

Australian Government

Australian Research Council



# **Engagement and Impact 2018**

# The University of Western Australia

# UWA11-PHS (HLS) - Impact

# Overview

# Title

(Title of the impact study)

Folate fortification reduces neural tube defects

# Unit of Assessment

11 - Medical and Health Sciences

### Additional FoR codes

(Identify up to two additional two-digit FoRs that relate to the overall content of the impact study.)

# Socio-Economic Objective (SEO) Codes

(Choose from the list of two-digit SEO codes that are relevant to the impact study.)

92 - Health
93 - Education and Training
95 - Cultural Understanding
86 - Manufacturing

### Australian and New Zealand Standard Industrial Classification (ANZSIC) Codes

(Choose from the list of two-digit ANZSIC codes that are relevant to the impact study.)

11 - Food Product Manufacturing
41 - Food Retailing
77 - Public Order, Safety and Regulatory Services
82 - Adult, Community and Other Education

### Keywords

(List up to 10 keywords related to the impact described in Part A.)

Neural Tube Defect (NTD)

Folate

Prevention

equity

inequity

Indigenous

flour

mandatory fortification

surveillance

Spina Bifida

#### Sensitivities

Commercially sensitive

No

Culturally sensitive

No

#### Sensitivities description

(Please describe any sensitivities in relation to the impact study that need to be considered, including any particular instructions for ARC staff or assessors, or for the impact study to be made publicly available after El 2018.)

### Aboriginal and Torres Strait Islander research flag

(Is this impact study associated with Aboriginal and Torres Strait Islander content? NOTE - institutions may identify impact studies where the impact, associated research and/or approach to impact relates to Aboriginal and Torres Strait Islander peoples, nations, communities, language, place, culture and knowledges and/or is undertaken with Aboriginal and Torres Strait Islander peoples, nations, and/or communities.)

# Yes

#### **Science and Research Priorities**

(Does this impact study fall within one or more of the Science and Research Priorities?)

Yes

Science and Research Priority	Practical Research Challenge
Health	Better health outcomes for Indigenous people, with strategies for both urban and regional communities.
Health	Effective technologies for individuals to manage their own health care, for example, using mobile apps, remote monitoring and online access to therapies.
Health	Better models of health care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure.

# Impact

### Summary of the impact

(Briefly describe the specific impact in simple, clear English. This will enable the general community to understand the impact of the research.)

Maternal dietary folate deficiency in the first weeks of life carries a higher risk that the fetus' neural tube will not fuse, leading to the development of either spina bifida or anencephaly. For two decades Bower et al. followed a dedicated pathway to impact by lobbying the Australian Government's Health portfolio's statutory authority, Food Standards Australia New Zealand (FSANZ), to introduce mandatory fortification of wheat flour. In 1995 voluntary fortification was allowed and in 2009 fortification of wheat flour with folate became mandatory. From 2011 to 2016, NTD births dropped, regardless of mother's culture, age, educational attainment or choice of hospital system.

#### **Beneficiaries**

(List up to 10 beneficiaries related to the impact study)

Women of child-bearing age, particularly Indigenous women

Newborns, particularly Indigenous children

Australian Government

Australian Health Care System

Food Standards Australia New Zealand

### Countries in which the impact occurred

(Search the list of countries and add as many as relate to the location of the impact)

#### Australia

### Details of the impact

(Provide a narrative that clearly outlines the research impact. The narrative should explain the relationship between the associated research and the impact. It should also identify the contribution the research has made beyond academia, including:

- who or what has benefitted from the results of the research (this should identify relevant research end-users, or beneficiaries from industry, the community, government, wider public etc.)

- the nature or type of impact and how the research made a social, economic, cultural, and/or environmental impact

- the extent of the impact (with specific references to appropriate evidence, such as cost-benefit-analysis, quantity of

those affected, reported benefits etc.)

- the dates and time period in which the impact occurred.

NOTE - the narrative must describe only impact that has occurred within the reference period, and must not make aspirational claims.)

Folate is essential to the healthy development of babies in early pregnancy. Maternal dietary folate deficiency in the first weeks of life carries a higher risk that the fetus' neural tube will not fuse, leading to the development of either spina bifida or anencephaly. Spina bifida results in significant lifelong physical disability and early death. Anencephaly almost always results in death before or within a few days of birth. Both conditions are known as Neural Tube Defects (NTD).

Bower et al identified the importance of folate in the 1980's resulting in widespread promotion of the benefits of folic acid supplements to Western Australian women considering pregnancy. However, campaigns to encourage folic acid supplements were not effective in reducing NTD in the Indigenous population. Other factors such as the mother's age, educational attainment, being pregnant for the first time, and the birthing using the public health system were found to increase risk of NTD, even though heavy promotional campaigning was undertaken. Additionally, the Indigenous population was found to be at higher risk of NTD compared to the non-Indigenous population. While health promotion was moderately successful in reducing the overall risk of NTD, it wasn't effective for Indigenous children, of whom a higher proportion were vulnerable. The result was an increasing disparity in NTD between Indigenous and non-Indigenous children.

For two decades Bower et al. had followed a dedicated pathway to impact by lobbying the Australian Government's Health portfolio's statutory authority, Food Standards Australia New Zealand (FSANZ), to introduce mandatory fortification of wheat flour. In 1995 voluntary fortification was allowed and in 2009 fortification of wheat flour with folate became mandatory. From 2011 to 2016, NTD births dropped, regardless of mother's culture, age, educational attainment or choice of hospital system.

#### ECONOMIC IMPACT OF REDUCED PREVALENCE OF SPINA BIFIDA

A 2016 review by the Australian Institute of Health and Welfare found that since the flour fortification program's introduction, levels of NTDs had dropped by 14.4 per cent. Pre-fortification, the cost of spina bifida was calculated as \$13,535 for the first four years and \$4354 for every year after, up to the age of 43 or 84 years. Children with spina bifida are hospitalised 19.4 times more than the general population and have 2.9 times more outpatient visits. Children with spina bifida have pharmaceutical use that is 3.1 times that of the general population and often require assistive technology. Loss of work productivity in carers of people with spina bifida has been estimated at 9.2 hours a week. People with spina bifida in the workforce lose an average of 10 days due to their disability and have reduced earning capacity (\$21,000 less than the general population). The Commonwealth of Australian Governments Health Council Report estimated that mandatory folic acid fortification resulted in 1) \$350,000 per year more value in terms of a combination of increased productivity and reduced health costs than the alternative of no mandatory fortification; 2) fewer NTD-affected pregnancies, translating into gains of 135 life years and 130 Quality Adjusted Life Years.

#### REDUCTION OF NTD IN THE AUSTRALIAN ABORIGINAL POPULATION

Pre-fortification (2007-2009) there were 2.43 cases of spina bifida per 1000 births in the Indigenous population. The disparity in mortality and morbidity between Indigenous and non-Indigenous Australians is a stark example of the inequity that exists in Australia. Mandatory fortification of wheat flour with bread is an example of a research led change in government policy that was designed to address the health needs of less socially privileged members of our society. Post-fortification (2010-2014) rates had dropped to 0.82 cases of spina bifida per 1000 births in the Indigenous population.

### SURVEILLANCE OF NTD: THE ABILITY TO QUANTIFY INEQUITY

In 2011, the Health (Western Australian Register of Developmental Anomalies: WARDA) Regulations 2010 were gazetted in the Western Australian State Parliament, making it mandatory to record NTD and other developmental anomalies within one register. Bower et al. have been instrumental in creating this register and those who preceded it by collating cases from WA, which included termination data. Collection of high-quality data requires consistent policy and inter-departmental cooperation. Along with South Australia and Victoria, Western Australia is considered to have one of the most complete registers of developmental anomalies. It is through this registry that FSANZ is able to monitor the ongoing impact of mandatory fortification. Without Statewide surveillance, it would not have been possible to quantify the risk of NTD in Indigenous children. The inequity would not have been proved and the government would not have instructed FSANZ to investigate mandatory fortification.

#### EMPOWERMENT OF FAMILIES AFFECTED BY NTD

Professor Bower has strong links to families affected by NTD, as well as the clinical services they encounter, and policymakers within the State and Federal Governments. The structure of the registry is designed to help improve knowledge of health services and reduce disparity experienced by a disadvantaged and vulnerable group. "As a parent of a child listed on the Register, I can see multiple benefits with the new Register. ...there is a strong recommendation for parents to be told of the notification, which is a good opportunity to provide information and support at a time that can be somewhat difficult." Rachel Skoss (WARDA Consumer Reference Group)

### Associated research

(Briefly describe the research that led to the impact presented for the UoA. The research must meet the definition of research in Section 1.9 of the El 2018 Submission Guidelines. The description should include details of:

- what was researched
- when the research occurred
- who conducted the research and what is the association with the institution)

#### The team demonstrated that:

1. promotion of folic acid supplements was not reaching all populations. Women who were unaware of promotion were younger, premigravada, single or defacto, without tertiary education and using the public health system. In contrast, there was no difference in dietary intake of voluntary fortified foods between groups, indicating that fortification was superior to promotion in reaching vulnerable populations.

2. before voluntary fortification was introduced and before folate supplements during pregnancy were promoted, neural tube defects were 43 per cent more common in Indigenous births, and disparity increased after voluntary fortification and promotion campaigns.

3. before mandatory fortification, folate deficiency in Indigenous populations was more prevalent than in non-Indigenous populations. In 2016, repeated analysis within the same population, but not the same subjects, demonstrated that, post-fortification, no Indigenous participants were deficient in folate.

4 post-fortification, a 68 per cent drop in the prevalence of NTD in the Indigenous population was observed.

The research was led by Carol Bower, UWA Adjunct Professor based at Telethon Institute for Kids (TKI): a UWAaffiliated research centre. The research team includes: Fiona Stanley\*, Susannah Maxwell, Siobhan Hickling\*, Heather D'Antoine, Peter O'Leary\*, Kate Brameld\*, Julia Marley\* at UWA\*, TKI, Curtin, Birth Defects Registry of

WA and the Menzies School of Health Research.

#### FoR of associated research

(Up to three two-digit FoRs that best describe the associated research)

11 - Medical and Health Sciences

### References (up to 10 references, 350 characters per reference)

(This section should include a list of up to 10 of the most relevant research outputs associated with the impact)

Fortification of food with folic acid and the prevention of neural tube defects. Bower, C. 2003 In : New Zealand Medical Journal. 116, 8, p. U292-294

Trends in neural tube defects in Western Australia in Indigenous and non-Indigenous populations. Bower, C., Eades, S., Payne, J., D'Antoine, H. & Stanley, F. 2004 In : Paediatric and Perinatal Epidemiology. 18, 4, p. 277-80

Promotion of folate for the prevention of neural tube defects: who benefits? Bower, C., Miller, M., Payne, J. & Serna, P. 2005 In : Paediatric and Perinatal Epidemiology. 19, 6, p. 435-444

Primary prevention of neural tube defects with folate in Western Australia: the value of the Western Australian Birth Defects Registry. Bower, C. 2006 In : Congenital Anomalies. 46, 2, p. 118-121

Folate intake and the primary prevention of non-neural birth defects. Bower, C., Miller, M., Payne, J. & Serna, P. 2006 In : Australian and New Zealand Journal of Public Health.30, 3, p. 258-261

A survey of folate knowledge and consumer behaviours in Western Australia prior to the introduction of mandatory food fortification. Molster, C., Samanek, A., Bower, C. & O'Leary, P. 2009 In : Australian and New Zealand Journal of Public Health. 33, 6, p. 577-582

Prevalence of neural tube defects in Australia prior to mandatory fortification of bread-making flour with folic acid. Abeywardana, S., Bower, C., Halliday, J., Chan, A. & Sullivan, E. A. 2010 In : Australian and New Zealand Journal of Public Health. 34, 4, p. 351-355

Prevention of neural tube defects with folate Bower, C. 2013 In : Journal of Paediatrics and Child Health. 49, 1, p. 2-4

Baseline investigations of folate status in Aboriginal and non-Aboriginal West Australians prior to the introduction of mandatory fortificationMaxwell, S. J., Brameld, K., Bower, C., D'Antoine, H., Hickling, S., Marley, J. & O'Leary, P. 2013 In : AUSTRALIAN & NEW ZEALAND JOURNAL OF OBSTETRICS & GYNAECOLOGY. 53, 1, p. 26–31

# Additional impact indicator information

# Additional impact indicator information

(Provide information about any indicators not captured above that are relevant to the impact study, for example return on investment, jobs created, improvements in quality of life years (QALYs). Additional indicators should be quantitative in nature and include:

- name of indicator (100 characters)
- data for indicator (200 characters)
- brief description of indicator and how it is calculated (300 characters).)