

## HSRAANZ WEBINAR SERIES

REAL WORLD COST EFFECTIVENESS OF  
MANDATORY FOLIC ACID FORTIFICATION OF  
BREAD MAKING  
FLOUR IN AUSTRALIA

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# Real World Cost Effectiveness of Mandatory Folic Acid Fortification of Bread Making Flour in Australia

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## Real-World Cost Effectiveness of Mandatory Folic Acid Fortification of Bread-Making Flour in Australia

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### Abstract

#### Background

In 2009, mandatory folic acid fortification of bread-making flour was introduced in Australia to reduce the birth prevalence of preventable neural tube defects (NTDs) such as spina bifida. Before the introduction of the policy, modelling predicted a reduction of 14–49 NTDs each year.

1. Background
2. Introduction
3. Methods
4. Results
5. Discussion

# Background



- Many countries have food fortification programmes, incl. flour, rice, maize...
- CHERE was commissioned by the Australian Health Ministers' Advisory Council (AHMAC) to evaluate the mandatory folic acid fortification of bread-making flour in Australia.
- Prior 2009 had voluntary fortification and education for women planning on conceiving to take supplements and eat folate-rich foods.
- In 2009 a mandatory program was implemented and flour millers were required to fortify wheat flour with folic acid. Bakers were required to use fortified flour. Exemptions on organic products etc.
- Real-world data on the clinical-effectiveness and cost-effectiveness.

# Background - What are Neural Tube Defects (NTDs)?

Birth defect of the spine, spinal cord and brain. Spina bifida and encephalocele need long-term care.

Preventable with sufficient folate intake pre-conception.

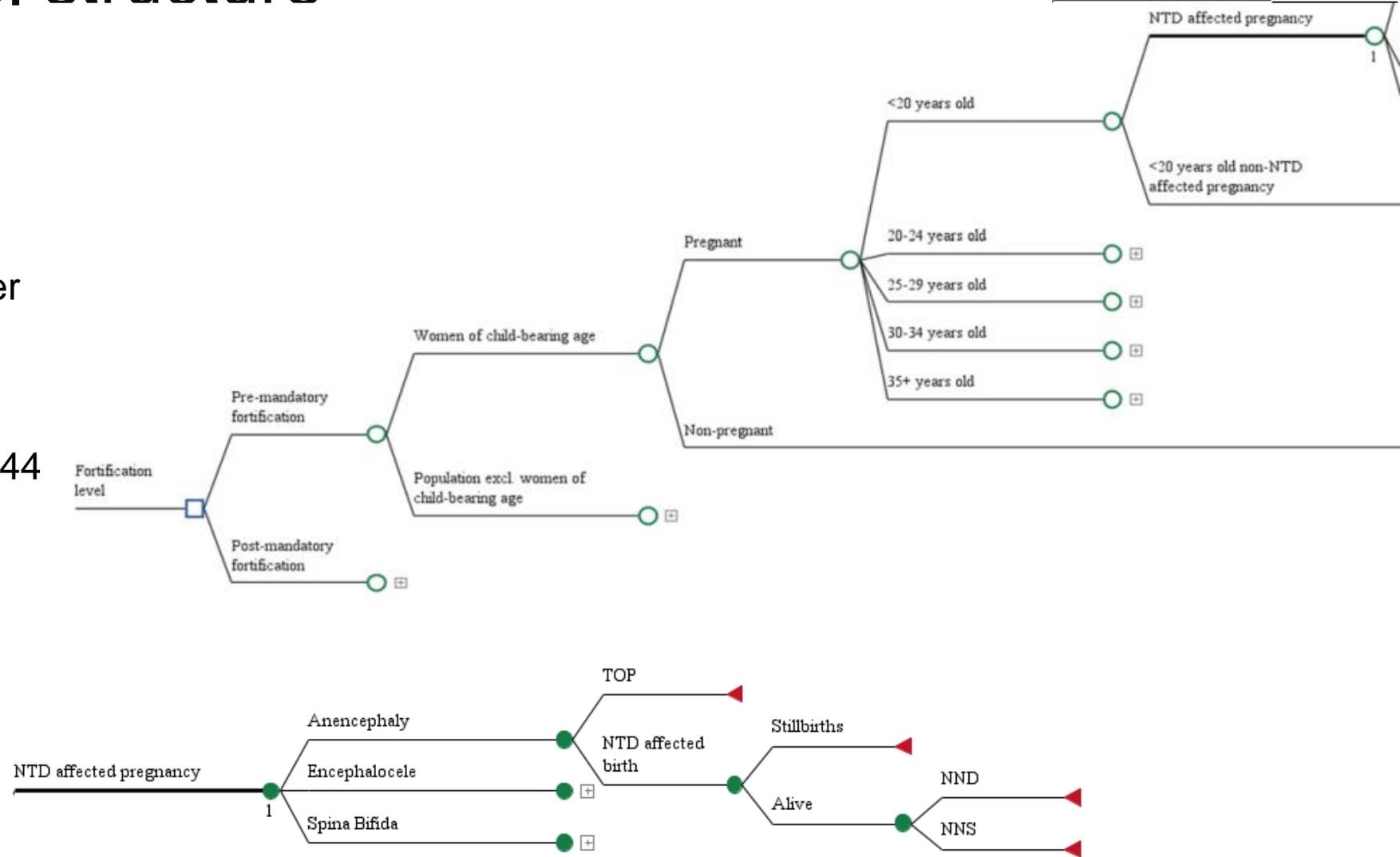
Annual decline between 1998-2008 of 0.2 per 10,000 births.

Higher rates in children born to mothers  $\leq 18$  years, and Aboriginal and Torres Strait Islander mothers.



# Methods - Model structure

- Pre-Post Analysis
- TreeAge® Pro
- Societal perspective (health, carer and productivity costs)
- Lifetime horizon
- Women of child-bearing age (16-44 years)
- NTD affected pregnancies
  - Termination
  - Stillbirth
  - Survive 28 days



# Methods - Model Inputs

- ABS data for demographics, age and gender
- Birth prevalence of NTDs (NSW, QLD, WA, SA and NT) by age group

Pre-mandatory  
fortification  
(baseline)  
2006-2008

Introduction of  
the initiative  
(transition)  
2009

Implementation  
period  
(standard)  
2009-2011

‘Control’ arm (pre-fortification) were based on conceptions in the baseline period.

‘Intervention’ arm (post-fortification) were based on conceptions in the standard period.

These rates were converted to probabilities. The odds ratio was applied to calculate the probability of an event after folic acid mandatory fortification in each age group.

- Background trend of improvement extrapolated in scenario analysis.
- FSANZ (2016) - Dietary intake of folic acid to 2014.

# Methods - Outcome measures

- Quality-adjusted life-years (QALYs)
  - Mother: non-NTD affected pregnancy or TOP = 0.87
  - Baby:
    - Encephalocele = 0.45 or Spina bifida = 0.55 using Health Utility Index 2
    - Stillbirth or Anencephaly = 0
- Life years undiscounted (discounted)
  - Mother:
    - non-NTD affected pregnancy = 84 (21)
    - TOP = 84 (18)
  - Baby:
    - NND or stillbirth = 0
    - Encephalocele = 77 or Spina bifida = 78
- NTD cases avoided

# Methods - Costs

- \$AUD in 2014
- Fortification costs from industry (equipment, folic acid and labelling) and government (monitoring). Costs split between ongoing per capita costs and implementation costs.
- Healthcare:
  - birth admission
  - lifetime healthcare costs (inpatient admissions and outpatient visits)
- Assistive technology (e.g. wheelchairs)
- Carer time costs
- Productivity loss (ABS employment statistics for those with a physical restriction)

# Methods - Sensitivity analyses

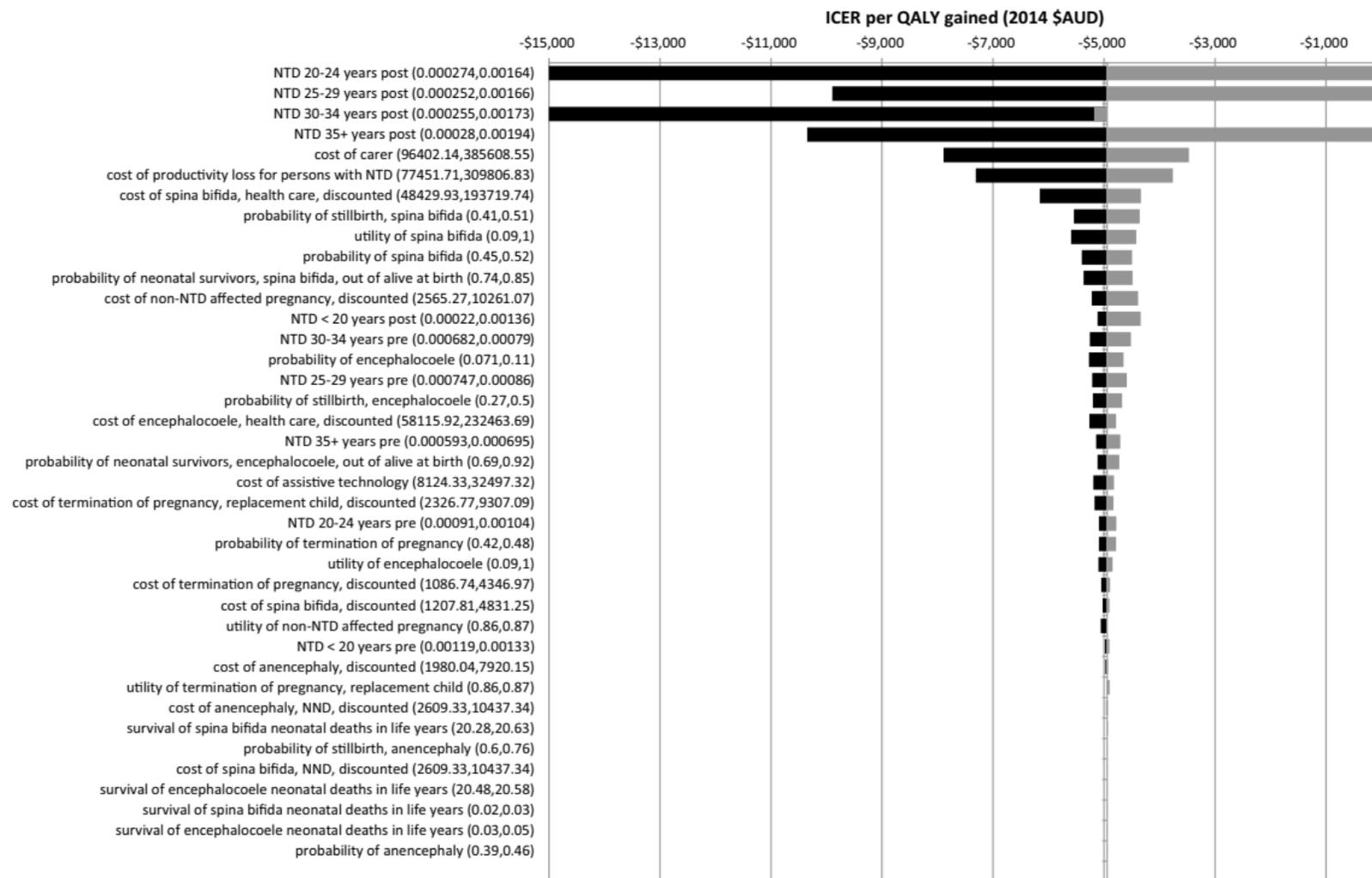
- Univariate sensitivity analyses using 95% CI from literature for NTD rates (convert to ORs), probabilities and utility values, whilst cost estimates halved and doubled.
- Probabilistic sensitivity analysis – beta distributions for probabilities and utility values; and gamma distribution for costs; 10,000 iterations
- Scenario analyses:
  - Background rate – reduced incremental NTD avoided
  - Apply disutility for TOP and stillbirth – increased incremental QALYs gained
  - Include start-up costs - increased incremental costs

# Results - Major Findings



- Scenario analyses**
- Background rate included 14 fewer cases; ICER was dominant.
  - Utility loss for TOP or stillbirth included 298 QALYs gained; ICER was dominant.
  - Carer and productivity cost excluded incremental cost was \$100,000; ICER was \$373 per QALY gained.
  - Start-up costs included incremental cost was \$2 million; ICER was \$7,192 per QALY gained.

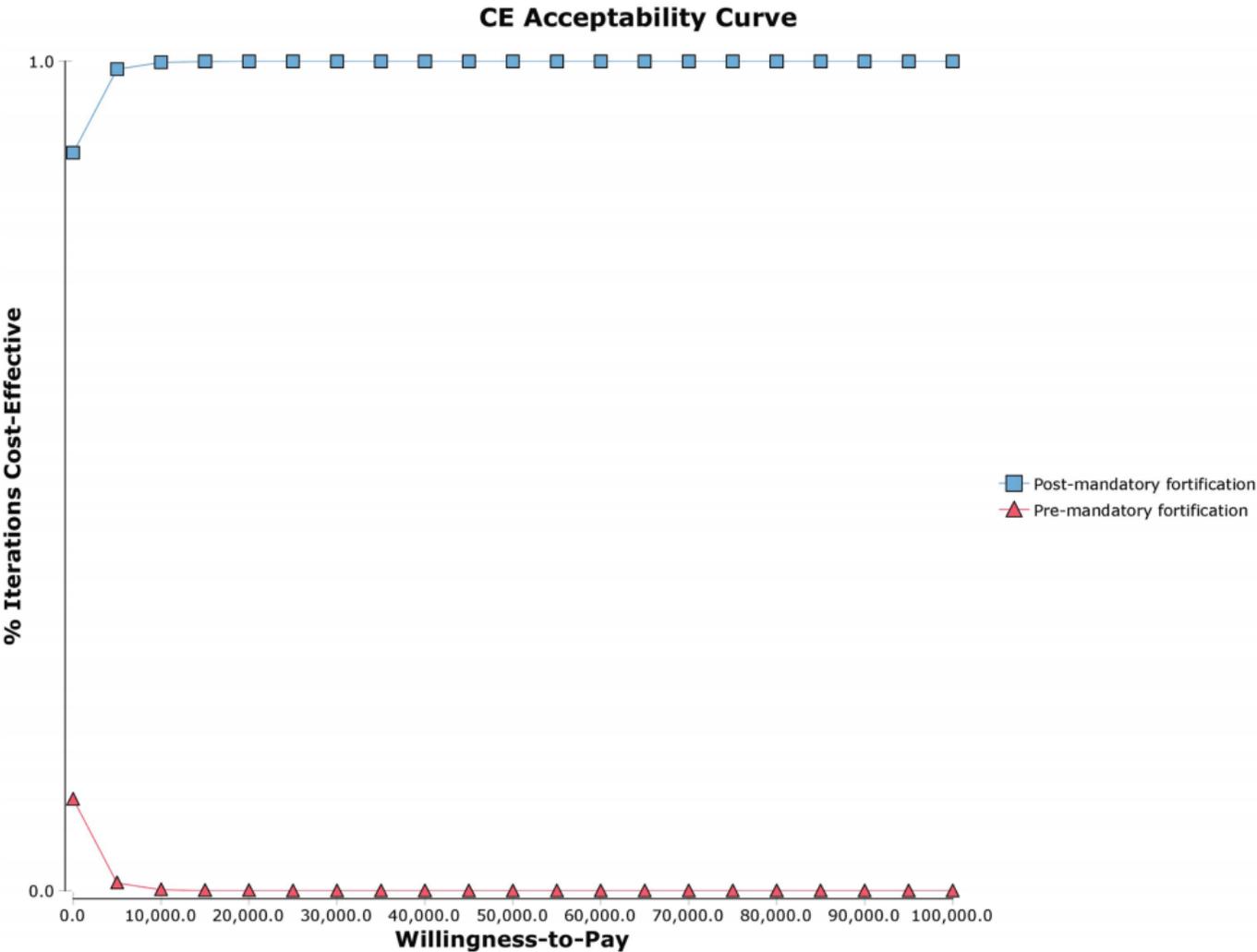
# Results – Univariate sensitivity analysis



- Main drivers:
- NTD rates in all age groups
  - Carer costs
  - Productivity loss

Fig. 2 Tornado diagram for one-way sensitivity analysis. ICER incremental cost-effectiveness ratio, NND neonatal death, NTD neural tube defect, QALY quality-adjusted life-year, \$AUD Australian dollar

# Results – Probabilistic sensitivity analysis



At a willingness-to-pay threshold of \$50,000 per QALY gained, mandatory folic acid fortification had a 100% probability of being cost-effective when compared to no mandatory fortification

# Discussion

- Mandatory folic acid fortification was effective and highly cost-effective.
- Reductions in NTDs consistent with previous modelled estimates by FSANZ of 14-49 per year → ours estimated 32.
- Previous economic evaluations in Australia estimated a reduction of 18.4 (Dalziel et al. 2010) and 31 (Rabovskaja et al. 2013).
- Contributed to reduced inequities of distribution of NTDs (stat sig. lower than total pop.):
  - Aboriginal and Torres Strait Islander mothers (75%; from 19.6 to 5.1 per 10,000 conceptions that resulted in a birth)
  - teenage mothers (55%; from 14.9 to 6.7 per 10,000 conceptions that resulted in a birth)
- Report endorsed by Australian Health Ministers' Advisory Council June 2017 and the programme to continue.



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