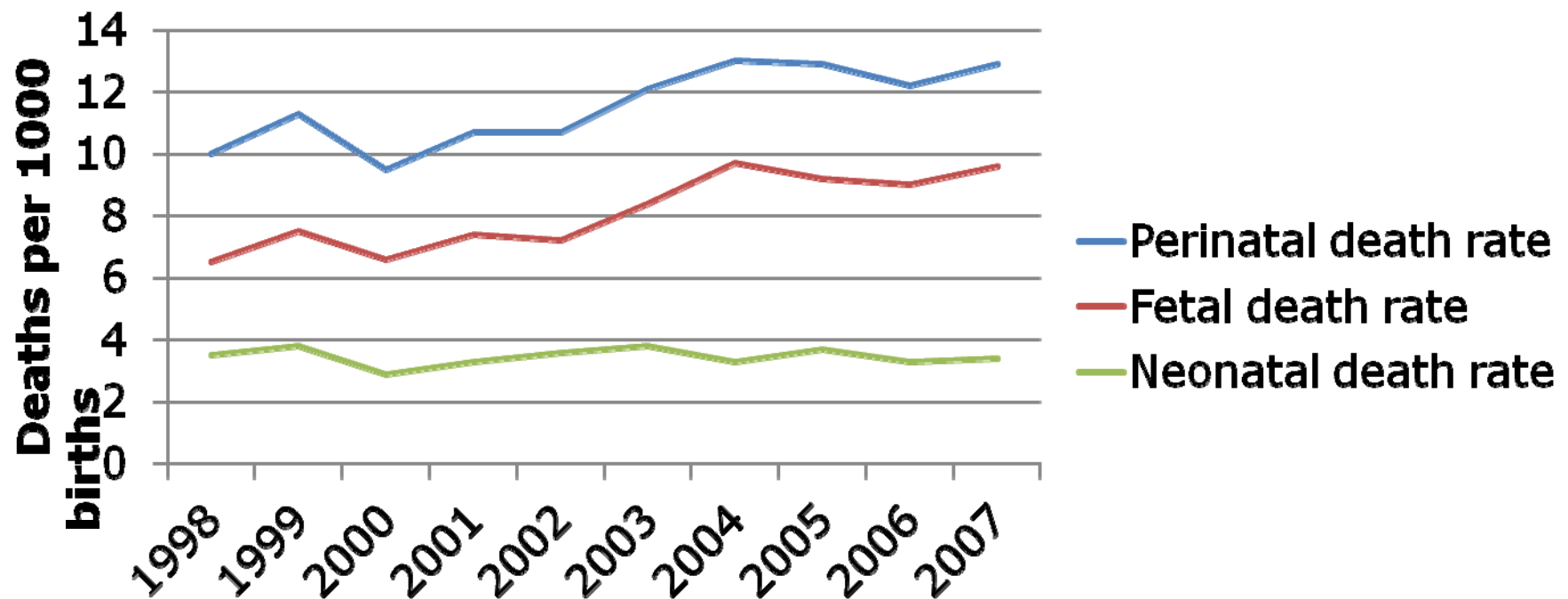


Extra slides

Spare slides in case of hairy questions

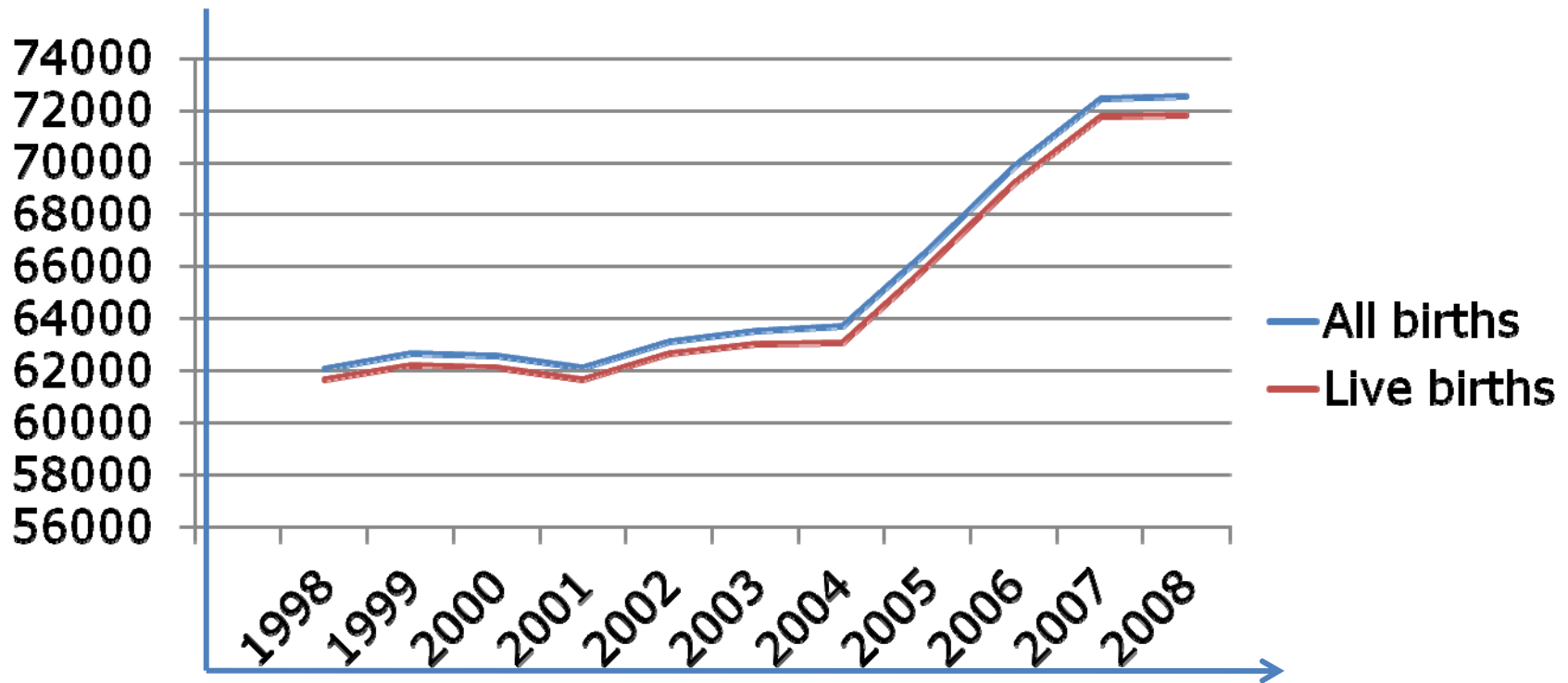
Perinatal mortality in Victoria

Per 1000 births in Victoria: AIHW, NPDC data




Birth rates in Victoria

AIHW *Australia's Mothers and Babies*, 1999 - 2010



Victorian babies: 22-30 weeks

	22-23 weeks'	24-25 weeks'	26-27 weeks'	28-29 weeks'
Survivor > D28	8	68	142	177
Neonatal deaths	46	18	14	9
Total	54	86	156	186

 Consultative Council on Obstetric & Paediatric Mortality & Morbidity (CCOPMM), 2010

NICHD: Combined outcome of death or significant disability

Babies who received NICU		Outcome at 18 – 22 months corrected		
GA in completed weeks	Death before NICU discharge	Death	Death or profound impairment	Death or mod. to severe impairment
22 weeks'	79%	80%	90%	95%
23 weeks'	63%	63%	76%	87%
24 weeks'	40%	41%	55%	70%
25 weeks'	23%	24%	37%	54%
All babies				
22 weeks'	95%	95%	98%	99%
23 weeks'	74%	74%	84%	91%
24 weeks'	44%	44%	57%	72%
25 weeks'	24%	25%	38%	54%

NICHD: Combined outcome of death or significant disability

Babies who received NICU		Outcome at 18 – 22 months corrected		
GA in completed weeks	Death before NICU discharge	Death	Death or profound impairment	Death or mod. to severe impairment
22 weeks'	79%	80%	90%	95%
23 weeks'	63%	63%	76%	87%
24 weeks'	40%	41%	55%	70%
25 weeks'	23%	24%	37%	54%

NICHD: Combined outcome of death or significant disability

All babies		Outcome at 18 – 22 months corrected		
GA in completed weeks	Death before NICU discharge	Death	Death or profound impairment	Death or mod. to severe impairment
22 weeks'	95%	95%	98%	99%
23 weeks'	74%	74%	84%	91%
24 weeks'	44%	44%	57%	72%
25 weeks'	24%	25%	38%	54%