



FOOD STANDARDS
Australia New Zealand
Te Mana Kounga Kai – Ahitereiria me Aotearoa

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DRAFT ASSESSMENT REPORT

PROPOSAL P295

CONSIDERATION OF MANDATORY FORTIFICATION WITH FOLIC ACID

DEADLINE FOR PUBLIC SUBMISSIONS: 6pm (Canberra time) 31 July 2006
SUBMISSIONS RECEIVED AFTER THIS DEADLINE
WILL NOT BE CONSIDERED

(See 'Invitation for Public Submissions' for details)

For Information on matters relating to this Assessment Report or the assessment process generally, please refer to <http://www.foodstandards.gov.au/standardsdevelopment/>

EXECUTIVE SUMMARY

In May 2004, the Australia and New Zealand Food Regulation Ministerial Council (the Ministerial Council) asked Food Standards Australia New Zealand (FSANZ) to investigate mandatory fortification with folic acid as a possible means of reducing the incidence of neural tube defects (NTDs) which are serious birth defects.

FSANZ released its Initial Assessment Report in October 2004 and presented four options, namely: maintenance of the *status quo*; extension of permissions for voluntary folic acid fortification; mandatory folic acid fortification; and increased health promotion and education strategies to increase folate intakes.

On the basis of Ministerial advice received in 2005 that mandatory folic acid fortification is an effective strategy, FSANZ reduced the number of regulatory options considered in this Draft Assessment Report to maintenance of the *status quo* and mandatory folic acid fortification.

Internationally, a number of countries have reported successful mandatory folic acid fortification programs as an equitable and sustainable means of increasing the folic acid intake of women of child-bearing age (the target population) to reduce the incidence of NTDs. Wheat flour is the most commonly chosen food vehicle.

FSANZ drew on this international experience and selected bread-making flour as the food vehicle for mandatory folic acid fortification in Australia and New Zealand. From a practical perspective, it considered bread-making flour as a feasible vehicle due to the existing mandatory fortification requirement with thiamin in Australia.

The report focuses on consideration of mandatory folic acid fortification as a means of reducing the incidence of NTDs in Australia and New Zealand and includes:

- an assessment of the health benefits and risks of increased dietary intakes of folic acid by the Australian and New Zealand populations;
- identification of a preferred food vehicle and level of folic acid concentration to achieve the desired health outcome;
- management of any identified risks;
- cost-benefit analysis;
- associated communication and education;
- monitoring and implementation issues; and
- presentation of a preferred regulatory approach.

This report also addresses issues arising from public submissions and targeted stakeholder consultations. The current approach gives particular consideration to folic acid intake from voluntary fortification and reported trends in NTDs.

Preferred Approach

Mandatory fortification of all bread-making flour with folic acid is the preferred approach in Australia and New Zealand to further reduce the incidence of NTDs.

The proposed level of mandatory fortification is 230-280 micrograms (μg) of folic acid per 100 g of bread-making flour, to achieve an average residual level of approximately 200 μg folic acid in the flour component of the final food.

The approach maintains current voluntary folic acid permissions except for bread which will be changed from a voluntary permission to a mandatory requirement.

Reasons for Preferred Approach

The reasons for the preferred approach are:

- fortifying flour with folic acid, in this case bread-making flour, is consistent with international experience of mandatory fortification to reduce the incidence of NTDs;
- bread-making flour is an effective and technically feasible food vehicle for mandatory folic acid fortification;
- bread-making flour (as bread and bread products) is a staple food consumed widely, consistently and regularly by the target population of women of child-bearing age;
- fortification of bread-making flour will deliver a mean increase in folic acid intake in the target population of 100 μg and 131 μg in Australia and New Zealand respectively, resulting in an estimated reduction of between 14-49 out of 300-350 pregnancies in Australia and 4-14 out of 70-75 pregnancies in New Zealand affected by an NTD each year;
- on the available evidence, including overseas experience with mandatory fortification, the proposed level of fortification does not pose a risk to public health and safety. The level has been set to minimise any potential health risks as a degree of uncertainty exists, particularly for the non-target population from increased folic acid intakes over the longer term;
- the cost-benefit analysis indicates that the benefits from the projected reduction in NTDs well exceed the costs of mandating fortification:
 - in Australia, the net benefits would be \$23.9 million each year ongoing based on a reduction in live births affected by an NTD, or \$124.5 million each year ongoing based on a reduction in all pregnancies affected by an NTD (including still births and terminations); and

- in New Zealand, the net benefits would be \$4.8 million each year ongoing based on a reduction in live births affected by an NTD, or \$41.2 million each year ongoing based on a reduction in all pregnancies affected by an NTD (including still births and terminations).
- the cost to consumers is likely to be small, probably less than 1% of the price of a loaf of bread;
- consumers will be provided with information through ingredient labelling to identify the presence of folic acid in products containing bread-making flour; and
- it is consistent with Ministerial policy guidance on mandatory fortification.

Accordingly, other strategies for reducing the incidence of NTDs will continue to be important. These strategies include the promotion of increased folate intakes in women of child-bearing age through education, voluntary fortification and supplement use. The optimal reduction in the incidence of NTDs depends on these strategies continuing, including a commitment to the ongoing promotion of folic acid supplements.

FSANZ will talk to relevant agencies to ensure that recommendations about supplement use take account of expected increases in dietary folic acid intake among women of child-bearing age.

There are some uncertainties associated with mandatory fortification, particularly chronic exposure to increased folic acid intakes beginning in childhood. As a result, a conservative approach to the level of fortification has been adopted.

Monitoring

Monitoring will form an essential component of implementing this Proposal. It will provide a basis to gauge both the ongoing effectiveness and safety of mandatory folic acid fortification, particularly in further reducing the incidence of NTDs and ongoing need for fortification at the recommended level.

Responsibility for establishing and funding a monitoring system to assess the impact of mandatory fortification on the population extends beyond FSANZ's responsibilities under the *FSANZ Act 1991*, and will require the concomitant involvement of health and regulatory agencies at a Commonwealth, State and Territory level in Australia and the New Zealand Government.

As part of its ongoing work, FSANZ will undertake the following monitoring activities:

- track changes in voluntarily fortified foods because of the potential impact this might have on dietary intakes of folic acid;
- update the food composition databases;
- track labelling changes on fortified foods;
- track changes in food consumption patterns for different demographic groups in key food categories that are likely to be fortified; and
- research changes in consumers' attitudes and behaviour towards fortified foods.

The cost-benefit analysis excludes the establishment of a monitoring system but preliminary costings for various elements of the system are included at Attachment 12 as the basis for future discussion with key stakeholders. Importantly, the exclusion of these cost estimates does not affect the net benefits attributed to mandatory fortification.

Consultation

FSANZ received a total of 72 submissions in response to the Initial Assessment Report for this Proposal during the public consultation period of 20 October to 24 December 2004. A full summary of submissions is at Attachment 2.

Submitters' views were mixed in relation to a preferred regulatory option. Organisations and individuals with a direct interest in NTDs strongly supported mandatory fortification, whereas industry submitters primarily supported extension of voluntary fortification permissions in conjunction with increased health promotion and education strategies to increase folate intakes. In general, government and public health submitters supported mandatory fortification on the condition that a national monitoring and surveillance system is in place prior to implementation. However other public health and government submitters did not indicate a preferred option, citing reservations due to the uncertainty surrounding potential risks from mandatory folic acid fortification and stressed the need for a conservative approach.

In addition to public consultation, FSANZ undertook targeted consultation to assist selection of the food vehicle, identification and investigation of risk management issues, the cost-benefit analysis, the development of recommendations for the implementation phase, and the identification of monitoring requirements for mandatory fortification.

Implementation

Following completion of a Final Assessment for this Proposal, if the FSANZ Board approves the proposed draft variations to *Australia New Zealand Food Standards Code* (the Code) the Ministerial Council will be notified of the decision. Subject to any request from the Ministerial Council for a review, the proposed draft variations to the Code are expected to come into effect upon gazettal.

Once gazetted, it is proposed that the normal 12-month transitional period will apply to the proposed mandatory fortification of bread-making flour with folic acid.

FSANZ has prepared a strategy to guide communication and education initiatives to raise awareness and understanding of the proposed standard for mandatory folic acid fortification and its implementation. In implementing this strategy, FSANZ will collaborate with other organisations that play an important role in providing information and education to consumers, industry and other key stakeholders.

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INVITATION FOR PUBLIC SUBMISSIONS

FSANZ invites public comment on this Draft Assessment Report based on regulation impact principles and the draft variation/s to the Code for the purpose of preparing an amendment to the Code for approval by the FSANZ Board.

Written submissions are invited from interested individuals and organisations to assist FSANZ in preparing the Final Assessment of this Proposal. Submissions should, where possible, address the objectives of FSANZ as set out in section 10 of the FSANZ Act. Information providing details of potential costs and benefits of the proposed change to the Code from stakeholders is highly desirable. Claims made in submissions should be supported wherever possible by referencing or including relevant studies, research findings, trials, surveys etc. Technical information should be in sufficient detail to allow independent scientific assessment.

The processes of FSANZ are open to public scrutiny, and any submissions received will ordinarily be placed on the public register of FSANZ and made available for inspection. If you wish any information contained in a submission to remain confidential to FSANZ, you should clearly identify the sensitive information and provide justification for treating it as commercial-in-confidence. Section 39 of the FSANZ Act requires FSANZ to treat in-confidence, trade secrets relating to food and any other information relating to food, the commercial value of which would be, or could reasonably be expected to be, destroyed or diminished by disclosure.

Submissions must be made in writing and should clearly be marked with the word 'Submission' and quote the correct project number and name. Submissions may be sent to one of the following addresses:

Food Standards Australia New Zealand
PO Box 7186
Canberra BC ACT 2610
AUSTRALIA
Tel (02) 6271 2222
www.foodstandards.gov.au

Food Standards Australia New Zealand
PO Box 10559
The Terrace WELLINGTON 6036
NEW ZEALAND
Tel (04) 473 9942
www.foodstandards.govt.nz

Submissions need to be received by FSANZ by 6pm (Canberra time) 31 July 2006.

Submissions received after this date will not be considered, unless agreement for an extension has been given prior to this closing date. Agreement to an extension of time will only be given if extraordinary circumstances warrant an extension to the submission period. Any agreed extension will be notified on the FSANZ website and will apply to all submitters.

While FSANZ accepts submissions in hard copy to our offices, it is more convenient and quicker to receive submissions electronically through the FSANZ website using the Standards Development tab and then through Documents for Public Comment. Questions relating to making submissions or the application process can be directed to the Standards Management Officer at the above address or by emailing slo@foodstandards.gov.au.

Assessment reports are available for viewing and downloading from the FSANZ website. Alternatively, requests for paper copies of reports or other general inquiries can be directed to FSANZ's Information Officer at either of the above addresses or by emailing info@foodstandards.gov.au.

INTRODUCTION

Neural tube defects (NTDs) are a group of birth defects, which occur *in utero* during the development of the brain or spinal cord. Since the early 1990s there has been convincing evidence that increased intakes of folic acid can reduce the risk of NTDs. As a result, a number of countries including Australia and New Zealand have adopted policies to increase the folate intake of women prior to and during pregnancy.

The primary prevention strategies in Australia and New Zealand have been, either singly or in combination: promotion of diets high in naturally occurring folate; promotion of folic acid supplements during the peri-conceptual period; and voluntary fortification of the food supply with folic acid.

Mandatory fortification has been under active consideration since May 2004 when the Australia and New Zealand Food Regulation Ministerial Council (Ministerial Council) adopted a Policy Guideline on the *Fortification of Food with Vitamins and Minerals* (see Attachment 3). At that time, Ministers also requested that Food Standards Australia New Zealand (FSANZ) give priority consideration to mandatory fortification with folic acid. FSANZ raised this Proposal (Proposal P295) and released an Initial Assessment Report for public consultation in October 2004.

In December 2004, FSANZ sought advice from the Food Regulation Standing Committee (FRSC) on two policy issues:

- whether mandatory fortification with folic acid is the most effective public health strategy; and
- a process to establish a health monitoring and review system in support of mandatory fortification.

FRSC undertook a process to clarify these policy issues which included seeking advice from the Australian Health Ministers' Advisory Council (AHMAC) and the Australian Health Ministers' Conference (AHMC). An Expert Panel convened by AHMAC¹ reported that mandatory fortification fulfilled their criteria² of effectiveness, equity, efficiency, certainty, feasibility and sustainability required for an effective public health strategy.

In October 2005, the Ministerial Council noted the advice of AHMAC and AHMC that mandatory fortification with folic acid is an effective public health strategy subject to clinical safety and cost-effectiveness. FSANZ was asked to progress consideration of mandatory fortification with folic acid as a matter of priority and on this basis expedited the consideration.

¹ *The effectiveness of mandatory fortification as a public health strategy to increase nutrient intakes, with reference to iodine and folate.* Expert public health advice prepared for AHMAC, June 2005.

² Case studies of public health interventions to increase nutrient intakes were used to generate effectiveness criteria.

Work on developing a monitoring scheme for mandatory fortification is currently underway by a FRSC working group. FSANZ has adapted the draft framework prepared by the FRSC working group and outlined the potential elements of a monitoring system that aims to assess the impact of mandatory fortification of the food supply with folic acid on consumers (see Attachment 12). Responsibility for establishing and funding a monitoring system to assess the impact of a mandatory fortification on the population extends beyond FSANZ's responsibilities under the *FSANZ Act 1991*, and will require the concomitant involvement of health and regulatory agencies at a Commonwealth, State and Territory level in Australia and the New Zealand Government.

This Draft Assessment Report focuses on consideration of mandatory fortification with folic acid as a means of reducing the incidence of NTDs in Australia and New Zealand. The Report provides a description of the current approach as well as an assessment of the health benefits and risks of mandatory fortification, identification of a preferred food vehicle, management of any identified risks, cost-benefit analysis, associated communication, education, monitoring and implementation issues and presents a preferred regulatory approach. Issues arising from public submissions and targeted stakeholder consultation have also been addressed where possible in this Report.

FSANZ now seeks public comment on the preferred regulatory option, particularly from affected parties, to inform and assist the progression of this Proposal to Final Assessment.

Refer to the Glossary (page 73) and Abbreviations and Acronyms (page 9) for a list of definitions and abbreviations used in this Report.

Scope of this Proposal

At Initial Assessment four options were presented, namely: maintenance of the *status quo*; extension of permissions for voluntary folic acid fortification; mandatory folic acid fortification; and increased health promotion and education strategies to increase folate intakes.

On the basis of the Ministerial advice that mandatory fortification with folic acid is an effective strategy, FSANZ has reduced the number of regulatory options being considered at Draft Assessment. This Report has narrowed consideration of regulatory options to maintenance of *status quo* (including existing voluntary folic acid fortification) and mandatory fortification. Extension of voluntary folic acid permissions has been excluded from further consideration in this report.

The scope of this Proposal reflects the relative success of international experience with mandatory folic acid fortification programs and the experience to date of this being able to deliver an equitable, sustained and predictable response to further reducing the incidence of NTDs in Australia and New Zealand.

1. Background

1.1 Folate terminology and forms

The following terms are used frequently throughout the report. For further details about definitions refer to the Glossary (page 73).

Folate is a water-soluble B-group vitamin. The term *folate* is used generically to refer to the various forms of the vitamin, both naturally-occurring and synthetic, and its active derivatives (Department of Health, 2000).

Naturally-occurring folate is the form of folate found in a wide variety of foods including green leafy vegetables, cereals, fruits, grains, legumes, yeast extract, and liver. The term *naturally-occurring folate* is used in this document, to differentiate it from folic acid added to food in fortification.

Folic acid, or pteroylmono-glutamic acid (PGA), is the most common synthetic form of folate and is the form used in fortification and in the majority of supplements. Folic acid is rarely found occurring naturally in foods (NHMRC, 1995).

Dietary folate refers to folate that is consumed in the diet, both naturally occurring and folic acid added through fortification. This term does not include folate consumed through supplements.

1.2 Nutritional role of folate

Folate is used by the body in two important pathways: the DNA cycle and the methylation cycle. Folate is essential for DNA synthesis as without it living cells cannot divide. The need for folate is higher when cell turnover is increased, such as in foetal development. The methylation cycle provides the cell with an adequate supply of S-adenosylmethionine, which acts a methyl donor in a wide range of methylation reactions. Homocysteine is methylated by methyl-THF to produce the amino acid methionine.

Recommended levels of intake of essential nutrients, including folic acid, have been established to:

- avoid deficiency in the majority of a healthy population;
- minimise health risks from excess nutrient consumption by setting an upper level of intake, where appropriate; and
- optimise nutrient intake for lowering chronic disease risk.

To capture the different levels, a range of values is given for each nutrient. For folate these include: an estimated average requirement (EAR³), a recommended dietary intake (RDI⁴) and an upper level of intake (UL⁵) for each age and gender group. These levels of intake are termed nutrient reference values (NRVs) and have been recently revised by the NHMRC⁶.

The NRVs recommend increased levels of folate intake to those previously published in 1991. The increased folate recommendations are based on new data which looked at the association between folate intake and homocysteine levels in the blood. The new EAR and RDI for folate are expressed as 'dietary folate equivalents' or DFEs⁷, which reflects the considerable difference in bioavailability (see Section 6.1.4) between naturally-occurring folate and folic acid. The new folate RDI for men and women is 400 µg as DFEs which replaces the previous folate RDI of 200 µg per day.

For women capable of, or planning a pregnancy, the recommendation is 400 µg of folic acid (equivalent to approximately 670 µg DFEs) either from fortified foods and/or supplements (NHMRC and NZMoH, 2006).

The UL for folate (1,000 µg per day of folic acid) in adults has been set based on the potential for regular intakes above this level, by the elderly in particular, to mask the diagnosis of vitamin B₁₂ deficiency (see Section 5.2.1). The UL set for adults has been applied to younger age groups on a relative body weight basis. However, vitamin B₁₂ deficiency is rare in children, and so the relevance of this endpoint and hence the risk to children is not clear.

Individual folate requirements can be affected by factors such as smoking, certain drugs and genetic variations. Inadequate folate intake leads to sub-optimal folate status. Limited data exist on the folate status of the Australian and New Zealand populations (see Section 2.4.2) although those 'at risk' of deficiency may be as high as one in three in some Australian population sub-groups (Abraham and Webb, 2001).

Foods naturally high in folate are green leafy vegetables (such as broccoli and spinach), nuts, orange juice, some fruits and dried beans and peas. Cereals are moderate sources of folate. Based on the national nutrition surveys conducted in Australia and New Zealand in 1995 and 1997 respectively, cereals and cereal-based dishes, vegetables and legumes contributed nearly 60% of naturally-occurring folate in the adult diet (ABS, 1999; NZMoH, 1999). These surveys were conducted prior to or about the time of the introduction of voluntary fortification.

³ The EAR is the daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group.

⁴ The RDI is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in a particular life stage and gender group.

⁵ The UL is the highest average daily nutrient intake likely to pose no adverse health effects to almost all individuals in the general population.

⁶ The NHMRC document *Nutrient Reference Values for Australia and New Zealand including recommended dietary intakes* is available online at <http://www.nhmrc.gov.au/publications/synopses/n35syn.htm>

⁷ DFEs is a term used to accommodate the various bioavailabilities of folate. One µg DFE = 1 µg food folate = 0.5 µg of folic acid on an empty stomach = 0.6 µg of folic acid with meals.

1.3 Neural Tube Defects (NTDs)

NTDs are a group of birth defects, which arise during the development of the brain and spinal cord *in utero*. In the very early stage of pregnancy, a band of cells along the dorsal surface of the embryo develop into a hollow tube called the neural tube, which eventually forms the spinal column and central nervous system. This process, called neurulation, is completed by day 22 to 28 after ovulation (Van der Put *et al.*, 2001; Verity *et al.*, 2003). Incomplete closure of the neural tube may lead to one of the following three neural tube defects:

- **Spina bifida** – This is a condition whereby incomplete closure of the neural tube results in the spinal cord being exposed or protruding through a gap in the spine. This may result in the spinal nerves not being fully developed. The proportion of infants with spina bifida who survive beyond one year of age in both Australia and New Zealand is likely to be in the range of 70-90%.
- **Anencephaly** – This condition is characterised by a failure of the anterior neural tube to close, resulting in the total or partial absence of the cranial vault and brain tissue. Infants are usually stillborn or die shortly after birth. Together spina bifida and anencephaly account for 90% of all cases of NTDs.
- **Encephalocele** – This condition is characterised by the meninges and/or brain tissue extruding through a defect in the skull. This is the least frequent of the neural tube defects. The survival pattern of encephalocele results in a low proportion of stillbirths, the majority of deaths occurring within the first year of life, although long-term survival after that is similar to children born with spina bifida.

The process of brain and spinal cord development can be disrupted by genetic and environmental factors. The risk of NTDs is increased by: certain single-gene disorders and chromosomal anomalies; maternal factors such as diabetes mellitus; use of anticonvulsant medication; and inadequate folate intake. The risk is also increased in women who have previously had a NTD-affected pregnancy. Differences in the distribution of NTD cases have also been associated with geographical location, ethnicity, seasonal variation, maternal age, and socioeconomic status (Van der Put *et al.*, 2001).

In Australia, 300-350 pregnancies are affected each year by a neural tube defect. In New Zealand there are approximately 70-75 cases per year (see Attachments 5 and 9).

The following terms in relation to NTDs are used frequently throughout the report. For further details about definitions refer to the Glossary (page 73).

Incidence: The number of live births, stillbirths and terminations affected by an NTD expressed as a rate per 1,000 total births⁸. As data on the number of terminations affected by an NTD is frequently incomplete, some authors use the term ‘prevalence’.

Birth prevalence: The number of live births and stillbirths affected by an NTD expressed as a rate per 1,000 total births.

The terms ‘incidence’ and ‘prevalence’ usually refer to a reference time period e.g. per year. In this report, however, these terms often refer to periods much longer than a single year and in some cases the reference time period is not specified.

⁸ Total births = live births + stillbirths.

1.4 Regulation of folic acid in foods in Australia and New Zealand.

Since 1995, in Australia, and 1996 in New Zealand, folic acid has been permitted to be voluntarily added to the following foods: flour; savoury biscuits; breads; breakfast cereals; vegetable and meat extracts; pasta; fruit and vegetable juices and drinks; and beverages derived from legumes. Folic acid may also be added to legume analogues of dairy foods and meat but in smaller amounts. More recently voluntary folic acid fortification permissions have been extended to cereal based beverages e.g. rice and oat ‘milks’. These permissions are provided in Standard 1.3.2 – Vitamins and Minerals of the *Australia New Zealand Food Standards Code* (the Code).

Under the existing food regulations, permitted claims made on the presence of a vitamin and mineral in a food refer to the total of both naturally-occurring and added forms of the nutrient. In the case of dietary folate in food the amount declared on a label is the sum of naturally-occurring folate and added folic acid and is listed as ‘folate’ in the Nutrition Information Panel. The changes to the NRVs for folate will require amendments to relevant standards in the Code, which may in the future impact on composition and nutrition labelling requirements. These amendments will occur in a separate review process.

Under Standard 1.1A.2 – Transitional Standard – Health Claims, a health claim highlighting the link between increased maternal dietary folate intake and reduction in NTD risk is permitted for some fortified and non-fortified foods that contain at least 40 µg folate per serving. The claim should state that increased maternal folate consumption in at least the month before and three months following conception may reduce the risk of NTDs. It must also include the recommendation that women consume a minimum of 400 µg of folate per day during this time.

FSANZ is currently working on Proposal P293 – Nutrition, Health and Related Claims, to develop a new standard for nutrition and health claims. The new standard (draft Standard 1.2.7 – Nutrition, Health and Related Claims) will permit a wider range of claims in the future including a proposed revised folate-NTD health claim. The temporary provision for the current folate-NTD claim has been in place since 1998, and will cease to have effect two years from the commencement of the new health claim standard.

1.5 Existing mandatory fortification requirements

Mandatory fortification of food with thiamin and vitamin D has existed in Australia for over 15 years; however, there is currently no mandatory fortification of food in New Zealand. Standard 2.1.1 – Cereals and Cereal Products of the Code requires *flour for making bread* to be fortified with thiamin in Australia only. Mandatory fortification of table edible oil spreads and table margarine with vitamin D in Australia is regulated under Standard 2.4.2 – Edible Oil Spreads of the Code.

1.6 International regulation of folic acid in foods

1.6.1 Codex Alimentarius

The Codex Alimentarius does not mandate the addition of particular nutrients to certain foods other than some special purpose foods.

For generally consumed foods, the *General Principles for the Addition of Essential Nutrients to Foods*⁹ state that essential nutrients may be added to foods for the purposes of restoration, nutritional equivalence of substitute foods, fortification¹⁰, or ensuring the appropriate nutrient composition of a special purpose food.

1.6.2 Countries with mandatory folic acid fortification

A number of countries have introduced mandatory requirements for folic acid fortification of foods in an effort to reduce the incidence of NTDs. These include Canada, the United States, Indonesia, and a number of African and South American countries including Chile. In these countries, the most common food fortified with folic acid is wheat flour. A number of other countries are currently considering mandating folic acid fortification of flour, and include the United Kingdom and Ireland.

Canada and the United States, countries with similar food supplies as Australia and New Zealand, have both mandated folic acid fortification of flour and other grain products (Table 1).

Table 1: Folic acid fortification in Canada and the United States

Country	Foods fortified with folic acid	Year of introduction	Level of fortification (mg/kg)
Canada ¹	Flour (white, enriched ¹¹ , enriched white); enriched cornmeal, enriched pasta, enriched pre-cooked rice	1998	1.5 (or 150 µg/100 g)
United States ²	Enriched cereal grain products including: enriched wheat flour, enriched bread, rolls & buns, enriched cornmeal & grits, enriched farina, enriched rice and enriched macaroni products	1998	1.4 (or 140 µg/100 g)

Sources:

1. Canadian Government (1998)
2. USFDA (1996)

In the United States, these food vehicles were chosen because they are staple food products for most of the population (including 90% of the target group) and have a long history of being successful vehicles for fortification (USFDA 1996, see Attachment 4). In addition, a cost-benefit analysis undertaken following the introduction of mandatory fortification in the United States found a considerable net benefit associated with the fall in NTDs (Grosse *et al.*, 2005, see Attachment 11).

⁹ Codex Alimentarius CAC/GL 09/1987 (amended 1989, 1991).

¹⁰ ‘Fortification’ or ‘enrichment’ means the addition of one or more essential nutrients to a food for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups.

¹¹ In the United States, ‘enriched’ refers to the addition of a nutrient to a food that has been lost during the course of food processing or during normal storage and handling, up to the nutrient’s level in the food before the processing, storage and handling.

2. Current approaches to increasing folate intake

The primary prevention strategies employed in Australia and New Zealand since the early 1990s to reduce the risk of inadequate folate intake during the peri-conceptual period, and the attendant risk of NTDs, have been:

- promotion of folic acid supplements and diets containing foods naturally rich in folate;
- voluntary fortification of the food supply with folic acid and subsequent promotion of fortified foods; and
- a folate-NTD health claim.

These strategies are summarised below. Further detail about the current strategies to increase folate and/or folic acid intake, improve folate status and reduce the incidence of NTDs is described in Attachment 5.

2.1 Folic acid supplement recommendations and availability

Folic acid supplementation during the peri-conceptual period can reduce the likelihood of a pregnancy affected by an NTD (Bower and Stanley, 1989; MRC Vitamin Study, 1991; Czeizel and Dudas, 1992; Berry *et al.*, 1999; Lumley *et al.*, 2001).

Australia and New Zealand introduced health policies recommending women take folic acid supplements during the peri-conceptual period in the early 1990s.

2.1.1 Australia

In Australia, the current NHMRC recommendation is that women capable of, or planning a pregnancy, should consume additional folic acid as a supplement or in the form of fortified foods at a level of 400 µg per day for at least one month before and three months after conception, in addition to consuming naturally-occurring folate in foods (NHMRC and NZMoH, 2006).

Folic acid supplements and multivitamin supplements containing folic acid can be purchased at pharmacies, health foods stores and supermarkets. Folic acid supplements generally contain 500 µg, with 5,000 µg (or 5 mg) folic acid daily dose supplements available for women at high risk of an NTD-affected pregnancy. Multivitamins marketed to peri-conceptual, pregnant and breast-feeding women contain folic acid levels ranging from 200 µg to 800 µg.

2.1.2 New Zealand

In New Zealand, the Ministry of Health recommends that all women planning a pregnancy, or who are in the early stages of pregnancy, take an 800 µg¹² folic acid tablet daily for at least four weeks before, and 12 weeks after conception to reduce the risk of NTDs.

Women at high risk of a pregnancy affected by an NTD are recommended to take a daily 5,000 µg (or 5 mg) folic acid tablet for the same period of time (NZMoH, 2006).

¹²In New Zealand, 800 µg is recommended as a 400 µg folic acid supplement is not available in New Zealand (NZMoH, 2003).

Eight hundred microgram folic acid supplements are registered medicines, and can be purchased over the counter in pharmacies. Dietary supplements (such as multivitamins) containing folic acid doses ranging from 30-350 µg can be bought from supermarkets, pharmacies and health food shops (NZMoH, 1999). Dietary supplement regulations¹³ limit folic acid in non-prescription folic acid tablets and multi-vitamin tablets to no more than 300 µg per tablet. New Zealand health authorities do not recommend non-medicine folic acid tablets for NTD prevention because the amount of folic acid does not meet the 400 µg recommended for NTD risk reduction.

2.1.3 Online sales

Online sales of pharmaceuticals are an emerging trend. Folic acid supplements with varying quantities of folic acid (up to 5,000 µg (or 5 mg) tablets) are available for purchase online.

2.2 Folic acid supplement use among women of child-bearing age

To maximise effectiveness, sufficiently high dose folic acid supplements must be taken consistently during the peri-conceptual period. The proportion of women of child-bearing age regularly taking folic acid during the recommended period is not high. Recent data from a study in Western Australia indicated that 28.5% of women who had had a live born baby without birth defects between 1997 and 2000 had taken 200 µg or more of folic acid from supplements daily in the peri-conceptual period (Bower *et al.*, 2005). Better educated women and/or those 25 years or older were more likely to take this supplemental level of folic acid. This result is despite a sustained campaign in Western Australia promoting the use of folic acid supplements to women of child-bearing age.

In New Zealand, results from two different studies found that the proportion of women who reported taking folic acid supplements during the peri-conceptual period (although not necessarily daily) ranged from 11-17% (Schader and Corwin, 1999; Ferguson *et al.*, 2000). There are no data on supplement dosage taken in New Zealand.

There are several impediments to the effectiveness of folic acid supplements as a strategy to reduce the incidence of NTDs including a high proportion (about 50%) of unplanned pregnancies; lack of knowledge and awareness among women of child-bearing age of the need for, the dose and when to take folic acid supplements; and their cost and availability.

2.3 Promotion of folate-rich foods and folic acid supplements

Three national campaigns have been implemented in Australia, together with a number of State-based campaigns to promote increased consumption of folate-rich foods and folic acid supplementation. There have not been any publicly funded campaigns in New Zealand.

Evidence that the risk of NTDs can be reduced by increased consumption of naturally occurring folate alone is lacking (Green, 2005¹⁴). Thus, recommendations to reduce the risk of NTDs focus on 400 µg of synthetic folic acid per day either in supplements or from fortified foods, in addition to the naturally-occurring folate in foods.

¹³ New Zealand Dietary Supplement Regulations 1985 http://www.legislation.govt.nz/browse_vw.asp?content-set=pal_regs

¹⁴ FSANZ commissioned report available at www.foodstandards.gov.au

2.4 Voluntary fortification of foods with folic acid

In 1994, the NHMRC estimated that NTDs could be reduced by up to two-thirds if women increased their folate intake. It concluded that there was sufficient evidence to recommend mandatory fortification of flour and voluntary fortification of a number of other foods including breakfast cereals, cereal flours, yeast extracts and fruit and vegetable juices (NHMRC, 1995). As a practical first step, voluntary fortification was recommended and in 1995, voluntary folic acid permissions for a range of foods were included in the Code.

In 1998, approval for a folate-NTD health claim pilot was granted for certain foods. In recent years there has been limited uptake of the folate-NTD health claim with the exception of breakfast cereals. Currently there are very few products using the health claim. The reasons for this are unclear, but may include the lack of broad appeal of the folate-NTD health claim which has been expressed by industry (ANZFA, 2000).

2.4.1 Current estimates of folic acid intake from voluntary fortification

FSANZ has estimated the current uptake of voluntary fortification permissions in Australia and New Zealand using the following sources:

- unpublished analytical data for a number of different types of common foods including breakfast cereals, bread and juice (Arcot *et al.*, 2002; Arcot, 2005);
- current label data for foods where no analytical values were available; and
- recipe calculation for foods that contain a folic acid fortified ingredient using estimates of the proportion of these ingredients in a food.

Information from these sources matched against the 1995 and 1997 Australian and New Zealand National Nutrition Survey (NNS) data indicate that 149 foods in Australia and 101 foods in New Zealand were presumably fortified with folic acid. Foods most likely to be fortified were breakfast cereals and breads. For foods where a fortified version of the food was not specifically identified within the NNS, but where it is known that a significant proportion of the food category in the market place is now fortified, a folic acid concentration was assigned to the food and weighted to reflect the market share for that food.

The mean intake of folic acid from voluntarily fortified foods among women of child-bearing age is estimated to be 95 µg in Australia and 58 µg in New Zealand. However, the median¹⁵ intake is much lower in both countries – just 57 µg and 21 µg in Australia and New Zealand, respectively (see Attachment 7). This indicates that some women in the target population are probably consuming larger amounts of fortified foods (thus increasing the mean intake) whereas a greater proportion are likely to be consuming relatively low amounts (hence the much lower median intake). The lower mean and median values for New Zealand reflect the lower uptake of voluntary fortification in that country.

In Australia, younger women (15-18 years) have higher median intakes of folic acid from fortified foods (77 µg) than older women (30-49 years) (44 µg) due to higher intakes of breakfast cereals.

¹⁵ The median intake is the point at which 50% of the surveyed population is below this amount and 50% is above it.

2.4.2 *Estimated improvement in folate status from voluntary folic acid fortification*

Folate status is an indicator of folate intake. Both serum folate and red blood cell folate are used as measures to reflect folate status. While serum folate in the individual reflects daily fluctuations in intake, at a population level, (i.e. when the data are aggregated) it is a useful biomarker of folate status.

There have been two regional Australian studies on folate status since the introduction of voluntary fortification. In Victorian adults aged 15-45 years there was a mean increase in mean serum folate concentrations of approximately 19% for women and 16% for men (Metz *et al.*, 2002) and a Perth study involving adults aged 27-77 years reported a 38% increase in mean serum folate between 1995-96 and 2001 (Hickling *et al.*, 2005).

There are no New Zealand studies examining changes in folate status since the introduction of voluntary fortification in that country.

2.4.3 *Estimated reduction in neural tube defects from voluntary folic acid fortification*

In Australia, South Australia, Western Australia and Victoria are the only States with good quality data on terminations. Falls in NTD rates of between 10-30% have been reported by these States (Lancaster and Hurst, 2001; Bower, 2003a; Victorian Perinatal Data Collection Unit, 2005) since the introduction of voluntary fortification.

Although there has been an overall fall in the incidence of NTDs in Western Australia, the disparity between the incidence of NTDs among Indigenous populations and that of the non-Indigenous population in this state has increased over time (Bower *et al.*, 2004).

There are no data on trends in NTD incidence in New Zealand.

2.5 Summary of the current approach to increasing folate intake

There are limited data about the impact of voluntary folic acid fortification on health outcomes. In Australia, some States with good case ascertainment have reported a fall in the incidence of NTDs since the implementation of voluntary fortification. Among selected population sub-groups there has also been an apparent rise in serum folate status. There are no data on trends for either of these indicators in New Zealand. Since the introduction of voluntary folic acid fortification there have been modest increases in mean intake of folic acid from fortified foods among women of child-bearing age in both Australia and New Zealand. These increases have occurred despite the variable uptake by industry of voluntary permissions.

This variability demonstrates the inherent uncertainty in voluntary fortification. Although voluntary fortification can contribute to achieving public health objectives, the nature of voluntary fortification is such that manufacturers can choose whether to take up fortification permissions, and whether to continue to fortify products over time.

Similarly, extension of voluntary fortification permissions to other foods would in theory provide more folate in the food supply, but the level of fortification permission uptake into the future is impossible to predict. So although modest increases in folic acid intakes have been achieved through voluntary fortification there is no reason to expect that extension of

voluntary folic acid fortification would present more certainty than the current approach, with regard to equity, efficacy, predictability and sustainability of the folic acid intake of the target population.

Confounding the impact of voluntary fortification is the impact of supplement intake on NTD incidence. Western Australia reports that only about 30% of women with healthy babies have taken supplements, despite a sustained campaign promoting supplement usage in that State over many years. Consequently, supplement usage at a national level among women of child-bearing age is not likely to be high. The limited data in New Zealand on the use of folic acid supplements restricts any comparison.

3. The Health Issue

In order to establish the regulatory response, the health issue under consideration needs to be clearly stated.

Neural tube defects (NTDs) are serious birth defects. Although the majority (about 70%) of pregnancies affected by an NTD will result in a late stage-termination (usually after 20 weeks), infants born with an NTD will either be stillborn, or in the case of spina bifida in particular, have minor to severe health problems. Live born infants with anencephaly or encephalocele comprise only a small proportion of those with NTDs who survive beyond one year of age.

There is convincing evidence that increased folic acid intake among women of child-bearing age from supplements and/or fortified foods can reduce the risk of NTDs.

Various education initiatives have been undertaken to encourage women of child-bearing age to increase their dietary folate intake and take folic acid supplements. Despite these campaigns, current advice for supplemental folic acid is not followed by a majority of women in the target group. Reasons for this include:

- lack of knowledge among women about the benefits of folic acid;
- knowledge not always equating to behavioural change; and
- barriers to regular supplement use at the recommended dose, such as cost and access.

A significant issue in relation to supplementation is the fact that approximately half of all pregnancies are unplanned and the neural tube develops before a woman would know she is pregnant.

Voluntary fortification of certain foods with folic acid was first permitted in Australia in 1995 and in 1996 in New Zealand. Since that time it has resulted in modest increases in folic acid intake among women of child-bearing age. This is due primarily to the variable uptake by industry of the voluntary permissions, particularly in New Zealand.

Some States in Australia, with good quality data collection systems, have reported a fall in the NTD rate since voluntary fortification was introduced. While not all NTDs can be prevented, there are indications that the proportion of pregnancies affected by an NTD can be further reduced.

Internationally, a number of countries have reported successful mandatory folic acid fortification programs as an equitable and sustainable means of increasing the folic acid intake of women of child-bearing age and thereby reducing the incidence of NTDs.

4. Objectives

The specific objective of this Proposal is to reduce the incidence of NTDs in Australia and New Zealand through mandatory fortification of the food supply with folic acid.

The goal is to reduce the incidence of NTDs to the maximum extent possible by increasing dietary folic acid intakes in women of child-bearing age. The prime focus for achieving a reduction in this risk will be to increase the folic acid content of the food supply without jeopardising the safety of the food supply.

The risks and benefits to the general population of increased folic acid intake are considered when making this determination.

In developing or varying a food standard, FSANZ is required by its legislation to meet three primary objectives which are set out in Section 10 of the *FSANZ Act 1991*. These are:

- the protection of public health and safety;
- the provision of adequate information relating to food to enable consumers to make informed choices; and
- the prevention of misleading or deceptive conduct.

In developing and varying standards, FSANZ must also have regard to:

- the need for standards to be based on risk analysis using the best available scientific evidence;
- the promotion of consistency between domestic and international food standards;
- the desirability of an efficient and internationally competitive food industry;
- the promotion of fair trading in food; and
- any written policy guidelines formulated by the Ministerial Council.

RISK ASSESSMENT OF MANDATORY FORTIFICATION

This risk assessment quantifies the NTD-related benefit that can be expected from a program of mandatory fortification of food with folic acid in Australia and New Zealand and considers other potential health benefits and risks for the population as a whole from an increase in the dietary consumption of folic acid.

To do this, a number of experts were commissioned to carry out literature reviews of benefits and risks and these are identified in the following discussion. A comprehensive dietary intake assessment was performed, based on the universal folic acid fortification of the most likely vehicle, bread-making flour, and an expert scientific group was convened to obtain advice on a series of questions that have arisen during the assessment process. The full text of the literature reviews is available at www.foodstandards.gov.au. A compilation of the main findings from the reviews and details of the dietary intake assessment are provided as attachments (see Attachments 6 and 7).

5. What are the potential health benefits, particularly regarding rates of NTDs, and potential health risks from further increases in folic acid intake through mandatory fortification?

The following section includes a discussion of the potential health benefits and risks associated with increased folic acid intake. Where data are available the benefits and risks arising from the international experience of mandatory folic acid fortification are discussed. Discussion on the risks and benefits associated with the proposed level of fortification in Australia and New Zealand is included in Section 7.

The potential health benefits and risks of increased folic acid intake are discussed in greater detail in Attachment 6.

5.1 Potential health benefits

5.1.1 Reduction in the incidence of neural tube defects

There is convincing evidence from both cohort studies and randomised controlled trials that increased folic acid intake at doses ranging from 400-4,000 µg/day and a related increase in folate status reduces the risk of occurrence and recurrence of neural tube defects (MRC Vitamin Study 1991; Czeizel and Dudas 1992; Berry *et al.*, 1999; Lumley *et al.*, 2001).

5.1.1.1 Experience in other countries following mandatory fortification

Significant falls in NTD rates have been attributed to the introduction of mandatory folic acid fortification in countries such as Canada, the United States and Chile (Table 2).

In Canada, rates of NTDs have fallen markedly, ranging from 49-78% in different provinces with the extent of the reduction being inversely correlated with the pre-fortification NTD rate.

In the United States, rates of NTDs have fallen by 27% although the analysis underpinning the introduction of mandatory fortification predicted a reduction of 41%.

In addition to a decline in incidence and birth prevalence of NTDs, researchers in the United States have also recently reported improved first-year survival of infants born with spina bifida post- fortification; possibly due to the potential role of folic acid in reducing the severity of NTDs (Bol *et al.*, 2006).

Following the introduction of mandatory fortification in the United States, folic acid intake is estimated to have increased to greater than 200 µg/day (Choumenkovitch *et al.*, 2002; Quinlivan and Gregory, 2003) compared with the projected average increase in intake of 70-130 µg /day (USFDA 1993). As a result, the mean serum folate levels in all age and sex groups have more than doubled (Dietrich *et al.*, 2005). Folic acid supplement use remains relatively unchanged (USCDC, 2004). Despite improvements in folate status across the whole population, low red blood cell folate is still prevalent in non-Hispanic blacks (about 21%) (Ganji and Kafai, 2006).

The greater percentage decline in Canada compared with the United States reflects the higher baseline NTD rates in Canada at the time mandatory fortification was introduced.

There are limited data from Canada to indicate if mandatory fortification has also led to a substantial increase in folate status in those provinces with previously high rates of NTDs. The exception is Ontario, Canada, where Ray *et al.* (2002) reported a mean increase in folate status (measured as mean red cell folate) of 41% since mandatory fortification was introduced.

In Chile, the birth prevalence rates for spina bifida and anencephaly have halved. Induced pregnancy terminations, which are illegal in Chile, were not reported.

5.1.1.2 Comparative rates for Australia and New Zealand

Between 1999 and 2003, the incidence of NTDs in Australia (based on reported rates in Victoria, South Australia and Western Australia) was 1.32 per 1,000 total births (Bower and de Klerk, 2005¹⁶). These rates are similar to the pre-fortification rates in the United States and Ontario, Canada.

In New Zealand, the birth prevalence is estimated to be 0.66 per 1,000 (including live births and stillbirths, but not terminations). No complete data for terminations are available from New Zealand.

Table 2: NTD rates in Canada, the United States and Chile: pre- and post-mandatory fortification compared with Australian NTD rates

Country	Year mandatory folic acid fortification was introduced	Pre-fortification NTD rate per 1,000 (Reference time period)	Post-fortification NTD rate per 1,000 (Reference time period)	Decline in NTD rate %
Australia ¹	na	1.32* (1999-03)	na	na
Canada ²	1998	0.75** (1997)	-	-
Newfoundland ³		4.36* (1991-97)	0.96* (1998-01)	78%
Nova Scotia ⁴		2.58* (1991-97)	1.17* (1998-00)	54%
Ontario ⁵		1.13*(a) (Jan 94-Dec 97)	0.58*(a) (Jan 98-Mar 00)	49%
United States ⁶	1998	1.06*(a) (1995-96)	0.76*(a) (1999-00)	27%
United States ⁷		0.38** (Oct 95-Dec 96)	0.31** (Oct 98-Dec 99)	19%
Chile** ⁸	2000	- (1990-00)	- (2001-02)	51%**

(a) NTD rates are spina bifida and encephalocoele only.

'na' – Not applicable; '-' No data available; * Incidence (i.e. includes terminations); ** Birth prevalence

Sources:

¹⁶ FSANZ commissioned report available at www.foodstandards.gov.au

1. Bower and de Klerk, 2005 (The Australian rate is extrapolated from the NTD rate for Victoria, South Australia and Western Australia).
2. Minister of Government Services and Public Works (2000).
3. Liu *et al.* (2004).
4. Persad *et al.* (2002).
5. Ray *et al.* (2002).
6. USCDC (2004).
7. Honein *et al.* (2001).
8. Lopez-Camelo *et al.* (2005).

In summary, there is strong evidence from other countries that have introduced mandatory fortification that increases in intake of folic acid up to 200 µg/day are associated with significant reductions in the incidence of NTDs. The extent of the fall in incidence appears to depend on the prevailing background rate of NTDs prior to fortification.

5.1.2 Other potential health benefits from increased folic acid intakes

Possible benefits from increased folic acid intake in the total population may accrue for several diseases and conditions that constitute a considerable health burden in the Australian and New Zealand population. Diseases investigated for a potential inverse association with increased folic acid intakes are cardiovascular disease, some cancers, and diseases associated with cognitive function. These diseases constitute a major portion of each country's burden of disease, with cardiovascular disease and cancers being the leading contributors (Mathers *et al.*, 1999b; Ministry of Health, 2001). The potential impact on birth weight has also been considered.

The evidence for an association between increased folic acid intake and cardiovascular disease, long thought to be probable due to the link between folic acid and homocysteine, is currently in doubt.

The evidence is inconclusive for a protective effect on cancer or cognitive function even at doses of folic acid much higher than would be achieved through mandatory fortification.

The evidence is inconclusive for a positive effect on birth weight from increased folic acid intake.

Further information on the potential health benefits from increased folic acid intake is given in Attachment 6.

5.2 Potential health risks

The following discussion considers potential health risks and uncertainties associated with increased folic acid intakes, in particular the safety associated with intakes of folic acid up to 1,000 µg/day – the upper level of intake (UL) for adults. The UL for folic acid is based on the potential to mask the diagnosis of vitamin B₁₂ deficiency.

5.2.1 Masking of the diagnosis of vitamin B₁₂ deficiency

It has been suggested that high folic acid intakes (>1,000 µg per day) could delay the diagnosis and eventual treatment of severe vitamin B₁₂ deficiency in older people (Capra *et al.*, 2005¹⁷). This could occur by correcting the anaemia that may accompany vitamin B₁₂ deficiency which is one of the clinical signs traditionally relied on for diagnosis.

Recent surveys conducted in Australia and New Zealand show a small to moderate prevalence of vitamin B₁₂ deficiency among older people. Six to twelve per cent of those surveyed were classified as deficient and a further 16-28% classified as at risk of deficiency or marginally deficient (Flood *et al.*, 2004a; Green *et al.*, 2005a). Information as to whether those found to be deficient had associated haematological or neurological sequelae was not collected, however, they had not been previously suspected of being vitamin B₁₂ deficient.

Vitamin B₁₂ deficiency in older people is mainly due to a reduced capacity to release vitamin B₁₂ from food sources (such as foods of animal origin, in particular red meat, dairy foods and eggs, but also foods fortified with vitamin B₁₂ such as soy-based beverages and some yeast extracts) during digestion, or alternatively as a result of malabsorption of free vitamin B₁₂ from the gut caused by gastrointestinal dysfunction. Very little deficiency in this age group is caused by inadequate dietary intake.

Vegetarians are also at risk of vitamin B₁₂ deficiency due to a reduced vitamin B₁₂ intake; vegans more so than lacto-ovo vegetarians because of a complete absence of animal products in vegans' diets. Hokin and Butler (1999b) report that serum B₁₂ in 11 vegan Australian Seventh Day Adventist ministers was not different from serum B₁₂ levels in non-vegan vegetarian ministers. There are no data on the prevalence of vitamin B₁₂ deficiency among vegans in Australia or New Zealand (Capra *et al.*, 2005).

Vitamin B₁₂ deficiency may take decades to develop and affected individuals may be asymptomatic or may present with a wide spectrum of haematological, neurological and/or psychiatric signs and symptoms. Vitamin B₁₂ deficiency is recognised through presentation of clinical signs of abnormal haematology or neuropathy and a definitive diagnosis is usually obtained from serum vitamin B₁₂ levels. Doctors are advised to consider vitamin B₁₂ deficiency as a possible cause when presented with individuals who have clinical signs of anaemia or neuropathy.

The UL for folate (1,000 µg per day of folic acid) in adults has been set based on the potential to mask the diagnosis of vitamin B₁₂ deficiency and the potential to exacerbate the related neurological symptoms (Institute of Medicine, 1998). However, there is a safety margin of five built into the UL, and intakes of folic acid above the UL are rare from fortification alone (see Section 7.2.2).

Among countries that have introduced mandatory fortification with folic acid, there have been no reports of adverse effects on neurological function, especially in people aged 65 years and over with low vitamin B₁₂ status (SACN, 2005).

¹⁷ FSANZ commissioned report available at www.foodstandards.gov.au

5.2.2 *Effects of exceeding the upper level of intake (UL) for individuals who are not vitamin B₁₂ deficient*

The UL for folic acid has been set on the basis of masking diagnosis of vitamin B₁₂ deficiency at high doses. However, in the absence of vitamin B₁₂ deficiency, there is little information on adverse effects which may occur at levels above the UL..

The UL set for adults has been applied to younger age groups on a relative body weight basis. However, vitamin B₁₂ deficiency is rare in children, and so the relevance of this endpoint and hence the risk to children is not clear. Due to their lower body weight and their consumption of more food per kilogram of body weight when compared to adults, children are more likely to exceed the UL for folic acid if staple foods are fortified.

In the United States post mandatory fortification, approximately 15-25% of children aged 1-8 years were estimated to have folic acid intakes above the UL (some up to 2-3 times the UL) and 0.5-5% of adults were estimated to consume >1,000 µg of folic acid/day (Lewis *et al.*, 1999). No adverse effects have been reported, although it is unclear if any surveillance is being undertaken, particularly as there was no commitment at the time mandatory fortification was introduced in the United States to monitor adverse health outcomes (Rosenberg, 2005).

5.2.3 *Other potential health risks from increased folic acid intake*

Other potential health risks from increased folic acid intake in the total population have also been reported in the literature. These include the likelihood of:

- increases in multiple births;
- increases in cancer incidence; and
- drug interactions.

There is a possible association between folic acid and multiple births based on findings from studies involving daily folic acid supplement use of up to 800 µg that showed a small per cent increase in twinning (<5%) (Halliday and Muggli, 2005¹⁸). Multiple births result in more complications and poorer outcomes than singleton births.

From the conflicting results and the small number and limited types of studies (primarily involving supplement use) there is insufficient evidence to establish an association between folate intakes and an increased risk of cancer (Bower and de Klerk, 2005¹⁹). Most studies in humans do not indicate an adverse effect.

Although, there is the potential for an increased folate intake to interfere with certain medications, available scientific evidence has not demonstrated any clinically significant interaction with therapeutic medicines from folate intakes up to 1,000 µg/day (Colinas and Cook, 2005²⁰).

¹⁸ FSANZ commissioned report available at www.foodstandards.gov.au

¹⁹ FSANZ commissioned report available at www.foodstandards.gov.au

²⁰ FSANZ commissioned report available at www.foodstandards.gov.au

5.2.4 *Uncertainties about increased risks*

The potential impact of an increased intake of synthetic folic acid on unmetabolised circulating folic acid is only just emerging in the scientific literature. The scientific discussion around this matter is not well developed, and cannot therefore be used to inform the assessment of risks associated with folate fortification.

6. What is an appropriate food vehicle and what level of folic acid intake can be achieved among women of child-bearing age using mandatory fortification?

This section describes the rationale for the selection of the food vehicle(s) and the safety and technical issues associated with adding folic acid to the food vehicle. It also describes various fortification scenarios aimed at maximising folic acid intake to the greatest extent possible among women of child-bearing age based on recommended target levels while ensuring that there is no additional health risk to the population as a whole, including young children.

6.1 Selection of food vehicle

FSANZ has drawn on international experience in narrowing the range of food vehicle options for mandatory folic acid fortification. In the majority of countries mandating folic acid fortification, flour has been selected as the food vehicle.

Guidance on the suitability of potential food vehicles for fortification is also provided by published international criteria (Codex Alimentarius Commission, 1991; Darnton-Hill, 1998; Nutrivit 2000). These criteria include the need for the selected vehicle(s) to:

- be regularly consumed by the population at risk in stable, predictable amounts (upper and lower intake levels known);
- be available to the target population regardless of socio-economic status;
- supply optimal amounts of micronutrient without risk of excessive consumption or toxic effects;
- retain high level stability and bioavailability of the added micronutrient under standard local conditions of storage and use;
- be economically feasible;
- be centrally processed so that quality control can be effectively implemented; and;
- not interact with the fortificant or undergo changes to taste, colour or appearance as a result of fortification.

From a practical perspective, bread-making flour was considered a feasible vehicle due to the existing mandatory fortification requirement with thiamin in Australia. The suitability of bread-making flour in relation to the above criteria has been addressed in relevant sections of this report, in particular Sections 6, 7 and 9.

6.1.1 *The suitability of bread-making flour as the selected vehicle*

Bread-making flour is widely and regularly consumed by the target group consistent with the first of the above criteria. Evidence from national nutrition surveys conducted in the 1990s indicates 83% of Australian and 81% of New Zealand women of child-bearing age consume products containing bread-making flour. Evidence from an Australian survey among adults in the 1980s reported similar consumption patterns indicating the consistency of consumption of foods containing bread-making flour over this period. Products containing bread-making flour are therefore a staple, relatively low cost food regularly consumed by the majority of the target population.

Flour is also particularly suited as a food vehicle as the dry, free flowing powders of the fortificant and flour can be easily blended.

6.1.2 *Consideration of the type of bread-making flour to provide consumer choice*

The option of fortifying either ‘white bread-making flour’, or ‘all bread-making flour’ was investigated on the basis that white bread-making flour would provide consumers with a choice between fortified white and non-fortified wholemeal bread and bread products. However, industry consultations indicated that wholemeal flour and wholemeal bread is commonly produced by returning the various bran and germ extractions during the milling process to white flour either at the mill or at the bakery. Thus, most wholemeal or wholegrain breads contain some white bread-making flour. Therefore, the fortification of white bread-making flour only, would be impractical and not provide for legitimate consumer choice.

6.1.3 *Stability of folic acid added to bread-making flour*

There are two key issues to consider in reviewing the stability of added folic acid: stability during storage and during processing (e.g. baking). Folic acid added to food is stable to a variety of processing and storage conditions. In contrast, natural folate is relatively unstable. Naturally occurring folates are easily destroyed during harvesting, storage, processing and preparation. Up to 75% of natural folate may be lost due to these processes (McKillop *et al.*, 2002).

6.1.3.1 Storage losses

Generally, the retention of folic acid is high during storage. Studies during the 1970s indicated that folic acid mixed with flour is stable (100% retention) after six months at room temperature or four weeks at 45°C.

Even after one year of storage at around 45°C, flour showed only small losses. Similarly, retention was 90-100% in pre-mix fortified yellow corn (NHMRC, 1995). A 1995 study in which folic acid was added at either 100 µg/100 g or 500 µg/100 g of flour showed around 100% retention at a range of temperatures (-23 to 48.8°C) after one year’s storage (Morgan, 1996).

6.1.3.2 Processing losses

The average loss of folic acid from bread made with fortified flour appears from the literature to be about 20% but may be as high as 40%. To account for these losses in fortified flour, millers would apply an average of 1.25 to 1.67.

In a study that examined sweet biscuits, the mean loss of folic acid in the biscuits was 15% under optimal conditions. In another study on crackers, mean loss was 7.2% (with a maximum of 15.3%) (NHMRC, 1995).

Further detailed discussions on the technical aspects of the chosen food vehicle, bread-making flour, are in the Food Technology report (see Attachment 10).

6.1.4 Bioavailability of folic acid

Bioavailability refers to the ability of the body to extract, absorb, and metabolise nutrients in food. The bioavailability of folate is not fully understood and there appear to be a number of factors that influence it.

It is difficult to predict the bioavailability of folate (both naturally-occurring and synthetic forms) from a mixed diet, based on studies of individual foods (Gregory, 1995; Brouwer *et al.*, 2001; Sanderson *et al.*, 2003).

Factors that influence folate availability from food include:

- composition of the food matrix (including the presence of antagonistic components most notably organic acids binding to other food components and encapsulation within plant cells leading to reduced exposure to digestive enzymes);
- amount of folate consumed;
- chemical form of folate; and
- host-related factors including nutrient and health status and genetic factors.

The bioavailability of naturally-occurring folates is thought to be only 50-60% while folic acid, used to fortify foods or as a supplement, is thought to be about 85% bioavailable. On this basis, folic acid added to bread-making flour is expected to have a similar bioavailability. A substantial increase in the folate status of populations exposed to mandatory folic acid fortification reflects its bioavailability²¹. Folic acid as a supplement is almost 100% bioavailable on an empty stomach (NHMRC and NZMoH, 2006)

6.2 Dietary targets

The recommendation for women of child-bearing age to reduce the risk of having an NTD-affected pregnancy is 400 µg/day of folic acid from supplements or fortified foods, which equates to 670 µg DFEs, in addition to food folate (NHMRC and NZMoH, 2006).

²¹ In Ontario, Canada, there has been a mean increase in folate status (mean red cell folate) of 41% since mandatory fortification was introduced in 1998 (Ray *et al.*, 2002) and in the United States, the folate status (mean serum folate) in all age and sex groups has more than doubled (Dietrich *et al.*, 2005).

While it is desirable to maximise the proportion of women who achieve this level of intake, the variability in intake among this group and in other population sub-groups limits what can be achieved with folic acid fortification without a significant proportion of other population sub-groups exceeding the UL.

6.3 Fortification scenarios

In assessing the introduction of mandatory fortification of food with folic acid in Australia and New Zealand, a dietary intake assessment (see Attachment 7) was conducted to estimate:

- **‘Baseline’** - current folic acid intakes from food alone²² based on the current uptake by industry of voluntary folic acid permissions outlined in Standard 1.3.2 of the Code for each relevant food category; and
- **‘Scenario 1’** - folic acid intakes from food alone for ‘Baseline’ (except bread) and the introduction of mandatory fortification of all bread-making flour.

The dietary intake assessment scenarios did not take into account naturally-occurring folate in food and the impact of folic acid from supplements was analysed separately. There is little evidence to support naturally-occurring folate as protective against NTDs (Green, 2005²³). Estimated intakes of folic acid from fortified foods, in addition to supplements, are discussed in Section 6.7.2.

6.4 Assessment of baseline folic acid intakes

For both Australia and New Zealand, ‘baseline’ folic acid intakes were assessed using folic acid concentration data from analytical programs, current food labels and recipe calculations where foods contained a known folic acid fortified food as an ingredient (see Section 2.4.1). Label concentrations were not adjusted for under- or overage of folic acid as there was insufficient information available on which to reliably assess the extent of such under- or overages. Where information on natural folates was available, this was used to adjust the declared label folates value to estimate added folic acid.

6.5 Selection of folic acid concentrations

Three levels of folic acid fortification were considered for mandatory fortification: 100 µg, 200 µg and 300 µg of folic acid per 100 g of bread-making flour retained in the final product after food preparation, cooking and storage. These concentrations were selected based on similar concentrations added to cereal-based products under mandatory folic acid fortification policies in the United States (140 µg/100 g of enriched cereal grain products) and Canada (150 µg/100 g of flour). The concentrations were adjusted based on the proportion of bread-making flour found in each food. For example, bread, on average contains about 60% bread-making flour. Hence 100 g of bread (about three slices) contains 60 g of bread-making flour.

²² Foods have been assumed to contain bread-making flour if Australian products were labelled as containing added thiamin. Thus, bread-making flour was assumed to be an ingredient in all plain, fancy, sweet, and flat breads and bread rolls, muffins, crumpets, scones, pancakes, pikelets, crepes, yeast donuts, pizza bases and crumbed products. Breakfast cereals, although often containing added thiamin, were not considered to be made from bread-making flour. Food intake data are derived from the 1995 and 1997 Australian and New Zealand national nutrition surveys, respectively.

²³ FSANZ commissioned report available at www.foodstandards.gov.au

If folic acid is added to bread-making flour to obtain a residual amount of 200 µg of folic acid per 100 g of flour there would be 120 µg of folic acid in 100 g of bread.

6.6 Preliminary results of dietary intake assessment

Preliminary dietary modelling results indicated that the introduction of mandatory fortification of all bread-making flour with 300 µg of residual folic acid per 100 g of bread-making flour was likely to result in a high proportion of some population sub-groups exceeding the UL. Of greatest concern was that 20% of 2-3 year olds and 9% of 4-8 year olds were likely to exceed the UL. There is doubt about the relevance of this UL for children, however, exceeding the UL is not desirable, particularly given the uncertainty around the use of voluntary fortification permissions by industry if mandatory fortification were introduced. For this reason, mandatory fortification of all bread-making flour with 300 µg of folic acid per 100 g was not considered further.

6.7 Dietary intake assessment for women of child-bearing age

6.7.1 Estimated folic acid intake from fortified foods

6.7.1.1 Baseline

It is estimated that Australian women aged 16-44 years are currently consuming about 95 µg of folic acid per day from food voluntarily fortified. In New Zealand, the amount is less due to the lower uptake of voluntary fortification in that country; about 58 µg per day among the target group.

In estimating the impact of mandating folic acid fortification, it has been assumed that the intake of folic acid from voluntary fortification remains constant.

6.7.1.2 Scenario 1

If intakes from voluntary fortification remain unchanged (baseline) then fortifying all bread-making flour at residual levels of 200 µg/100 g results in an estimated mean intake of folic acid from fortified foods of 195 µg per day in Australia and 189 µg per day in New Zealand among women of child-bearing age (Table 3). However, even with this additional intake, just 5% of women in Australia and 2% in New Zealand would meet the recommended intake of 400 µg of folic acid per day from fortified foods.

Table 3: Estimated mean folic acid intake for women of child-bearing age* (+mean increase) due to the introduction of mandatory folic acid fortification of all bread-making flour

Model	Residual concentration of folic acid ($\mu\text{g}/100\text{ g}$)	Mean folic acid intake ($\mu\text{g}/\text{day}$)	
		<i>Australia</i>	<i>New Zealand</i>
Baseline		95	58
Scenario 1			
All bread-making flour	100	135 (+40)	123 (+65)
	200	195 (+100)	189 (+131)

* Women aged 16-44 years.

6.7.2 *Estimated folic acid intake from fortified foods and supplements*

Additional calculations were conducted to estimate folic acid intakes for women of child-bearing age who consume a folic acid supplement as well as fortified food. Supplements containing folic acid concentrations of 200 μg (Australia and New Zealand), 500 μg (Australia only) and 800 μg (New Zealand only) were selected because folic acid supplements containing 500 μg of folic acid are widely available in Australia, whereas in New Zealand, 800 μg of folic acid supplements are recommended (see Section 2.1.2). In addition, a daily supplement containing 200 μg was selected on the basis of a recent study (Bower *et al.*, 2005).

When women receive 200 μg of folic acid per day from supplements in addition to fortified foods, their mean intake is only slightly below the recommended 400 μg of folic acid per day. To achieve 400 μg of folic acid per day a woman could consume one 40 g serve of voluntarily fortified breakfast cereal (containing 120 μg folic acid) + two slices of bread (containing 72 μg per 60 g of folic acid based on a fortification level of 200 $\mu\text{g}/100\text{ g}$ of residual folic acid in the flour) + a supplement containing 200 μg of folic acid. If supplements containing 500 μg (in Australia) and 800 μg (in New Zealand) are taken daily mean intakes increase substantially (Table 4).

It should be noted that these estimated folic acid intakes assume all females 16-44 years receive additional folic acid from folic acid supplements, which although unlikely to occur, highlights the resulting outcome if universal supplementation prevailed.

Table 4: Estimated folic acid intakes from voluntary and mandatory fortified foods and supplements for Australian and New Zealand women of child-bearing age *

Model	Residual concentration of folic acid (µg/100 g)	Folic acid intake from folic acid in food and supplements (µg/day)			
		Australia		New Zealand	
		Mean Intake + 200 µg	Mean Intake + 500 µg	Mean Intake + 200 µg	Mean Intake + 800 µg
Baseline		295	595	258	858
Scenario 1					
All bread-making flour	100	335	635	323	923
	200	395	695	389	989

* Women aged 16-44 years.

7. Based on the expected increase in folic acid intake from mandatory fortification what are the likely health benefits and risks?

7.1 Expected reduction in neural tube defects

The number of NTDs that could be prevented for Scenario 1 described in Section 6.7.1.2 has been estimated using an approach recommended by (Wald *et al.*, 2001). The Wald model is underpinned by a dose-response relationship between folic acid intake and risk of NTDs according to serum folate concentrations (Attachment 9).

The results indicate that at a residual concentration of 200 µg /100 g of bread-making flour, an estimated 14-49 NTD-affected pregnancies would be prevented in Australia and 4-14 NTD-affected pregnancies prevented in New Zealand. This represents a reduction of up to 14% in Australia and up to 20% in New Zealand. Slightly fewer cases would be expected at the lower concentration level (Table 5).

As some Indigenous populations in Australia have double the NTD rate compared with the non-Indigenous population (Bower *et al.*, 2004), the fall in NTD incidence among some Australian Indigenous populations may be greater.

It is estimated that 70% of NTDs could be prevented through universal use of folic acid supplements (Berry *et al.*, 1999) although the extent of the potential fall is dependent on the folate status of the target population.

Table 5: Estimated number of NTD pregnancies prevented for all bread-making flour at different folic acid concentrations in Australia and New Zealand

	Residual concentration of folic acid µg/100 g	Mean increase in folic acid intake* µg/day	Estimated number of NTD pregnancies prevented/year (95% CI)**	Estimated number of NTD live births/year	Estimated number of NTD stillbirths/year	Estimated number of NTD terminations/year
Australia						
All breadmaking flour	100	40	10 (6-20)	2	1	7
	200	100	26 (14-49)	5	3	18
New Zealand						
All breadmaking flour	100	65	4 (2-7)	1	1	3
	200	131	8 (4-14)	1	1	5

* Estimates of the mean increase in folic acid intake are based on dietary modelling using DIAMOND.

** Estimates of the number of NTDs prevented are based on the approach by Wald *et al.* (2001) (see Attachment 9).

7.2 Health risks to the whole population

To assess health risks that might arise from mandatorily fortifying food with folic acid, the folic acid intake of population sub-groups was compared to the appropriate UL. The health risks to the whole population are discussed in greater detail in Attachment 8.

7.2.1 Comparison of estimated dietary folic acid intakes with the UL

The proportion of each population group exceeding the UL²⁴ is shown in Table 6.

²⁴ The UL (see Section 5.2.2), which is based on masking the diagnosis of vitamin B12 deficiency, has been set for different age groups on a relative body weight basis (see Figure 1, Attachment 6).

Table 6: Per cent of Australian and New Zealand respondents with folic acid intakes above the UL at Baseline and Scenario 1

Population Group	Baseline (% > UL)	Scenario 1: All bread-making flour (% > UL)	
		100 µg/100 g	200 µg/100g
Australia			
2-3 years	1	2	6
4-8 years	0.6	1	3
9-13 years	0.8	1	2
14-18 years	0.5	0.8	2
19+ years	0.2	0.2	0.3
New Zealand*			
15-18 years	0	0	0.4
19+ years	0.04	0.02	0.05

* Data from the New Zealand national nutrition survey is only available for ages 15 years and over.

7.2.2 Masking of the diagnosis of vitamin B₁₂ deficiency

7.2.2.1 Young children

Vitamin B₁₂ deficiency is rare in children and so the relevance of the UL and hence the risk to children is not clear.

At all fortification levels, including the baseline level, Australian children aged 2-3 years were the most likely population sub-group to exceed the UL, due to their relatively higher food consumption on a body weight basis. However, for Baseline and Scenario 1, at both levels of fortification, the percentage of respondents with intakes greater than the UL declined with increasing age.

At residual fortification levels of 100 µg /100 g and 200 µg /100 g, a small percentage of children aged 2-3 and 4-8 years exceed the UL (5-6% and 3%, respectively). Of the small proportion of children that are estimated to exceed the UL following the introduction of fortification at a residual level of 200 µg/100g flour, all are predicted to have intakes below those which would be expected to cause adverse effects. Such intakes still remain within the margin of safety. This, combined with the low probability of vitamin B₁₂ deficiency within this age group, suggests that fortification up to residual levels of 200 µg/100 g flour is very unlikely to put children at risk.

7.2.2.2 Target group (women 16-44 years)

Only a very small percentage (0.1%-0.2%) of women aged 16-44 years exceed the UL at residual fortification levels of 100 µg/100 g of flour and 200 µg/100 g of flour. This percentage is unchanged from the percentage of women exceeding the UL at baseline.

Thus, there is no additional risk to health among women of child-bearing age from the level of folic acid intakes likely to arise from mandatory fortification.

The percentage of the target group exceeding the UL increases significantly when folic acid intake from supplements is considered, in addition to folic acid from fortified food. This particularly applies to the 800 g supplement recommended in New Zealand which contributed to 40% of New Zealand women in the target group exceeding the UL. However, due to the low prevalence of vitamin B₁₂ deficiency in women of child-bearing age, intakes of folic acid at or above the UL are unlikely to have adverse effects.

As daily 400 µg folic acid supplements are considered to be effective in the prevention of NTDs, consideration could be given to reducing the amount of folic acid in New Zealand supplements to avoid women having unnecessarily high intakes.

7.2.2.3 Older people

The sub-group most at risk of adverse effects if the UL is exceeded are older people as vitamin B₁₂ deficiency is most prevalent in this group (see Section 5.2.1). Dietary intake assessment showed none of the individuals aged 70 years and over exceeded the UL at residual fortification levels up to 200 µg/100 g of flour. Only a very small proportion (0-0.2%) of individuals aged 50-69 years exceed the UL at these fortification levels. This is very similar to the percentage exceeding the UL at baseline (0-0.1%). Therefore, it is unlikely that fortification at a residual level of 200 µg/100 g of flour will increase the risk of adverse effects in this population sub-group because of the increased incidence of masking the diagnosis of vitamin B₁₂ deficiency.

7.2.2.4 Conclusion on masking of the diagnosis of vitamin B₁₂ deficiency

Based on the dietary intake assessment, it is unlikely that fortification of all bread-making flour at a residual level up to 200 µg/100 g of flour will increase masking the diagnosis of vitamin B₁₂ deficiency in either the target or non-target populations.

7.2.3 Uncertainties

In the absence of vitamin B₁₂ deficiency, there is little information on the potential effects (adverse or beneficial) of an increase in folic acid intakes in the general population might be over the long term. Data from overseas do not indicate any particular cause for concern at this stage, however, there are significant uncertainties and insufficient evidence to be able to predict all possible outcomes from an increase in folic acid intakes.

There is significant uncertainty around how the use of voluntary fortification permissions might change following the implementation of mandatory fortification. If the uptake of voluntary fortification increases, intakes of folic acid could be higher than estimated in the dietary intake assessment. Due to the uncertainty of the impact of increased folic acid intakes on health in the long term, it will be essential to closely monitor all identified potential adverse health outcomes.

8. Risk assessment summary

In terms of the potential health benefits, there is strong evidence based on international experience of mandatory fortification in countries with pre-fortification NTD rates similar to Australia and New Zealand that mandatory folic acid fortification of all bread-making will further reduce the incidence of NTDs. The extent of the reduction, however, depends on several factors including the initial folate status of women and the background prevalence of NTDs.

The totality and quality of evidence in support of a protective effect of folate on cardiovascular disease, some cancers and cognitive function is variable with no evidence of a beneficial impact on these conditions following mandatory folic acid fortification in other countries. The protective effect of folate on cardiovascular disease, considered probable for many years, has recently been challenged. The studies in question, however, have assessed only the secondary prevention of the disease (rather than primary prevention) and involve much higher doses (e.g. 2,500 µg of folic acid per day in capsule form) than would occur with mandatory fortification. The evidence of a possible protective effect of folate on some cancers and cognitive decline is inconclusive.

In terms of the potential health risks, there have been no reports of adverse effects on neurological function in older people with low vitamin B₁₂ status among countries that have introduced mandatory fortification with folic acid. There is a possible association between folic acid and multiple births but insufficient evidence linking increased folic acid intake with increased risk of cancer. There have been no clinically significant interactions with folic acid intakes up to 1,000 µg/day and therapeutic medicines.

These conclusions are, however, based on limited evidence. As a result it cannot be concluded that mandatory fortification is completely without health risks either from the potential risks described above or uncertainties about health risk such as unmetabolised circulating folic acid from chronic, long-term exposure to significantly higher intakes among the population as a whole, but particularly from childhood onwards. As a result, a conservative approach to mandatory fortification is recommended.

With this view in mind, the dietary intake assessment indicates that fortification of all bread-making flour at residual levels of 200 µg of folic acid per 100 g of flour will result in an estimated mean increase in folic acid intake in the target population (women aged 16-44 years) of 100 µg and 131 µg per day, in Australia and New Zealand, respectively. In response to this anticipated increase in intake, the number of pregnancies affected by an NTD is likely to reduce by up to 14% in Australia and up to 20% in New Zealand.

As just 5% of women of child-bearing age in Australia and 2% in New Zealand would meet the recommended intake of 400 µg of folic acid per day at this level of fortification, it will be necessary to continue to promote folic acid supplements. Also, due to the uncertainty of increased folic acid intakes on health in the long term, it will be essential to monitor all identified adverse health outcomes.

RISK MANAGEMENT OF MANDATORY FORTIFICATION

9. Identification of risk management issues

The following section identifies risks, other than public health and safety risks identified by the Risk Assessment, and discusses associated issues relevant to consideration of mandatory folic acid fortification. These include social, consumer and economic issues particularly related to the selected food vehicle of bread-making flour.

9.1 Appropriateness of the selected food vehicle

The selection of bread-making flour as the preferred food vehicle is discussed in Section 6.1. Additional points with regard to the suitability of bread-making flour as a food vehicle for mandatory folic acid fortification are discussed below.

9.1.1 Bread-making flour as the selected food vehicle

FSANZ has drawn on international experience with mandatory folic acid fortification in determining an appropriate food vehicle for mandatory folic acid fortification. In addition, Australia's experience with mandatory thiamin fortification provides an opportunity to extend the use of existing infrastructure to the mandatory addition of folic acid to bread-making flour. Furthermore, submitters to the Initial Assessment Report who provided comment on possible food vehicles favoured flour or bread as suitable food vehicles.

Bread-making flour (as bread and bread products) is a staple food which is widely and regularly consumed by the target group (83% of Australian and 81% of New Zealand women) across all socio economic groups.

Bread and bread products are also readily available at a relatively low cost. The cost of bread and bread products is therefore not considered to be a barrier to consumption.

9.1.2 Fortification of bread-making flour versus bread.

The addition of folic acid to flour at the end of the milling process was selected as the preferred point of fortification for practical reasons. This provides centralised fortification and quality control processes with less than 40 flour mills in Australia and seven in New Zealand. Additionally, Australian millers already have the infrastructure in place for the mandatory addition of thiamin to bread-making flour, using feeders at the end of the milling process.

Technically, folic acid can be added to bread at the bakery, as part of additional ingredients such as improvers, rather than to flour, at the mill. The option of adding folic acid at the improver stage of bread production in a premix with other ingredients was considered but was assessed as presenting practical difficulties. Bread is manufactured not only in large commercial bakeries, but also in smaller artisan bakeries, 'in house' supermarket bakeries and hot bread shops. The sheer numbers of bakeries and the individual variations in baking processes and ingredients presents difficulties in achieving the level of quality control and certainty with regard to folic acid addition, which is required for regulatory compliance.

9.2 Technical and industry issues for mandatory fortification

9.2.1 *Flour production in Australia and New Zealand*

In Australia and New Zealand, flour is milled domestically to meet local market demands, and relatively little flour is imported into either country. Australia exports significant amounts of flour and New Zealand a small quantity. Both countries export food products using bread-making flour. While Australia already has the capacity to segregate unfortified bread-making flour or bread products for export because of the existing mandatory thiamin fortification requirement, New Zealand does not, and if required would need to develop the segregation infrastructure in order to supply export markets with unfortified flour and flour products.

9.2.2 *Industry capacity for mandatory folic acid fortification*

Mandatory fortification may require the New Zealand milling industry to put in place the necessary systems and equipment for the addition of folic acid to flour. This may include the purchase of feeders for the addition of the folic acid to flour, reconfiguration of milling processes, and increased storage facilities in order to segregate fortified flour from unfortified flour. Analytical testing may be required to confirm the consistent and correct levels of fortificant in the flour. This may present a challenge for some mills, in terms of costs, expertise, and developing quality control processes.

The New Zealand milling industry²⁵ has indicated that this process will involve substantial effort and ensuing costs. This may have cost implications for the baking industry and consumers if these costs are passed on.

9.2.3 *Issues for speciality flour millers and bread manufacturers*

Mandatory folic acid fortification may be an issue for food manufacturers producing products using only 'natural ingredients' or organic bread products, and for small mills producing speciality bread-making flours such as stone ground flour and organic flours. These manufacturers may consider the fortification of their products will not fit with their niche market, and could detrimentally affect sales. Folic acid may not be considered a 'natural ingredient' as it is a synthetic form of folate, and may also conflict with organic industry standards.

9.2.4 *Use of bread-making flour*

Although flour millers produce a range of flours with different specifications according to their end use, bread-making flour (commonly termed 'bakers flour') is the most widely used type of flour and is used for food products other than bread. This is a particular issue for the New Zealand milling and baking industry, who, as yet, do not segregate bread-making flour nor differentiate its end use.

²⁵ New Zealand Flour Millers Association, personal communications 2006.

9.2.5 *Industry overages*

An additional consideration is the industry practice of ‘overages’ when adding vitamins and minerals to foods. This is where manufacturers usually add more nutrients to account for losses during processing and storage. Where no maximum is established, the actual amounts added can be considerably higher than the minimum required in the purchased food. This was the experience in the United States after mandatory folic acid fortification was introduced (see Attachment 4).

9.2.6 *Labelling*

All food manufacturers using bread-making flour will be required to list folic acid as an ingredient. This will include not only bread and bread products, but associated products where bread-making flour may be used, such as biscuits and cakes. Folic acid will be required to be listed as an ingredient unless it is present as part of a compound ingredient²⁶ making up less than 5% of the food. Labelling for the presence of folic acid will necessitate labelling modifications and as a result incur costs for manufacturers.

9.3 **Consistency with Ministerial Policy Guidance**

The Ministerial Council’s Policy Guideline on *Fortification of Food with Vitamins and Minerals* (the Policy Guideline, see Attachment 3) provides guidance on the addition of vitamins and minerals to food for both mandatory and voluntary fortification. In considering mandatory fortification as a possible regulatory measure, FSANZ must have regard to the Policy Guideline.

The Policy Guideline provides ‘High Order’ Policy Principles as well as ‘Specific Order’ Policy Principles and additional guidance for mandatory fortification. The ‘High Order’ Policy Principles reflect FSANZ’s statutory objectives (see Section 4) and therefore take precedence over the ‘Specific Order’ Policy Principles.

The five ‘Specific Order’ Policy Principles state that the mandatory fortification should:

1. be only in response to demonstrated significant population health need taking into account the severity and prevalence of the health problem;
2. be assessed as the most effective public health strategy to address the public health problem;
3. be consistent with national nutrition policies and guidelines;
4. not result in detrimental dietary excesses or imbalances of vitamins and minerals; and
5. deliver effective amounts of added vitamins or minerals to the target group to meet the health objective.

Advice from the Ministerial Council is that mandatory folic acid fortification is an effective public health strategy to reduce the incidence of NTDs in Australia and New Zealand, subject to assessment of clinical safety and cost-effectiveness. In recognition of this significant population health problem, FSANZ was asked to consider mandatory folic acid fortification.

²⁶ A compound ingredient means an ingredient of a food which is itself made from two or more ingredients. Standard 1.2.4 of the Code requires the components of a compound ingredient to be labelled where the amount of compound ingredient in the food is 5 % or more.

Therefore within the context of the ‘High Order’ Policy Principles, which are FSANZ’s statutory objectives, the remaining ‘Specific Order’ Policy Principles are considered as follows.

9.3.1 Consistency with Australia and New Zealand national nutrition guidelines

Each of the Australian and New Zealand dietary guidelines²⁷ for all age groups promote eating plenty of cereals including breads with particular emphasis on wholegrain varieties. In selecting all bread-making flour as the food vehicle for mandatory folic acid fortification all bread including wholemeal/grain varieties will be fortified with folic acid. Therefore, the selection of all bread-making flour as the preferred food vehicle is consistent and supports the current nutrition guidelines and healthy eating messages to women of child-bearing age.

9.3.2 Safety and effectiveness

Ensuring the proposed levels of folic acid will not result in detrimental excesses or imbalances across the population and that the fortification delivers effective amounts of folic acid to reduce the prevalence of NTDs have been assessed by this Proposal. The Risk Assessment has considered both risk of excess and efficacy for two folic acid levels in bread-making flour. In selecting a preferred regulatory option FSANZ has used this assessment to identify the most appropriate fortificant level that delivers effective NTD reduction with very small numbers of the population consuming folic acid in excess of the upper level of intake.

9.3.3 Additional Policy Guidance

The Policy Guideline provides additional policy guidance in relation to assessment of alternative strategies (see Section 2.5), labelling (see Section 13.3) and monitoring (see Section 17.1).

9.4 Consumer issues

Mandatory fortification of bread-making flour with folic acid raises a number of important concerns from the perspective of consumers including:

- choice and availability of non-fortified products;
- awareness and understanding of folic acid fortification;
- impacts of mandatory fortification on consumption patterns; and
- labelling and product information as a basis for informed choice.

In understanding the impacts on, and responses of, consumers FSANZ has drawn upon relevant consumer studies and literature regarding mandatory fortification, as well as commissioning a more general literature review²⁸ of the social and consumer aspects of food fortification and the factors that influence health-related attitudes to food.

²⁷ NHMRC. Dietary Guidelines for Australian Adults. Commonwealth of Australia, 2003; Ministry of Health. Food and Nutrition Guidelines for Healthy Adults: A background paper. Wellington. Ministry of Health, 2003.

²⁸ The literature review is being undertaken by Dr Anne Ring and Professor Heather Greenfield of New South Global Consulting – a consulting arm of the University of New South Wales. The review is currently in progress and will be made available on the FSANZ website once completed.

A range of psycho-social and demographic variables influence health-related attitudes to food, for example age (Kearney *et al.*, 1997; Childs and Poryzees, 1998; Worsley and Skrzypiec, 1998), gender (Worsley and Scott, 2000), income (Childs and Poryzees 1998), values (Ikeda, 2004) and personality (Cox and Anderson, 2004). Accordingly the response to mandatory fortification of bread-making flour with folic acid is unlikely to be uniform, but rather will be mediated by the particular circumstances of individuals and the communities within which they live. Attitudes and responses to mandatory fortification are also likely to vary within groups and over time.

The difficulty of assessing the likely responses of consumers to mandatory fortification is further exacerbated by a lack of specific studies exploring likely consumers' responses. Two recent studies of New Zealand consumers' responses to mandatory fortification of bread with folic acid have been carried out: one commissioned by the Baking Industry Research Trust (Brown, 2004) and one by the New Zealand Food Safety Authority (Hawthorne, 2005). No specific studies have been carried out in Australia. Additionally a range of New Zealand and Australian studies measuring the effectiveness of folate promotion campaigns provide information about the level of folate awareness and understanding among women of child-bearing age (Abraham and Webb, 2001). Currently the UK Food Standards Agency is undertaking consumer research to inform their assessment of mandatory fortification of bread with folic acid, with the results expected to be available in September 2006 (UKFSA, 2006).

9.4.1 *Choice and availability of non-fortified products*

Mandatory folic acid fortification of bread-making flour is expected to reach more than 80% of women of child-bearing age (see Section 6.1.1), additionally a large proportion of the remaining population will also increase their folic acid intake. While the safety considerations for folic acid fortification have been established (see Section 7.2), some consumers may be concerned about the long-term consumption of folic acid in amounts greater than their need. Accordingly some consumers may be opposed to mandatory folic acid fortification. Importantly, while the degree of choice is minimal, consumers will still be able to purchase non-fortified flours which can be used as desired. Additionally, through the use of labelling, consumers will be informed where products have added folic acid²⁹.

Consumer research has found varying levels of support for mandatory fortification. The two New Zealand studies mentioned above both found the majority of participants were opposed to mandatory fortification with folic acid (Brown, 2004; Hawthorne, 2005). This opposition was primarily based on strong support for individual rights rather than any specific concerns regarding folic acid fortification *per se*. A third survey of New Zealand adults found that 58% of respondents considered choice to be very or extremely important to them, with 16% of respondents considering choice to be slightly or not important at all. The survey also found that 49% of respondents neither agreed nor disagreed with the statement that 'folate should be added to bread' (Bourn and Newton, 2000).

Exposure to mandatory fortification is also likely to impact on the level of support for such measures. In Canada, there was significant change between the public response to thiamin fortification in 1930s and 1940s and the response to folic acid fortification in the 1990s.

²⁹ Folic acid will be required to be listed as an ingredient unless it is part of a compound ingredient making up less than 5% of the food. Standard 1.2.4 defines a compound ingredient as an ingredient of a food which is itself made from two or more ingredients.

The shift in response has been linked to a growing acceptance of fortification and of technological solutions (Nathoo *et al.*, 2005). Unlike Australia which mandates the fortification of bread-making flour with thiamin and fat spreads with vitamin D, New Zealand currently has no mandatory fortification requirements. The greater levels of exposure to mandatory fortification in Australia may differentiate the response of Australian consumers to New Zealand consumers.

9.4.2 *Awareness and understanding of folic acid fortification*

Unlike some other nutrient disease relationships awareness and understanding of the link between folic acid and NTDs among the general community is low (National Institute of Nutrition, 1999; Abraham and Webb, 2001). Not surprisingly though, women and men generally have different levels of awareness and understanding, with women generally being more informed of the rationale for ensuring adequate intake of folic acid. Furthermore, the levels of awareness increases among women following public health campaigns targeted at pregnant women and women of child-bearing age (van der Pal-de Bruin KM *et al.*, 2000; Abraham and Webb, 2001; Ward *et al.*, 2004). Women with some experience with NTDs among relatives are also more likely to be aware and use folic acid supplementation (Byrne *et al.*, 2001).

While there is likely to be a link between awareness and understanding and the level of support for mandatory fortification, the link may not be simple nor in expected directions (Wilson *et al.*, 2004). In one of the New Zealand studies, participants were provided with, and discussed, materials explaining the importance of folic acid in preventing NTDs (Hawthorne, 2005). Despite this, opposition to mandatory fortification of bread with folic acid was high. It is proposed to monitor the level of consumer awareness and understanding of folic acid fortification as part of the *Bi-national monitoring system to track the impact of regulatory decisions on mandatory and voluntary fortification* (Attachment 12).

9.4.3 *Impacts of mandatory fortification on consumption patterns*

The level of opposition to mandatory fortification raises a concern that consumers may change their consumption patterns to avoid fortified products. The limited evidence available suggests that this is unlikely, however, it is possible that some individuals may consume less of the fortified food categories (Brown, 2004). A key element here is the extent to which opposition is based on a notion of individual choice rather than other concerns such as health and safety. As noted above there will be some, albeit limited, options for those who wish to avoid the consumption of folic acid fortified products.

By contrast, some women may feel that, in addition to the availability of voluntary fortified products, the mandatory fortification of bread-making flour will provide enough folic acid. However, dietary modelling demonstrates at 200 µg of residual folic acid per 100 g of bread-making flour women of child-bearing age will still require supplementation to reach recommended levels of folic acid (see Section 6.7). Public health campaigns and advice from medical practitioners will continue to be important mechanisms to ensure women of child-bearing age take adequate supplementation.

There may be some groups of women who will not receive the health benefit of mandatory folic acid fortification as a consequence of other socio-demographic factors. However there is little evidence that can be drawn upon to characterise these groups of women.

The dietary intake data indicate that products containing bread-making flour are widely and regularly consumed by the target group. There may be a slight increase in the price of bread, though this is likely to be small, perhaps a few cents per loaf, and thus of limited, if any, financial impact. Women whose diets do not normally include products containing bread-making flour will not consume the recommended amount of folic acid through mandatory fortification and will require additional supplementation. This includes women who are gluten intolerant and thus avoid wheat-based products. Similarly, women of ethnic and cultural groups whose primary source of carbohydrate is not products containing bread-making flour (e.g. rice) will also not receive sufficient increased folic acid through their diet. Home bakers that use commercial pre-mixes will have access to a fortified product; those who use unfortified retail flour for their home baking will not receive the advantage of folic acid fortification.

9.4.4 Labelling and product information as a basis for informed choice.

Consumers will be informed about the addition of folic acid to bread-making flour through general labelling requirements that require all ingredients of a product to be identified in the ingredient list (see Section 13.3). Additionally, if manufacturers choose to do so, or where a claim is made about a product and its folate content (naturally-occurring and added folic acid), folate will be declared in the Nutrition Information Panel. This information will enable consumers to either select products fortified with folic acid or to avoid those products depending upon their individual choice.

9.5 Factors affecting safe and optimal intake

The Risk Assessment raises a number of uncertainties with fortification associated with ensuring the sustainability and predictability of folic acid intake across the population.

9.5.1 Mandatory fortification

The amount of folic acid that can be delivered to the target population from mandatory fortification is dependent on:

- the consumption of the food vehicle;
- the level of fortification; and
- safety considerations for both the target and non target populations.

The food vehicle and fortification level have been selected to maximise folic acid intakes in the target group, while also preventing significant proportions of the non-target population exceeding upper safe levels of intake. This consideration is particularly relevant when the recommended intake for the target population differs markedly from the non-target group, as is the case for folic acid. The recommendation for the target population is 400 µg of folic acid, whereas for children aged 1-3 years the RDI expressed as DFEs is 150 µg per day.

Mandatory fortification can deliver additional amounts of folic acid in the food supply for women of child-bearing age. However, due to safety considerations for the whole population, the amount delivered for women of child-bearing age does not by itself reach recommended levels. Thus, additional strategies will be needed to assist the target group to achieve the recommended folic acid intake to reduce the NTD risk as much as possible.

The current industry practice of ‘overages’ is an additional concern with mandatory fortification. An analysis of folic acid fortified foods in New Zealand in 2005 found that of the foods tested 32% (11/34) exceeded the label claim for folate with a range of overages between 41-296%³⁰. The practice of ‘overages’ when used under a mandatory fortification scenario may therefore result in an increase in folic acid intake greater than anticipated. For example, in the United States, mandatorily fortified foods have been found to contain nearly twice as much as their predicted levels (See Attachment 4). Subsequently there would be a potential risk for some population groups to exceed the UL of intake for folic acid, and this risk will need to be managed when setting the level of fortification.

9.5.2 *Voluntary fortification*

The dietary intake assessment includes the level of folic acid intake from current voluntary fortification permissions. In general, there has been limited uptake of voluntary permissions across the food categories, with the exception of breakfast cereals. However, from the current uptake of voluntary folic acid permissions, the mean increase in intake of folic acid in women of child-bearing age in Australia and New Zealand is estimated to be 95 µg and 58 µg per day, respectively. In New Zealand, the amount is less due to the lower uptake of voluntary fortification permissions in that country. These amounts formed the baseline for the dietary modelling scenarios.

It is uncertain how the use of voluntary folic acid fortification permissions might change following the implementation of mandatory fortification. If the uptake of voluntary fortification increases, intakes of folic acid could be higher than estimated in the dietary intake assessment.

There is potential for the implementation of mandatory fortification to increase consumer awareness of the relationship between folic acid and NTDs, creating more marketing opportunities for other food categories to be voluntarily fortified. As a result, more voluntary folic acid permissions may be utilised. Alternatively, mandatory fortification may result in loss of marketing advantage for products currently voluntarily fortified, resulting in less folic acid permissions being used. If uptakes do change significantly, this may impact on the effectiveness or safety of mandatory folic acid fortification.

The mandatory fortification scenario assumes that folic acid will be added to bread-making flour only and not to all flours. However, current voluntary permissions allow cereal flours to be fortified with folic acid. This presents a situation where flour that is not intended for bread making may be fortified with folic acid and used in other products not originally intended to be fortified. If this occurs, manufacturers will be required to comply with the labelling requirements of the Code and will need to include folic acid in the ingredient list.

9.5.3 *Folic acid supplement use*

It is estimated that mandatory fortification of all bread-making flour at residual levels up to 200 µg of folic acid per 100 g of bread-making flour will result in an estimated mean increase in folic acid intakes in the target population (women 16-44 years) of 100 µg and 131 µg per day, in Australia and New Zealand respectively.

³⁰ ESR Report on Fortification overages of the food supply, folate and iron. Prepared for the NZFSA, September 2005.

This folic acid intake from mandatory fortification combined with folic acid intake contributed by foods voluntarily fortified with folic acid, is less than the 400 µg folic acid recommended for women of child-bearing years. Folic acid supplementation for women planning to, or capable of, becoming pregnant will therefore continue to be an important strategy in NTD prevention.

The dietary intake assessment demonstrated that when folic acid supplements of 500 µg (in Australia)³¹ and 800 µg (in New Zealand) are taken daily by women of child-bearing age in addition to fortified foods, the mean intakes of folic acid increase substantially. This is of particular relevance for women who consume the 800 µg supplement, as it may result in some of these women exceeding the UL. As supplementation at this level is generally confined to the peri-conceptual period, long term exposure to this level of folic acid is unlikely.

An additional uncertainty with folic acid supplement use is that there is potential for some women of child-bearing age to falsely believe that mandatory fortification of foods with folic acid delivers sufficient folic acid for NTD prevention, and therefore folic acid supplementation during the peri-conceptual period is not necessary.

Folic acid supplement use by those individuals outside of the target group provides an additional uncertainty, particularly for children. Estimated folic acid intake in the general population under mandatory fortification shows that a proportion of children are likely to exceed the UL for folic acid (see Section 7.2.2.1). Therefore, if a child is given additional folic acid in the form of supplements, the likelihood of this child being exposed to folic acid at levels exceeding the UL would be raised. While there have been no reported health risks associated with increased folic acid intake from international experience, a conservative approach has been recommended due to the uncertainties about health risks, particularly for young children.

9.6 Summary

A number of risks and issues affecting consumers and industry arising from mandatory folic acid fortification of bread-making flour have been identified. These are:

- factors contributing to a degree of uncertainty about the folic acid intake of the target group and the general population, notably uptake of voluntary permissions by industry, the possibility of overages in folic acid fortification, and future folic acid supplement use in women of child-bearing age, and the general population;
- the impact of mandatory fortification on consumer choice and provision of information to consumers to enable informed choice with regard to identifying fortified products; and
- the impact on the milling industry, particularly for the New Zealand milling industry which does not as yet have the necessary infrastructure for flour fortification or differentiation of bread-making flour.

³¹ In Australia, 800 µg folic acid supplements can be purchased by peri-conceptual women, however the recommended supplements contain 500 µg of folic acid. For the purpose of the dietary intake assessment, only 200 µg and 500 µg supplements were modeled for Australia.

Strategies for the management of these identified risks and issues as they relate to the preferred regulatory option are addressed later in this Report (see Section 13).

10. Regulatory options

Selection of bread-making flour as the food vehicle chosen for fortification is on the basis of its ability to effectively deliver and sustain an increase in the folic acid intake of the target population. Consequently at Draft Assessment the following two options have been identified.

10.1 Option 1 – Current approach – the status quo

Maintenance of the *status quo* would see the continuation of the existing permissions for the voluntary addition of folic acid to certain foods as well as the continuation of the folate-NTD health claim. In recent years there has been limited uptake of voluntary permissions across food categories, with the exception of breakfast cereals. Currently, there are very few products using a folate-NTD health claim.

Australia and New Zealand have health promotion and education strategies in place to promote the use of folic acid supplements and increase folate intakes in women of childbearing age. These strategies would be expected to continue under the *status quo*.

10.2 Option 2 – Mandatory folic acid fortification of all bread-making flour

This Option proposes that flour used for bread making be fortified with folic acid. The Risk Assessment has considered two scenarios of fortifying bread-making flour at residual levels of:

- (a) 100 µg per 100 g in the final product; and
- (b) 200 µg per 100 g in the final product.

The food products most likely to be fortified with folic acid, on the basis of using bread-making flour, include plain, fancy, sweet and flat breads and bread rolls, English muffins, crumpets, pancakes, pikelets, crepes, scones, yeast donuts, pizza bases and crumbed products.

Australia and New Zealand have health promotion and education strategies in place to promote the use of folic acid supplements and increase folate intakes in women of child-bearing age. These strategies would be expected to continue under this Option.

Under a mandatory fortification option, monitoring is necessary and would be an important part of the implementation of the proposed draft Standard. FSANZ believes that it is important to undertake an assessment of the incidence of NTDs in both Australia and New Zealand at the commencement of this Standard to provide a benchmark for future monitoring as well as other features bearing on the success of the draft Standard after gazettal. This issue is discussed further in the section on Monitoring (see Section 17.1).

The responsibility for establishing and funding a monitoring system to assess the impact of mandatory fortification on the population extends beyond FSANZ's responsibilities under the FSANZ Act and will require the concomitant involvement of health and regulatory agencies at the Commonwealth, State and Territory level in Australia and the New Zealand Government.

11. Impact Analysis

11.1 Affected parties

The parties most likely to be affected by this Proposal are:

11.1.1 Industry

- Local manufacturers servicing the local market only.
- Manufacturers who only export.
- Importers.
- Specialist producers – e.g. organic, gluten free etc.

11.1.2 Consumers

- Women of child-bearing age i.e. target consumers.
- Non-target consumers e.g. older adults and children.

11.1.3 Government

- New Zealand and Australian State and Territory Governments.
- Australian Government.

11.2 Cost-benefit analysis of regulatory options

FSANZ commissioned Access Economics in March 2006 to investigate the benefits and costs of fortifying bread-making flour in Australia and New Zealand with folic acid. A number of countries (for example, the United States and Canada) have adopted mandatory fortification but few cost-benefit analyses have been undertaken. However, an analysis of fortification with folic acid of enriched cereal products in the United States suggested that such a policy is associated with net benefits (Grosse *et al.*, 2005, see Attachment 11). This is consistent with the results of this study.

The following has been taken from the Cost-Benefit Analysis prepared by Access Economics, which is provided in full at Attachment 11.

11.2.1 Methodology

The analysis of benefits focused on the costs avoided as a result of new cases of NTDs per year that could be prevented in future. The costs avoided through a fall in the occurrence of NTDs include pain and suffering from disability and premature mortality, total outlays on health care and personal care, production losses, and efficiency losses that arise from lower taxation revenues and higher welfare payments.

The costs of mandatory fortification include the costs to government of administering and enforcing mandatory fortification and the costs to industry of fortifying their product. The costs to consumers of reduced choice have been identified in-principle but were not able to be quantified. The costs of monitoring mandatory fortification were not included in the benefit cost analysis, but are discussed as part of the Monitoring section of this report (see Section 17.1).

11.2.2 The benefits

New cases of NTDs prevented through mandatory fortification were estimated by FSANZ (see Section 7.1). Three scenarios were modelled: lower estimates of NTDs prevented, mean estimates and upper estimates of NTDs prevented. The projected mean number of incident cases prevented per year is presented in Table 7 below.

Benefits were calculated based on two scenarios:

- live NTD births prevented (i.e. excluding terminations and still births prevented by fortification on the basis of ‘replacement’ births); and
- all NTD births prevented (i.e. including NTD terminations and still births prevented by fortification on the basis of the intrinsic value of human life).

Table 7: Projected number of neural tube defect incident cases prevented per year

Food vehicle	Residual folic acid content per 100g flour in the final food	Total NTD incident cases prevented	Live NTD births prevented	Still NTD births prevented	Terminations of pregnancy prevented
<i>µg folic acid</i>					
Australia					
All bread-making flour	100	10.4	2.0	1.2	7.2
	200	26.0	5.0	3.0	18.0
New Zealand					
All bread-making flour	100	3.9	0.7	0.7	2.6
	200	7.9	1.3	1.3	5.2

Source: FSANZ modelling

The benefits for Australia and New Zealand include:

- production losses avoided through prevention of NTDs (the loss of lifetime earnings of people with NTDs who are not able to participate fully in the labour force, and of NTD pregnancies terminated or NTD still births who may otherwise have survived and accrued lifetime earnings);
- the pain and suffering from disability and premature mortality avoided through fortification (disability adjusted life years (DALYs) avoided). The value of these in dollars is the net burden of disease;
- avoided outlays on health care and personal care (‘other costs’ in the table) — based on live NTD births prevented; and

- avoided efficiency losses that arise from lower taxation revenues and higher welfare payments as a result of the occurrence of NTDs.

Productivity losses form the largest component of the benefits of mandatory fortification, followed by the benefits of avoiding disability and premature death (net burden of disease).

11.2.3 *The costs*

As a result of mandatory fortification, consumers will face reduced choice and potentially a slight increase in the price of bread. This increase is likely to be small, perhaps a few cents per loaf. The cost of reduced choice was not able to be quantified.

The costs to industry of mandatory fortification of all bread-making flour with folic acid have been summarised in Table 8. In the first year, industry in both Australia and New Zealand would incur additional costs associated with both changing labelling and packaging as well as costs related to the purchase of folic acid, preparation of premix, the per annum costs associated with additional machinery and equipment, analytical testing, flushing out mills, storage and administration. The once off (first year) costs of changes to labelling pre-packaged products are likely to affect a large number of product lines because labelling standards require that the ingredients of a compound (such as bread-making flour) be declared if the amount of the compound ingredient in the final food is 5 per cent or more by weight. At most, the cost in the first year for Australian industry would be about \$AUD2.5 million, and at most in New Zealand, \$NZ1.7 million.

After the passing of one-off labelling costs in first year, the recurrent costs per year would fall to just over \$AUD1 million in Australia and around \$NZ2.3 million in New Zealand. While some machinery costs would be lumpy expenditures, the machine requires replacement on a regular cycle, so these costs have been amortised on a per annum basis. The higher ongoing (or yearly costs) for New Zealand firms reflect:

- the need to purchase micro-feeders. Feeder systems for thiamin are already in place in Australian mills, whereas there are no feeder systems currently in place in New Zealand. These costs have been included in the calculation of per annum costs, rather than as an up front cost;
- the estimate that additional silos would be necessary in New Zealand to enable fortified and non-fortified flour to be stored separately (and the inclusion of these in the calculation of per annum costs); and
- higher cost estimates provided by New Zealand millers in relation to flushing out mills to remove traces of folic acid, and also higher estimates of the cost associated with preparation of folic acid premix.

While there is a slight difference in timing between realisation of the benefits and outlays associated with costs of machinery and labelling which has not been taken into account in the modelling, this is unlikely to make a material difference to the results.

Access Economics' estimates for the annual costs of government administration and enforcement of mandatory fortification in both Australia and New Zealand include the costs of awareness raising and training, compliance auditing, administration and enforcement (dealing with complaints).

Table 8: Summary of costs of mandatory fortification of bread-making flour per year

		Australia (A\$)		New Zealand (NZ\$)	
	Residual folic acid content per 100g flour in the final food	100µg	200µg	100µg	200µg
Industry	First year	2,486,400	2,486,400	1,690,000	1,690,000
	Subsequent year	1,001,548	1,057,548	2,248,390	2,260,138
Government		150,809	150,809	88,520	88,520
Total	First year	2,486,400	2,486,400	1,690,000	1,690,000
	Subsequent year	1,152,357	1,208,357	2,336,910	2,348,658

11.2.4 Net benefits

Table 9 summarises the net benefits of mandatory fortification of bread-making flour with folic acid in Australia and New Zealand for live NTD births (excluding the benefits associated with prevention of NTD terminations and still births). With the exception of one scenario in New Zealand, the benefits outweigh the costs. Benefit-cost ratios are also presented in the table.

Table 9: Net benefits live NTD births, bread-making flour

	Lower confidence limit (95%)		Mean		Upper confidence limit (95%)	
	100µg	200µg	100µg	200µg	100µg	200µg
Australia (A\$)						
<i>Residual folic acid content per 100g flour in the final food</i>						
Benefit	5,406,727	13,511,929	10,041,063	25,093,582	18,923,543	47,291,750
Cost first year	2,486,400	2,486,400	2,486,400	2,486,400	2,486,400	2,486,400
Subsequent year	1,152,357	1,208,357	1,152,357	1,208,357	1,152,357	1,208,357
Net benefit first	2,920,327	11,025,529	7,554,663	22,607,182	16,437,143	44,805,350
Net benefit subsequent year	4,254,370	12,303,572	8,888,706	23,885,225	17,771,186	46,083,393
15 year NPV net benefit	55,920,180	163,005,247	117,522,626	316,955,679	235,593,992	612,027,334
Ratio benefits to costs	4.5	10.8	8.4	20.1	15.8	37.9
New Zealand (NZ\$)						
<i>Residual folic acid content per 100g flour in the final food</i>						
Benefit	1,765,616	3,559,419	3,531,232	7,118,839	6,473,925	13,051,204
Cost first year	1,690,000	1,690,000	1,690,000	1,690,000	1,690,000	1,690,000
Subsequent year	2,336,910	2,348,658	2,336,910	2,348,658	2,336,910	2,348,658
Net benefit first	75,616	1,869,419	1,841,232	5,428,839	4,783,925	11,361,204

	Lower confidence limit (95%)		Mean		Upper confidence limit (95%)	
Net benefit subsequent year	-571,294	1,210,761	1,194,322	4,770,181	4,137,015	10,702,546
15 year NPV net benefit	-6,468,424	16,553,607	15,717,439	61,333,031	52,693,881	135,876,215
Ratio benefits to costs	0.8	1.6	1.5	3.2	2.8	5.8

Table 10 summarises the net benefits of mandatory fortification of bread-making flour with folic acid in Australia and New Zealand for all NTDs (including terminations and still births). In all cases, the benefits outweigh the costs.

Table 10: Net benefits all NTDs, bread-making flour

	Lower confidence limit (95%)		Mean		Upper confidence limit (95%)	
Australia (A\$)						
<i>Residual folic acid content per 100g flour in the final food</i>	<i>100µg</i>	<i>200µg</i>	<i>100µg</i>	<i>200µg</i>	<i>100µg</i>	<i>200µg</i>
Benefit	27,076,592	27,686,592	50,285,100	125,703,672	94,768,073	236,903,073
Cost first year	2,486,400	2,486,400	2,486,400	2,486,400	2,486,400	2,486,400
Subsequent year	1,152,357	1,208,357	1,152,357	1,208,357	1,152,357	1,208,357
Net benefit first	24,590,192	25,200,192	47,798,700	123,217,272	92,281,673	234,416,673
Net benefit subsequent year	25,924,235	26,478,235	49,132,743	124,495,315	93,615,716	235,694,716
15 year NPV net benefit	343,969,308	883,128,080	652,471,024	1,654,326,667	1,243,765,966	3,132,457,271
Ratio benefits to costs	22.6	54.2	41.9	100.6	79.0	189.7
New Zealand (NZ\$)						
<i>Residual folic acid content per 100g flour in the final food</i>	<i>100µg</i>	<i>200µg</i>	<i>100µg</i>	<i>200µg</i>	<i>100µg</i>	<i>200µg</i>
Benefit	10,796,839	21,760,810	21,593,681	43,521,621	39,588,415	79,789,637
Cost first year	1,690,000	1,690,000	1,690,000	1,690,000	1,690,000	1,690,000
Subsequent year	2,336,910	2,348,658	2,336,910	2,348,658	2,336,910	2,348,658
Net benefit first	9,106,839	20,070,810	19,903,681	41,831,621	37,898,415	78,099,637
Net benefit subsequent year	8,459,929	19,412,152	19,256,771	41,172,963	37,251,505	77,440,979
15 year NPV net benefit	107,013,504	245,316,856	242,681,320	518,752,535	468,794,325	974,478,642
Ratio benefits to costs	4.7	9.7	9.5	19.4	17.4	35.7

11.2.5 Key findings

At a residual folic acid fortification level of 200µg per 100g bread-making flour in the final food, the benefits outweigh the costs.

- in Australia, the net benefits would be \$23.9 million each year ongoing based on a reduction in live births affected by an NTD, or \$124.5 million each year ongoing based on a reduction in all pregnancies affected by an NTD (including still births and terminations); and
- in New Zealand, the net benefits would be \$4.8 million each year ongoing based on a reduction in live births affected by an NTD, or \$41.2 million each year ongoing based on a reduction in all pregnancies affected by an NTD (including still births and terminations).

At residual folic acid fortification level of 100 µg folic acid per 100 g bread-making flour, the benefits generally outweigh the costs — with the exception of one scenario for New Zealand.

12. Comparison of Options

This Proposal has considered mandatory fortification at either 100 µg or 200 µg residual folic acid per 100 g of bread-making flour in the final product.

At a fortification level of 100 µg per 100 g of bread-making flour in the final product, the benefits generally outweigh the costs – with the exception of one scenario for New Zealand. At the higher fortification level of 200 µg per 100 g of flour in the final product, significantly higher benefits are achieved and outweigh the costs in all scenarios in both countries.

FSANZ has selected 200 µg of folic acid per 100 g of flour in the final product as the preferred fortification level. As outlined in Section 11.2, fortifying all bread-making flour at this concentration will reduce the incidence of NTDs and deliver benefits to Australia and New Zealand of \$25.0 million per year and \$7.1 million per year respectively if live birth NTDs are considered, or \$125.7 million and \$23.5 million per year respectively if all NTDs (including still births and terminations) is considered. These benefits far exceed the costs, of \$2.5 million in Australia and \$1.7 million in New Zealand in the first year of implementation. For each subsequent year the costs are \$1.2 million and \$2.3 million for Australia and New Zealand, respectively.

The impact analysis clearly shows that there are significant net benefits from introducing a mandatory folic acid fortification program at a fortification level of 200 µg residual folic acid per 100 g of bread-making flour in the final product as opposed to continuing with the *status quo* (Option 1). Therefore Option 2 – 200 µg residual folic acid per 100 g of bread-making flour in the final product – is the preferred option.

13. Strategies to manage risks associated with mandatory fortification

Issues relating to mandatory fortification have been identified as part of this assessment. Approaches to minimising risks associated with these issues are considered below.

13.1 Managing safety and effectiveness

The Risk Assessment has recommended that a conservative approach to mandatory fortification be taken, as it cannot be concluded that mandatory fortification is without health risks given the limited evidence available and recognised uncertainties.

With this in mind, the proposed level of mandatory fortification will deliver additional folic acid in the food supply for women of child-bearing age, however, the amount delivered will not meet the recommended intake for NTD prevention. The level of fortification recommended balances effectiveness for the target group against safety considerations for the whole population. Therefore, for greatest possible effectiveness it will be necessary for mandatory fortification to be combined with the existing NTD prevention strategies of voluntary fortification, education, and supplementation.

Strategies to manage risks associated with the safety and effectiveness of mandatory fortification are outlined below, including prescribing the level of fortification as a range, monitoring possible changes in the uptake of voluntary permissions, and considering the need for changes to supplement use by the target and non-target population groups.

13.1.1 Level of fortification

The fortification of bread-making flour at residual levels up to 200 µg of folic acid per 100 g of bread-making flour was determined by the dietary intake assessment to achieve effective and safe fortification of the food supply with folic acid.

The residual level of 200 µg folic acid per 100 g of bread-making flour represents the amount of folic acid that is required in the final food, e.g. bread. As the folic acid is to be added to bread-making flour during the milling process, folic acid losses on processing, storage and baking, and industry practice with regard to the addition of folic acid have been considered. As previously noted in Section 6.1.3.2, average losses of folic acid during the bread-baking process are 20% but may be as high as 40%. There appears to be no other significant losses of folic acid during processing or storage. In determining the proposed level of folic acid to be added to bread-making flour, the level has been adjusted to accommodate for these baking losses.

Additionally given industry's usual practice of adding vitamins and minerals in amounts in excess of a fortification level (i.e. overage), there is concern based on overseas experience that a higher than desired level of folic acid (i.e. 200 µg residual folic acid content in the final food) will result. Given the uncertainties and the need for a conservative approach to mandatory fortification, application of a prescribed range of fortification is considered necessary. Furthermore, to account for error in the accuracy of fortification during the milling process, this prescribed range will need to allow for a tolerance level of approximately $\pm 10\%$ ³².

Therefore, the proposed prescribed range for mandatory folic acid fortification is 230-280 µg of folic acid per 100 g bread-making flour, with the aim of achieving the target residual level of approximately 200 µg folic acid in the final food.

This range accounts for the average folic acid losses on baking of 20% (i.e. nutrient equivalent of 200 µg with 20% losses is 250 µg), and allows for a $\pm 10\%$ accuracy of fortification during the milling process rounded to nearest 10 µg/100 g (0.1 mg/kg).

³² Based on the UK FSA advice to their Ministers (2002) that an error of up to $\pm 10\%$ is possible when fortifying flour with folic acid at the mill.

As losses and industry practice have been accommodated, flour millers will be required to add folic acid to bread-making flour within the proposed range which should ensure the risk of exceedance of the upper intake limit is minimised.

13.1.2 Impact of voluntary fortification

The current voluntary folic acid permissions have provided additional amounts of folic acid in the food supply. However, by virtue of the nature of voluntary permissions, it is not possible to guarantee this level of uptake in the future.

To provide more regulatory certainty, different options could be considered. Voluntary permissions in some foods, such as breakfast cereals, could be made mandatory, and other permissions that currently have little uptake removed. However, these actions have trade implications, imposts for industry and may create confusion for some consumers. In keeping with FSANZ's mandate of ensuring minimum effective regulations, robust and definitive evidence will be needed before pursuing this course of action.

In addition to the existing voluntary permissions³³, industry could in the future apply to have further voluntary folic acid permissions considered. These applications would need to be assessed in relation to the predicted mandatory folic acid fortification outcomes. It may be possible to deliver additional amounts of folic acid to women of child-bearing age, via voluntary fortification, without compromising the health and safety of other population subgroups such as children. Additional food vehicles, highly specific to the target population, may be identified as being suitable for consideration.

However given the difficulties in predicting future trends in voluntary fortification permissions for folic acid, FSANZ proposes to monitor changes in the use of voluntary fortification permissions to determine if additional regulatory responses are necessary. FSANZ also proposes to consult directly with industry regarding the use of existing voluntary fortification permissions and their potential future use.

As part of the proposed draft variation to the Code (see Attachment 1), removal of the current voluntary permission to add folic acid to bread has been incorporated. This is in response to this voluntary permission being redundant with the proposal to mandate folic acid fortification of bread-making flour.

13.1.3 Folic acid supplement use

Under mandatory fortification women of child-bearing age will not receive sufficient folic acid from fortified foods to reach the recommended folic acid intake of 400 µg per day. Health education information for NTD prevention under mandatory fortification should therefore continue to advise women planning pregnancies to take folic acid supplements for NTD prevention.

³³ Folic acid has been permitted to be voluntarily added to flour, savoury biscuits, breads, breakfast cereals, pasta, fruit and vegetable juices and drinks, fruit cordials, beverages derived from legumes and legume analogues of dairy foods and meat.

As shown by the dietary intake assessment, folic acid intake from both food and a 800 µg supplement substantially increases mean daily folic acid intakes to a level near the upper limit. FSANZ intends to discuss with Medsafe³⁴ the implications of mandatory fortification on the current New Zealand recommendation for peri-conceptual folic acid supplement use. While this level of folic acid intake is not likely to have a negative impact on public health and safety, consideration could be given to providing access to 400 µg folic acid supplements in New Zealand. The New Zealand Ministry of Health has previously indicated that it may recommend a lower dose folic acid supplement (400 µg) be made available as a registered medicine to women planning a pregnancy³⁵.

Under mandatory fortification it may also be necessary to consider guidelines in relation to supplement use by the non-target population groups. Vitamin and mineral supplements are generally not recommended for children, primarily due to concerns about the adverse effects related to the continued use of large numbers of certain vitamins and minerals³⁶.

However, supplement use does impact on both the safety and effectiveness of mandatory fortification and for this reason has been included as a key element of the proposed monitoring system (See Attachment 12).

13.2 Consumer Choice

In delivering the public health benefits of mandatory fortification of bread-making flour with folic acid there may be fewer options for the consumption of non-fortified products. On the limited evidence available, FSANZ has been unable to identify the extent to which this will be of concern to Australian and New Zealand consumers.

Consumers will be able to purchase non-fortified flours which can be used as desired and labelling should ensure they can determine if a product has added folic acid. Additionally there may be other options for extending the range of products available to consumers.

The views of stakeholders are being sought as to whether and how additional options for consumers can be accommodated within the preferred mandatory fortification option. FSANZ also intends, as part of ongoing monitoring and review of mandatory fortification (see Section 17.1), to track and monitor consumer response and any subsequent changes in behaviour.

Question to Submitters

Do you have any comments on and/or suggestions for extending consumer choice within the preferred mandatory fortification option?

13.3 Labelling and information provision

The purpose of food labelling is to provide consumers with information about food to enable them to make informed food choices. Labelling provides an important source of information for consumers regarding fortification, and enables consumers to make informed decisions regarding their consumption of fortified foods.

³⁴ Medsafe – New Zealand Medicines and Medical Devices Safety Authority.

³⁵ NZMoH (2003).

³⁶ NZMoH (1997).

The generic labelling requirements of the Code applicable to foods fortified with folic acid include:

- listing of ingredients (Standard 1.2.4);
- nutrition information requirements for foods making nutrition claims (Standard 1.2.8);
- the conditions applying to nutrition claims about vitamins and minerals (Standard 1.3.2); and
- permissible health claims (Transitional Standard 1.1A.2)

Under mandatory fortification, foods containing folic acid will be required to list folic acid as an ingredient in the ingredient list, but in accordance with the Ministerial Policy Guideline for mandatory fortification, *there is no mandatory requirement to label a food product as fortified*. The policy guidance further states that *however, consideration should be given, on a case by case basis, to a requirement to include information in Nutrition Information Panel*.

FSANZ considers the generic requirements of the Code to be appropriate for providing consumers with information and therefore does not believe mandating inclusion in the NIP is warranted. The ingredient listing of folic acid will alert consumers to the presence of folic acid, and may be used by consumers to assist in the selection of fortified foods for improving folate status, or conversely, to avoid folic acid fortified foods if they so wish.

13.3.1 Use of nutrition and health claims

Mandatory fortification presents the opportunity for food manufacturers to make nutrition and health claims, as permitted under the Code, related to the folic acid content of bread and bread products in labels and related information. Although nutrition and health claims can be a useful source of information for consumers, it is noted that food manufacturers may not choose not to use these claims to promote the folic acid content of their foods if no marketing advantage is perceived.

The types of claims currently possible in relation to the folic acid/folate content of bread and bread products are outlined below:

- nutrition content claims which are a claim about the presence of naturally-occurring folate plus folic acid, for example ‘source’ and ‘good source’ claims;
- a health claim under Transitional Standard 1.1A.2 which highlights the link between increased maternal dietary folate consumption and reduction in NTD risk; and
- claims which may include reference to function and health maintenance in relation to folate consumption, so long as they are not prohibited by the Code or the requirements of fair trading legislation in relation to making false or misleading statements.

A new Standard (draft Standard 1.2.7 – Nutrition, Health and Related Claims) is currently under development and will permit a wider range of claims in the future, including a revised folate-NTD health claim but proposes more stringent qualifying criteria.

13.3.2 'Natural foods' and related descriptor labels

Food labelling or promotional claims must be factually correct and not misleading or deceptive under the fair trading legislation of Australia and New Zealand³⁷. FSANZ intends to discuss the use of descriptors such as 'natural food', and 'organic foods' with the Australian Competition and Consumer Commission and the New Zealand Commerce Commission, to clarify the status of folic acid fortified foods with regards to fair trading labelling requirements.

COMMUNICATION AND CONSULTATION

14. Communication and Education Strategy

FSANZ has prepared a strategy to guide communication and education initiatives to raise awareness and understanding of the proposed standard for mandatory folic acid fortification and its implementation. The communication and education strategy incorporates key messages including education requirements, supplementation advice and monitoring, which are all vital components of the preferred regulatory option. To implement this strategy, FSANZ will collaborate with other organisations that play an important role in providing information and education to consumers, industry and other key stakeholders. The communication and education strategy is outlined further at Section 16.2.

15. Consultation

15.1 Initial Assessment

FSANZ received a total of 72 written submissions in response to the Initial Assessment Report for this Proposal during the public consultation period of 20 October to 24 December 2004.

Submitters' views were mixed in relation to a preferred regulatory option. Organisations and individuals with a direct interest in NTDs strongly supported mandatory fortification.

Government and public health submitters (19) in general supported mandatory fortification on the condition that a national monitoring and surveillance system is in place prior to implementation. However other public health and government submitters (12) did not indicate a preferred option citing reservations due to the uncertainty surrounding potential risks from mandatory folic acid fortification and stressed the need for a conservative approach.

Industry submitters primarily supported extension of voluntary fortification permissions in conjunction with increased health promotion and education strategies to increase folate intakes. Two Australian milling companies supported mandatory fortification if it was shown to be beneficial to the community and named bread-making flour as an effective food vehicle.

³⁷ *Trade Practices Act 1974*, State and Territory Fair Trading legislation and *Fair Trading Act 1986*.

A full summary of the issues raised in submissions is provided at Attachment 2. Key issues identified in submissions have been addressed where possible in the main body of this Report and focus on:

- choice of food vehicle for fortification, including the need for an assessment on the bioavailability and stability of folic acid in the proposed food vehicle;
- other potential benefits of mandatory folic acid fortification;
- potential risks associated with an increased folic acid intake, particularly for the non-target population including; the masking of the diagnosis of vitamin B₁₂ deficiency, potential cancer-promoting effects of folic acid, drug-nutrient interactions and unknown risks associated with increased folic acid intakes;
- the lack of consumer choice associated with mandatory fortification;
- the lack of baseline and ongoing monitoring data necessary to assess effectiveness and track longer term effects. Identified data gaps included: folate intake and status; prevalence of vitamin B₁₂ deficiency; incidence of NTDs and NTD-affected pregnancies including terminations; also up-to-date national dietary intake and food composition data;
- the need to establish a national monitoring and surveillance system, prior to the implementation of mandatory fortification;
- the perceived inconsistency of this Proposal with Ministerial Policy Guideline, in particular how it meets the Specific Order Policy Principles for mandatory fortification; and
- the need for ongoing health promotion and education strategies that are wide reaching and supported by the governments.

15.2 Targeted consultation process

Issues identified from public submissions formed the basis of further targeted consultation with key stakeholder groups, particularly the milling and baking industry. Information received has informed FSANZ's process for selecting the food vehicle, identification and investigation of risk management issues, the cost-benefit analysis, the recommendations for the implementation phase, and the monitoring requirements for mandatory fortification.

As part of this targeted consultation process, FSANZ involved a Standards Development Advisory Committee (SDAC) to help identify views and issues while progressing work on this Proposal. The SDAC is comprised of members who have a broad interest in, and knowledge of, fortification-related issues and represent the following sectors: public health nutrition; food manufacturing; enforcement; food policy; health promotion; and consumer education.

Given the increased incidence of NTDs among Indigenous population in some regions of Australia, FSANZ will be seeking to engage key representatives of Indigenous groups during the consultation process. To date, members of the Reference Group for the National Aboriginal and Torres Strait Islander Nutrition Strategy and Action Plan (NATSINSAP) and the Maori Reference Group (Kauai Kounga Kai) have been involved in the consultation process.

In addition, FSANZ commissioned an independent economic consultancy organisation, Access Economics, to investigate the benefits and costs of fortifying bread-making flour with folic acid in Australia and New Zealand. Access Economics held further consultations with key stakeholders, particularly industry groups, in regard to the financial and health implications of mandatory fortification.

15.3 World Trade Organization

As members of the World Trade Organization (WTO), Australia and New Zealand are obligated to notify WTO member nations where proposed mandatory regulatory measures are inconsistent with any existing or imminent international standards and the proposed measure may have a significant effect on trade.

There are no relevant international standards and amending the Code to require the mandatory fortification of all bread-making flour with folic acid is unlikely to have a significant effect on international trade. This is because bread-making flour is principally used for domestic markets, and virtually all bread-making flour is milled domestically.

However, FSANZ recognises that a requirement to mandatorily fortify a staple food such as bread-making flour may have trade implications not yet identified. Therefore, notification of the proposed mandatory fortification regulations will be made to the WTO in accordance with the WTO Technical Barrier to Trade Agreement. This will enable other WTO member countries to comment on proposed changes to standards where they may have a significant impact on them.

CONCLUSION

16. Conclusion and Preferred Regulatory Option

As requested by the Ministerial Council, FSANZ has considered the feasibility of mandatory fortification of the food supply with folic acid as a means of reducing the incidence of NTDs in Australia and New Zealand.

On the basis of the available evidence, FSANZ concludes that mandatory fortification of bread-making flour at a residual level of 200 µg per 100 g of flour in the final product (Option 2) (prescribed as a fortification range of 230 -280 µg per 100 g of flour) would deliver substantial net-benefits to Australia and New Zealand.

Other strategies for reducing the incidence of NTDs will continue to be important. These strategies include the promotion of increased folate intakes in women of child-bearing age through education, voluntary fortification and supplement use. The optimal reduction in the incidence of NTDs depends on these strategies continuing, including a commitment to the ongoing promotion of folic acid supplements.

The approach maintains current voluntary folic acid permissions except for bread which will be changed from a voluntary permission to a mandatory requirement.

FSANZ concludes that Option 2 is the preferred approach at Draft Assessment for the following reasons:

- the approach of fortifying flour with folic acid, in this case bread-making flour, is consistent with international experience of mandatory fortification to reduce the incidence of NTDs;
- bread-making flour is an effective and technically feasible food vehicle for mandatory fortification;
- bread-making flour (as bread and bread products) is a staple food consumed widely, consistently and regularly by the target population of women aged 16-44 years;
- fortification of bread-making flour will deliver a mean increase in folic acid intake in the target population of 100 µg and 131 µg in Australia and New Zealand respectively, resulting in an estimated reduction of between 14-49 out of 300-350 pregnancies in Australia and 4-14 out of 70-75 pregnancies in New Zealand affected by an NTD each year;
- on the available evidence, including overseas experience with mandatory fortification, the proposed level of fortification does not pose a risk to public health and safety. The level has been set to minimise any potential health risks as a degree of uncertainty exists, particularly for the non-target population from increased folic acid intakes over the longer term;
- the cost-benefit analysis has indicated that the benefits from the projected reduction in NTDs will exceed the costs of mandating fortification:
 - in Australia, the net benefits would be \$23.9 million each year ongoing based on a reduction in live births affected by an NTD, or \$124.5 million each year ongoing based on a reduction in all pregnancies affected by an NTD (including still births and terminations); and
 - in New Zealand, the net benefits would be \$4.8 million each year ongoing based on a reduction in live births affected by an NTD, or \$41.2 million each year ongoing based on a reduction in all pregnancies affected by an NTD (including still births and terminations).
- the cost to consumers is likely to be small, probably less than 1% of the price of a loaf of bread;
- consumers will be provided with information through ingredient labelling to identify the presence of folic acid in products containing bread-making flour; and
- it is consistent with Ministerial policy guidance on mandatory fortification;

Monitoring will form an important component of implementing this Proposal. It will provide a mechanism to gauge both the ongoing effectiveness and safety of mandatory folic acid fortification, particularly in further reducing the incidence of NTDs.

17. Implementation

Following public consultation, a Final Assessment for this Proposal will be completed. Once the Final Assessment Report and the proposed draft variations to the Code are approved by the FSANZ Board, notification will be made to the Ministerial Council. The proposed draft variations to the Code are expected to come into effect upon gazettal, subject to any request from the Ministerial Council for a review.

It should be noted that the success of this important public health strategy extends beyond implementing mandatory fortification as the sole strategy, and incorporates the key components of education, folic acid supplementation policy and monitoring and review. A proposed approach to monitoring and review is discussed below in Section 17.1.

17.1 Transitional period

Division 1 of Standard 1.1.1 – Preliminary Provisions - Application, Interpretation and General Prohibitions of the Code requires a food product to comply with any variation to the Code within 12 months after the commencement of the variation. It is proposed that this standard transitional period will apply to the proposed mandatory fortification of bread-making flour with folic acid.

17.2 Communication and education strategy for the preferred regulatory option

FSANZ has prepared a communication and education strategy for the preferred regulatory option of mandatory folic acid fortification.

The strategy aims to increase awareness among all target audiences of the proposed standard for folic acid fortification; and to promote the importance of increased dietary folate consumption and folic acid supplementation among women of child-bearing age. Target audiences identified for the strategy are: consumers, particularly women of child-bearing age; industry; health professionals; government agencies that are responsible for monitoring, enforcement and education; and the media.

To implement this strategy, FSANZ will collaborate with other organisations that play an important role in providing information and education to consumers, industry and other key stakeholders. This collaborative approach will increase public awareness of the proposed standard and fortification issues, ensure consistency of information, and maximise the effectiveness of available resources. For this strategy to be most effective, communication and education activity will need to be sustained over time.

18. Monitoring

18.1 Monitoring and review of the impact of mandatory folic acid fortification

Monitoring and review is a fundamental component of any mandatory fortification program. The Ministerial Policy Guideline states any agreement to require fortification should require that it be monitored and formally reviewed to assess the effectiveness of, and continuing need for, the mandating of fortification.

Monitoring of the impact of mandatory folic acid fortification is an important risk management consideration. As noted in the editorial note to the draft variation of the Code (see Attachment 1), this mandatory fortification requirement will be reviewed when sufficient monitoring data become available.

The responsibility for establishing and funding a monitoring system to assess the impact of a mandatory fortification on the population extends beyond FSANZ's responsibilities under the FSANZ Act and will require the concomitant involvement of health and regulatory agencies at a Commonwealth, State and Territory level in Australia and the New Zealand Government.

For the purposes of progressing discussion on the proposal to mandate folic acid fortification, FSANZ has adapted the draft monitoring framework prepared by the FRSC working group for mandatory fortification of nutrients and outlined the potential elements that could be considered for inclusion in a monitoring system for assessing the impact of folic acid fortification on consumers (see Attachment 12). For nutrients such as folate, where there are already voluntary permissions in the Code to fortify some food products with folic acid as well as the proposed folic acid mandatory permissions, the monitoring system will need to include information on the cumulative impact of both sets of regulatory decisions on consumers.

As the main objective of a mandatory fortification program for folic acid is to reduce the incidence of NTDs, measurement of change in NTD incidence (including still births and terminations) would be an essential component of any monitoring system that aims to assess the effectiveness of the fortification measure. It would also be necessary to collect information on potential unintended adverse health effects of increasing folic acid intakes for the target and non target groups in the population. As for any monitoring system, the collection of baseline data prior to or just after the implementation of the fortification program and at some time in the future to assess changes in performance measures is essential.

In order to determine the impact of mandatory fortification on folic acid intake, it is also necessary to collect additional data on changes to the fortified food products available and their folic acid content, consumer attitudes and purchase behaviour in relation to fortified foods, actual consumer food and supplement consumption patterns and on biochemical markers of folic acid status such as folic acid and homocysteine levels in blood serum or red blood cells. Attachment 12 gives details on possible data collection methods for each of these elements of a more comprehensive monitoring system. These data collections would provide extremely valuable information on how the fortification policy has affected the whole food system. This would be particularly important if implementation of mandatory fortification did not achieve the desired end outcome of reducing the incidence of NTDs by the expected amount or if there was evidence that it was adversely affecting the population in

general. A comprehensive monitoring system should provide sufficient data to answer the question ‘why is it not working?’ and be able to identify the best intervention point for improving the system in the future to achieve a better outcome.

FSANZ recognises that the costs for establishing an ongoing monitoring system have not been included in the cost-benefit analysis presented elsewhere (see Section 11.2) because the inter agency discussion on the elements (and hence costs) to be included in such a system has yet to take place. However, the cost of a monitoring system will need to be considered by the Ministerial Council when making their final decision on the proposal.

Preliminary costings for various elements of a monitoring system based on current estimates have been included in Attachment 12 as a basis for future discussion with key stakeholders, including the food industry as well as the government agencies involved.

As part of its ongoing work, FSANZ will contribute directly to the following elements of the monitoring system:

- tracking changes in the food supply for fortified/unfortified foods in key food categories in consultation with the food industry;
- updating the food composition databases;
- tracking labelling changes on fortified foods;
- tracking changes in food consumption patterns for different demographic groups in key food categories that are likely to be fortified; and
- researching changes in consumers’ attitudes and behaviour towards fortified foods.

FSANZ may also be involved indirectly in other program activities.

ATTACHMENTS

1. Draft variation to the *Australia New Zealand Food Standards Code*
2. Summary of submissions from the Initial Assessment Report
3. Fortification policy guidelines
4. Impact of mandatory fortification in the United States
5. Current approach to increasing folate intake among women of child-bearing age
6. Potential health benefits and risks of increased folic acid intake
7. Methodology and results of dietary modelling
8. Evaluation of the health risk from mandatory folic acid fortification
9. Wald model: NTD risk reduction according to increments of folic acid
10. Food technology report
11. Cost-benefit analysis report
12. Development of a bi-national monitoring system to track the impact of regulatory decisions on mandatory and voluntary fortification

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Draft variations to the *Australia New Zealand Food Standards Code*

To commence: on gazettal

[1] *Standard 1.3.2 of the Australia New Zealand Food Standards Code is varied by –*

[1.1] *omitting the Purpose, substituting –*

This Standard regulates the addition of vitamins and minerals to foods, and the claims which can be made about the vitamin and mineral content of foods, other than those special purpose foods standardised in Part 2.9, the addition of iodine to certain salt products in Standard 2.10.2, the addition of thiamin (Australia only) and folate to flour for making bread in Standard 2.1.1, the addition of vitamin D to table edible oil spreads and margarine in Standard 2.4.2, the addition of vitamins to formulated caffeinated beverages in Standard 2.6.4 and certain claims permitted elsewhere in this Code.

[1.2] *omitting from the Table to clause 3, under the headings Cereal and cereal products, Bread, the entry for folate.*

[2] *Standard 2.1.1 of the Australia New Zealand Food Standards Code is varied by –*

[2.1] *omitting the Purpose, substituting –*

This Standard defines a number of products composed of cereals, qualifies the use of the term ‘bread’, and requires the mandatory fortification of flour for making bread with folate in both Australia and New Zealand and thiamin in Australia only.

[2.2] *omitting clause 4, substituting –*

4 Flour for making bread

(1) Paragraph 4(2)(a) does not apply to flour for making bread produced in, or imported into, New Zealand.

(2) Flour for making bread must contain -

- (a) no less than 6.4 mg/kg of thiamin; and
- (b) no less than 2.3 mg/kg and no more than 2.9 mg/kg of folic acid.

[2.3] *omitting the Editorial note following clause 4, substituting –*

Editorial note:

Paragraph 4(2)(a) will be reviewed to assess the future need for this mandatory requirement for Australia and New Zealand.

The maximum limit for folic acid given in paragraph 4(2)(b) ensures the addition of folic acid to flour for making bread in Australia and New Zealand is in controlled amounts to provide for a safe population intake of dietary folic acid. Paragraph 4(2)(b) will be reviewed, when sufficient monitoring data are available to assess the impact of this mandatory requirement.

SUMMARY OF SUBMISSIONS FROM THE INITIAL ASSESSMENT REPORT

Executive Summary

Background

In December 2004 FSANZ received 72 submissions in response to the Initial Assessment Report of Proposal P295 – Consideration of Mandatory Fortification with Folic Acid. There were four options proposed at Initial Assessment to increase the folic acid intake among women of childbearing age to reduce the prevalence of neural tube defects (NTDs) in Australia and New Zealand, namely:

- Option 1 – Maintaining the *Status Quo*;
- Option 2 – Increased permissions for voluntary folate fortification;
- Option 3 – Mandatory folate fortification; and
- Option 4 – Increased health promotion and education strategies to increase folate intakes (non-regulatory option).

Submitter representation and preferred regulatory options.

Submitter Classification	No.	Preferred Option					
		1	2	3	4	Option 4 in	Not
Consumers	16	0	1	14	1	4	0
Industry	19	2	13	2	1	15	1
Public health and Academic Institutions	28	2	1	14	1	5	10
Government	9	0	1	5	1	3	2
Total	72	4	16	35	4	27	13

In summary, submitters views were mixed in relation to a preferred regulatory option. Organisations and individuals with a direct interest in NTDs strongly supported mandatory fortification.

Government and public health submitters (19) in general supported mandatory fortification on the condition that a national monitoring and surveillance system is in place prior to implementation.

However, other public health and government submitters (12) did not indicate a preferred option citing reservations due to the uncertainty surrounding potential risks from mandatory folic acid fortification and stressed the need for a conservative approach.

Industry submitters primarily supported extension of voluntary fortification permissions in conjunction with increased health promotion and education strategies to increase folate intakes. Two Australian milling companies supported mandatory fortification if it was shown to be beneficial to the community and named bread-making flour was an effective food vehicle.

KEY ISSUES IDENTIFIED FROM SUBMISSIONS

1. Regulatory options

Reasons for and against each of the regulatory options included:

1.1 Maintaining the Status Quo

Support

- Believe that manufacturers must be given an option to fortify or not

Against

- Uptake of voluntary permissions by industry has been low
- The potential to reduce NTDs is not optimised and there will be no change in the prevalence of NTDs.

1.2 Increased permissions for voluntary folate fortification

Support

- Voluntary fortification both maintains and widens consumer choice.
- Industry is best placed to identify foods consumed by the target groups and to develop appropriate fortified products.
- Allows for product innovation and maintains competitive advantage.
- Minimum risk and a cost effective approach.

Against

- Voluntary fortification and education programs have not achieved the maximum reduction in NTDs.
- Limited uptake of voluntary permissions by industry to date and no guarantee that industry will fortify more products if permissions are extended.
- Unlikely to reach the target population equally and consistently, reporting that voluntary fortification favours educated people who can afford to purchase targeted products and have planned their pregnancy.
- Difficult to monitor folic acid in the food supply with voluntary fortification.

1.3 *Mandatory folate fortification*

Support

- Strong evidence that adequate folic acid intake in peri-conceptional women prevents up to 70% of NTDs.
- Only way to ensure equal and sustained access, regardless of education and financial situation.
- Has been implemented in other countries and resulted in a reduction in NTD rates.
- Other options have not had significant or sustained success.
- A simple, effective and affordable public health measure.
- Evidence that the general population may benefit from an increased folate status, with respect to other improved health outcomes.
- Would capture unplanned pregnancies, where women are generally reluctant to take folic acid supplements when not planning a pregnancy.
- No adverse health effects of mandatory fortification have been reported.
- Cost to consumers would be negligible.
- More predictable levels of folic acid in the food supply

Against

- Consumer choice is removed.
- It indiscriminately increases folate intake of the whole population.
- Potential health risks associated with increased folate intake, especially for the non-target population (e.g. masking of vitamin B₁₂ deficiency).
- Lack of data, including folate intake and status of the population.
- Does not reflect Ministerial policy guidance.
- Technical difficulties and costs associated with fortifying foods, where the cost may be passed onto consumers.
- Mandatory fortification alone will not address the health problem.

2. Choice of food vehicles for fortification

Submitters in favour of mandatory fortification strongly supported the use of flour or bread as the food vehicle, therefore limiting it to only one or a few foods. Flour was considered favourable as it was widely consumed by the target population, many other countries had implemented mandatory fortification of flour, and the same infrastructure used by the Australian milling industry to add thiamin could be used. In comparison, industry submitters supported extended voluntary fortification permissions, including dairy products, to allow product differentiation and flexibility to adapt to consumer demands and food consumption trends.

Four submitters considered there was a need to assess the bioavailability of folic acid in the selected food vehicle(s). One submitter commented that folic acid is an unstable vitamin, and questioned if the food industry will be willing to take up the challenges of label claim verification, stability studies, bioavailability and efficacy on an ongoing basis.

3. Potential benefits and risks of increased folate status

Submitters acknowledged there was conclusive evidence of the protective role of folate in reducing the rates of NTDs. Another reported benefit of increased folic acid intake was reduced homocysteine levels and therefore reduced rates of cardiovascular disease.

Many submitters expressed concern related to increasing the folate status of the wider population, particularly if mandatory folic acid fortification was implemented. Concern noted included the masking of vitamin B₁₂ deficiency (though some submitters dispute this), twinning, potential cancer-promoting effects of folic acid, drug-nutrient interactions (e.g. with epileptic medication), and other unknown risks associated with excess folic acid intakes over a long period of time.

4. Impact of fortification on consumer choice

Submitters generally agreed that consumer choice was important and should be considered when assessing the options for folic acid fortification, particularly for fortification that affected the wider population. They noted that consumer choice was maintained with voluntary fortification, but removed with mandatory fortification. Some suggested that if mandatory fortification of flour is selected, wholemeal flour could remain non-fortified.

5. Impact of fortification on industry

Industry submitters, particularly those representing the baking and milling industries, generally felt that mandatory fortification would impose increased operating costs for the industries involved. The New Zealand baking and milling industry submissions noted the financial cost of mandatory fortification would be particularly high in New Zealand because there was no existing infrastructure for fortification of flour, or bread.

6. Data gaps

Some submitters commented that there are data gaps specific to Australian and New Zealand populations, where this baseline data is required before implementing fortification, particularly mandatory fortification. Data gaps identified included:

- folate intake and status of the whole population, target group and other population groups;
- the optimal folate status for reducing occurrence of NTDs;
- vitamin B₁₂ status and prevalence of deficiency;
- incidence of NTDs and NTD affected pregnancies, including terminations;
- long term impacts of folate fortification and increased folate consumption, especially for the non-target population; and
- foods currently fortified with folate and their consumption by the target group.

7. Rates of neural tube defects (NTDs)

Many submitters provided prevalence data for NTDs for Australian states and New Zealand, and commented on the interpretation of trends in the data.

Some submitters commented that the decline in the prevalence of NTDs over the past two decades only reflected the number of live births and did not include terminations, where terminations have reportedly increased over this time with implementation of prenatal screening programs. Many submitters considered that this highlighted the need for national birth defect registers, to ensure the collection of accurate information for all live births, stillbirths and terminations. Other submitters also noted that Aboriginal women were twice as likely as non-Aboriginal women to have a baby with a NTD, and that the decline in NTDs had been confined to the non-Indigenous population.

Two industry submitters commented that limited evidence suggested that rates of NTDs in Australia and New Zealand appeared to be as low as rates in some countries with mandatory folate fortification.

8. Monitoring

Submitters commented on the need for comprehensive monitoring programs in both Australia and New Zealand to monitor the effects of folic acid fortification on the whole population, not just the target group, particularly if mandatory fortification were selected. Many considered it would be essential that this monitoring system be in place before mandatory fortification is implemented. Submitters considered that monitoring would be the responsibility of Government.

Monitoring was needed for:

- prevalence of NTDs and NTD affected pregnancies, including terminations;
- folate status – serum and red blood cell folate;
- folate dietary intakes;
- folate content of fortified foods, including overages; and
- consumer and industry attitudes to fortification.

9. Health promotion and education strategies

Many submitters supported national public awareness campaigns across Australia and New Zealand. Twenty-seven of the 72 submitters supported fortification of some description in conjunction with health promotion and education strategies. Many highlighted the need for these campaigns to be wide reaching, ongoing and supported by Government, noting that women are continuously entering the target group. Submitters also considered that education alone was not an effective strategy, some stating that education generally favoured educated women who had planned their pregnancy. In addition to educating women on the role of folate in pregnancy, submitters considered the wider population should be educated on the potential risks of increased folate intake.

10. Consistency with Ministerial Policy Guideline on Vitamin and Mineral Fortification

Some submitters questioned how this proposal met each of the Specific Order Policy Principles for mandatory fortification. Specifically, they questioned whether mandatory fortification was the most effective public health strategy, and whether it would lead to detrimental excesses or imbalances of folate across the general population.

Some submitters highlighted the need for a comprehensive assessment of alternative strategies before mandatory fortification can be selected, as specified in the Policy Guideline.

Summary of Submissions

FSANZ received 72 submissions in response to the Initial Assessment Report (IAR) of Proposal P295 – Consideration of Mandatory Fortification with Folic Acid, during the consultation period of 20 October to 24 December 2004. A summary of submitter comments is provided in the table below.

Four regulatory options were proposed at Initial Assessment, namely:

Option 1 – Maintain Status Quo;

Option 2 – Increased permissions for voluntary folate fortification;

Option 3 – Mandatory folate fortification; and

Option 4 – Increased health promotion and education strategies to increase folate intakes.

Option 4 is a non-regulatory option that was proposed as being either a stand alone option or implemented in conjunction with any of the three preceding options.

	Submitter	Submission Comments
	Consumers	
	<i>Consumers</i>	
1	Private Ms Lee Bickley, Queensland	Supports Option 3 Supports mandatory fortification of flour with folate. Notes the effects of spina bifida, including emotional and financial burdens, on individuals with the condition and their families. Education and voluntary fortification programs have increased awareness of the benefits, but have not reduced the incidence of NTDs to the fullest extent possible.
2	Private Mr Patrick and Mrs Lynette Byrne, Australia	Supports Option 3 Supports mandatory fortification of flour with folate. Notes the effects of spina bifida, including emotional and financial burdens, on individuals with the condition and their families. Considers mandatory fortification is the only way to ensure equal access regardless of education and financial situation.
3	Private Ms Kerrie Duff, Western Australia	Supports Option 3 Notes the effects of spina bifida, including emotional and financial burdens, on individuals with the condition and their families. Considers educational messages to the community on this issue are worthwhile and should continue, however these messages alone and/or voluntary fortification are unable to achieve the maximum reduction in NTD cases. Considers mandatory fortification is the only way to ensure equal access regardless of education and financial situation.

	Submitter	Submission Comments
4	Private Ms Amanda Hemley, Australia	Supports Option 3 Supports mandatory folate fortification of basic foods. Notes the effects of spina bifida, including emotional and financial burdens, on individuals with the condition and their families.
5	Private Ms Helen Leech, Western Australia	Supports Option 3 Supports mandatory fortification of flour with folate. Notes the effects of spina bifida, including emotional and financial burdens, on individuals with the condition and their families. Considers voluntary fortification programs have been unsuccessful.
6	Private Ms Annette Roehrer, Tasmania	Supports Option 3 Supports mandatory fortification of flour with folate. Notes the effects of spina bifida, including emotional and financial burdens, on individuals with the condition and their families. Considers mandatory fortification is the only way to ensure equal access regardless of education and financial situation.
7	Private Mr Philip Vinci, Western Australia	Supports Option 3 Strongly supports mandatory fortification of flour with folate. Notes the effects of spina bifida on the individual regarding ongoing medical input and missed education, on the entire family, and the cost to governments for ongoing treatment. His experience indicates that education and voluntary fortification programs have been tried and have not succeeded in reducing the incidence of NTDs to the maximum extent possible. Notes that flour is the preferred food vehicle, used by a number of other countries.
Consumer Organisations		
8	Genetic Support Council WA Mr Terry Keating	Supports Option 3 in conjunction with Option 4 Considers it highly desirable to develop further strategies over and above current arrangements to generally increase folate intakes within the general community. Notes support for Options 3 & 4, but may alter position if future research clearly demonstrated any health concerns. Regulatory options <i>Maintain status quo</i> Does not support Option 1, as uptake of voluntary fortification permissions by industry has been low. <i>Increased permissions for voluntary fortification</i> Given the limited uptake of voluntary fortification by industry under the current permissions, it is unlikely that an extension of permissions would have a significant impact.

	Submitter	Submission Comments
		<p><i>Mandatory fortification</i></p> <p>Supports mandatory fortification in view of the significant benefits in reducing NTDs and the limited apparent side effects.</p> <p><i>Health promotion and education strategies</i></p> <p>Considers there to be significant evidence that education strategies to increase folate intakes has reduced NTDs, and that such strategies should continue.</p>
9	<p>March of Dimes, USA</p> <p>Dr Jennifer Howse</p>	<p>Supports Option 3</p> <p>Strongly supports mandatory fortification of flour with folic acid.</p> <p>The March of Dimes works to improve the health of babies through prevention of birth defects and infant mortality.</p> <p>Subsequent to mandatory fortification of flour at 140 µg of folic acid per 100 g of enriched grain product in the US, the rate of NTDs has reduced by 25%.</p>
10	<p>New Zealand Crippled Children Society (CCS) Inc</p> <p>Mr Lyall Thurston</p>	<p>Supports Option 3</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Does not support maintaining the status quo, citing prejudice against disabled people, ongoing cost of health care to support disabled children, and rights of newborn babies, women and their families as reasons.</p> <p><i>Mandatory fortification</i></p> <p>Supports the mandatory fortification of flour with folic acid at 285 µg/100 g, the current level permitted for voluntary fortification.</p> <p>CCS has led the New Zealand Folate Awareness campaign seeking mandatory fortification of flour with folic acid so as to prevent NTDs in babies since the early 1990s.</p> <p>Believes that further delay in implementing mandatory fortification of flour is not acceptable – in moral, ethical, physical, social, public health or financial terms.</p> <p>Incidence/prevalence of NTD</p> <p>Believes the statement that “the prevalence of NTDs has been declining over the past two decades” is not substantiated, as second trimester NTD terminations are not officially recorded.</p> <p>Estimated that there are up to 80 NTD conceptions per year in New Zealand, and they understand that 70% of these pregnancies are terminated.</p> <p>CCS is demanding that a national birth defects register be given urgent priority.</p> <p>Increase in late stage terminations as amnio procedures are more accessible leading to morally questionable terminations.</p>

	Submitter	Submission Comments
		<p>Vitamin B₁₂ deficiency</p> <p>State that those who attended a Folate Scoping Symposium (Wellington, March 2003) were unanimous that the issue of B₁₂ was not an issue, i.e. hypothetical, unlikely and any risk would be counteracted by appropriate action from health professionals.</p> <p>Impact</p> <p><i>Mandatory fortification</i></p> <p>Considers the benefits of mandatory fortification outweigh the costs, regarding cost of benefits to support the disabled (e.g. sickness and unemployment benefits) and cost of ongoing medical support (e.g. paediatricians, urologist, neurologists etc).</p> <p>Consumer choice</p> <p>Considers it unlikely that consumers would be concerned about lack of consumer choice if mandatory fortification were instigated, given price driven purchase of the majority of bread consumed.</p> <p>Propose that wholegrain bread could be exempt which would cater for the pure food lobby and promote better dietary habits.</p> <p>Recommend a comprehensive public information campaign accompany mandatory fortification to ensure consumer awareness of the reason for introducing this initiative and to capitalize on the opportunity of promoting preconception and general health.</p> <p>Monitoring</p> <p>Propose that NZFSA would be responsible for monitoring compliance with levels and appropriate labelling and packaging, and the Ministry of Health would monitor health and nutrition status with increased folic acid consumption.</p> <p>Health promotion and education strategies</p> <p>Effectiveness of campaigns is directly related to budget, reach of all populations and sustaining at significant levels. They consider such activity is unprecedented and unlikely to be achieved given widespread health priorities.</p>
11	<p>Spina Bifida Association of WA Inc</p> <p>Mr Philip Vinci</p>	<p>Supports Option 3</p> <p>Incidence/prevalence of NTDs</p> <p>Estimated 5,000 people with spina bifida and 315 cases per year in Australia.</p> <p>Impact</p> <p>Considers education and voluntary fortification programs have not succeeded in maximising the number of preventable cases of NTDs (i.e. up to 70%).</p> <p>Comments that spina bifida is a condition that affects the entire family, and the cost is excessive to the community, schools and governments.</p>

	Submitter	Submission Comments
		<p>Food vehicles</p> <p>Supports mandatory fortification of flour with folate.</p> <p>Comments that 50 countries have agreed or are agreeing to mandate fortification and that flour is the preferred vehicle.</p>
12	<p>Spina Bifida</p> <p>Foundation of Victoria</p> <p>Ms Stephanie Taylor</p>	<p>Supports Option 3 in conjunction with Option 4</p> <p>Asks that discussion of prevention of NTDs be balanced with consideration of the feelings and needs of those living with spina bifida and their families.</p> <p>Incidence/prevalence of NTDs</p> <p>Prevalence rate since 1996 has declined by approximately 30%, from around two NTD per 1,000 births (data from Australian state-based birth defect registers). This includes many pregnancy terminations.</p> <p>In Victoria approximately 60% of NTDs are diagnosed prenatally and the pregnancy terminated before 20 weeks, and another 30% die either before or soon after birth (Riley M et al, 2002).</p> <p>In Victoria, there are currently 1 in 850 pregnancies in which the baby has a NTD, which equates to approximately 73 babies, and many of these pregnancies are terminated.</p> <p>Evidence that the decline in NTD rate has been confined to the non-Indigenous population.</p> <p>Folate supplement use</p> <p>Evidence for suboptimal use of periconceptual folic acid supplements globally, from countries where there is both voluntary and mandatory fortification (Ray et al, 2004).</p> <p>Impact</p> <p><i>Maintain status quo</i></p> <p>Considers the existing voluntary fortification permissions have not sufficiently reduced the prevalence of NTDs.</p> <p>As no specific monitoring has taken place, it is not possible to determine the degree of importance voluntary fortification has played in the decline of NTD rates that have been observed.</p> <p><i>Mandatory fortification</i></p> <p>Considers it possible to reduce the prevalence of NTD by 70% with mandatory fortification.</p> <p>Important to deliver folic acid effectively as many women are not aware of the importance of folate, and therefore are not seeking foods rich in folate or taking supplements.</p> <p>Considers cost of fortification to be very small, and envisage there may be an increased cost of 1 cent per loaf of bread.</p> <p>Data from US, Chile and other countries with mandatory fortification show a decline in NTDs even with low dose fortification and so far no adverse effects have been observed.</p>

	Submitter	Submission Comments
		<p><i>Increased health promotion and education strategies</i></p> <p>Public awareness campaigns must promote the importance of folate periconceptually and allow women the choice of taking supplements as well as, or instead of, eating fortified foods.</p> <p>Generally, Australian campaigns have had limited effectiveness in alerting women to the importance of taking folate.</p> <p>Data from Western Australia shows that awareness is relatively high amongst women of childbearing age (62%) but only 30% of women take adequate amounts of folic acid as supplements in the periconceptual period (Bower C, 2004).</p> <p>Supplement use is higher in older women, women who are married, better educated and private patients (Bower C, 2004 and Bower et al, 1997).</p> <p>Data from South Australia show that about 55% of women overall may be taking supplements appropriately (DalGrande et al, 2001).</p> <p>Consumer Choice</p> <p>Labels should show clearly that the food is fortified, so that those who prefer (or need) to supplement their diet naturally can do so.</p> <p>Monitoring</p> <p>Need to monitor prevalence of NTDs, including pregnancy termination data, nutritional status e.g. folate and vitamin B₁₂, and changes in frequency and presentation of pernicious anaemia.</p> <p>Baseline/pre-fortification data should be collected now.</p> <p>Community awareness and attitude surveys should be undertaken.</p> <p>Health promotion and education</p> <p>Health promotion campaigns should not be the sole strategy, but used in conjunction with mandatory fortification.</p> <p>References</p> <p>Riley, M., Halliday, J. Birth defects in Victoria 2001-2002. Melbourne, Victoria: Victorian Perinatal Data Collection Unit, Public Health, Victorian Government.</p> <p>Ray, JG., Singh, G., Burrows, BF. 2004. Evidence for suboptimal use of periconceptual folic acid supplement globally. <i>Bjog</i> 111(5);399-408.</p> <p>Bower, C. 2004. Folate promotion in Western Australia and the prevention of neural tube defects. <i>Australia and New Zealand Journal Public Health</i> 28(5);458-64.</p> <p>Bower, C., Blum, L., O'Daly, K., Higgins, C., Loutsky, F., Kosky, C. 1997. Promotion of folate for the prevention of neural tube defects: knowledge and use of periconceptual folic acid supplements in Western Australia, 1992-1995. <i>Australia and New Zealand Journal of Public Health</i> 21(7);716-21.</p>

	Submitter	Submission Comments
13	Spina Bifida Group of NSW Ms Anita Fisher	<p>Supports Option 3</p> <p>Incidence/prevalence of NTDs</p> <p>Estimated 5,000 people in Australia have spina bifida and each year about 315 pregnancies are affected by a NTD.</p> <p>Regulatory options</p> <p><i>Mandatory fortification</i></p> <p>Considers mandatory fortification is the only way to ensure equal access regardless of education or financial situation.</p> <p><i>Increased health promotion and education strategies</i></p> <p>Considers that education and voluntary fortification programs have been tried and have not been successful to the extent that is possible.</p> <p>Food vehicle</p> <p>Supports addition of folate to staple foods like flour.</p>
14	Spina Bifida Hydrocephalus Queensland Mr Trevor Capps	<p>Supports Option 3 in conjunction with Option 4</p> <p>Incidence/prevalence of NTDs</p> <p>Approximately 245 terminations of pregnancy with NTD and approximately 100 infants are born with spina bifida each year in Australia (National Perinatal Statistics Unit).</p> <p>Vitamin B₁₂ deficiency</p> <p>Considers that there are other ways of dealing with the issue of vitamin B₁₂ deficiency, and that this issue should not be used to justify inaction.</p> <p>Folate Supplement Use</p> <p>Research indicates between 28-33% of the target group take folate supplements, a result of 10 years of campaigns (Bower et al, 2004, Henry et al, 2000 and Maats et al, 2002). Therefore, if folate works in 7 out of 10 cases, then we are potentially preventing between 21-24% of a possible 70% of cases.</p> <p>Considers that folate supplementation of the target group has improved. Believes current programmes are not achieving the potential results of NTD reduction, as the primary group who are aware of taking folate supplements are educated people with private health insurance who plan their pregnancy.</p> <p>Foods Currently Fortified with Folic Acid</p> <p>The major food groups fortified with folic acid are bread, orange juice, cereals and milk.</p> <p>There are no market programs targeting women of childbearing age to increase awareness of the benefit of folate in reducing NTDs.</p> <p>Reports that an evaluation of the health claims pilot project for folate showed no increase in sales due to the ability to make a health claim regarding the reduction of NTDs.</p>

	Submitter	Submission Comments
		<p>Impact</p> <p><i>Maintain status quo</i></p> <p>Notes that the National Perinatal Statistics Unit prevalence data may not include all terminations, whereas the rates of NTD affected pregnancy terminations have increased. This needs to be considered when determining the effectiveness of maintaining the status quo.</p> <p><i>Voluntary fortification</i></p> <p>Reduction rates of 30% have been achieved through folic acid supplements and voluntary fortification. This requires continual education programs for the momentum to be maintained.</p> <p>Considers the benefits of voluntary fortification to be limited to commercial interests.</p> <p>Comments that voluntary fortification favours people from higher socio-economic classes who can afford to purchase target marketed products.</p> <p><i>Mandatory Fortification</i></p> <p>The degree of reduction in NTDs would depend on the level of fortification and the food vehicle used.</p> <p>If the current mandatory level is accepted, then considers there is a higher potential to reach the optimum levels of 70% reduction.</p> <p>Studies show rates of spina bifida and anencephaly were reduced by 20-50% with mandatory fortification (references provided).</p> <p>Considers the cost to implement mandatory fortification would be negligible, as the Australian milling industry already has the equipment to add thiamin. However, the New Zealand mills would have to purchase the required equipment.</p> <p>Comments that the Governments stand to benefit financially, as it is estimated that the cost of caring for a person with spina bifida is approximately \$200,000 in the first ten years of life alone.</p> <p>Comments that many women are reluctant to take supplements if they are not intending to get pregnant, and as at least 40% of pregnancies are unplanned, these women's pregnancies may not be protected against NTDs.</p> <p>Considers mandatory fortification removes the competitive issue with the distribution of folate. The effect of this should be to minimise the cost to consumers.</p> <p>States that millers consider it an issue that the cost of the fortification lays with them whilst the supplier increases their business, and that a more equitable solution needs to be found.</p> <p>Comments that there will be start up costs for labelling and installation of machinery for millers in New Zealand, however there will also be considerable savings to the health budget for every case of a NTD that is prevented. Suggests that with these savings the government could subsidise the installation of materials.</p>

	Submitter	Submission Comments
		<p><i>Health promotion and education strategies</i></p> <p>Four studies examined the effect of mass media campaigns on periconceptional folic acid use, where the reported rates increased significantly by a factor of 1.7-7.2, but in no study was the post-campaign rate above 50% (Ray et al, 2004).</p> <p>Food vehicles</p> <p>Flour, bread, cereals, pasta, juice and milk are products that could be fortified with folate.</p> <p>Flour is the primary vehicle recommended as it is the base for so many foods and the mechanism for mandatory fortification has already been established in Australia for thiamin.</p> <p>Consumer choice</p> <p>Considers consumer choice can be maintained by providing non-fortified flour options too.</p> <p>Monitoring</p> <p>Data on serum folate or red blood cell folate status of Australians and New Zealanders should be collected now, before mandatory fortification is implemented.</p> <p>Considers it is essential that an effective birth defects registry be developed for both Australia and New Zealand, which also includes terminations due to a NTD. This should be the responsibility of the Commonwealth Health Department.</p> <p>Monitoring is also required for folate levels in fortified foods, and serum and red cell folate in representative samples of the population.</p> <p>Health promotion and education strategies</p> <p>Comments that educated, higher socio-economic status women are more likely to learn about folate and take action.</p> <p>Comments that unplanned pregnancies are missed by health promotions, and that health promotions have not reached Indigenous mothers.</p> <p>Considers health promotion campaigns should be used in conjunction with other regulatory options to reduce the incidence of NTDs, as part of the introduction of mandatory fortification.</p> <p>Considers that support exists amongst Health Authorities for education, however the implementation and investment varies greatly between states.</p> <p>References</p> <p>Bower, C., Miller, M., Payne, J., Serna, P., de Klerk, N., Stanley, FJ. 2004. Folate promotion in Western Australia and the prevention of neural tube defects. Australia and New Zealand Journal of Public Health 28;458-464.</p> <p>Henry, A., Crowther, CA., Crowther, CA. 2000. Universal periconceptional folate supplementation: chasing a dream? MJA 172;407-8.</p>

	Submitter	Submission Comments
		<p>Maats, FH., Crowther, CA. 2002. Patterns of vitamin, mineral and herbal supplement use prior to and during pregnancy. Aust NZ J Obstet Gynaecol 42;494-6.</p> <p>Ray, JG., Singh, G., Burrows, RF. 2004. Evidence for suboptimal use of periconceptional folic acid supplements globally. Bjog 111;399-408.</p>
		<i>National Consumer Organisations</i>
15	<p>Australian Consumers' Association</p> <p>Ms Clare Hughes</p>	<p>Supports Option 4 while further research is conducted</p> <p>Regulatory options</p> <p>Supports Option 4 while further research is conducted. However, health promotion and education strategies to increase folate intake should commence as soon as possible.</p> <p>At the very minimum a long term strategy for education and health promotion should be implemented.</p> <p>Believes fortification should be mandatory rather than voluntary, if it is decided that there is a significant health issue to warrant fortification.</p> <p>Does not support voluntary folate fortification to address NTDs, due to limited uptake by Australian and United Kingdom manufacturers, and the potential for it to become a marketing exercise to differentiate products. However, acknowledges that voluntary fortification may be more effective in giving the target population a variety of options for increasing folate intake, while also allowing non-target and at-risk consumers the option to avoid the fortified foods.</p> <p>Impact</p> <p>Considers there to be costs and benefits in any strategy to increase folate consumption.</p> <p>The following issues must be considered when assessing options for folate fortification:</p> <ul style="list-style-type: none"> • The range of options to increase folate fortification – natural food sources, fortified food and supplements. • Prevent and minimise negative effects on non-target populations, for example masking of vitamin B₁₂ deficiency. • Determine the specific target group and how they can best be targeted. • Bioavailability of folate in the fortified foods. • The extent that the target group is impacted by NTDs. • The need for public awareness campaigns to accompany any fortification strategy. • Screening of vulnerable groups to minimise undetected vitamin B₁₂ deficiency. • The need for further research to determine the impact of fortification in target and non-target groups, and a commitment to evaluation of any fortification strategy. • The apparent limited success of the current voluntary fortification strategy. • The apparent limited success and uptake of the pilot folate health claim.

	Submitter	Submission Comments
		<p>Target group</p> <p>The target group needs to be clarified.</p> <p>Considers women from lower socio-economic groups, who may or may not be planning a pregnancy and who have a poor diet, should be the main targets of folate fortification, as they are less likely to increase their consumption of folate by other means.</p> <p>If mandatory fortification is selected, the foods must be affordable and readily consumed by the target group.</p> <p>Data gaps</p> <p>Further research required on the long term impacts of folate fortification and increased folate consumption, and any negative effects on non-target groups, including masking of vitamin B₁₂ deficiency.</p> <p>Considers the following questions need to be answered to determine if folate fortification is the most appropriate and effective way of reducing NTDs:</p> <ul style="list-style-type: none"> • How many NTD pregnancies are unplanned? • How many terminations are a result of the NTD itself verses unplanned pregnancy? • What is the socio-economic distribution of NTD pregnancies? <p>Food vehicles</p> <p>Fortification should not result in these products becoming more expensive, as this may prevent lower socio-economic groups from purchasing them.</p> <p>Folate fortified foods should be accessible to all consumers regardless of ethnicity, geographical location or socio-economic status.</p> <p>Monitoring</p> <p>Any folate fortification strategy must be accompanied by an increase in screening of elderly people for vitamin B₁₂ deficiency.</p> <p>Need an updated National Nutrition Survey, to provide data to guide food regulatory decisions, and monitor and evaluate public health nutrition interventions.</p> <p>Mandatory fortification should be accompanied by a broad reaching public awareness campaign, commitment to screening of elderly for vitamin B₁₂ deficiency and impact evaluation of fortification.</p> <p>Health promotion and education strategies</p> <p>Consumer education is required to implement a successful strategy to reduce NTDs.</p> <p>The target group needs to be aware of NTDs, the role of folate in preventing NTDs and how they can increase their consumption of folate.</p> <p>Requires long term campaigns, with women receiving clear and consistent messages from a variety of sources.</p> <p>If folate fortification is considered necessary, then all consumers should be told of impacts folate fortification may have for target, non-target and vulnerable groups.</p>

	Submitter	Submission Comments
16	<p>Consumers' Institute of New Zealand Inc</p> <p>Ms Belinda Allan</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Considers there is little impact on non-target groups and consumer choice is maintained.</p> <p>However, it is unknown if a reduction in NTDs can occur if the status quo is maintained.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Extending folate permissions maintains consumer choice, and may increase the folate status of the population and reduce the incidence of NTDs if industry takes up these new permissions.</p> <p>Depending on uptake by industry there is the risk of masking vitamin B₁₂ deficiency.</p> <p><i>Mandatory fortification</i></p> <p>Will increase the intake of folate by the target population, which may reduce the incidence of NTDs.</p> <p>However, the non-target population may consume excess amounts of folate, which may mask vitamin B₁₂ deficiency, and other long term consequences of higher intakes are unknown.</p> <p>This option lacks consumer choice, and the cost may be passed onto consumers.</p> <p><i>Health promotion and education strategies</i></p> <p>This option increases consumer awareness about the issue.</p> <p>Health promotion and education strategies</p> <p>Notes the New Zealand Ministry of Health document 'Improving Folate Intake in New Zealand' (2003) states that mandatory fortification on its own would not reduce the incidence of NTDs. The promotion of folate rich foods and a recommendation that women planning a pregnancy take a folic acid supplements would still be required. There is also concern that mandatory fortification may result in nutrient imbalances and excesses for members of the non-target population.</p> <p>Comments that there has been no publicly funded awareness campaign in New Zealand.</p> <p>Increased health promotion and education strategies should be incorporated into any strategy for increasing folate intake in the target population.</p> <p>Policy</p> <p>Does not support mandatory fortification in the first instance, as the Policy Guideline stipulates that mandatory fortification only be permitted if it is assessed to be the most effective public health strategy to address the health need.</p>

	Submitter	Submission Comments
	Industry	
	<i>Food Manufacturers</i>	
17	Allied Mills Australia Pty Ltd Mr Ian Baker	<p>Supports Option 3</p> <p>Impact</p> <p><i>Mandatory fortification</i></p> <p>Agrees that mandatory fortification will create a level playing field for all manufacturers of bread flour, which will allow the incremental costs associated with fortification to be passed along the supply chain.</p> <p>If implemented using the existing thiamin dosing systems into bread flour only, the costs are likely to be relatively low, and should not impose any additional capital costs upon the industry.</p> <p>However, if all flour products were required be fortified there would be considerable cost to industry, as feeders would be required on every product line in every mill.</p> <p>Food vehicle</p> <p>Supports mandatory fortification of bread flour, should FSANZ determine that fortification with folic acid is beneficial to the community and that flour is an effective food vehicle.</p>
18	Cadbury Schweppes Australia & New Zealand Mr Neil Smith	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p>Considers increased voluntary permissions in conjunction with health promotion and education strategies provide a suitable outcome for both industry and the population at risk.</p> <p>Does not consider mandatory fortification of many foods an appropriate solution, and instead considers expanding voluntary permissions accompanied by an increased level of awareness as being sufficient.</p> <p>Would consider voluntary fortification if the opportunity arose and if there was benefit to the population at risk.</p>
19	George Weston Foods Limited (GWF) Ms Fiona Fleming	<p>Supports Option 2 in conjunction with Option 4</p> <p>Recognises and acknowledges the medical evidence that indicates the protective role of folate in reducing the rates of NTDs, and accepts that increasing folic acid intake by women of child bearing age will assist in reducing the incidence of NTDs.</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Does not support this option as the current process to gain approval to use the folate health claim for the addition of folate is “overly prescriptive”.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Supports extension of permissions in combination with increased health promotion and education strategies, though would like more information on the food categories that are likely to be included.</p>

	Submitter	Submission Comments
		<p>Supports the combination of options as it is inappropriate for governments to shift the contingent liability for a public health measure onto the food industry for a solution.</p> <p><i>Mandatory fortification</i></p> <p>Does not support mandatory fortification given that there is insufficient information to assess the folate intakes of the general population and at risk groups.</p> <p>Foods currently fortified with folic acid</p> <p>GWF currently fortify the following foods with folic acid: Burgen Soy and Linseed, Burgen Honey and Oat Bran, Tip Top 9 Grain and Tip Top 9 Grain Muffins. Three of these products carry the permitted health claim.</p> <p>States that these products are not ‘niche’ from the perspective of folate addition and are not specifically marketed to the target population.</p> <p>Comments that in consumer research, undertaken by GWF, folate has not appeared to be a key motivator for purchase.</p> <p>Believes that if the government encourages public support for folate fortified foods then the food industry would be more likely to develop foods with folate in order to meet consumer demand.</p> <p>To support a government funded public awareness campaign, GWF would consider developing specific products containing folate that target women of childbearing age.</p> <p>Impact</p> <p><i>Impact on industry</i></p> <p>Notes that manufacturers are unlikely to develop a product with only folic acid as the selling point, which may impact on commercial returns.</p> <p>Contends that without knowing which food vehicles would be chosen, FSANZ cannot conclude that mandatory fortification would provide a level playing field. Instead, they believe that it will not be equal, as some food groups will have to bear the cost of fortification while others will not.</p> <p>Disagrees that increased costs are unlikely to impact significantly on overall operating costs.</p> <p>Costs to GWF of mandatory fortification with folate would include the cost of folic acid, the equipment for addition, testing and change of packaging. They estimate this cost to be in excess of \$1.5 million, which would have an impact on their business costs.</p> <p><i>Mandatory fortification</i></p> <p>Considers fortification of such a broadly consumed food is an expensive way to target a small group of the population.</p> <p>Not aware of any advantages of mandatory fortification from industry’s perspective.</p> <p>Considers disadvantages of mandatory fortification from industry’s perspective would be the lack of choice to add folate to a targeted range of products and the cost to fortify across the full product range.</p>

	Submitter	Submission Comments
		<p>Food vehicles</p> <p>Does not support mandatory fortification of bread, as bread is consumed by 99% of Australian households spanning all age ranges, where the number of pregnant women represents approximately 2% of the female population.</p> <p>Monitoring</p> <p>Believes the government should be responsible for continuous monitoring of the folate and vitamin B₁₂ status of the population, with a focus on those at risk.</p> <p>States there has been a lack of support for monitoring the effectiveness of mandatory thiamin fortification of bread flour. Therefore, are concerned that industry would not receive the support from government that would be required to ensure a folate fortification program is effective.</p> <p>States that industry must not be expected to fund any monitoring program.</p> <p>Health promotion and education strategies</p> <p>Government studies in South Australia and Western Australia have demonstrated that public awareness programs are effective at building awareness of the need for folate and changing the behaviour of women of child bearing age.</p> <p>Believes that government clearly has a responsibility to educate women on the need for folate.</p>
20	<p>Goodman Fielder</p> <p>Ms Kirsten Grinter</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Recognises and acknowledges the medical evidence that indicates the protective role of folate in reducing the rates of NTDs, and accepts that increasing folic acid intake by women of child bearing age will assist in reducing the incidence of NTDs.</p> <p>Considers this issue a “public health priority, not a mandatory fortification issue”.</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Does not support this option as the current claim approval process is prohibitive and the prescriptive wording of the claim means that the use on products will continue to be limited.</p> <p>The status quo does not address the fact that new consumers are continually entering the target market and need to be educated, and there is no evidence that the rates of NTDs would continue to decline under this option.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Supports this option in combination with Option 4, as industry is best placed to identify foods consumed by the target group and to develop appropriate fortified products that communicate the benefit to the target group.</p> <p>Extending folate permissions provides consumers with greater product choice to achieve the required amount of dietary folate.</p>

	Submitter	Submission Comments
		<p>Believes ongoing communication about the folate-NTD issue is essential, as new consumers are continually entering the target market.</p> <p><i>Mandatory fortification</i></p> <p>Rejects mandatory fortification as it indiscriminately increases the folate intake of the entire population where there is insufficient evidence to determine the impact of this and does not reflect Ministerial policy guidance.</p> <p>Incidence/prevalence of NTDs</p> <p>Reports that limited evidence suggests that rates of NTDs in Australia and New Zealand appear to be as low as in countries that already mandate folate fortification of their food supply.</p> <p>Vitamin B₁₂ deficiency</p> <p>Prevalence estimates in New Zealand indicate 13% of elderly women had sub-optimal B₁₂ status (de Jong N et al, 2003).</p> <p>In a larger study, between 12-28% of over 65's had deficient to sub-optimal B₁₂ status (Green T et al, 2004).</p> <p>Data gaps</p> <p>Current data insufficient to provide the required baseline information.</p> <p>Considers a population based survey would need to be conducted to establish baseline information, prior to any decision to mandate folate fortification in Australia and New Zealand.</p> <p>Foods currently fortified with folic acid</p> <p>Goodman Fielder adds folic acid to breakfast cereals, breakfast bars, smoothies and breads, but no products currently carry the folate health claim.</p> <p>Impact</p> <p>The primary objective is decreased NTDs, where increased trans-national education, availability of subsidised supplements and increased permissions to voluntary fortify are all justified if the outcome is achieved.</p> <p>Considers increasing the choice of fortified foods for the target group will assist in maximising the reduction in avoidable NTD pregnancies and births.</p> <p>Considers potential health risks due to excess consumption are not likely if the fortified products carry a health claim or a general folate claim. These claims would indicate the target group and the permitted maximum addition per serve.</p> <p>Food vehicles</p> <p>Many food categories are appropriate for folate fortification.</p> <p>Recommends wider fortification of foods consumed by the target population, as if only one food group is chosen then it may not reach a significant proportion of the target group.</p>

	Submitter	Submission Comments
		<p>Monitoring</p> <p>Recommends a trans-national program of monitoring NTD pregnancies and birth outcomes be implemented to measure the success of the education and fortification program, as consistent with the Ministerial Policy Guideline.</p> <p>Health promotion and education strategies</p> <p>Requires a sustained national education campaign across Australia and New Zealand.</p> <p>Considers it a government responsibility to maintain an education campaign on preventable NTD pregnancies, if we are to achieve a sustainable outcome.</p> <p>Policy</p> <p>Believes Option 3 does not reflect Ministerial policy guidance, which requires that before mandating the addition of a vitamin to foods it must be assessed as the most effective health strategy.</p> <p>Comments that Government policy is for minimum effective regulation, and that regulation should be flexible to support product innovation. Does not support regulations that are overly complex to the extent that compliance is difficult without excessive costs to both industry and the consumer.</p> <p>Supports the Australian Food and Grocery Council's policy on mandatory fortification, where it is warranted if the public health issue cannot be addressed through alternative means.</p> <p>References</p> <p>de Jong, N., Green, T.J., Skeaff, C.M., Gibson, R.S., McKenzie, J.E., Ferguson, E.L., Horwath, C.C., Thomson, C.D. 2003. Vitamin B12 and folate status of older New Zealand women. <i>Asia Pac J Clin Nutr.</i> 12,85-91.</p> <p>Green, T.J., Venn, B.J., Skeaff, C.M., Williams, S.M. 2004. Serum vitamin B12 concentrations and atrophic gastritis in older New Zealanders. <i>Eur J Clin Nutr.</i> Oct 13, 2004.</p>
21	<p>Manildra Group</p> <p>Mr John Honan</p>	<p>Support Option 3</p> <p>General comments</p> <p>The Manildra Group is the largest user of wheat for industrial purposes in Australia.</p> <p>Supports the introduction of mandatory fortification of flour with folate.</p> <p>Believes the scientific evidence of health benefits is strong (e.g. NTDs and heart disease), and are not aware of any significant negative health implications from folate consumption.</p> <p>From this evidence, considers it would be negligent not to introduce mandatory fortification of flour at a suitable level.</p> <p>Believes that Australia should follow the 50-plus countries that already have mandatory fortification of flour with folate.</p>

	Submitter	Submission Comments
		<p>Food vehicles</p> <p>Considers flour is the ideal food vehicle, as it is consumed by almost all Australians across all socio-economic groups.</p> <p>Impact</p> <p>Believes the health benefits of mandatory fortification outweigh any contrary arguments about freedom of choice.</p> <p>Education combined with folate supplements have not substantially increased the intake of folate to suitable levels, where these strategies tend to only reach higher socio-economic groups.</p> <p>From an industry perspective, consider folate could be added to flour at little expense as the technology and methodology already exists for adding thiamin to flour.</p>
22	<p>PB Foods Ltd</p> <p>Ms Monica Witsch</p>	<p>Support Option 2 in conjunction with Option 4</p> <p>General comments</p> <p>PB Foods Ltd is a global ice cream and dairy company, which produces two folic acid containing milk products.</p> <p>Would like additional strategies other than increasing dietary folate intake to be considered, as dietary folate can only be effective in reducing a maximum of 70% of NTDs.</p> <p>Considers that Proposal P295 discusses mandatory fortification in isolation, and needs to also consider other standards and policies such as the definition of ‘special purpose foods’ and the Fortification Implementation Framework.</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Considers this option not acceptable as the current standards favour certain food categories. They note that milk containing added folate is considered a ‘special purpose food’.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Supports extended voluntary permissions to allow a wider range of foods to be fortified with folate, where selected foods would be based on their ability to effectively deliver folate to the target population.</p> <p><i>Mandatory fortification</i></p> <p>Considers there are issues to clarify before mandating folate fortification, including dietary folate intake of the target group and the impact on other population groups, and would require regular reviews to ensure the desired outcome.</p> <p><i>Health promotion and education strategies</i></p> <p>Considers health promotion strategies are crucial in building consumer awareness and consumer trust in fortified products, and in supporting health messages promoted by food manufacturers.</p>

	Submitter	Submission Comments
		<p>Foods currently fortified with folic acid</p> <p>PB Foods add folic acid to ‘Brownes Calcium Plus’ which is targeted at women of child bearing age, and to ‘Brownes Heart Plus’ which is targeted at middle aged men.</p> <p>Comments that the marketing of folate containing foods is very difficult as the current folate claim is very negative and not well received by consumers, where these products can be seen as women’s products and are therefore not consumed by men. Consider more positive folate messages with a broader appeal (i.e. use of other medical conditions in addition to NTDs) need to be developed to market folate containing products successfully.</p> <p>Impact</p> <p><i>Mandatory fortification</i></p> <p>There would be costs associated with surveillance and regular reviews to ensure that mandatory fortification achieves the desired outcome.</p> <p>Certain industry sectors would be disadvantaged as they are forced to add folic acid and cannot use it as a marketing advantage (i.e. if the current health claim is the only one permitted).</p> <p>Very restrictive in providing a choice of innovative products and not flexible in responding to new research and consumer demands.</p> <p>Food vehicles</p> <p>Considers all dairy products suitable for folate fortification.</p> <p>As foods can only have a percentage of the RDI per serving, it is likely that several fortified foods will have a greater impact on increasing folate intakes than a sole food.</p> <p>Supports fortifying foods with folic acid, as folate from natural sources is less bioavailable.</p> <p>Comments that the addition of folate can be difficult for manufacturers, as losses due to processing and storage need to be considered in new product development.</p>
23	<p>Sanitarium Health Food Company</p> <p>Ms Alison Tickle</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Believes that allowing folate to be added to a wider range of foods should be trialled and assessed before mandatory folate fortification is opted for.</p> <p>In addition, a strong, well-targeted education campaign should be combined with the increased fortification permissions to help maximise the effectiveness of the voluntary fortification strategy.</p> <p><i>Mandatory fortification</i></p> <p>Comments they are not opposed to mandatory fortification, however in the case of folate they do not believe it is appropriate as:</p> <ul style="list-style-type: none"> • a food should not be fortified where there is a risk of excessive intake, adverse nutrient interactions or adverse effects on the absorption/metabolism of other nutrients in that food;

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • potential risk that vitamin B₁₂ deficiency may be masked; • it would reduce consumer choice; • data suggests that folate deficiency is not a problem amongst the general population and yet mandatory fortification would result in an unnecessary increase in folate intakes in the wider population; and • lack of data on the dietary effect of voluntary fortification over the last 10 years since it was first permitted. <p>Vitamin B₁₂ deficiency</p> <p>Detailed five studies evaluating the vitamin B₁₂ status of various population groups:</p> <ul style="list-style-type: none"> • Of 245 Australian Seventh Day Adventist ministers studied who were not taking vitamin B₁₂ supplements, 73% of vegetarian ministers and 40% of non-vegetarian ministers had serum vitamin B₁₂ levels below the reference range of 221 pmol/L (Hokin et al, 1999). • Prevalence of vitamin B₁₂ deficiency in an elderly New Zealand population with gastritis was 12%, and marginal deficiency 28% (Green et al, 2004). • 13% of elderly women in a New Zealand study were found to have sub-optimal plasma vitamin B₁₂ levels (De Jong et al, 2003). • Satisfactory vitamin B₁₂ levels were found for both vegetarian and non-vegetarian Seventh Day Adventists in New Zealand (Harman et al, 1998). • However, an earlier study found that 35% of long term vegetarians had inadequate plasma vitamin B₁₂ levels (Alexander et al, 1994). <p>Data gaps</p> <p>Limited data on folate intakes – required to measure the effectiveness of voluntary fortification (since 1995) and the need for mandatory fortification. Propose a follow up National Nutrition Survey.</p> <p>Lack of Australia/New Zealand studies on optimal folate status for reducing occurrence of NTDs.</p> <p>Lack of information on vitamin B₁₂ status in the general population, thus assessment of the possible effects of folate fortification masking vitamin B₁₂ deficiency is difficult.</p> <p>A modelling study looking at the effects of food fortification on the population should be done in Australia and New Zealand.</p> <p>Foods currently fortified with folic acid</p> <p>Sanitarium fortifies a number of its products with folate, including Weet-Bix, So Good Essential, Cornflakes, Weet-Bix Crunch, Light ‘n Tasty, Up & Go Liquid Breakfast Drink, their cereal bars and Marmite.</p> <p>Women are a key target market for Weet-Bix and So Good Essential.</p> <p>Impact</p> <p><i>Mandatory fortification</i></p> <p>Perceives the main disadvantage to industry of mandatory fortification for a food category would be the loss of competitive advantage that may be gained by one product being fortified over another.</p>

	Submitter	Submission Comments
		<p>A further disadvantage would be if fortified products were not allowed to be promoted as containing added folate.</p> <p>Food vehicles</p> <p>Recommends that dairy milk and alternatives, dairy products and their alternatives, and peanut butter and other nut/seed spreads be considered for voluntary fortification. Consider these foods are nutritious and are recommended for consumption in the dietary guidelines.</p> <p>Consumer choice</p> <p>Considers that consumer choice is important to try and maintain.</p> <p>As the general population is unlikely to be deficient in folate, they perceive this to be a bigger issue, as consumers may not be given the choice of an unfortified product in certain product ranges.</p> <p>References</p> <p>Hokin, BD., Butler, T. 1999. Am J Clin Nutr 70(Suppl), 576-578.</p> <p>Green, TJ., Venn, BJ., Skeaff, CM., et al. 2004. Eur J Clin Nutr 13.</p> <p>De Jong, N., Green, TJ., Skeaff, CM., et al. 2003. Asia Pac J Clin Nutr 12(1), 85-91.</p> <p>Harman, SK., Parnell, WR. 1998. NZ Med J 111(1062), 91-94.</p> <p>Alexander, D., Ball, MJ., Mann, J. 1994. Eur J Clin Nutr 48(8), 536-546.</p>
24	<p>Unilever Australasia</p> <p>Ms Julie Newlands</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Supports the Australian Food and Grocery Council's submission.</p> <p>Regulatory options</p> <p>In general agrees with widening permissions for the addition of essential nutrients to food, in this case folic acid, where the data demonstrates that the intake falls short of the RDI.</p> <p>Support a combined approach of:</p> <ul style="list-style-type: none"> • wider voluntary permissions for folic acid; • a national education campaign to support folate fortification initiatives; and • appropriate folate supplements being made available through government subsidy to enable those unable or unwilling to select fortified products. <p>Considers the above approach has less potential to adversely impact on the non-target population, has the benefit of increasing public awareness of the issue, and provides the target population with a range of methods to increase their folate intake.</p> <p>Oppose mandatory fortification for the following reasons:</p> <ul style="list-style-type: none"> • lack of data on current folate intake of the population; • lack of data on the dietary patterns of the proposed target group makes it difficult to establish suitable food vehicles; and • the potential for mandatory fortification to impact adversely on the non-target population.

	Submitter	Submission Comments
	<i>Industry Associations</i>	
25	Australian Food and Grocery Council (AFGC)	<p>Supports Option 2 in conjunction with Option 4</p> <p>General comments</p> <p>Acknowledges the medical evidence that indicates the protective role of folate in reducing the rates of NTDs, and accepts that increasing folic acid intake by women of child bearing age will assist in reducing the incidence of NTDs.</p> <p>Regulatory options</p> <p>Propose an interim step until sufficient evidence is available to support or refute the need for mandatory fortification. They recommend:</p> <ul style="list-style-type: none"> • broadening permissions for voluntary fortification; • permitting the food industry to target appropriate consumers through their marketing strategies using an effective health claim; and • developing and maintaining a cost effective public education campaign. <p><i>Maintain status quo</i></p> <p>Reject for the following reasons:</p> <ul style="list-style-type: none"> • the current process of gaining approval to use the folate health claim is overly prescriptive, which has increased the time to market for new products; • elements of the wording for the folate claim has reduced its use on products otherwise permitted to use the claim; and • wider permissions are needed to address the identified health need. <p><i>Increased permission for voluntary fortification and health promotion & education</i></p> <p>Support for the following reasons:</p> <ul style="list-style-type: none"> • industry is best placed to identify foods consumed by the target group and to develop appropriately fortified products; • as consumer needs and dietary habits change over time, the market can adjust the fortified product mix to reflect those changes; and • communicating the issue and benefits is necessary at the public health level through government promotion in combination with the fortified foods. This will need to be ongoing, as new consumers continually enter the target group. <p><i>Mandatory fortification</i></p> <p>Reject for the following reasons:</p> <ul style="list-style-type: none"> • indiscriminately increases folate intake of the entire population; • removes consumer choice; and • fails to meet the Policy Guideline for fortification. <p>Prevention of avoidable NTDs</p> <p>Proposes 6 actions:</p> <ol style="list-style-type: none"> 1. A concerted sustained national educational campaign, whatever approach to fortification is taken.

	Submitter	Submission Comments
		<p>2. That folate supplements be made available through government subsidy for those unable or unwilling to select fortified products.</p> <p>3. That industry incentives be considered for the voluntary fortification of certain foods, to reinforce the national education campaign and maintain consumer choice. Also, that existing permissions to fortify be reviewed in light of current usage and with a view to widening the permissions in line with the target groups dietary habits.</p> <p>4. A trans-national program of monitoring NTD pregnancies and birth outcomes to measure the success of the education and fortification program.</p> <p>5. That monitoring of the food supply be part of the National Nutrition Surveys in Australia and New Zealand, to monitor intake over time and to assess the effectiveness of regulatory and non-regulatory measures.</p> <p>6. FSANZ convene a workshop on detection of folate in the food matrix prior to any decision to mandate the addition to the food supply. The accuracy and precision of existing methods are of concern to industry.</p> <p>The above measures will be at significant cost to the public purse but necessary to achieve reduced rates of NTDs, with associated cost savings to public health.</p> <p>Considers it inappropriate and unacceptable for the governments to shift the contingent liability for a public health measure onto the food industry for solution.</p> <p>Incidence/prevalence of NTDs</p> <p>Notes that limited evidence suggests rates of NTDs in Australia and New Zealand appear to be as low as in some countries that already have mandatory folate fortification.</p> <p>Folate status</p> <p>New Zealand data indicates that 3% of elderly women have low serum folate and 5% low RBC folate (de Jong et al, 2003).</p> <p>Vitamin B₁₂ deficiency</p> <p>Prevalence estimates in New Zealand indicate 13% of elderly women had sub optimal B₁₂ status (de Jong N et al, 2003).</p> <p>A New Zealand study shows between 12-28% of over 65's had deficient to sub optimal vitamin B₁₂ status (Green T et al, 2004).</p> <p>Data gaps</p> <p>Agrees there is sufficient evidence to determine the optimal plasma folate status for decreasing NTDs but that comprehensive data is not available for the target group in Australia or New Zealand.</p> <p>Considers there is insufficient evidence to determine the impact of increasing folate intake within the non-target population.</p> <p>Agrees that additional strategies are needed to increase dietary folate intake in the target group to increase the effectiveness of NTD risk mitigation.</p>

	Submitter	Submission Comments
		<p>Foods Currently Fortified with Folic Acid</p> <p>Breakfast cereals, bars and smoothies, and some breads are examples of foods currently fortified, but not all foods carry the folate health claim.</p> <p>Impact</p> <p><i>Maintaining status quo</i></p> <p>Does not provide for a continuing education program for the target group, disadvantaging consumers and those in the target group.</p> <p>The limited number of foods permitted to contain folate also disadvantages consumers and those in the target group.</p> <p>Considers there is no evidence either way that the rates of NTDs would continue to decline while maintaining the status quo.</p> <p>Considers the failure of government(s) to maintain an education program would not assist in maintaining a decline.</p> <p><i>Mandatory fortification</i></p> <p>Considers potential adverse health outcomes due to excess consumption of folate less likely under a voluntary fortification system compared with mandatory fortification.</p> <p>Noted that some non-target group individuals, especially elderly, would be at risk of vitamin B₁₂ masking if their folate intake exceeds the tolerable upper intake level.</p> <p>Considers the evidence is insufficient to predict likely reduction in NTDs with mandatory fortification, but given the already low rates in Australia and New Zealand believe the effect will be closer to 30% rather than the 50-70% reported in some other countries.</p> <p>Reports that the NZFSA consultation document on reducing NTDs concluded that mandatory fortification in New Zealand would result in a maximum of 13-16 fewer NTD pregnancies per year.</p> <p>Notes that mandatory fortification removes an element of informed choice, as required in one of the Section 10 objectives of the FSANZ Act.</p> <p>Considers that wider permissions to fortify can achieve the objective of reducing NTDs, without removing consumer choice.</p> <p>Emotional and social benefits will occur with a reduction in NTDs.</p> <p><i>Impact on industry</i></p> <p>Considers the costs to the food industry indicated in the consultation document would be an underestimate.</p> <p>AFGC data indicates a cost of \$120,000 per annum for folic acid addition at 37% of RDI per serve into a bakery product and a further \$240,000 one off cost for label changes across the range.</p> <p>Costs associated with determining the overages needed to allow for losses in manufacturing and during the shelf life of the product.</p> <p>Food vehicles</p> <p>An appropriate food vehicle would be one known to be consumed by the target group.</p>

	Submitter	Submission Comments
		<p>Notes that there is no up to date information concerning the food habits of the target group.</p> <p>Considers the broader the choice of fortified foods for the target group, the greater the likelihood their intakes will reach the desired level.</p> <p>Losses of folic acid from the fortified product during manufacturing and preparation in the home would need to be considered. Notes that losses can be as high as 50% from small rolls (Hansen M et al, 2001).</p> <p>Monitoring</p> <p>Current data is insufficient to provide baseline information to allow monitoring of the impact of mandatory fortification, as required by the Policy Guideline for mandatory fortification.</p> <p>Recommends a population based survey be undertaken to establish appropriate baseline data, prior to any decision to mandate folate intake.</p> <p>Recommends a trans-national program of monitoring NTD outcomes, which is the responsibility of the Health Departments.</p> <p>Recommends that monitoring of the food supply be part of the National Nutrition Surveys.</p> <p>Health promotion and education strategies</p> <p>Considers it the governments responsibility to maintain education campaigns on preventable NTD pregnancies.</p> <p>Policy</p> <p>Fully endorses the policy for minimum effective regulation and the FSANZ objectives.</p> <p>Believes mandatory fortification is warranted to correct and/or prevent nutritional problems of public health significance which cannot be adequately addressed through alternative means. They regard this to be consistent with current national policies.</p> <p>States that FSANZ has interpreted “be considered” to mean that a standard “should be developed”, regarding Ministerial Council guidance on mandatory fortification of food with folate, and therefore have not included and assessment of alternative strategies.</p> <p>References</p> <p>de Jong, N., Green, TJ., Skeaff, CM., Gibson, RS., McKenzie, JE., Ferguson, EL., Horwath, CC., Thomson, CD. 2003. Vitamin B12 and folate status of older New Zealand women. <i>Asia Pac J Clin Nutr.</i> 12,85-91.</p> <p>Green, TJ., Venn, BJ., Skeaff, CM., Williams, SM. 2004. Serum vitamin B12 concentrations and atrophic gastritis in older New Zealanders. <i>Eur J Clin Nutr.</i> Oct 13, 2004.</p> <p>NZFSA. 2004. Reducing neural tube defects in New Zealand. NZFSA. July 2004.</p> <p>Hansen, M., Samman, S., Madsen, LT., Jensen, M., Sorenson, SS., Sandstrom, B. 2001. Folic acid enrichment of bread does not appear to affect zinc absorption in young women. <i>Am J Clin Nutr.</i> 74,125-9.</p>

	Submitter	Submission Comments
26	<p>Australian & New Zealand Baking Industry Associations (ANZBAKE)</p> <p>Mr Scott Wiseman</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p>Supports a ‘dual’ approach of increased voluntary fortification permissions with increased health promotion and education strategies.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Supports increased voluntary permissions because:</p> <ul style="list-style-type: none"> • allows differentiation of products; • allows additional industries the same differentiable competitive advantages as those with current permissions; and • maintains consumer purchasing freedom. <p><i>Mandatory fortification</i></p> <p>Strongly oppose mandatory fortification because:</p> <ul style="list-style-type: none"> • believes that with an aging population the importance of issues such as B₁₂ masking may become more frequent and serious, and therefore mandatory fortification whilst aiding one sector of the community may be detrimental to another; and • addition of folate to baking ingredients will cause ingredient prices to increase and as the industry has tight selling margins this will result in significant loss of profitability and financial hardship to the majority of small business baking operators. <p><i>Health promotion and education strategies</i></p> <p>Supports increased health promotion and education as believes research presented in the Initial Assessment Report highlights the effectiveness of existing education and promotion campaigns.</p> <p>Supports enhanced targeted education, to be run in conjunction with any of the proposed options.</p>
27	<p>Australian Self-Medication Industry (ASMI)</p> <p>Mr Jonathon Breach</p>	<p>Preferred option not indicated</p> <p>Does not have a particular position to convey on this proposal.</p> <p>Folate supplement use</p> <p>Provided market data on folic acid supplement purchases from pharmacies (does not cover supplements sold through health food stores) in Australia. Sales data are for the year ending October 2004:</p> <ul style="list-style-type: none"> • folic acid/folate - 94,000 units/packs sold; and • prenatal vitamins/minerals inclusive of vitamin B₁₂/folic acid combinations – approximately 354,000 units/packs. The most popular brand (two thirds of sales) contains 800 µg folic acid and 4 µg of vitamin B₁₂. <p>Sales through grocery for “multivitamin” preparations were approx. 336,000 units/packs (would be equal to or less than 500µg folic acid in a daily dose) (Retail World, Vol. 57, No. 24, December 2004).</p>

	Submitter	Submission Comments
28	Complementary Healthcare Council of Australia Mr Allan Crosthwaite	<p>Supports Option 1 in conjunction with Option 4</p> <p>General comments</p> <p>Supports the Ministerial Council’s Policy Guideline that aims to ensure the health and safety of the public is protected, while allowing for food industry innovation and trade.</p> <p>Considers folate fortification of some foods has good public benefit, provided that consumers are educated to not totally rely on specific foods for complete health management.</p> <p>Comments that food manufacturers have indicated that folate fortification and the associated health claim may be causing promotional problems, where consumers are interpreting that the products are specific to female health and therefore reducing the sales potential of these products. Believes this is why a low number of foods are currently fortified with folic acid.</p> <p>Regulatory options</p> <p>Supports Option 1 in combination with Option 4.</p> <p>Believes that manufacturers must be given an option to fortify or not.</p> <p>Considers education will be the key to making sure consumers make an informed choice.</p> <p>Believes that educating consumers may have a flow on effect to manufacturers and it may increase the number of products containing folic acid.</p> <p>Foods currently fortified with folic acid</p> <p>Foods include breads, cereals and fruit juices.</p> <p>Considers manufacturers are promoting these products to a broad consumer spectrum rather than targeting a specific group.</p> <p>Impact</p> <p>Concerned that mandatory inclusion of folic acid in foods may be used solely as a marketing tool rather than a public benefit.</p> <p>States that voluntary fortification cannot ensure an effective level of folic acid in the food supply, and consequently cannot maximise a reduction in the incidence of NTDs.</p> <p>Consider maintaining the status quo will not have a major impact on folate supplement sales, as women are and have been for many years, directed to therapeutics rather than foods.</p> <p>Food vehicles</p> <p>Considers no sole food vehicle is likely to be more successful than several in administering folic acid.</p> <p>Considers breads, cereals and fruit juices as appropriate food vehicles for mandatory fortification.</p> <p>States breakfast cereals have been the most successful food vehicle with 49% of cereals fortified with folate, however, only 34% of women of child bearing age eat these products.</p>

	Submitter	Submission Comments
		<p>Bioavailability</p> <p>Considers that folic acid supplementation can only be useful if effective doses are administered regularly over suitable periods of time, in a bioavailable, stable and guaranteed content product.</p> <p>Considers the best presentation of folic acid is as a complementary medicine as it is an unstable vitamin, which can impact on bioavailability if used in foods.</p> <p>Questions if the food industry will be willing to take up the challenges of label claim verification (analysis), stability studies, bioavailability and efficacy on an ongoing basis.</p> <p>Monitoring</p> <p>Considers that FSANZ should be responsible for monitoring the effectiveness of mandatory fortification.</p> <p>Health promotion and education strategies</p> <p>Health promotion campaigns should not be the sole strategy to reduce NTD incidence.</p> <p>Comments there is apparently no evidence that a targeted campaign to increase folic acid supplement use during the periconceptual period would be more effective than the other three regulatory options.</p> <p>Considers public health education programs need to clearly define the differences between food and therapeutic supplementation, to eliminate any potential confusion for consumers.</p>
29	Dairy Australia Ms Anita Lawrence	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Increased permission for voluntary fortification and health promotion & education</i></p> <p>Supports a well coordinated expanded voluntary fortification system, inclusive of appropriate education activities. Considers this provides the target group with increased food choice and knowledge, and allows manufacturers point of product differentiation and innovation.</p> <p>Considers a multi-pronged approach is required that includes increased voluntary fortification permissions, education that recommends intake of folate-rich foods, and folate supplements.</p> <p>States the above is supported by recent research by Knudsen et al, 2004 and Chan et al, 2001.</p> <p><i>Mandatory fortification</i></p> <p>Considers mandatory folate fortification is not the most effective mechanism to increase total folic acid intake in periconceptual women and reduce the incidence of NTDs.</p> <p>Opposes mandatory fortification for the following reasons (substantiation provided):</p> <ul style="list-style-type: none"> • the data used to justify the need for mandatory fortification is outdated and invalid, and conflicts with the first two Ministerial Council Specific Order Policy Principles for mandatory fortification;

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • appropriate evaluation and monitoring of foods voluntarily fortified with folic acid has not been conducted and hence the basis for P295 is invalid; • voluntary fortification of foods has not been combined with continuous national education strategies that use a variety of communication mediums appropriate to the target audience; • there is inequity in the fortification process and which foods can have added folic acid (i.e. for breakfast cereals, pasta and biscuits versus dairy foods); and • the long term consequences of higher amounts of folic acid in the diet or the impact on non-target audiences are unknown. <p>Data gaps</p> <p>Need to understand current food-consumption patterns of consumers, and reinforces the need for another comprehensive National Nutrition Survey.</p> <p>Monitoring</p> <p>Considers ongoing monitoring and evaluation is obligatory regardless of the fortification strategy, and must be implemented to determine the effectiveness of fortification.</p> <p>References</p> <p>Knudsen, VK., et al. 2004. Low compliance with recommendations for folic acid use in relation to pregnancy: is there a need for fortification? <i>Public Health Nutrition</i>, 7(7), 843-50.</p> <p>Chan, A., et al. 2001. Folate before pregnancy: the impact on women and health professionals of a population-based health promotion campaign in South Australia. <i>Medical Journal of Australia</i>, 174(12), 631-6.</p>
30	<p>Flour Millers Council of Australia</p> <p>Mr Graeme Lukey</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Believes that the positive trend seen in the reduction of NTDs since the 1980s can only be enhanced with improved public health campaigns, access to suitable supplements and wider voluntary fortification permissions.</p> <p>Regulatory Options</p> <p><i>Maintain status quo</i></p> <p>Considers that although a further decline in NTDs rate is likely under the status quo, it is appropriate to take additional steps to achieve this quicker.</p> <p><i>Increased permission for voluntary fortification and health promotion & education</i></p> <p>Considers extending voluntary permissions is of minimum risk and a cost effective approach to increase folate intakes in the target population.</p> <p>However, a sustained and effective public health awareness program regarding folate supplementation is also necessary, as it is difficult to obtain adequate folate from diet alone.</p>

	Submitter	Submission Comments
		<p><i>Mandatory fortification</i></p> <p>Considers mandatory fortification of limited value to the target population as it is difficult to obtain the recommended intake of folate through diet alone, introduces potential risk to the wider population, introduces higher costs to industry, and cost to government to educate at risk groups to avoid folate containing foods, e.g. vegans and elderly.</p> <p>Views mandatory fortification as a transfer of risk from one sub population to another and is inappropriate.</p> <p>Impact</p> <p>Notes the combination of voluntary fortification and education in Western Australia was effective in reducing the incidence of NTDs by 30%, with a similar result in the US with mandatory fortification.</p> <p>Policy</p> <p>Considers combined extended voluntary permissions and education are consistent with and satisfy the specific order policy principles for voluntary fortification.</p> <p>Notes the Ministerial Council requires full assessment of alternative strategies before a decision on mandatory fortification is made, e.g. promotion of high folate diet, promotion of supplementation, voluntary fortification, health claim and public health campaigns.</p> <p>Notes that mandatory fortification should only be required in response to a demonstrated significant population health need taking into account both the severity and prevalence of the problem, and if it is assessed as the most effective public health strategy.</p> <p>Acknowledges the severity of NTDs, however believes the prevalence to be low, as per the statistics in the Initial Assessment Report, and lower in New Zealand as reported in the New Zealand Food Safety Authority/Ministry of Health Consultation Document No 2/04.</p>
31	<p>Food Technology Association of Victoria Inc (FTAV)</p> <p>Mr David Gill</p>	<p>Supports Option 4</p> <p>Comments that until the resolution of Proposal P293 – Health, Nutrition and Related Claims, food should not be used as a vehicle for fortification with one specific ingredient with positive, supporting label claims of a purely specific medical condition.</p>
32	<p>Food Technology Association of Western Australia Inc (FTAWA)</p> <p>Ms Monica Witsch</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p>Voluntary fortification would allow more flexibility in responding to consumer needs and product demand.</p> <p>Requires health promotion campaigns run by government for effective communication of health messages.</p> <p>Data gaps</p> <p>Comments that no clear data on dietary intakes of the target group was outlined in the Initial Assessment Report, which complicates the selection of appropriate foods for folate fortification.</p>

	Submitter	Submission Comments
		<p>Impact</p> <p>Considers folate fortification may be easy and low cost for large manufacturers, however for small businesses it would be more complex without the necessary expertise in handling vitamin additions, and the need to rely on external advice and testing.</p>
33	<p>New Zealand Association of Bakers Inc</p> <p>Ms Marcia Dunnett</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p>Supports an increase in the range of bread covered by voluntary fortification in conjunction with a vigorous public awareness campaign that is supported by health professionals.</p> <p>Believes this could assist in increasing folate intakes of the target group without major cost increases and other negative impacts when compared with mandatory fortification.</p> <p>However, supports Option 1 in conjunction with Option 4 if bread is determined to be the most appropriate vehicle for fortification.</p> <p><i>Mandatory fortification</i></p> <p>Strongly opposes mandatory fortification.</p> <p>Considers that if mandatory fortification is chosen that the only method would be to add folate to flour, however it would be difficult to do so.</p> <p>In addition there would need to be a combined policy of promotion of folic acid supplements and increased intake of dietary folate.</p> <p>Oppose mandatory fortification of bread as:</p> <ul style="list-style-type: none"> • considers it will limit consumer choice and result in a negative commercial impact on the industry, as consumers will seek alternative food sources; • fortification of all bread raises concerns with respect to the risk of folic acid intakes of sub-populations above the tolerable upper intake level; and • technical difficulties and costs associated with ensuring the correct improvers are added to the correct bread would be greatly increased, e.g. what is the influence of grains in bread with respect to final available folate? <p>Oppose mandatory fortification of flour as:</p> <ul style="list-style-type: none"> • consumer choice will be removed; • the cost of fortification will be significantly higher and technically difficult to ensure consistency; • it will be more difficult to monitor intake levels of folate because of the wider range of products involved; • additional administration costs will be involved to ensure that imported flour-based products comply; and • it will not be possible to separate out products destined for export markets.

	Submitter	Submission Comments
		<p>Impact</p> <p>Private research on food fortification, conducted by Elizabeth Brown BDR Limited on behalf of the New Zealand Association of Bakers Inc, September 2004. Copy of the report attached to submission. Major issues identified were:</p> <ul style="list-style-type: none"> • Opposition to mandatory fortification of food which everyone consumes for the sake of a small number of people. • Participants consider they have a fundamental right to choose the foods and supplements they feel are right for them and their children. • Overall feeling that mandatory folate fortification is a very poor answer to a significant public health issue. • Political and social impacts were identified, including some scepticism that authorities have consumers' best interests at heart and concern about 'food tampering'. • Fortification of flour was rejected outright on the basis of no consumer choice. Bread was even more negatively viewed for reasons such as, bread is an everyday staple food and there will be no other acceptable substitute for children. <p>Industry Undertaking</p> <p>At the annual general meeting of the New Zealand Association of Bakers Inc in November 2004, members agreed that should Options 1 & 4 be supported, the industry would undertake to broaden the range of bread fortified with folate and would be happy to work with government authorities on an education campaign.</p>
34	<p>New Zealand Flour Millers Association</p> <p>Mr Andy Worrill</p>	<p>Supports Option 1 in conjunction with Option 4</p> <p>Regulatory options</p> <p>Recommends a targeted approach, such as:</p> <ul style="list-style-type: none"> • Public health awareness campaign targeting women of child-bearing age. • Proactive advice from health professionals to women. • An increase in the range of bread covered by voluntary fortification permissions. <p>Considers this will improve folate intakes by the target group without major increased cost to the food industry, be easy to implement, and would be supported by the wider community.</p> <p><i>Mandatory fortification</i></p> <p>Strongly opposes mandatory folate fortification.</p> <p>Matters to consider:</p> <ul style="list-style-type: none"> • Mandatory fortification removes consumer choice. • Wholemeal flour will not meet legal composition when folate premix is added. • Limited functionality of flour mills to fortify flour. • Limited capacity for flour mills to segregate fortified and unfortified flours. • A broad range of products use flour as an ingredient. • Impact on international markets where fortification is not wanted.

	Submitter	Submission Comments
		<p>Impact</p> <p><i>Concerns regarding folate fortification:</i></p> <ul style="list-style-type: none"> • The lack of conclusive evidence of the benefits to the majority of the population. • Will apply to the whole population but the target group is only a small part of the population. • Will impose additional costs on the food industry. • Limited public awareness of the need for fortifying food ingredients. <p><i>Problems associated with fortifying flour:</i></p> <p>Will require each flour mill to invest in and install micro feeders, which cost approximately \$30,000 each. For smaller flour mills, this would be a significant financial burden. Consider these costs can only be recovered by passing it onto the final consumer.</p> <p>An addition rate of 1.4 g/1000 kg flour would require the folate to be “premixed” with a carrier flour to ensure satisfactory performance of the micro feeders, which would require extensive analysis to prove homogeneity of folate.</p> <p>The manual handling of premix bags into micro feeders provides increased OSH risk to employees, and to eliminate this would cost over \$1 million to the industry.</p> <p>High level electronic surveillance and control systems would be required to ensure required levels of folate are met.</p> <p>The carrier flour (of the premix) will contaminate the specific end-use flour, which could compromise the performance of these flours.</p> <p>Many flour products are “streamed” and processed through other applications (e.g. heat treatment) and exported, and it is unknown if this diverse processing affects the efficacy of folate.</p> <p>Flour is an ingredient across many food groups, therefore if all flours are fortified a consistent level of folate intake by consumers will not be achieved, as consumers will consume varying quantities of flour based products.</p> <p>Mandatory fortification of flour would eliminate consumer choice, where some consumers may avoid eating flour products altogether, which are recommended foods on the nutritional food pyramid.</p> <p>Some specialty flours are produced overseas, and would either no longer be available or would require reprocessing at an increased cost to the New Zealand food industry.</p> <p><i>Consumers</i></p> <p>Not aware of evidence or research demonstrating consumer support or demand for mandatory fortification of flour with folate.</p> <p>Report that recent research, commissioned by the New Zealand Association of Bakers, revealed overwhelming consumer concern at the prospect of mandatory fortification of flour with folic acid.</p>

	Submitter	Submission Comments
35	<p>New Zealand Food and Grocery Council</p> <p>Ms Brenda Cutress</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Does not support maintaining status quo as the potential to reduce NTDs is not maximised, and the current folate health claim is overly prescriptive and limits the range of products that can make a claim.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Supports extending the permissions for voluntary fortification as it will enable industry to develop a wider and more appropriate range of products to be marketed to the target group.</p> <p>Considers industry is in the best position to identify the products that best suit the target group, and provides choice for consumers who do not wish to consume folate fortified foods.</p> <p><i>Mandatory fortification</i></p> <p>Does not support mandatory fortification for the following reasons:</p> <ul style="list-style-type: none"> • mandatory fortification alone is insufficient to address the problem. It requires a combined policy to continue the promotion of folic acid supplements and increased dietary folate intake. This ensures that sub-populations are not exposed to levels greater than the tolerable upper intake level from fortified foods; • mandatory fortification is not ‘the most effective public health strategy to address the health problem’, which is a condition for mandatory fortification as specified in the Policy Guideline; • risks exposing a greater percentage of the population to folate levels above the tolerable upper intake level, particularly masking vitamin B₁₂ deficiency; • it indiscriminately increases the folate intake of the whole population, which may result in detrimental excesses or imbalances, and thus does not fulfil this Specific Order Policy Principle; • an awareness campaign aimed at the target group should be trialled first; • would impose substantial costs on industry – the baking and milling industry would incur costs of \$2.5 million in the first year and \$80,000-\$100,000 per year thereafter to add folic acid. Re-labelling costs would also be substantial, for example it costs between \$1,000-10,000 to change the label of a single stock unit; • mandatory fortification will have implications for companies who manufacture for both the domestic and export markets. Foods fortified with folic acid may be disallowed in countries that products are exported to, and it is not cost effective for many New Zealand companies to maintain separate manufacturing runs for their export and domestic markets; • considers there to be other more effective ways of achieving a reduction in NTDS; • Restricts consumer choice. Research undertaken by the New Zealand Baking Industry Research Trust showed consumers rejected the mandatory fortification of food;

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • It is questionable whether mandatory fortification alone will reduce NTDs as the target audience may still not consume an adequate amount of folate; and • The ability to change the food vehicle quickly if it is no longer found to be effective is restricted if folate fortification is mandated. <p><i>Health promotion and education strategies</i></p> <p>Considers increased public health promotion essential, regardless of what option is implemented, and will need to be continuous as the target group is constantly changing.</p> <p>Impact</p> <p><i>Voluntary fortification</i></p> <p>Comments that the reason why industry has been slow to produce folate-fortified products is not reluctance but because of the difficulties involved in obtaining approval for products, and also the range of approved products where a health claim can be made is too limited.</p> <p><i>Mandatory fortification</i></p> <p>Notes the NZFSA and Ministry of Health “Reducing Neural Tube Defects” Consultation Paper suggested that a maximum of 13-16 fewer NTD pregnancies per year in New Zealand with mandatory fortification.</p> <p>Considers currently fortified products would require reformulation and re-labelling if mandatory fortification were implemented, which is a major exercise for food processors.</p> <p>Food vehicles</p> <p>Believes the wider the choice of fortified food, the higher the likelihood of raising the folate level of the target group, rather than using a sole food vehicle.</p> <p>Potential that some target group members may avoid certain foods, for example if following fad diets, making it difficult to identify an appropriate food vehicle(s).</p> <p>Would need to assess the correct concentrations of folic acid to be used, as losses can be high and differ from product to product.</p> <p>Monitoring</p> <p>Notes that the Policy Guideline requires that monitoring of the impact of mandatory fortification be undertaken, and thus data on folate status will be required.</p> <p>Considers monitoring essential to protect health and safety, and thus will be essential regardless of option chosen.</p> <p>Health promotion and education strategies</p> <p>Considers health promotion campaigns have a major role in reducing the incidence of NTDs.</p> <p>Effective campaigns need to be constantly repeated and reinforced.</p> <p>Should not be used as the sole strategy, as a campaign to increase folate intakes also requires a variety of folate fortified food products or supplements to be readily available and affordable.</p>

	Submitter	Submission Comments
	Public Health	
	<i>Academic Individuals and Institutes</i>	
36	Dr Diane Bourn Department of Food Science, University of Otago	<p>Supports Option 4 with or without a fortification program</p> <p>Notes that based on the content of the Initial Assessment Report it is difficult to make an informed decision on a preferred regulatory option.</p> <p>Data gaps</p> <p>Indicates that the following data is lacking and needs to be improved before the implementation of any fortification strategy:</p> <ul style="list-style-type: none"> • prevalence of vitamin B₁₂ deficiency in New Zealand - notes that the Dunedin data (Pg 19) does not include older women; • incidence of NTDs and NTD affected pregnancies in New Zealand; • folate status of New Zealanders, including baseline data; and • up-to-date data on food currently fortified with folic acid and their consumption by the target group. <p>Impact</p> <p>Considers that modelling for the various scenarios is essential in order for stakeholders to be able to gain a better appreciation of the impact of each scenario.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>To assist evaluation of Option 2 need information on what would increase industry support of voluntary fortification so as to actually increase folic acid intakes.</p> <p><i>Mandatory fortification</i></p> <p>Asks for further information on the cost increase (if any) of fortified foods if fortification was mandated.</p> <p><i>Increased health promotion and education strategies</i></p> <p>Suggests that a New Zealand government funded education program must be implemented with or without fortification.</p> <p>Consumer choice</p> <p>Considers consumer choice to be important particularly for the non-target population.</p> <p>Policy</p> <p>At Draft Assessment would like an analysis of the extent to which folic acid fortification meets (or otherwise) the specific order policy principles.</p> <p>General comments</p> <p>Should clarify recommended intake of folic acid to reduce NTDs, i.e. Initial Assessment Report reports recommended <u>total</u> folate intake as 400µg/day (Pg 13) whereas understands that this is <u>additional</u> to usual intake.</p> <p>The Initial Assessment Report states (Pg 22) that there have been no publicly funded campaigns in New Zealand to promote folate rich foods and supplement use. However further on it is implied that there have been campaigns. Asks that this be clarified.</p>

	Submitter	Submission Comments
37	<p>Centre for Child Health Research, The University of Western Australia</p> <p>Prof Carol Bower and Prof Fiona Stanley</p>	<p>Supports Option 3 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Considers maintaining the status quo is unlikely to lead to a further fall in NTDs, and is insufficient to realise the full preventative capacity of periconceptual folate.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Considers neither the extension of voluntary fortification to additional food products nor limiting voluntary fortification to a sole vehicle is a satisfactory basis for a public health approach to the prevention of NTDs.</p> <p><i>Mandatory fortification</i></p> <p>Supports the mandatory fortification of food with folic acid in Australia for the prevention of neural tube defects on the grounds of effectiveness and equity, because:</p> <ul style="list-style-type: none"> • NTDs result in termination of pregnancy, perinatal death or lifelong disability; • NTDs occur more commonly in Indigenous than non-Indigenous infants and the difference in rates is increasing; • adequate maternal folic acid intake periconceptionally prevents up to 70% of NTDs; • health promotion campaigns in Australia have resulted in only a third of women taking periconceptional folic acid supplements and have not reached the target population in an equitable manner. Non-users are more likely to be young, single, less educated, smokers, public patients and have an unplanned pregnancy; • voluntary fortification has not been extensively taken up by industry, and is not a responsible approach to public health; • many countries have mandatory folic acid fortification, resulting in prevention of a substantial proportion of NTDs and no adverse effects. In particular, there has been no evidence of “masking” of vitamin B₁₂ deficiency; and • there has been a 30% fall in NTDs in response to use of folic acid supplements and voluntary fortification in Australia. Considers mandatory fortification represents an opportunity to increase the prevention of NTDs by folate in an equitable manner across the whole of the target population. <p>Mandatory fortification should be introduced without any further delay, along with continued health promotion and adequate monitoring, so that all children have the best opportunity to be born without these disabling birth defects.</p> <p><i>Increased health promotion and education strategies</i></p> <p>Supports increased health promotion and education strategies in conjunction with mandatory fortification.</p>

	Submitter	Submission Comments
		<p>Incidence/prevalence of NTDs</p> <p>NTDs in live born, stillborn infants and terminations of pregnancy affected around 2 per 1000 births in Australia from 1960 to the early 1990s, prior to identification of the link between NTDs and folate.</p> <p>Total rate of NTD (live births, stillbirths and terminations of pregnancy) in 2001 for South Australia, Victoria and Western Australia combined was 1.4 per 100 births (AIHW, 2004).</p> <p>Western Australia data for 2002 and 2003 are 1.4 per 1000 and 1.0 per 1000 respectively.</p> <p>Australian NTD rates are relatively high compared with most developed countries.</p> <p>Vitamin B₁₂ deficiency</p> <p>There is no evidence that high serum folate levels masked the macrocytosis of vitamin B₁₂ deficiency (Metz J et al, 2004).</p> <p>Evidence that masking of B₁₂ deficiency has not occurred in countries where mandatory fortification has been instituted, and believe it is time that this ceased to be an argument against mandatory fortification (Mills et al, 2003 and Lui et al, 2004).</p> <p>Folate supplement use</p> <p>A recent Australian study showed that 28% of women took 200 µg or more of folic acid in supplements daily over the recommended period (Bower C et al, 2004).</p> <p>Women who did not take periconceptional folic acid supplements were more likely to be younger, not married, be of lower educational status, be public patients, smokers and less likely to have planned their pregnancy.</p> <p>Impact</p> <p><i>Maintain status quo</i></p> <p>Considers the impacts of maintaining the status quo includes the continued occurrence of preventable NTDs and their attendant costs to family, community, health professionals, industry and governments.</p> <p>There has been a sustained education program in Western Australia plus voluntary fortification but no evidence of a continued decline in NTDs.</p> <p><i>Voluntary fortification</i></p> <p>Considers it impossible to estimate what reductions in NTDs would occur with extended permissions for voluntary fortification.</p> <p>Voluntary fortification cannot ensure an effective and consistent level of folic acid in the food supply for the simple reason that it is voluntary.</p> <p><i>Mandatory Fortification</i></p> <p>Evidence indicates that the benefits of mandatory fortification would outweigh all costs.</p>

	Submitter	Submission Comments
		<p>Would assist in improving folate levels of the population, with other potential benefits including reducing the risk of cardiovascular disease and a protective effect against some cancers.</p> <p>Folic acid is not expensive. It should not be a major additional expense to industry, as millers are already geared up for thiamine fortification, although there would be some up-front additional costs for packaging.</p> <p>An analysis of costs from the USA shows a cost-saving – for every dollar spent on fortification at least 40 dollars is saved in avoiding the costs of providing care to children with spina bifida (Grosse S et al, 2004).</p> <p>A conservative estimate is that the rate of NTDs could be reduced to 1 per 1000 with mandatory fortification, based on information from Australia and the USA.</p> <p>Believes that voluntary fortification should be discontinued if mandatory fortification is instigated, to address concerns about excess intake.</p> <p>Food vehicles</p> <p>Flour is likely to be an appropriate vehicle.</p> <p>Modelling of food consumption data should be used to determine the best vehicle, taking into consideration food choices of Indigenous women too.</p> <p>Consumer choice</p> <p>Understands there is limited information about consumer views on lack of choice if mandatory fortification were instigated.</p> <p>Considers it important to seek consumer views, address their concerns and provide consumers with information about fortification, its safety, costs and benefits.</p> <p>Considers that having one or two non-fortified products would retain consumer choice. For example, if flour were fortified then wholegrain flour could be unfortified.</p> <p>Monitoring</p> <p>Monitoring of mandatory fortification is essential and should include:</p> <ul style="list-style-type: none"> • levels of folate in fortified food; • labelling; • consumer and industry attitudes to fortification; • serum and red cell folate status of representative samples from all segments of the population; • NTDs (live births, stillbirths and terminations of pregnancy), other birth defects, multiple births; • anaemia in patients with vitamin B₁₂ deficiency; and • cancer. <p>There needs to be adequate funding both for the monitoring activities and the supervisory activities. This has not been the case for the monitoring of voluntary fortification and folic acid supplement use.</p> <p>An open, transparent system of monitoring with timely feedback to consumers, industry, government and non-government partners is essential.</p>

	Submitter	Submission Comments
		<p>Health promotion and education strategies</p> <p>Considers health promotion campaigns should not be the sole strategy to reduce the incidence of NTDs but should be used in conjunction with mandatory fortification.</p> <p>Health promotion efforts may not be effective for women with unplanned pregnancies.</p> <p>Ample evidence that targeted campaigns to increase supplement use are not fully effective and, perhaps of greater importance, are inequitable in their reach.</p> <p>Education programs need to be sustained in order to reach each cohort of women as they enter and pass through their child-bearing years.</p> <p>References</p> <p>Numerous references provided, including:</p> <p>Grosse, S., Waitzman, N., Romano, P., Mulinare, J. 2004. The costs and benefits of folic acid fortification in the United States: a comparison of ex ante and ex post economic evaluations. Department of Economics Working Paper Series. Salt Lake City: University of Utah. Report No.:2004-8.</p> <p>AIHW. 2004. Australia's babies: their health and wellbeing. Australian Institute of Health and Welfare National Perinatal Statistic Unit. Report No.:21, December 2004.</p> <p>Metz, J., McNeil, A.R., Levin, M. 2004. The relationship between serum cobalamin concentration and mean red cell volume at varying concentrations of serum folate. <i>Clinical and Laboratory Haematology</i> 26, 323-5.</p> <p>Mills, JL., Von Kohorn, I., Conley, MC., Zeller, JA., Cox, C., Williamson, RE., et al. 2003. Low vitamin B₁₂ concentrations in patients without anaemia: the effect of folic acid fortification of grain. <i>Am J Clin Nutr</i> 77:1474-1477.</p> <p>Lui, S., West, R., Randell, E., Longerich, L., Steel O'Connor, K., Scott, H., et al. 2004. A comprehensive evaluation of food fortification with folic acid for the primary prevention of neural tube defects. <i>BMC Pregnancy and Childbirth</i> 4:20:doi:10.1186/1471-2393-4-20.</p> <p>Bower, C., Miller, M., Payne, J., Serna, P., de Klerk, N., Stanley, F.J. 2004. Folate promotion in Western Australia and the prevention of neural tube defects. <i>Aust NZ J Public Health</i> 28, 458-464.</p>

	Submitter	Submission Comments
38	<p>Dr Robert Leeming</p> <p>Children's Hospital, Birmingham</p>	<p>Preferred option not indicated</p> <p>Potential health risks and benefits</p> <p><i>Breast cancer</i></p> <p>Responds to an article by Charles et al in the British Medical Journal (2004) that showed an increase in breast cancer among women who had taken folic acid during pregnancy.</p> <p>Has concerns about food fortification with folic acid as an alternative to elective medication, and believes we should be conservative about 'medication through food'.</p> <p>Expresses concern regarding the possible risk from folic acid supplementation and fortification on the increased risk of breast cancer. Considers there are benefits and side effects from all medication, which must be weighed carefully against each other.</p>
39	<p>Dr Mark Lucock</p> <p>School of Applied Sciences, University of Newcastle</p>	<p>Supports fortification, however urges a conservative approach</p> <p>Regulatory options</p> <p>Recommends a staged approach:</p> <ul style="list-style-type: none"> (a) Increase levels of awareness of folate health benefits combined with the existing level of discretionary folate fortification (i.e. maintain the status quo). Urges authorities to monitor the effect of this policy first. (b) As above, but with increased permissions for voluntary folate fortification. (c) Aim for a lower target figure of 200 µg folate intake from mandatory fortification. This would reduce the likelihood of any group receiving too much unmodified pteroylmonoglutamic acid (PGA). The health benefits could then be evaluated prior to moving to a target of 400 µg folate if required. <p>Scientific opinion</p> <p>The absorption and biotransformation process of folate in the body is saturated at a 400 µg dose (Lucock M et al, 1989). A dose higher than 400 µg will lead to unmodified PGA appearing in the blood. It is unknown what the potential detrimental effects are, if any, of unnatural folic acid metabolites when they are absorbed into the body. We need to know more about the effects of chronic exposure to PGA before instituting mandatory fortification.</p> <p>Evidence shows that periconceptual exposure to increased levels of folate increases the prevalence of the mutant C677T-MTHFR genotype which is associated with increased risk for NTD, vascular disease and certain common cancers (Lucock M et al, 2003). Proposes that over a generation, mandatory fortification of grain with folate as PGA could lead to an increase in the MTHFR-TT genotype within society, and thus lead to an increase in these diseases.</p> <p>Believes 400 µg folate per day is optimal to prevent NTDs. States that US fortification ensures that those least likely to achieve an extra 400 µg daily via grain products do so. Therefore, those who eat a lot of grain products readily achieve the 1 mg upper limit threshold on a daily basis.</p>

	Submitter	Submission Comments
		<p>This raises issues in the elderly where vitamin B₁₂ deficiency may be masked in folate replete individuals.</p> <p>At 1 mg a day, folate would likely interfere with anticonvulsant drug therapy.</p> <p>Questions how exposure to high folate levels in the diet would influence the efficacy of cancer chemotherapy, which is often based on antifolate drugs.</p> <p>References</p> <p>Lucock, M.D., Wild, J., Smithells, R. & Hartley, R. 1989. In vivo characterisation of the absorption and biotransformation of pteroylglutamic acid in man: A model for future studies. <i>Biochemical Medicine and Metabolic Biology</i> 42, 30-42.</p> <p>Lucock, M., Yates Z., Glanville T., Leeming R., Simpson R. & Daskalakis I. 2003. A critical role for B-vitamin nutrition in human developmental and evolutionary biology. <i>Nutrition Research</i> 23, 1463-1475.</p>
40	<p>Prof. Glen Maberly</p> <p>Rollins School of Public Health, Emory University, Atlanta, USA</p>	<p>Supports Option 3</p> <p>Impact</p> <p>Quotes the text from the outcome notes of a recent WHO meeting indicating that fortifying flour with 140 µg/100 g folic acid is unlikely to bring intakes above the Tolerable Upper Level of 100 g/day in any age or gender group or exacerbate or obscure vitamin B₁₂ deficiency.</p> <p>Quotes the consensus statement from a workshop held by the US Centres for Disease Control and Prevention and the Mexico Institute of Public Health:</p> <p><i>All fortified flour should include synthetic folic acid at a level between 1.4 and 2.8 ppm as determined by flour consumption patterns and the availability of other sources of folic acid in the diet (ensuring 400 µg/day) because:</i></p> <ul style="list-style-type: none"> • <i>Folic acid has been shown to be effective in the prevention of 50-70% of NTD cases;</i> • <i>Additional benefits include the correction of folic acid deficiency anaemia and decreased homocysteine levels;</i> • <i>Other potential benefits include reduced risk of other birth defects, stroke, heart disease, and cancer; and</i> • <i>There have been no reports that folic acid fortification masks anaemia or neurological manifestations in vitamin B₁₂ deficiency.</i> <p><i>Monitoring to measure program success as well as to serve as a basis for modifying the levels of folic acid in flour should include:</i></p> <ul style="list-style-type: none"> • <i>Folic acid levels in flour and flour products as a process indicator;</i> • <i>Serum folate as a biological indicator; and</i> • <i>Mortality from heart disease and incidence of NTD.</i> <p>Comments that more than 50 nations have taken steps toward flour fortification with folic acid, and all report good outcomes.</p>

	Submitter	Submission Comments
		<p>Considers the opportunity to implement mandatory fortification as a “simple, effective and affordable”.</p> <p>References (provided)</p> <p>Flour Power Australia and New Zealand: The case for Mandatory Folic Acid in Flour.</p> <p>Oakley, G., Bell, K., Weber, M. 2004. Workshop Summary, Recommendations for Accelerating Global Action to Prevent Folic-Preventable Birth Defects and other Folate-Deficient Diseases. Meeting of Experts on Preventing Folic Acid- Preventable Neural Tube Defects. Birth Defects Research 10: 835-837.</p>
41	<p>Mother & Child Health Research, La Trobe University</p> <p>Prof. Judith Lumley and Dr Max Watson</p>	<p>Preferred option not indicated</p> <p>Regulatory options</p> <p><i>Mandatory fortification</i></p> <p>Comments that support for mandatory fortification is not universal.</p> <p>Recommends caution with considering mandatory folate fortification, for the following reasons:</p> <ul style="list-style-type: none"> • even with mandatory fortification it will remain desirable that women of childbearing age take folic acid supplements periconceptionally. Concerned that if mandatory fortification is approved a negative impact with respect to rates of NTDs may result from a decline in the number of women taking folic acid supplements periconceptionally; • the United Kingdom Board of Food Standards Agency decided against mandatory fortification, even though the Committee on Medical Aspects of Food and Nutrition Policy concluded that it would be beneficial; • evidence surrounding other possible benefits of folate fortification is uncertain, with respect to conditions such as cardiovascular disease, certain cancers and mental health; • there is ongoing debate regarding folate fortification and masking of vitamin B₁₂ deficiency. Acknowledges that while the prevalence is low, there is potential with a population wide intervention for significant numbers of individuals to be affected; • the possible impact of folic acid on increased risk of multiple gestations has been too readily discounted based on US data. This is potentially an adverse outcome due to the higher risk of poorer health and development outcomes in twin pregnancies; and • introduction of mandatory folate fortification will have resource implications for provision of health services including monitoring and surveillance, and would demand careful planning. <p>References</p> <p>Various references provided.</p>

	Submitter	Submission Comments
42	<p>Murdoch Children's Research Institute, Royal Children's Hospital</p> <p>Dr Jane Halliday</p>	<p>Supports Option 3</p> <p>Regulatory options</p> <p>Supports mandatory fortification due to the reluctance of women to take supplements when not planning a pregnancy, and since 40% of pregnancies are unplanned these pregnancies may not be protected against NTDs.</p> <p>In addition, considers that voluntary fortification has not been effective in preventing NTDs.</p> <p>Incidence/prevalence of NTDs</p> <p>Notes the decline in prevalence of NTDs up to 2002, but states the magnitude of this decline did not reach maximum potential. Reports that preliminary data from 2003/4 (unpublished) indicates that the decline has not been sustained and that the incidence is increasing again.</p> <p>Data from population-based, comprehensive complete and up-to-date birth defects registers should be used in preference to data from the National Perinatal Statistics Unit, which does not report all pregnancy terminations.</p> <p>Victoria, South and Western Australia have good data on pregnancy terminations and show a higher rate of NTDs (around 2 per 1000 births) in years preceding health promotion and voluntary fortification, and a 30% drop in rates since these strategies were implemented.</p> <p>There are approximately 245 terminations of pregnancy with NTDs and around 100 infants born with spina bifida each year in Australia.</p> <p>Impact</p> <p><i>Voluntary fortification</i></p> <p>Considers an increase in voluntary fortification could lead to further reductions in NTDs if the fortified vehicle was aimed at a new market of consumers who have low serum folate levels. Considers this approach complicated when compared to fortifying a food product consumed by most people.</p> <p>Comments that industry may argue that it has the expertise to market to target consumers, but questions why this hasn't occurred given the available permissions to fortify and use a health claim for the past 5 years.</p> <p><i>Mandatory fortification</i></p> <p>Up to 70% reduction in NTDs is possible if a sufficient level of fortification is applied.</p> <p>Data from China suggests that NTDs can be reduced to 5 per 10,000 by folic acid consumption.</p> <p>Evidence from the US and Canada shows a drop in spina bifida rates of 27% (Morbidity & Mortality Weekly Report, 2004), although a higher concentration of folic acid in flour would lead to more prevention.</p> <p>Additional health benefits include improved cardiovascular health in the general population.</p> <p>Consider mandatory fortification of grain products with folic acid is safe and inexpensive.</p>

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		<p>Consider financial costs to millers (if flour is the vehicle) are minimal as they already put thiamin in flour. However, New Zealand mills would have to purchase the equipment that adds vitamins to flour.</p> <p>Notes that labelling costs would be incurred with mandatory fortification.</p> <p>Total increase is predicted at about 1 cent per loaf, which would be borne by the consumer.</p> <p><i>Health promotion and education strategies</i></p> <p>Studies show effect of mass media campaigns on periconceptual folic acid supplement use of a factor of 1.7-7.2, but no post-campaign rate was above 50%.</p> <p>There is recent evidence of suboptimal use of periconceptual folic acid supplements globally (Ray et al, 2004).</p> <p>Food vehicles</p> <p>The recommended food vehicle from countries that have adopted mandatory fortification is flour.</p> <p>Consumer choice</p> <p>Consider consumer choice is important.</p> <p>Suggest providing products with non-fortified wholegrain flour to maintain consumer choice, as used in other countries to accommodated this issue.</p> <p>Consider mandatory fortification will benefit the whole population while allowing those who would prefer to have non-fortified food to do so. In contrast, voluntary fortification favours educated people who can afford to purchase target-marketed products.</p> <p>Monitoring</p> <p>Essential that all jurisdictions in Australia have a birth defects registry that collects information on terminations for birth defects. Funding should be secured by the Australian Institute of Health and Welfare (i.e. Commonwealth funding).</p> <p>Monitoring of serum and red blood folate levels should also be implemented so the concerns that people are exceeding their upper limits are addressed. This should start immediately to facilitate collection of baseline data.</p> <p>Monitoring systems must be established to examine postulated side effects, such as twinning and masking of B₁₂ deficiency.</p> <p>Health promotion and education strategies</p> <p>Health promotion has not reached Indigenous mothers.</p> <p>There is no current education strategy in Victoria and is not aware of any being planned.</p> <p>Considers education campaigns should be used in conjunction with all of the regulatory options.</p>

	Submitter	Submission Comments
		<p>References</p> <p>Ray, JG., et al. 2004. Evidence for suboptimal use of periconceptional folic acid supplements globally. <i>Bjog</i> 111(5);399-408.</p> <p>Morbidity & Mortality Weekly Report 2004: CDC, 2004:362-365.</p>
43	<p>Peter F Nixon</p> <p>Department of Biochemistry & Molecular Biology, The University of Queensland</p>	<p>Advises caution in mandating folate fortification</p> <p>Considers that the Initial Assessment Report to be a sound summary of pertinent nutrition literature since 1990, but does not consider older literature in a comprehensive manner. Provided a number of references from earlier research.</p> <p>Regulatory options</p> <p>Desirable to target folate fortification to young women rather than to the whole population. Considers it would be valuable to assess whether foods other than cereals would enable a narrower delivery of fortification to the target population.</p> <p>Potential health risks and benefits</p> <p><i>Vitamin B₁₂ deficiency</i></p> <p>States that literature from 1947 to 1962 shows that in persons who are vitamin B₁₂ deficient, administration of folic acid in amounts exceeding 400 µg has not only masked the anaemia of B₁₂ deficiency, but also precipitated or exacerbated neurological diseases leading to severe disease and sometimes death.</p> <p>Need to compare older research in this area to assess the significance of findings for any increase in population-wide folate nutrition.</p> <p>The smallest dose of folic acid giving a positive haematologic response for megaloblastic anaemia in vitamin B₁₂ deficiency was only 400 µg, within the range of the proposed fortification of food in Australia and New Zealand.</p> <p>As vitamin B₁₂ is accumulated in stores it can take 5 to 15 years before those stores are depleted to the point of precipitating disease, whereas the increased folate nutrition of the North American population is quite recent.</p> <p>On current knowledge we can make no accurate predictions of the effects of population-wide increased folate nutrition on the incidence of neurological disease associated with vitamin B₁₂ deficiency.</p> <p>Argues for great caution in mandating folate fortification that targets the whole population. It would be preferable to explore measures that target increased folate nutrition to young women, if possible.</p> <p><i>Folate-Cobalamin Interactions and 5-methyl-tetrahydrofolate</i></p> <p>The “methyl-tetrahydrofolate trap” is no longer a hypothesis, but is well established. Thus, the utilization of 5-methyl-tetrahydrofolate is prevented by vitamin B₁₂ deficiency.</p> <p>It has been proposed that methyl-tetrahydrofolate may be safer than folic acid for folate fortification, however it is both less stable and more expensive than folic acid. Notes that polyglutamates of 5-methyl-tetrahydrofolate are by far the most common folates found naturally in foods.</p>

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		<p><i>Effects of folate nutrition on risk of disease</i></p> <p>Considers the Initial Assessment Report discusses well the effects of folate nutrition on the prevalence of NTDs, and the effect on lowering homocysteine concentrations and thus the prevalence of vascular disease. Notes that the later association appears to apply particularly to persons who are homozygous for the rather common polymorphisms of the enzyme 5,10-methylene-tetrahydrofolate reductase.</p> <p>Folate nutrition appears to have contrary effects on cancer risk. Some evidence shows the risk of occurrence of certain cancers is decreased by folate nutrition, however increased folate nutrition also accelerates the progression of established cancers.</p> <p>Considers that in light of such conflicting claims regarding cancer risk, mandatory folate fortification should be approached cautiously.</p> <p>Food vehicles</p> <p>Recommends milk be assessed as a food vehicle for folate fortification, as milk is the most acceptable food for the delivery of adequate calcium nutrition, also needed by young women both in preparation for pregnancy and for the prevention of osteoporosis.</p> <p>One consideration is whether the folate binding protein in milk increases, decreases or has no effect on the bioavailability of folate present in milk.</p> <p>Scientific opinion - folates and folate metabolism</p> <p>Natural folates are always reduced, mostly to derivatives of tetrahydrofolate and only transiently to derivatives of dihydrofolate, making them more prone to spontaneous degradation than folic acid unless they are stabilised by being bound to specific folate-binding proteins. It is partly for this reason that natural folates are less bioavailable than folic acid.</p> <p>Natural folates (except those in blood plasma) are polyglutamated, requiring that food folates be hydrolysed by conjugase (gamma-glutamyl hydrolase) prior to absorption, sometimes an additional impediment to bioavailability of food folates.</p> <p>Folic acid has never been found occurring naturally in foods.</p> <p>Fortification by folic acid has the potential to cause minor degrees of inhibition of folate-dependent enzymes that may conceivably affect DNA integrity, fertility and other folate dependent functions.</p> <p>Recommends changes to Figure 1 on page 18 of the Initial Assessment Report – DNA Biochemical Pathways Influenced by Folic Acid/Folate Intake.</p>

	Submitter	Submission Comments
44	<p>Dr Godfrey P Oakley, Jr</p> <p>Rollins School of Public Health, Department of Epidemiology, Emory University, Atlanta, USA</p>	<p>Supports Option 3</p> <p>Regulatory options</p> <p><i>Voluntary fortification</i></p> <p>States that voluntary folate fortification has not worked in Australia and New Zealand since companies were permitted to fortify flour, as most millers have chosen not to fortify.</p> <p>Unlikely that a voluntary program would be as effective as a mandatory program.</p> <p><i>Mandatory fortification</i></p> <p>Strongly recommends that Australia and New Zealand require mandatory folic acid fortification of wheat flour at 280 micrograms per 100 grams flour.</p> <p>Recommends an “expedited, fast track process”, with mandatory fortification implemented by October 1 2005.</p> <p>Considers mandatory fortification a “practical, economical and safe intervention that will immediately reduce or totally prevent a group of human diseases”.</p> <p>Reasons for supporting mandatory fortification: (Note: provided many scientific references to support comments made)</p> <ul style="list-style-type: none"> • randomised controlled trials show that folic acid supplements prevent spina bifida and anencephaly; • the United States, Canada, Chile and many other countries have implemented mandatory folic acid fortification programs; • mandatory folic acid fortification programs have been shown to: (1) prevent spina bifida and anencephaly, (2) to not mask vitamin B₁₂ deficiency, (3) sufficiently raise serum/plasma and red blood cell folate levels to prevent most folate deficiency anaemia, and (4) decrease homocysteine concentrations of the population; • no known risks from mandatory fortification; • Australia and New Zealand have concluded it is safe for manufacturers to voluntarily fortify flour at 280 µg per 100 g of flour; • a reduction of deaths from strokes and heart attacks in the US was noted after mandatory folate fortification was implemented; • each case of spina bifida prevented saves about \$US500,000 in lifetime costs. • it has an immediate, measurable, positive impact on public health; • it is inexpensive, saves the government money, and can easily be implemented and sustained; • does not require personal behaviour change; • supplements are effective for women who take them, but since 50-75% of women don’t take them, they are ineffective for at least 50% of women who have babies; and • supplement programs for women of reproductive age do not prevent folate deficiency diseases in the wider population. <p>Considers mandatory fortification is the only option that would benefit the whole population, by decreasing the prevalence of NTDs, prevent folate deficiency anaemia and lower the risk of cardiovascular disease.</p>

	Submitter	Submission Comments
		<p><i>Increased health promotion and education strategies</i></p> <p>Considers health promotion and education to be “ineffective”, as demonstrated by many studies.</p> <p>Considers supplement programs leave the vast majority of women in the population not consuming enough folic acid.</p> <p>Relevant Issues</p> <p>Determining optimal folate status for decreasing NTDs – considers this less important than taking immediate action to improve folate status. States that no country that has fortified has known the “optimal”. If an optimal level is ever determined, the prescribed amount of folate can be changed.</p> <p>Optimal program of mandatory folic acid fortification – designed so that the average woman of reproductive age consumes 400 micrograms of folic acid per day to protect against spina bifida and anencephaly.</p> <p>Benefits and risks – comments that the Proposal does not consider and weigh the current evidence that suggests considerable benefit for the entire population. States that concerns about vitamin B₁₂ deficiency should not be used to delay mandatory folic acid fortification, nor to minimise the folic acid concentrations permitted.</p> <p>References (provided)</p> <p>Oakley, G.P, Jr., Weber, M.B., Bell, K.N., Colditz, P. 2004. Scientific evidence supporting folic acid fortification of flour in Australia and New Zealand. <i>Birth Defects Research</i> 70(11), 838-41.</p> <p>Oakley, G.P, Jr., Bell, K.N., Weber, M.B. 2004. Recommendations for accelerating global action to prevent folic acid-preventable birth defects and other folate-deficiency diseases: Meeting of experts on preventing folic acid-preventable neural tube defects. <i>Birth Defects Research</i> 70(11), 835-7.</p> <p>Bower, C., Stanley, F.J. 2004. Case for mandatory fortification of food with folate in Australia, for the prevention of neural tube defects. <i>Birth Defects Research</i> 70(11), 842-3.</p>
45	<p>Paediatrics and Child Health Division, The Royal Australasian College of Physicians</p> <p>Dr Catherine Marraffa</p>	<p>Supports Option 3</p> <p>Incidence/prevalence of NTDs</p> <p>Comments that decline in rates is only observed in areas where live births are counted, not terminations. Comment that the observed decrease in NTD rates is attributable to the increase in terminations not a decrease in prevalence.</p> <p>Folate supplement use</p> <p>28% of women in Western Australia and 55% of women in South Australia reported taking folate one month prior to conception and in the first 3 months of pregnancy (Bower et al, 2004 and Ray et al, 2004).</p> <p>Impact</p> <p><i>Mandatory fortification</i></p> <p>Considers mandatory fortification has potential to decrease NTD rates by 70%, whereas combined voluntary fortification and supplements about 30%.</p>

	Submitter	Submission Comments
		<p>Considers there is little, if any, evidence of side effects in the non-target population with mandatory fortification.</p> <p><i>Health promotion and education strategies</i></p> <p>Comments that campaigns miss unplanned pregnancies (40% in Australia).</p> <p>Considers campaigns reach educated, higher socio-economic status groups and miss the indigenous or non-English speaking mothers.</p> <p>Food vehicles</p> <p>Supports the use of flour as the vehicle for mandatory fortification, based on overseas experience and its regular consumption by women of all ages.</p> <p>References</p> <p>Bower, C., Miller, M., Payne, J., Serna, P., de Klerk, N., Stanley, FJ. 2004. Folate promotion in Western Australia and the prevention of neural tube defects. ANZ J Public Health 28;458-464.</p> <p>Ray, JG., Singh, G., Burrows, RF. 2004. Evidence for suboptimal use of periconceptual folic acid supplements globally. International Journal Obstetrics and Gynaecology 111;399-408.</p>
46	<p>Perinatal Research Centre, The University of Queensland</p> <p>Prof. Paul Colditz</p>	<p>Supports Option 3</p> <p>Regulatory option</p> <p>Considers mandatory fortification the best public health approach, as other options have not had significant or sustained success.</p> <p>Provides a recent peer reviewed paper, which he is a co-author, that details the benefits of mandatory fortification in Australia and New Zealand (Oakley et al, 2004).</p> <p>Monitoring</p> <p>Considers the effect and safety of mandatory fortification should be monitored, to add to the international experience.</p> <p>References</p> <p>Oakley G, Weber M, Bell K, Colditz P. 2004. Scientific evidence supporting folic acid fortification of flour in Australia and New Zealand. Birth Defects Research 70;838-841.</p>
47	<p>A/Prof. Samir Samman</p> <p>School of Molecular & Microbial Biosciences, The University of Sydney</p>	<p>Supports Option 1 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Mandatory fortification</i></p> <p>Has reservations about the mandatory fortification for the following reasons:</p> <ul style="list-style-type: none"> • potential for masking of B12 deficiency, particularly in vegans and the elderly; • potential cancer-promoting effect of folic acid, where mandatory fortification would increase the exposure of non-target populations to folate; and • concerns about the use of wheat flour as the vehicle for fortification since the losses due to baking are potentially high and variable (e.g. 50% in small bread rolls and 8-30% in other baked products).

	Submitter	Submission Comments
		<p>The loss may be related to the surface area to volume ratio, which industry will have to determine and account for, where analytical testing costs are likely to be substantial.</p> <p>Reference (provided)</p> <p>Hansen, M., Samman, S., Madsen, L. et al. 2001. Folic acid enrichment of bread does not appear to affect zinc absorption in young women. <i>Am J Clin Nutr</i> 74:125-9.</p>
48	<p>School of Population Health, The University of Western Australia</p> <p>Angela Mitchell and Siobhan Hickling</p>	<p>Preferred option not indicated</p> <p>General comments</p> <p>Submitted a recently completed paper researched and prepared by The University of Western Australia. The study has been provisionally accepted for publication in the <i>Journal of Clinical Epidemiology</i> in 2005.</p> <p>The study objective was to investigate the effect of the voluntary fortification policy in Australia on serum folate and total plasma homocysteine concentrations.</p> <p>Relevant findings to P295 include:</p> <ul style="list-style-type: none"> • women of childbearing age are not currently consuming the recommended level of folate for maximal prevention of neural tube defects; • estimate that the general population is now consuming an additional 65µg folate per day, since the introduction of voluntary folate fortification in 1998; • 62.5% of women surveyed in 2004 reported consuming one or more folate fortified products in the previous week; • estimate that only a small proportion of women meet the RDI for pre-pregnancy and pregnancy folate; and • the types and brands of fortified foods were generally more expensive than their unfortified counterparts.
49	<p>A/Prof. Frits van der Haar</p> <p>Rollins School of Public Health, Emory University, Atlanta, USA</p>	<p>Supports Option 3</p> <p>Regulatory option</p> <p><i>Supports mandatory fortification:</i></p> <p>Considers mandatory fortification of cereal flours with folic acid the most effective strategy of delivering additional folic acid to the entire population.</p> <p>Comments that Proposal P295 correctly summarises the reasons why the recommendation to take folic acid supplements is ineffectual and why voluntary fortification of selected foods has not resulted in sufficient reduction of the incidence of NTDs.</p> <p>Mandatory fortification of flour ensures that all women of childbearing age consume extra folic acid without personal behavioural change.</p> <p>No known risks from mandatory folic acid fortification at the level currently permitted voluntarily in Australia and New Zealand.</p> <p>Comments that more than 50 nations have taken steps toward flour fortification with folic acid, and all report good outcomes.</p> <p>Considers the option to implement mandatory fortification as a “simple, effective, safe and affordable opportunity”.</p>

	Submitter	Submission Comments
50	<p>Prof. Nicholas Ward</p> <p>Wolfson Institute of Preventative Medicine, London</p>	<p>Preferred option not indicated, however supports folate fortification.</p> <p>General comments</p> <p>Experience has shown that fortification of flour with folic acid can lead to significant increases in blood folate levels, reduction in homocysteine levels and the expected reduction of NTDs.</p> <p>Fortification programmes offer an important first step in the prevention of NTDs throughout the community.</p> <p>Fortification provides a simple, safe, effective and inexpensive way of reducing the incidence of a serious and disabling birth defect.</p> <p>No adverse effects of folate fortification, and there are clear benefits, notably the prevention of NTDs and anaemia due to folate deficiency. Other likely benefits related to cardiovascular disease and stroke.</p> <p>States that the food industry has raised no objections in principle to fortification of flour if it is a requirement on all manufacturers, so that no one manufacturer is financially disadvantaged by introducing fortification on their own.</p>
<i>Public Health Organisations</i>		
51	<p>Auckland Regional Public Health Service, Nutrition Team.</p> <p>Ms Chris Cook</p>	<p>Preferred option not indicated</p> <p>Food currently fortified with folate</p> <p>Breakfast cereals, bread, fruit juice and soy beverages.</p> <p>Comments that it does not appear the food industry perceives value in marketing fortified foods to women of child bearing age, as the biggest consumers of breakfast cereals (predominant food fortified with folic acid) are not this group.</p> <p>Impact</p> <p><i>Maintain status quo</i></p> <p>Maintaining the status quo would require more effort in promoting folic acid supplements to all women of child bearing age by health professionals. Government would need to provide increased funding to support these campaigns.</p> <p>Considers there is evidence that rates of NTDs could continue to decline while maintaining the status quo, as shown by large scale education campaigns undertaken in the UK, Netherlands, Western Australia and South Carolina.</p> <p>A 30% fall in NTDs (including terminations) was documented in Western Australia from 1996-2000, and was achieved through a combination of voluntary fortification and an education campaign recommending supplements.</p> <p><i>Voluntary fortification</i></p> <p>Achieving a reduction in NTD rates from increased voluntary fortification would depend on the many variables, including the level of uptake by industry and the level of consumption of fortified foods by the target group.</p>

	Submitter	Submission Comments
		<p>Considers it possible that the benefits of increased voluntary fortification permissions may not outweigh the costs, for example if some groups unwittingly consume excessive quantities of folic acid, and the level of monitoring may be less than that undertaken with mandatory fortification.</p> <p>Considers voluntary fortification cannot ensure an effective level of folic acid in the food supply in order to maximise a reduction in the incidence of NTDs.</p> <p><i>Mandatory fortification</i></p> <p>Based on US data since mandatory fortification was introduced, estimate 13-16 fewer NTD pregnancies per year in New Zealand if the same fortification levels were implemented here and assuming that decline observed in the US was due to fortification alone.</p> <p>Unknown whether the benefits of mandatory fortification would outweigh all the costs, as there is the potential for excessive intakes resulting in adverse health implications, for example for those individuals on epileptic and antifolate drugs and those with undetected cancer.</p> <p>The impact on foods currently fortified with folic acid would depend on what vehicle is selected for mandatory fortification. Some currently fortified foods may need to remove folic acid from their ingredients, as it could already be present in flour (if this was the selected food vehicle). Also, some foods may opt out of fortifying with folate as the value of fortification and marketing edge may be diminished.</p> <p><i>Health promotion and education strategies</i></p> <p>Provides data on a mail survey (n=220, a 44% response rate) conducted in Auckland in 2002 on knowledge and behaviours of women (25-44 yrs) regarding folic acid supplement use (Barry K et al, 2003). Results were:</p> <ul style="list-style-type: none"> • 74% had heard of the Ministry of Health recommendations regarding folic acid and pregnancy; • 46% knew the recommended time to take folic acid; • 29% with a pregnancy had taken folic acid at the recommended time; • groups with low levels of knowledge about folic acid recommendations and low use of folic acid at the recommended time were Pacific women, women with lower levels of education and women with no previous pregnancies; and • the most common sources of this information were general practitioners, friends and family. <p>Relying on health promotion alone does not seem to be an equitable approach as uptake of health messages are greater in some sectors of society. Also, as half of pregnancies are unplanned, relying solely on health promotion is inappropriate.</p> <p>Food vehicles</p> <p>Bread would be a suitable food for extending permissions for voluntary folate fortification.</p> <p>Flour could be successfully used as a sole food vehicle rather than several fortified products.</p> <p>Considers flour the best food vehicle if mandatory fortification was adopted.</p>

	Submitter	Submission Comments
		<p>Consumer choice</p> <p>Consumer choice is important and needs to be considered, as some consumers would be concerned about lack of choice.</p> <p>Monitoring</p> <p>Constant surveillance of folate status is required to assess the health and safety impact of increases in folic acid intake, and must include the whole population, not just women of child bearing age.</p> <p>The introduction of mandatory fortification will require a significant increase in resources allocated to monitoring vitamin B₁₂ status of older adults.</p> <p>Annual random testing of folic acid fortified foods by NZFSA to determine actual folic acid content.</p> <p>Measurement of folate status in serum and red blood cells of the whole population, which should be the responsibility of the Ministry of Health and possibly as part of the National Nutrition Survey, should include collection of baseline data before mandatory fortification.</p> <p>References</p> <p>Barry, K. MPH Dissertation, University of Auckland, 2003.</p> <p>Kim, Y. Will mandatory folic acid fortification prevent or promote cancer? 2004. Am J Clin Nutr 80,1123-8.</p> <p>Note a number of studies (as listed below) that have evaluated the impact of education campaigns on NTD rates:</p> <p>COMA (Committee on Medical Aspects of food and Nutrition Policy). 2000. Folic Acid and the Prevention of Disease. London; Department of Health.</p> <p>Van der Pal-de Bruin, K., de Walle, H., Jeeninga, W. et al. 2000. The Dutch ‘folic acid campaign’: have the goals been achieved? Paediatric and Perinatal Epidemiology 14, 111-117.</p> <p>Bower, C., Blum, L., O’Daly, K. et al. 1997. Promotion of folate for the prevention of neural tube defects: knowledge and use of periconceptional folic acid supplements in Western Australia, 1992 to 1995. Australian and New Zealand Journal of Public Health 21, 716-721.</p> <p>Stevenson, R., Allen, P., Pai, G. et al. 2000. Decline in neural tube defects in a high-risk region of the United States. Pediatrics 106, 677-683.</p> <p>Bower, C., Ryan, A., Rudy, E. et al. 2002. Trends in neural tube defects in Western Australia. Australia and New Zealand Journal of Public Health 26, 150-151.</p>
52	Central and Southern Regional Genetic Services, Capital & Coast Health, Wellington	<p>Supports Option 3</p> <p>Regulatory options</p> <p><i>Mandatory fortification</i></p> <p>Endorses mandatory fortification because:</p> <ul style="list-style-type: none"> • if the levels of fortification are correct, up to 70% of NTD cases will be prevented; • the benefits will most definitely outweigh all the costs;

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • there is no evidence of widespread consumer concern regarding mandatory fortification; • consumer choice would be preserved for those individuals wishing to avoid fortified products, as the availability of “organic” products increases; • flour is the appropriate vehicle for fortification; • the overall cost to consumers would be negligible; and • monitoring would be vital and should be mandated in line with the mandatory fortification. The Ministry of Health Epidemiology Unit in New Zealand currently monitors the incidence of NTDs in live births and stillbirths. <p>Incidence/prevalence of NTDs</p> <p>True incidence of NTDs in New Zealand is unknown, as cases that are terminated in pregnancy are not recorded. The Abortion Supervisory Committee are now collecting this data.</p> <p>There are several population-based birth defects registers in Australia with data on all births and terminations of pregnancy with NTD.</p> <p>Registers from Victoria, South Australia and Western Australia show higher rates of NTDs in the years preceding health promotion and voluntary fortification.</p> <p>Vitamin B₁₂ deficiency</p> <p>Questions the theory that increased consumption of folic acid may delay the diagnosis of vitamin B₁₂ deficiency.</p> <p>Considers the upper tolerable intake limit of 1000 µg as a target for modelling and estimation purposes only, and that it is safe to consume above this level.</p> <p>Folate supplement use</p> <p>Many women are reluctant to take supplements if they are not intending to get pregnant. At least 40% of pregnancies are unplanned, therefore these pregnancies may not be protected against NTDs.</p> <p>Data on current folate use by the target group in Australia and New Zealand includes:</p> <ul style="list-style-type: none"> • 32% took folic acid supplements periconceptionally, where they were more likely to take supplements if they had planned the pregnancy, had private health insurance and high educational attainment (Henry A et al, 2000). • 33% took folic acid supplements periconceptionally, therefore no change between the two study periods (Maats FH et al, 2002). • 28% of women reported taking 200 ug or more of folic acid in supplements daily for at least one month before pregnancy and the first three months of pregnancy (Bower C et al, 2004). This study was conducted in a state with considerable health promotion activity. • 38% of women reported knowing that folic acid helped prevent birth defects, but only 11% had taken a folic acid supplement prior to pregnancy (Ministry of Health, New Zealand).

	Submitter	Submission Comments
		<p>Foods currently fortified with folate</p> <p>Currently some breads and cereals are fortified with folate, with fewer fortified varieties available in New Zealand.</p> <p>Presently there are no programs in New Zealand targeting women of childbearing age to increase awareness of the benefit of folate in reducing the incidence of NTDs.</p> <p>Evidence from Western Australia shows that intake of voluntary fortified products is not affected by education or socio-economic factors.</p> <p>Impact</p> <p><i>Maintain status quo</i></p> <p>No change for consumers and the community if the status quo is maintained, as there will be no change in the rate of NTDs.</p> <p><i>Voluntary fortification</i></p> <p>Low-level uptake of current voluntary fortification permissions by industry. This is a failed public health initiative.</p> <p>Voluntary fortification favours educated people who can afford to purchase targeted products.</p> <p><i>Mandatory fortification</i></p> <p>Degree of reduction in NTDs would depend on the level of fortification and the food vehicle used.</p> <p>Rates of spina bifida and anencephaly were reduced by 20-50% with folic acid fortification (Williams LJ et al, 2002, Honein MA et al, 2001, Persad VL, 2002, Ray JG, 2002, De Wals P et al, 2003).</p> <p>Considers costs to industry are negligible as millers already have equipment to add thiamin.</p> <p>There would be start-up costs in labelling and installation of machinery in New Zealand.</p> <p>Considerable savings to the health budget for every case of a NTD that is prevented.</p> <p><i>Increased health promotion and education strategies</i></p> <p>Considers education regarding diet combined with supplementation of target groups is “at best, ineffective and, at worst, completely useless”.</p> <p>Consumer choice</p> <p>Notes that in some countries the issue of consumer choice has been overcome by also allowing non-fortified flour.</p> <p>Monitoring</p> <p>Essential that an effective birth defects registry be developed for both Australia and New Zealand which also records terminations and whether the fetus was terminated because of a NTD.</p> <p>Need to monitor folate levels in fortified foods, serum and red cell folate and postulated side effects.</p>

	Submitter	Submission Comments
		<p>Food vehicles</p> <p>Recommends mandatory fortification of white flour, as adopted by other countries.</p> <p>Flour, bread, cereals, pastas, juice and milk are some products that could be used.</p> <p>Health promotion and education</p> <p>Health promotion campaigns are a critical component for educating the public following a decision for mandatory flour fortification.</p> <p>Health authorities support education strategies, however the implementation and investment varies greatly between states and countries.</p> <p>Considers large-scale continued health promotion strategies expensive and ineffective, and they tend not to be sustained by health authorities.</p> <p>References</p> <p>Henry, A., Crowther, C.A. 2000. Universal periconceptional folate supplementation: chasing a dream? MJA 172, 407-8.</p> <p>Maats, F.H., Crowther, C.A. 2002. Patterns of vitamin, mineral and herbal supplement use prior to and during pregnancy. Aust NZ J Obstet Gynaecol. 42, 494-6.</p> <p>Bower, C., Miller, M., Payne, J., Serna, P., de Klerk, N., Stanley, F.J. 2004. Folate promotion in Western Australia and the prevention of neural tube defects. Aust NZ J Public Health 28, 458-464.</p> <p>Ministry of Health, New Zealand. 2003. Bulletin 18.</p> <p>Williams, L.J., Mai, C.T., Edmonds, L.D. 2002. Prevalence of spina bifida and anencephaly during the transition to mandatory folic acid fortification in the United States. Teratology 66(1), 33-9.</p> <p>Honien, M.A., Paulozzi, L.J., Mathews, T.J., Erickson, J.D., Wong, L.Y. 2001. Impact of folic acid fortification of the US food supply on the occurrence of neural tube defects. JAMA 285(23), 2981-6.</p> <p>Persad, V.L., Van den Hof, M.C., Dube, J.M., Zimmer, P. 2002. Incidence of open neural tube defects in Nova Scotia after folic acid fortification. CMAJ 167(3), 241-5.</p> <p>Ray, J.G., Meier, C., Vermeulen, M.J., Boss, S., Wyatt, P.R., Cole, D.E. 2002. Association of neural tube defects and folic acid food fortification in Canada. Lancet 360(9350), 2047-8.</p> <p>De Wals, P., Rusen, I.D., Lee, N.S., Morin, P., Niyonsenga, T. 2003. Trend in prevalence of neural tube defects in Quebec. Birth Defects Research 67(11), 919-23.</p>
53	Dietitians Association of Australia (DAA)	<p>Supports Option 2 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Supports the extension of permissions for voluntary fortification and a national education campaign directed at the target population, including Indigenous women.</p>

	Submitter	Submission Comments
		<p>If this method proves ineffective in reducing the prevalence of NTDs then consideration of mandatory fortification is warranted.</p> <p>Considers the success of any fortification program lies with the agreement and full support of industry, government and the wider community.</p> <p><i>Mandatory fortification</i></p> <p>Reasons for not supporting mandatory fortification include:</p> <ul style="list-style-type: none"> • there is currently insufficient population dietary data available to assess the folate intakes of the general population and at risk groups; • concerns regarding over consumption of folate need to be reviewed, for example increased twinning in pregnancy and masking of vitamin B₁₂ deficiency in older adults; and • the alternative strategies of voluntary fortification and targeted education need to be trialled and evaluated before mandatory fortification is considered. <p>If mandatory fortification is considered then the following points need to be addressed:</p> <ul style="list-style-type: none"> • determine the nutrient status of the population, particularly at risk groups; • provide a national education program targeting women in their childbearing years; • identify an appropriate food vehicle that is acceptable to the target population; • obtain agreement on the amount of folic acid required to be added to the food; • assess the bioavailability of the nutrient in the food; • conduct a controlled field trial; and • provide ongoing monitoring and review following implementation. <p>Impact</p> <p><i>Voluntary fortification</i></p> <p>Appears that current voluntary folate fortification has had some success in reducing the prevalence of NTDs in Australia (Bower C et al, 2003 and Metz J et al, 2002).</p> <p>Voluntary fortification relies on industry support and without incentive, whether it be financial or market presence, industry is unlikely to participate.</p> <p>To encourage the assistance of industry the DAA advocates for the following:</p> <ul style="list-style-type: none"> • A continuous national public awareness campaign on the importance of folic acid and NTDs, targeting women of childbearing age and sensitive to Indigenous women. This will increase demand for folate fortified foods and result in a more attractive proposition for industry; and • Government support for industry to assist with set up and ongoing evaluation.

	Submitter	Submission Comments
		<p>Monitoring</p> <p>Recommends continuous monitoring of the folate and B₁₂ status of the population, with a focus those at risk, including women of childbearing age, children and older adults.</p> <p>References</p> <p>Bower, C., Stanley, F., Miller, M. Voluntary fortification of food with folate in Australia. Presentation at the Future Directions for Folic Acid Fortification in Australia and New Zealand meeting, 31 January 2003.</p> <p>Metz, J., Sikaris, K., Maxwell, E., Levin, M. 2002. Changes in serum folate concentrations following voluntary fortification in Australia. Medical Journal of Australia 176:90-91.</p>
54	<p>Diversity Health Institute, New South Wales</p> <p>Mr Abd Malak</p>	<p>Supports Option 3</p> <p>Regulatory options</p> <p>Supports mandatory fortification of flour with folic acid, as the ideal public health measure to reach all women regardless of cultural background.</p> <p>Consider the scientific evidence and support for mandatory fortification is “overwhelming”.</p> <p>Impact</p> <p>Folic acid may prevent 50-70% of birth defects such as NTDs as well as providing additional health benefits, and is used in over 50 nations with good outcomes and no adverse effects.</p> <p>National and state health policy and legislation is founded on principles of access and equity and emphasises the need to include the needs of Australia’s diverse population.</p> <p>Provides figures for the increasing number of the New South Wales population who are born overseas and/or where English is not their first language. Notes the benefit of mandatory fortification for these groups who, for various reasons, may not receive education regarding folic acid and pregnancy or be able to afford supplements.</p> <p>Considers mandatory fortification is simple to implement, affordable and effective, with universal reach which would enable even the most disadvantaged in our society to access this important health benefit.</p>
55	<p>The Food and Nutrition Special Interest Group, Public Health Association of Australia</p> <p>Mr Mark Lawrence</p>	<p>Preferred option not indicated</p> <p>General comments</p> <p>Considers mandatory food fortification intervention needs to take particular account of the objective to protect public health and safety.</p> <p>Recognises that NTDs are associated with considerable emotional, social and economic cost.</p> <p>Submission based on the Public Health Association of Australia’s policy position on periconceptional folate and the prevention of NTDs (document attached to submission).</p> <p>The Codex general principles for the addition of essential nutrients to food specify that mandatory food fortification be implemented where there is evidence of a population-wide benefit.</p>

	Submitter	Submission Comments
		<p>This is not the situation regarding evidence of the folate-NTD relationship. Instead it is the special requirements of a population sub-group that need to be addressed. Selecting mandatory folate fortification would create a policy precedent in Australia and New Zealand.</p> <p>Recommends a thorough risk-benefit analysis of all the policy options be undertaken before a decision on one policy option is made, which will require up to date information.</p> <p>Impact</p> <p><i>Mandatory Fortification</i></p> <p>Potential benefits of mandatory folate fortification are:</p> <ul style="list-style-type: none"> • offers a relatively equitable and immediate policy approach to increase folic acid exposure of the target group during the periconceptional period, especially given the challenges associated with changing behaviour towards increased folic acid supplementation; • evidence from countries where mandatory folate fortification has been implemented indicates that the incidence of NTDs can be reduced by 27-70%; and • possible population benefits such as reducing the prevalence of cardiovascular disease and the incidence of other adverse outcomes of pregnancy. <p>Potential risks of mandatory folate fortification are:</p> <ul style="list-style-type: none"> • some health risks have been associated with folate supplementation, where it is possible that these may occur with fortification. These include masking of vitamin B₁₂ deficiency, it may increase the incidence of multiple births, and may promote the progression of pre-malignant and malignant lesions; • would represent a “natural experiment” on the population, where adverse health risks cannot be predicted with certainty; and • removes consumer choice and raises ethical concerns related to balancing the interests of certain individuals with freedom of choice for the public as a whole. <p><i>Health promotion and education strategies</i></p> <p>Agrees that nutrition education will be unlikely to achieve complete coverage of the target group.</p> <p>However, believes there has been inadequate investment in this strategy by government departments since the National Health and Medical Research Council released its original policy statement on this issue.</p> <p>Considers nutrition education and campaigns have had a substantial impact in Australia relative to other policy options. For example, in Western Australia in 1996 a 36% reduction in the incidence of NTDs relative to the rate since 1980 was observed and the incidence has remained stable at this level. They attribute this outcome to the respective state education campaign to promote increased folate supplementation rather than voluntary fortification.</p>

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		<p>Monitoring</p> <p>Systematic, national nutrition monitoring and surveillance is required, noting that it is nearly 10 years since the last Australian National Nutrition Survey was conducted.</p> <p>Would need mechanisms in place to detect health impacts across the population, not just for the target group, if extra folic acid is added to the food supply.</p> <p>Data would be required on the folate composition of food products in Australia and New Zealand.</p>
56	<p>Genetic Health Services Victoria</p> <p>Dr Mac Gardner and Prof Agnes Bankier</p>	<p>Support Option 3</p> <p>General comments</p> <p>In principle, strongly support the proposal of mandatory fortification of appropriate foods.</p> <p>Not aware of any untoward effect of an increased folate level in pregnancy, e.g. through supplementation, with respect to other malformations.</p> <p>Understands there is suggestive evidence that increased folate status may also reduce rates of some other birth defects (Czeizel A, 1998).</p> <p>There may be a slight increase in twinning in supplemented women (Czeizel A et al, 2004), and noting that birth complications are seen more in twin than in singleton pregnancies.</p> <p>References</p> <p>Czeizel, AE. 1998. Periconceptional folic acid containing multivitamin supplementation. Eur J Obstet Gynecol Reprod Biol. 78(2): 151-61.</p> <p>Czeizel, A.E., Vargha, P. 2004. Periconceptional folic acid/multivitamin supplementation and twin pregnancy. Am J Obstet Gynecol. 191(3): 790-4.</p>
57	<p>Joondalup Child Development Centre, The Royal Australasian College of Physicians</p> <p>Dr Brad Jongeling</p>	<p>Supports Option 3 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Considers maintaining the status quo is accepting a less than ideal preventive strategy.</p> <p>Considers health promotion and voluntary fortification are failing to provide maximal protection against the development of NTDs in Australia.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>This option has no guarantee that industry would fortify more products and provides limited control over fortification.</p> <p>Notes that not all products currently allowed to be fortified are fortified.</p> <p>Considers it unlikely that this option would reach all segments of the population equally and consistently.</p> <p><i>Mandatory fortification</i></p> <p>Strongly supports mandatory fortification.</p>

	Submitter	Submission Comments
		<p>Considers mandatory fortification of a staple food eaten by most women of childbearing age provides “an outstanding opportunity to provide considerable protection against NTD in the offspring of all members of our population”.</p> <p><i>Increased health promotion and education strategies</i></p> <p>Does not support this option as a sole strategy, as this has been only partially successful and does not reach the target population in an equitable fashion.</p> <p>Does support increased health promotion and education in conjunction with mandatory fortification.</p> <p>Incidence/prevalence of NTDs</p> <p>Rates in Australia has been relatively constant at around 2 per 1000 births.</p> <p>Most NTDs are diagnosed prenatally and many parents choose to terminate affected pregnancies.</p> <p>Health promotion activities and voluntary food fortification have resulted in a 30% fall in NTDs (births plus terminations) in states able to monitor such a trend.</p> <p>Aboriginal women are twice as likely as non-Aboriginal women to have a baby with a NTD and there has been no fall in NTDs in Aboriginal infants.</p> <p>Folate supplement use</p> <p>Even extensive and sustained health promotion campaigns have not been able to achieve proportions of more than 50% of women taking folic acid supplements periconceptionally.</p> <p>Health promotion activities are not reaching all segments of the population equally - those not taking supplements are more likely to be young, less educated, smokers and single. Furthermore, there has been no fall in NTDs in Aboriginal infants.</p>
58	<p>Manufactured Food Database, New Zealand (MFD)</p> <p>Lyn Gillanders and Alannah Steeper</p>	<p>Supports Option 1 in conjunction with Option 4</p> <p>Regulatory options</p> <p>The MFD recommends that fortification remains voluntary and is combined with a public health awareness campaign.</p> <p>In addition, manufacturers should be strongly encouraged to increase voluntary fortification of breakfast cereals and breads.</p> <p>If this does not occur then the MFD would favour mandatory fortification of bread making flour.</p> <p>Foods currently fortified with folate</p> <p>Uptake of voluntary fortification by industry over the past 8 years has been primarily by breakfast cereal manufacturers, however some products have been subject to change over this time. Six breads have been fortified with folate, out of the 217 breads listed on the MFD, and a small range of biscuits.</p> <p>Could assume that many women of child-bearing age will not be eating fortified breakfast cereals on a regular basis at present – approximately 25% in the National Nutrition Survey.</p>

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		<p>A North American study, not presented at Initial Assessment, found that analysed values of folic acid in breakfast cereals were considerably higher than labelled values, and intake was approximately 200% of the labelled serving size (June 2001). MFD and NZFSA are currently collaborating on an overage project for iron and folate values in fortified foods in New Zealand.</p> <p>Impact</p> <p><i>Voluntary fortification</i></p> <p>The MFD has tracked voluntary folate fortification since 1996 in New Zealand, and this is an ongoing requirement by the Ministry of Health.</p> <p>Considers the effectiveness of voluntary fortification in delivering folic acid to women of childbearing age is not substantial.</p> <p><i>Mandatory fortification</i></p> <p>Considers mandatory fortification of bread making flour would be effective in delivering folic acid to most of the population, including women of childbearing age. However, non-target groups would be exposed to levels greater than the tolerable upper intake level.</p> <p>The risk of masking vitamin B₁₂ deficiency in older adults must be considered, especially with the aging New Zealand populations.</p> <p>The increased costs associated with mandatory fortification are likely to be passed on to consumers. If flour is used, then a wide range of manufactured foods would cost more and the potential dosage effects of folate may be more widespread.</p> <p><i>Health promotion and education strategies</i></p> <p>Unknown whether the reduction in NTDs seen in Western Australia can be sustained long term without repeated public awareness campaigns.</p> <p>However, education does minimise the risk of exposure to excessive levels for the vulnerable elderly population and preserves consumer choice.</p> <p>Monitoring</p> <p>The MFD currently provides the only surveillance of levels of fortification in manufactured food available in New Zealand.</p> <p>Recommends this surveillance continues with voluntary and/or mandatory folate fortification.</p>
59	<p>Marg Miller Health Consulting, Western Australia</p> <p>Ms Margaret Miller</p>	<p>Preferred option not indicated</p> <p>Foods currently fortified with folate</p> <p>Provided data on foods currently fortified with folate.</p> <p>Product types and brands of breads, breakfast cereals and other products fortified with folate are provided, including amounts of folate per 100g.</p> <p>Data was collected as part of a national case-control study of the causes of acute lymphoblastic leukaemia in children. The study hypothesis is that maternal folate supplementation during pregnancy is associated with reduced risk of acute lymphoblastic leukaemia in the offspring.</p>

	Submitter	Submission Comments
60	<p>New Zealand Dietetic Association (NZDA)</p> <p>Ms Carole Gibb/Ms Helen Wallwork</p>	<p>Supports effective folic acid fortification and education</p> <p>Submission has been drawn extensively from the Ministry of Health’s <i>Public Health Intelligence Occasional Bulletin Number 18: Improving Folate Intake in New Zealand – Policy Implications</i>, 2003.</p> <p>Regulatory options</p> <p>States that members are divided in their support between voluntary and mandatory fortification, but do support the principle of fortification of the food supply with folic acid for the prevention of NTDs, and unanimously support a targeted health promotion campaign that is adequately funded by government.</p> <p>Supports effective folic acid fortification of the food supply. If it is predicted that voluntary fortification will not be effective after extensive examination, then mandatory fortification must be considered the best option.</p> <p>Critical to the success of any fortification programme, voluntary or mandatory, is the agreement and full support of industry and the leaders of the community, a public awareness campaign, and continued publicised recommendations for women of child bearing age to take folic acid supplements as well as consumption of fortified foods.</p> <p>Impact</p> <p><i>Voluntary Fortification</i></p> <p>Considers there has been limited uptake of voluntary fortification permissions by New Zealand industry, which have been in place since 1996. Therefore considers it unlikely that food manufacturers would agree to either increase the number of foods fortified with folic acid from the current permissions, or to extend the range of foods fortified with folic acid, particularly as the food industry is wary of a potential threat of liability.</p> <ul style="list-style-type: none"> • For the year ending 2002, there were only 81 foods fortified with folic acid, and over half were breakfast cereals (as voluntarily reported to the MFD). • Notes that the New Zealand Association of Bakers is wary of moving collectively towards fortification unless it has an assurance of minimal commercial risk. <p>Considers voluntary fortification under status quo does not seem to be an effective strategy.</p> <p>For voluntary fortification to be effective it would require:</p> <ul style="list-style-type: none"> • a public awareness campaign on the importance of folic acid and NTDs, which will increase community demand for fortified foods; • public support for fortification from leaders of the community; • costs of fortification in set up phase to be covered by government; • assurances to industry from the government of no liability if regulations are followed; • fortification of flour in order to reach sufficiently high folic acid levels in the food supply for the target group; • information campaign on folic acid fortification to be targeted towards industry;

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • extensive monitoring of the level of fortification in the food supply; and • continuous monitoring of the folate status of the population. <p><i>Mandatory fortification</i></p> <p>Considers mandatory fortification has the ability to do the greatest good compared to other methods of increasing folate intakes in the target population, but this has to be weighed against the rights of the general population to have personal choice with regard to consumption of fortified foods.</p> <p>Notes mandatory fortification has been effective in increasing folic acid levels in the target population in a number of countries. The US and Canada have had declines in the prevalence of NTDs, which can be attributed in part to fortification.</p> <p>The cost of mandatory fortification at a level of 140 ug/100 g has been estimated at \$2.5 million for the first year, and reducing to \$80 –120,000 each year thereafter for the cost of folic acid.</p> <p>This level is estimated to reduce the number of spina bifida cases by 20% per year, which is 3 less cases per year based on the number of live births.</p> <p>Suggests that if the initial costs are covered by government, there should be minimal cost to industry and therefore no reason to raise food prices.</p> <p>Mandatory fortification provides an ethical dilemma in that by benefiting a very small group in the population, the entire population must give up personal freedom to select foods with or without added folate. However, the benefit to this population group is life changing.</p> <p>States there is clear evidence that the greatest reduction in NTDs is achieved through mandatory fortification, compared to voluntary fortification alone or in combination with a public health promotion of supplementation and foods rich in folate.</p> <p>No data regarding the effects of long-term exposure of populations to high levels of folic acid, particularly for vulnerable populations such as children and the elderly. However there does not appear to be any evidence of harm from countries that have had mandatory fortification for up to seven years.</p> <p>Food vehicles</p> <p>Fortification of white flour appears to be the most effective food vehicle, as a reasonable proportion of the target population will consume sufficient flour-containing products to reach the recommended intake of 400 µg/day.</p> <p>Fortification of white rice should also be considered, as there is significant number of Asian women in Australia and New Zealand.</p> <p>Monitoring</p> <p>Monitoring program for mandatory fortification should be initiated before fortification for pre- and post-intake and serum folate levels.</p> <p>Measurement of folate and B₁₂ status in the whole population must accompany the monitoring of folic acid in the food supply.</p>

	Submitter	Submission Comments
		<p>Regular surveys of food consumption trends, to ensure foods fortified with folic acid are consumed sufficiently by the target population, and to ascertain more appropriate food vehicles if necessary.</p> <p>Mandatory fortification would be easier to monitor than voluntary fortification.</p> <p>Health promotion and education strategies</p> <p>Notes that New Zealand has never had a major comprehensive public awareness campaign with regard to NTDs and folic acid.</p>
61	<p>Spina Bifida Clinic, Royal Children's Hospital</p> <p>Dr Catharine Marrafa/Dr Kevin Dunne</p>	<p>Supports Option 3</p> <p>Regulatory options</p> <p>Strongly support mandatory folate fortification for the following reasons:</p> <ul style="list-style-type: none"> • to reduce the number of conceptions affected by NTDs and therefore the number of parents having to make the decision of whether to terminate an affected pregnancy; • to help those that are unaware of a family history of NTDs and therefore that they have increased risk; • caring for these children places a huge burden on families, which is distinct from the cost to government and the community; • 40% of pregnancies in Australia are unplanned, so this limits the effectiveness of voluntary periconceptual supplementation with folate or the voluntary fortification of foods; and • no convincing data to suggest there are adverse side effects for the wider population. <p>Incidence/prevalence of NTDs</p> <p>In Victoria there are 50-60 conceptions with NTDs each year, though most women terminate an affected pregnancy, with about 5 babies with NTDs born each year.</p>
62	<p>The Children's Hospital at Westmead</p> <p>Prof. Kim Oates</p>	<p>Supports Option 3</p> <p>Regulatory options</p> <p><i>Mandatory fortification</i></p> <p>Supports mandatory fortification.</p> <p>States that mandatory fortification is an established and effective public health practice to prevent vitamin and mineral deficiency in many countries.</p> <p>Co-convened an international forum in January 2003 to consider the evidence and public health implications of low folate intakes and fortification of flour. Consensus was that the scientific evidence supports mandatory flour fortification and that as a public health measure it is well overdue.</p> <p>Member of an international collaboration - the Flour Power Initiative, which promotes folate and iodine fortification globally. Have experience working with the private sector, e.g. wheat producers, millers and bakers, to address and overcome their concerns.</p>

	Submitter	Submission Comments
		<p>Incidence/prevalence of NTDs</p> <p>Prevalence of NTDs and spina bifida in Australia in 2001 was 0.5 per 1,000 and 0.3 per 1,000 births respectively (AIHW National Perinatal Statistics Unit, 2004).</p> <p>Estimated that in Australia there are over 5,000 people with spina bifida.</p> <p>In New South Wales between 1991 and 1997, 6 per 10,000 births were affected by a NTD and 2 terminations per 10,000 births were due to a NTD (Lancaster et al, 2001).</p> <p>Folate status</p> <p>Considers periconceptual women in the general population are at risk of folate intakes below recommended levels, as data from New South Wales and Western Sydney shows many have inadequate consumption of two key dietary sources of folate, namely fruit and bread.</p> <p>Impact</p> <p><i>Increasing folate intakes</i></p> <p>Adequate folate intake in periconceptual women would prevent up to 70% of NTDs (FSAI Nutrition Sub-committee, 2003).</p> <p>Increasing the total folate intake of the general population could have additional benefits, such as eliminating folate deficiency anaemia, reducing homocysteine levels, reducing cardio-vascular disease, and possibly some cancers.</p> <p>Potential risks of increased folate intake include masking of vitamin B₁₂ deficiency and increased incidence of twinning, though this has not been reported since the implementation of mandatory folic acid fortification in the USA.</p> <p><i>Mandatory Fortification</i></p> <p>Believes mandatory folate fortification of the food supply is the most effective method of increasing total folate intake. Considers the preventative opportunity has not been optimised through education programs.</p> <p>Important to ensure that the level of folate fortification is sufficient to maximise the public health benefits, and current evidence suggests that this level is 240 µg/100 g flour.</p> <p>Considers mandatory fortification to be a simple, effective and affordable public health measure.</p> <p>Food vehicles</p> <p>Supports mandatory fortification of flour with folate.</p> <p>Notes that 50 countries have agreed or are in the processes of agreeing to mandatory fortification of the food supply, with many selecting flour as the food vehicle.</p> <p>References</p> <p>Future Directions for Folic Acid Fortification in Australia and New Zealand, Meeting held 31 January 2003, Westmead, NSW, Australia.</p>

	Submitter	Submission Comments
		<p>FSAI Nutrition Sub-committee, 2003. Report on the mandatory fortification of flour with folic acid for the prevention of neural tube defects. Dublin, Food Safety Authority Ireland.</p> <p>AIHW National Perinatal Statistics Unit. 2004. Australia's babies: Their health and wellbeing. Bulletin No. 21. AIHW Cat. No. AUS 54. Canberra: AIHW NPSU.</p> <p>Lancaster, P., Hurst, T. 2001. Trend in neural tube defects in Australia. Australian Food and Nutrition Monitoring Unit, national Food and Nutrition Monitoring and Surveillance Project.</p> <p>Additional references provided.</p>
63	<p>Western Sydney Area Health Service (WSAHS)</p> <p>A/Prof Steven Boyages</p>	<p>Supports Option 3</p> <p>Comments as per The Children's Hospital at Westmead submission.</p>
Government		
64	<p>Department of Agriculture, Fisheries and Forestry</p> <p>Mr Richard Souness</p>	<p>Supports Option 2 in conjunction with Option 4</p> <p>General comments</p> <p>Notes that consideration of the issues appears to be lacking in some varied and important areas, for example, in relation to folate intakes, folate status and the dietary patterns of the target group, net public health benefit or cost associated with mandatory fortification, and the consequences of long-term high-level intakes of folate.</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Notes that the potential opportunity to further reduce the impact of NTDs would not be realised if the status quo was maintained.</p> <p><i>Increased permission for voluntary fortification and health promotion & education</i></p> <p>Extending permissions for voluntary fortification should increase consumer access to a greater range of folate rich foods, and stimulate industry to develop new products and provide opportunities for market differentiation.</p> <p>Increased health promotion should serve to heighten consumer awareness, leading to a more informed target group with a greater capacity to choose between folate-enriched products.</p> <p>A more informed target group may in turn stimulate further industry development and diversification of new folate products, potentially resulting in further improvements to folate status and NTD incidence.</p> <p>Considers the combination of Options 2 and 4 has the potential to reinforce the beneficial outcomes achievable rather than pursuing either option in isolation, and lessens the likelihood of adverse impacts associated with Option 3 on non-target populations, e.g. vitamin B₁₂ masking.</p>

	Submitter	Submission Comments
		<p>Requires well designed strategies which specifically take into account the characteristics of the target group and the fact that the group is dynamic, thus requiring continuous strategies.</p> <p>Policy</p> <p>Not clear from the Initial Assessment Report that all of the specific order policy principles relating to mandatory fortification have been met. Specifically regarding whether mandatory fortification is the most effective public health strategy, detrimental excesses/imbbalances, and effective amounts to meet the health objective.</p>
65	<p>Department of Health and Human Services, Tasmania</p> <p>Ms Judy Seal</p>	<p>Supports Option 3 in conjunction with Option 4</p> <p>Regulatory options</p> <p><i>Maintain status quo</i></p> <p>Supports some form of action as the scientific evidence of benefits appears to outweigh any known risks associated with higher folate intakes, and therefore would not support maintaining the status quo.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Concerned about extending voluntary fortification permissions for the following reasons:</p> <ul style="list-style-type: none"> • uptake of voluntary permissions has been low in Australia, despite being allowed since 1995; • the effectiveness of voluntary fortification relies to some extent on women’s informed choice of fortified foods, and therefore would be unlikely to address unplanned pregnancies and lack of knowledge among the target group; • unless priced competitively, voluntary fortification would continue to present a barrier for some consumers; • may increase the risk of higher than recommended intakes, especially among the young children of periconceptual women as the same foods may be consumed in the home; and • enhanced and ongoing education both of industry and consumers would be required to increase the effectiveness of voluntary fortification, and would come at the expense of other public health initiatives. <p><i>Mandatory fortification</i></p> <p>Preferred option is mandatory fortification, with a conservative approach to the amount of folate added and focussing on one staple (or a limited number of staples).</p> <p>Mandatory fortification has the advantage of a greater and more equitable reach compared to voluntary fortification, and reduced potential for unintended high intakes.</p> <p><i>Health promotion and education strategies</i></p> <p>Would not support increased health promotion and education strategies as a sole strategy at state level.</p> <p>Comment that they have limited capacity to undertake any form of mass media health campaigns, and there would be competing nutrition priorities for this type of activity.</p>

	Submitter	Submission Comments
		<p>Supports Option 4 in conjunction with mandatory fortification, with ongoing education and promotion of folic acid supplements to women planning and in the early stages of pregnancy.</p> <p>Considers information could be relatively easily distributed to primary health care workers and promulgated with other general health advice about pregnancy.</p> <p>Food vehicle</p> <p>Recommend focussing on one staple or a limited number of staples.</p> <p>Monitoring</p> <p>Strongly recommends that a comprehensive monitoring program be developed in parallel to the fortification program by the Australian Government and carried out by an appropriate authority.</p> <p>The monitoring program should include monitoring of folate intake and status, rates of NTDs and designed to identify any negative side-effects of fortification.</p> <p>A monitoring program should include investigation of the effects of un-metabolised folic acid in plasma in specific population groups such as young children.</p>
66	<p>South Australian Department of Health</p> <p>Ms Joanne Cammans</p>	<p>Provisional support for Option 3</p> <p>Regulatory options</p> <p>Provides provisional support for mandatory fortification for the following reasons:</p> <ul style="list-style-type: none"> • good evidence that increasing folic acid intakes of periconceptional women can substantially lower the risk of NTDs; • some evidence of folate deficiency in the general population and good evidence that this can be corrected by fortification; and • no available data to suggest toxicity or other adverse effects of increasing folic acid intakes. <p>The future position of South Australia Health is dependent on the outcome of the Draft Assessment Report.</p> <p>Data gaps</p> <p>Considers more information is needed on the following:</p> <ul style="list-style-type: none"> • baseline data on levels of folate in women of child bearing age in Australia; • potential for masking B₁₂ deficiency; • possible long term health effects of increased folate intakes in the population, in the absence of data at the present time; • resource allocation for enforcement and monitoring outcomes of mandatory fortification; • potential interaction of folate with other drugs; • minimum level of folic acid fortification to produce the intended outcomes; • bioavailability data - foods intended to be fortified should be those eaten by the target population; and • safety and risk assessment data.

	Submitter	Submission Comments
67	<p>Department of Human Services Victoria</p> <p>Mr Victor Di Paola</p>	<p>Preferred option not indicated</p> <p>Regulatory options</p> <p>Considers there are only 2 options put forward in the Initial Assessment Report – Option 1 and Option 3. Consider Options 1 & 2 are the same as permissions can be extended on application, and that Option 4 cannot be considered as FSANZ has no power to regulate to mandate health promotion.</p> <p>However, recognises health promotion is an important component of any approach to increasing folate consumption within the community.</p> <p>States that the Specific Order Policy Principles for mandatory fortification must be met for the Proposal to be supported.</p> <p>Impact</p> <p><i>Voluntary fortification</i></p> <p>Recommends a review of the current voluntary folate permissions if mandatory fortification is adopted, to prevent excess intakes of folate by some population groups.</p> <p>Concerned that if further voluntary fortification takes place in the absence of sufficient monitoring, there is the potential for high folate intakes in young children.</p> <p>Monitoring</p> <p>If mandatory fortification is adopted, recommends population monitoring to assess current folate status including baseline data, and monitoring to assess the ongoing risk or benefit of folate fortification, particularly for groups at risk.</p> <p>Policy Guideline</p> <p>Compares the Initial Assessment Report with each of the Specific Order Policy Principles for mandatory fortification. Considers that only Principle 3 and possibly Principle 1 are met.</p> <p><i>Principle 2</i> – Questions if the bioavailability of folate is not fully understood, how can fortification of food be demonstrated as the most effective public health strategy? Also, the number of NTD births prevented with mandatory fortification need to be quantified, and therefore information on folate intakes and folate status need to be determined.</p> <p><i>Principle 4</i> – Consider it is not clear if studies have been undertaken that would clearly show that fortification would not result in detrimental excesses or imbalances. Concern regarding the effect of increased folate consumption across the population, e.g. masking of vitamin B₁₂ deficiency, and thus recommend extensive modelling.</p> <p><i>Principle 5</i> – Raises three questions: Will effective amounts of folic acid be delivered? Will there be specific effect? What work has been undertaken to model differential uptake of folate by different population groups?</p>

	Submitter	Submission Comments
68	Environmental Health Unit, Queensland Health Mr Gary Bielby	<p>Supports Option 3 with conditions</p> <p>Regulatory options</p> <p>Supports mandatory fortification under the following conditions:</p> <ul style="list-style-type: none"> • a satisfactory monitoring and surveillance system is established prior to implementation; • existing voluntary fortification permissions must be reviewed and not run in conjunction with mandatory permissions; • a cautionary low level of folate is used initially until sufficient evidence is available to support a higher safe level (or reduction if necessary); • a limit to one or two food vehicles only (e.g. white bread and/or white flour versus all cereal products); and • a suitable food vehicle is chosen to ensure consumption by the target group. <p>Supports mandatory fortification for the following reasons:</p> <ul style="list-style-type: none"> • voluntary fortification in association with an approved health claim has not had the impact on NTD rates that health professionals are seeking; • voluntary fortification relies on the marketability of folic acid fortified products and how well the target group is informed of the link between folate and NTDs; • a large number of voluntarily fortified foods have a greater potential for excess consumption among non-target groups than mandatory fortification of one or two staple foodstuffs; and • health promotion campaigns on this issue would have to compete with other existing public health nutrition priorities, and therefore may not receive adequate funding to ensure the required success. <p>Data gaps</p> <p>The issue of relevant baseline data and ongoing monitoring and surveillance is vital to this Proposal. Without up-to-date data on dietary intake, health status and food composition, it is impossible to judge the success or failure of any fortification programme.</p> <p>Difficult to establish the optimal folic acid intake and red blood cell folate levels for reducing the occurrence of NTDs, due to insufficient data in Australia and New Zealand.</p> <p>There has been poor surveillance of previous and current strategies to increase folate intake and reduce incidence of NTDs, and thus it is difficult to assess their effectiveness.</p> <p>Impact</p> <p><i>Consumers</i></p> <p>Concern expressed regarding the possible increased cost to consumers of foods fortified with folic acid with either mandatory or voluntary fortification, especially for lower socio-economic groups who form a major part of the target consumers.</p> <p>It would be advisable to investigate further the interaction between medications and folate.</p>

	Submitter	Submission Comments
		<p>Concerned that long term consequences of high folate intake are unknown, and this warrants further investigation.</p> <p>No indication is given as to the tolerable upper intake level for children and whether mandatory and/or voluntary fortification permissions would put children at risk of excess consumption.</p> <p>Further consideration should be given to the potential for excess consumption among consumers who regularly consume supplements containing folic acid.</p> <p><i>Maintain status quo</i></p> <p>The limited data suggests that the current voluntary fortification and associated health claim have not made a significant public health impact on folate status.</p> <p>This highlights the need for a national coordinated surveillance system to monitor consequences of both current and future strategies to safely increase folate intake.</p> <p><i>Increased permissions for voluntary fortification</i></p> <p>This will potentially expand the range of fortified foods.</p> <p>Its reach depends solely on industry uptake and marketing. Therefore, its ability to reach the target group depends on the food vehicle chosen, consumer knowledge of the issue, and knowledge transference to influence food choices.</p> <p>Potential cost to Government agencies to provide sufficient education to assist in the appropriate use of voluntarily fortified products.</p> <p>The potential shift in food consumption from fresh foods towards more processed should be considered, with the risk of adding to the chronic disease burden by reducing beneficial nutrients found in fruits, vegetables and whole grains.</p> <p><i>Mandatory fortification</i></p> <p>Will require extensive monitoring.</p> <p>Need to consider what would happen to existing voluntary folic acid fortification permissions should a mandatory programme be implemented.</p> <p>Who will be responsible for ensuring health professionals are adequately informed regarding the potential masking of vitamin B₁₂ deficiency, if mandatory fortification is approved?</p> <p><i>Increased health promotion and educational strategies</i></p> <p>Data to date suggests that health promotion and education strategies alone have not had the desired success and may not be a financially viable option based on the returns required.</p> <p>Monitoring</p> <p>An adequate surveillance system must be in place before mandatory fortification can be introduced, in order to determine baseline levels of both folate and B₁₂ status.</p>

	Submitter	Submission Comments
		<p>Essential that the uptake of fortified foods by potential population subgroups is monitored to prevent detrimental side effects such as excessive consumption or the masking of nutrient deficiencies.</p> <p>Fortification levels need to be adequately modelled and monitored to prevent over usage by the food industry.</p> <p>Health promotion and education strategies</p> <p>Considers that health promotion and education campaigns may need to be included as part of a multi-faceted public health campaign on the issue.</p>
69	<p>New Zealand Food Safety Authority (NZFSA) and the New Zealand Ministry of Health</p> <p>Ms Carole Inkster</p>	<p>Supports Option 3 in conjunction with Option 4</p> <p>Regulatory options</p> <p>Considers Option 3 the only option that would ensure, with any certainty, that the majority of the target population is reached. It would capture unplanned pregnancies, where increasing folate intake prior to conception is not possible. In addition it would raise the folate status of the general population who may benefit from other improved health outcomes.</p> <p>Considers that public health education programmes are necessary and should be used in conjunction with any option for folate fortification.</p> <p>Incidence/prevalence of NTDs</p> <p>Prevalence (live births, stillbirths and abortions) in New Zealand in 1999 – 9.1 per 10,000 (Ministry of Health, 2003).</p> <p>Folate status</p> <p>States that key academics from New Zealand consider a red blood cell folate level of 900 nmol/L to be the most protective level associated with minimising the rate of NTDs.</p> <p>Vitamin B₁₂ deficiency</p> <p>Believes that masking of vitamin B₁₂ deficiency should not be used as the justification against mandatory fortification with folic acid. Instead, vitamin B₁₂ deficiency should be managed as one part of the public health communication strategies undertaken by NZFSA and the Ministry.</p> <p>Notes that rates of vitamin B₁₂ deficiency, without anaemia, have not increased in the USA since mandatory fortification was introduced in 1998.</p> <p>Folate supplement use</p> <p>Industry data shows sales of folic acid are steady and do not appear to be increasing greatly. However, the number of tablets subsidised by PHARMAC is increasing, which may mean more people on low incomes are accessing folic acid tablets this way.</p> <p>Foods currently fortified with folate</p> <p>Nearly 100 folate fortified foods were listed on the Manufactured Food Database as at December 2003.</p> <p>Three major food categories – bread products, breakfast cereals, drinks and juices, with a few specialised products.</p>

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		<p>NZFSA is currently undertaking research on the current overages of folic acid in foods – final results available by June 2005.</p> <p>Given the trend towards ‘low-carb’ diets it is debatable whether or not these products containing added folate are being marketed to or consumed by the target group.</p> <p>Impact</p> <p><i>Maintaining the status quo</i></p> <p>Believes maintaining the status quo would not increase consumer awareness of the issue, and would make no difference to the rate of NTDs in unplanned pregnancies (approximately 50% in New Zealand).</p> <p>This option would not allow industry to widen the range of foods that folate can be added to, and rates of NTDs are not expected to decrease any further unless industry takes up voluntary fortification more widely.</p> <p><i>Increased permission for voluntary fortification</i></p> <p>Considers that voluntary fortification cannot be guaranteed to increase the folate levels in the target population to the same extent as mandatory fortification.</p> <p>The reduction in NTD rates if voluntary fortification permissions were extended would depend entirely on uptake by industry. In New Zealand voluntary uptake has been very limited.</p> <p>The greater the range of fortified food products available, the greater the chance that an effective folic acid level will be reached in the target population.</p> <p><i>Mandatory fortification</i></p> <p>The rate of NTDs in the United States dropped 27% after the introduction of mandatory fortification, so a greater reduction than this in New Zealand would not be expected.</p> <p>Considers the financial costs of mandatory fortification to be small, however cost in the context that it is for fortifying for all where a small number of people will benefit needs to be considered.</p> <p>Monitoring of the food supply already occurs, and could be increased to monitor compliance with mandatory fortification requirements for little additional cost.</p> <p>Considers any perceived costs associated with masking of vitamin B₁₂ are theoretical, as the susceptible population should be screened for deficiency regardless of the fortification issue.</p> <p>Perceives that mandatory fortification may remove the marketing and competitive edge for a manufacturer. It may limit some marketing opportunities but on the other hand it provides a level playing field and ensures political commitment to the issue.</p> <p>The actual cost of folic acid is minor, with the major costs related to changes to the manufacturing process.</p> <p>Expects there to be little impact on foods currently fortified with folic acid, due to very few manufacturers having taken up the current permissions.</p>

	Submitter	Submission Comments
		<p><i>Increased health promotion and education strategies</i></p> <p>Considers health education strategies as essential to raising the awareness about increasing folate intake and reducing the rate of NTDs, and need to be ongoing for long-term benefit.</p> <p>Not aware of any evidence suggesting that targeted education alone can reduce the incidence of NTDs more effectively than fortification.</p> <p>Targeted education needs to be part of an on-going public health education programme.</p> <p>The public health approach would use the Ottawa Charter principles including:</p> <ul style="list-style-type: none"> • healthy public policy through fortification provision; • supportive environments through easy and free access to folic acid supplements; and • health education programmes. <p>The NZFSA and the Ministry would work together to ensure adequate public education on the benefits of increasing folate intake and the role of fortified foods in achieving this.</p> <p>It should be recognised as an area of responsibility for public health workers, and will require additional resources in terms of personnel and materials.</p> <p>Food vehicles</p> <p>Other food products that might be suitable to fortify include milk and milk based products, e.g. yoghurt.</p> <p>Must be a staple food of the target population and the folic acid must be bioavailable.</p> <p>Identify bread as preferable to flour as it would be easier to monitor, enforce mandatory fortification, and would retain consumer choice. Also, fortification of flour would allow little consumer choice, as all flour and flour containing products would be fortified.</p> <p>Offer milk and milk products as potential food vehicles as one of a number of fortified food vehicles.</p> <p>Consumer choice</p> <p>Need to consider maintaining consumer choice, so those who choose not to consume folate fortified foods can still do so without being economically disadvantaged or having their choice of foods reduced.</p> <p>Monitoring</p> <p>Imperative that the Ministry continues to monitor the occurrence of NTDs through the NZ Birth Defects Monitoring Programme and to assess any impact that mandatory fortification has on these rates.</p> <p>NZFSA would continue to monitor the food supply, with an expanded focus to ensure compliance with the mandatory status.</p> <p>Health promotion and education strategies</p> <p>Considers educating the public about the benefits of increasing folate intakes to be pivotal to the ongoing success of any folate fortification scheme.</p>

	Submitter	Submission Comments
		<p>Vital that women of child bearing age, especially those planning a pregnancy, are aware of the benefits of increasing folic acid intake or taking folic acid supplementation during the periconceptual phase of pregnancy.</p> <p>References</p> <p>Ministry of Health, Improving Folate Intake in New Zealand, 2003.</p>
70	<p>Nutrition & Physical Activity Branch, Department of Health Western Australia</p> <p>Ms Christina Pollard</p>	<p>Supports Option 4</p> <p>Regulatory options</p> <p>Preferred regulatory option is increased health promotion and education strategies to increase folate intakes.</p> <p>Cannot support mandatory fortification based on the content of the Initial Assessment Report. Considers dietary modelling is essential to provide detailed information on the impacts of mandatory fortification with folate on all population groups.</p> <p>Folate status</p> <p>States available evidence shows that mean dietary folate intake for the population is adequate.</p> <p>The population group at risk, due to increased dietary requirements, are per-conceptual women, in particular adolescent girls.</p> <p>Consider encouraging the increased intake of fruit and vegetables to meet national recommendations is an important strategy to improve the folate status of the target population.</p> <p>Impact</p> <p><i>Mandatory fortification</i></p> <p>Important public health nutrition considerations to mandating folic acid fortification of the food supply include:</p> <ul style="list-style-type: none"> • Concerns about possible negative impacts, including the risk to populations groups with high intakes of folate (e.g. adolescent boys) and the risk to population groups with potential vitamin B₁₂ deficiency (e.g. older adults and vegans); • Essential to use dietary modelling to determine a suitable food vehicle, level of fortification, number of preventable NTDs, and percentage of older adults that would be exposed to a folic acid intake of greater than the tolerable upper intake level; and • Monitoring and evaluation would be essential. <p><i>Health promotion and education strategies</i></p> <p>Public awareness campaigns to increase the proportion of women taking folic acid supplements can have a positive effect.</p> <p>To ensure maximum impact, campaigns need to be sustained on an ongoing basis.</p> <p>Monitoring</p> <p>If folate fortification is mandated, monitoring and evaluation is essential.</p> <p>An on-going commitment to monitor and evaluate the following would be required:</p>

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • folate status of peri-conceptual women; • prevalence of NTD-affected pregnancies and births; • number of peri-conceptual women taking dietary supplements containing folate; • prevalence of vitamin B₁₂ deficiency; • dietary intake of folate and vitamin B₁₂ for all population groups; • number and types of foods fortified with folate; and • levels of fortification analyses for overages. <p>Attachments</p> <p>Provided additional information on unpublished data from the 2003 Child and Adolescent Physical Activity and Nutrition Survey:</p> <ul style="list-style-type: none"> • Daily folate intake for age group, gender and persons. • Percentage folate contribution to total intake of selected food groups. • Estimated 24-hour intake of cereal and cereal products for children 10- 15 years – 1985, 1995 and 2003. • Age and gender differences in food sources of folate. <p>References</p> <p>Many references provided.</p>
71	<p>Population Health, Department of Health Western Australia</p> <p>Mr Michael Jackson</p>	<p>Supports Option 3</p> <p>Many references to scientific papers provided throughout the submission.</p> <p>Regulatory options</p> <p><i>Voluntary fortification</i></p> <p>Believes that the existing voluntary fortification program has been suboptimal in reducing the number of NTDs in the population.</p> <p>The current framework does not require food manufacturers to notify when they fortify a food with folic acid, and hence it is difficult to qualify and quantify the practice and extent of fortification.</p> <p>Considers that industry has largely not taken advantage of the voluntary fortification permissions. This suggests that fortifying with folic acid does not hold a significant commercial benefit or advantage to the majority of industry.</p> <p>Notes that very few products use the folate health claim. This suggests that the health claim has not provided a marketing advantage.</p> <p>Does not support industry's request for wider health claims and extension of voluntary fortification permissions, reporting this has not been successful anywhere else in the world.</p> <p>Believes that voluntary fortification has the potential to turn a preventable public health issue into a marketing opportunity.</p> <p><i>Mandatory fortification</i></p> <p>Reasons for supporting mandatory fortification:</p> <ul style="list-style-type: none"> • world experience indicates that it is the most effective method of optimising folate status in women of reproductive age; • maximises benefits by also providing protection in cases of unplanned pregnancy and among disadvantaged groups;

	Submitter	Submission Comments
		<ul style="list-style-type: none"> • several countries have observed a significant decrease in the incidence of NTDs with mandatory fortification, for example 27% in the US; • it is a safe, cost-effective public health strategy; • consider there to be a demonstrated population health need for mandatory fortification of the food supply with folic acid; • significant benefit to the community with reduced death and disability, direct economic savings and intangible benefits to family and carers; • general improvement in dietary folate intake and hence folate status for the general population. In the US this has been associated with other health benefits, for example reduced homocysteine levels; • no adverse effects from mandatory fortification have been reported; • mandatory fortification in the US provides an economic return of \$40 for each dollar spent on fortification; and • mandatory fortification would restore equity and benefit to all Australians. <p>Comments on the safety of mandatory fortification (references provided):</p> <ul style="list-style-type: none"> • No reports of masking of vitamin B₁₂ deficiency in the US or Chile since mandatory fortification was introduced. • No adverse effects reported where excess folate has been consumed. • Does not alter the efficacy of anticonvulsant medications. • Preliminary studies indicate that periconceptual doses of folic acid do not increase mortality from cancer and heart disease. <p>Incidence/prevalence of NTDs</p> <p>Believes the reason for the decline in incidence of NTDs since the 1980s is a combination of the discovery of the preventative role of folate during pregnancy in the 1990s, and the implementation of prenatal screening programs and terminations of affected pregnancies.</p> <p>State that the observations from Ireland do not reflect a true world-wide trend of “natural” or “background” decline, as suggested by FSANZ, but are a regional anomaly contrary to the experience of Australia, continental Europe and the United States.</p> <p>Believes the only significant decrease in the total incidence of NTDs in Australia has been due to the implementation of folate education campaigns in 1992 and the fortification of some foods from 1995 onwards.</p> <p>Approximately 20 per 10,000 live births in both Western Australia and South Australia, prior to the knowledge of the role of folate in pregnancy. This rate fell by approximately 30% in these states with the introduction of national and state-based education campaigns, plus folic acid fortification of some foods.</p> <p>Since the introduction of voluntary fortification, Australia as a whole has only observed an estimated 7% reduction in the incidence of NTDs. Thus, most of the decrease in the rate of NTDs experienced in Western Australia and South Australia can be attribute to the state-based folate education campaigns.</p> <p>Neither the existing education programmes nor voluntary fortification are having an effect on the Indigenous population of Western Australia, who have had a constant rate of NTDs from 1980 to 2000 (25.6 per 10,000 live births).</p>

	Submitter	Submission Comments
		<p>This is now almost twice that of the non-Indigenous population.</p> <p>Estimates that mandatory fortification of the food supply should theoretically allow an additional 30% decrease in the incidence of NTDs on Australia.</p> <p>Monitoring</p> <p>Complete ascertainment of all affected pregnancies, including terminations, is necessary to provide reliable baseline data on the total incidence of NTDs. Western Australia, South Australia and Victoria already have established birth defects registries or reporting systems.</p> <p>Folate intake of the target and non-target group, folate content of fortified foods and masking of vitamin B₁₂ deficiency are important factors to monitor with mandatory fortification.</p> <p>Health promotion and education strategies</p> <p>All health departments need to undertake a commitment to folate education campaigns.</p> <p>Mandatory fortification represents a supplement to the existing education campaigns, not a replacement.</p> <p>Current education resources provided by the Department of Health, Western Australia advise women of reproductive age to consume 500 µg of folic acid per day, or women with a family history of NTDs, on anti-epileptic medication or with diabetes mellitus to take 5,000 µg daily.</p> <p>These resources are distributed via general practitioners, obstetricians, child health nurses, midwives and pharmacists. Women of reproductive age are also directly targeted via the media, seminars, newsletters and displays at public expositions. Resources specific for Indigenous people are also used.</p> <p>A survey of 20 countries indicates that compliance rates beyond 50% are unlikely to be achieved, primarily due to many pregnancies being unplanned.</p>
72	<p>Therapeutic Goods Administration (TGA)</p> <p>Dr Fiona Cumming</p>	<p>Preferred option not indicated</p> <p>General comments</p> <p>Fortification of foods with folic acid can only be effective if there is a high level of certainty that the folic acid delivered in the dose form is bioavailable to consumers from the food vehicle.</p> <p>Notes that therapeutic goods legislation in Australia requires that in order to help ensure bioavailability, medicines containing folic acid meet strict standards relating to manufacturing, disintegration dissolution and stability.</p> <p>Comments that consideration will need to be given during development of any food standard as to how similar standards can be developed and applied to folic acid–fortified food products.</p>

**Australia and New Zealand Food Regulation Ministerial Council
Policy Guideline**

Fortification³⁸ of Food with Vitamins and Minerals

This Policy Guideline provides guidance on development of permissions for the addition of vitamins and minerals to food.

The Policy Guideline does not apply to special purpose foods the formulation and presentation of which are governed by specific standards in Part 2.9 of the Australia New Zealand Food Standards Code (the Food Standards Code).

The policy should only apply to new applications and proposals. There is no intention to review the current permissions.

The policy does not apply to products that should be or are regulated as therapeutic goods. This should not lead to a situation where generally recognised foods, through fortification, become like or are taken to be therapeutic goods.

The policy assumes the continuation of a requirement for an explicit permission for the addition of a particular vitamin or mineral to particular categories of foods to be included within the Food Standards Code. Currently the majority of permissions are contained in Standard 1.3.2 – Vitamins and Minerals.

Regard should be had to the policy in development of regulatory measures applying to the mixing of foods where one, or both of the foods may be fortified.

The policy for regulation of health and nutrition claims on fortified food is covered by the Policy Guideline on Nutrition, Health and Related Claims. Claims should be permitted on fortified foods, providing that all conditions for the claim are met in accordance with the relevant Standard.

‘High Order’ Policy Principles

The Food Standards Australia New Zealand Act 1991 (the Act) establishes a number of objectives for FSANZ in developing or reviewing of food standards.

1. The objectives (in descending priority order) of the Authority in developing or reviewing food regulatory measures and variations of food regulatory measures are:

- (a) the protection of public health and safety;

³⁸ Within the context of this policy, fortification is to be taken to mean all additions of vitamins and minerals to food including for reasons of equivalence or restoration.

- (b) the provision of adequate information relating to food to enable consumers to make informed choices; and
- (c) the prevention of misleading or deceptive conduct.

2. In developing or reviewing food regulatory measures and variations of food regulatory measures the Authority must also have regard to the following:

- (a) *the need for standards to be based on risk analysis using the best available scientific evidence;*
- (b) *the promotion of consistency between domestic and international food standards;*
- (c) *the desirability of an efficient and internationally competitive food industry;*
- (d) *the promotion of fair trading in food; and*
- (e) *any written policy guidelines formulated by the Council for the purposes of this paragraph and notified to the Authority.*

These objectives apply to the development of standards regulating the addition of vitamins and minerals to food.

A number of other policies are also relevant to the development of food standards including the Council Of Australian Governments document ‘Principles and Guidelines for national Standard Setting and Regulatory Action by Australia and New Zealand Food Regulatory Ministerial Council and Standard Setting Bodies (1995, amended 1997)(Australia only), New Zealand Code of Good Regulatory Practice (November 1997), the Agreement between the Government of Australia and the Government of New Zealand concerning a Joint Food Standards System and relevant World Trade Organisation agreements.

Specific Order Policy Principles - Mandatory Fortification

The mandatory addition of vitamins and minerals to food should:

- Be required only in response to demonstrated significant population health need taking into account both the severity and the prevalence of the health problem to be addressed.
- Be required only if it is assessed as the most effective public health strategy to address the health problem.
- Be consistent as far as is possible with the national nutrition policies and guidelines of Australia and New Zealand.
- Ensure that the added vitamins and minerals are present in the food at levels that will not result in detrimental excesses or imbalances of vitamins and minerals in the context of total intake across the general population.
- Ensure that the mandatory fortification delivers effective amounts of added vitamins and minerals with the specific effect to the target population to meet the health objective.

Additional Policy Guidance - Mandatory Fortification

Assessment of alternative strategies – consideration must be comprehensive and include for example assessment of voluntary fortification and education programs.

Requirement to label – no mandatory requirement to label as fortified however, consideration should be given, on a case by case basis, to a requirement to include information in Nutrition Information Panel.

Monitor/Review – any agreement to require fortification should require that it be monitored and formally reviewed to assess the effectiveness of, and continuing need for, the mandating of fortification.

Specific order policy principles – Voluntary fortification

- The voluntary addition of vitamins and minerals to food should be permitted only:
 - Where there is a need for increasing the intake of a vitamin or mineral in one or more population groups demonstrated by actual clinical or sub-clinical evidence of deficiency or by data indicating low levels of intake.
 - or
 - Where data indicates that deficiencies in the intake of a vitamin or mineral in one or more population groups are likely to develop because of changes taking place in food habits.
 - or
 - Where there is generally accepted scientific evidence that an increase in the intake of a vitamin and/or mineral can deliver a health benefit.
 - or
 - To enable the nutritional profile of foods to be maintained at pre-processing levels as far as possible after processing (through modified restoration²).
 - or
 - To enable the nutritional profile of specific substitute foods to be aligned with the primary food (through nutritional equivalence).
- The permitted fortification has the potential to address the deficit or deliver the benefit to a population group that consumes the fortified food according to its reasonable intended use.

² The principle of Modified Restoration as derived from The FSANZ document *Regulatory principles for the addition of vitamins and minerals to foods*. (Canberra, 2002) is as follows:

Vitamins and minerals may be added, subject to no identified risks to public health and safety, at moderate levels (generally 10-25% Recommended Dietary Intake (RDI) per reference quantity) to some foods providing that the vitamin or mineral is present in the nutrient profile, prior to processing, for a marker food in the food group to which the basic food belongs. The vitamin or mineral must be naturally present at a level which would contribute at least 5% of the RDI in a reference quantity of the food. This regulatory principle is based on the restoration or higher fortification of the vitamin or mineral to at least pre-processed levels in order to improve the nutritional content of some commonly consumed basic foods.

- Permission to fortify should not promote consumption patterns inconsistent with the nutrition policies and guidelines of Australia and New Zealand.
- Permission to fortify should not promote increased consumption of foods high in salt, sugar or fat.
- Fortification will not be permitted in alcoholic beverages.
- Permissions to fortify should ensure that the added vitamins and minerals are present in the food at levels which will not have the potential to result in detrimental excesses or imbalances of vitamins and minerals in the context of total intake across the general population.
- The fortification of a food, and the amounts of fortificant in the food, should not mislead the consumer as to the nutritional quality of the fortified food.

Additional Policy Guidance - Voluntary Fortification

Labelling – There should be no specific labelling requirements for fortified food, with the same principles applying as to non-fortified foods. An added vitamin or mineral is required to be listed in the Nutrition Information Panel only if a claim is made about it and the vitamin or mineral is present at a level for which a claim would not be misleading. An added vitamin or mineral must be listed in the ingredient list under current labelling requirements.

Monitoring/Review - A permission to voluntarily fortify should require that it be monitored and formally reviewed in terms of adoption by industry and the impact on the general intake of the vitamin/mineral.

Impact of mandatory fortification in the United States of America

Background

In December 1996, the United States Food and Drug Administration (USFDA) reviewed its voluntary regulations for folic acid fortification and required that enriched cereal grains products be fortified on a mandatory basis at 140 µg folic acid per 100 g cereal grain product by January 1998 (USFDA 1996). In addition, ready to eat breakfast cereals were permitted to be voluntarily fortified with folic acid up to 400 µg per serve.

This decision was based on modelling and public consultation on the proposal to amend the standards of identity for enriched cereal grain products to require folic acid fortification. Modelling was undertaken for cereal grains, dairy products and fruit juices, at levels of 70, 140 and 350 µg per 100 g, using the 1987-8 national food consumption data and the safe upper limit of 1 mg per day as recommended by the United States Centers for Disease Control (USCDC). The amount of folic acid added to enriched cereal grains was chosen so that approximately 50% of all reproductive-age women would receive a total of 400 µg of folate from all sources (USCDC, 1992) and increase the typical folic acid intake by approximately 100 µg per day (Jacques *et al.*, 1999). The selected fortification level of 140 µg was considered to be a compromise between safety and prevention of NTDs (USCDC 1992; Daly *et al.*, 1997). This amount of fortification was estimated to reduce the incidence of NTDs by up to 41%, (Daly *et al.*, 1997; Wald *et al.*, 2001).

The cereal foods enriched with folic acid included enriched: wheat flour; bread, rolls and buns; corn grits and cornmeal; farina; rice and macaroni products. These food vehicles were chosen on the basis of being staple food products for most of the US population (including 90% of the target group), and a long history of being successful vehicles for fortification (USFDA 1996). Unenriched cereal-grain products are not fortified with folic acid to allow for consumer choice (USFDA, 1996), although these constitute a minority of the entire available product.

Implementation by industry

Mandatory fortification of folic acid in cereal grains commenced in 1996 and was basically complete by mid 1997 (Jacques *et al.*, 1999). As a result, it was estimated that the folic acid content of more than one third of available foods had increased (Lewis *et al.*, 1999).

It appears that the actual folate content of fortified foods was greater than had been assumed in predicting folate intakes under mandatory fortification. Initial studies comparing the analysed folate content of enriched cereal-grain products to the levels required by Federal regulations showed that mandatorily fortified foods contained up to 160-175% of their predicted folate content (Rader *et al.*, 2000; Choumenkovitch *et al.*, 2002). Similar results were found with fortified breakfast cereals (Whittaker *et al.*, 2001). The high levels of total folate were thought to be due to overages used by manufacturers to ensure food products contained at least the amount of nutrient specified on the label throughout shelf life, as well as higher than expected levels of naturally-occurring folate and/or problems with the analysis method used (Rader *et al.*, 2000; Whittaker *et al.*, 2001).

Public health impact of mandatory fortification

Impact on dietary intake

Following the introduction of mandatory fortification, folic acid intake is estimated to have increased by up to 200 µg/day across the community, including the target group of reproductive-age women (Choumenkovitch *et al.*, 2002; Quinlivan and Gregory 2003).

The Framingham Offspring cohort study showed that among non-supplement users in the cohort, the prevalence of older individuals who consumed less than the recommended daily intake of folate (defined as 320 µg DFE per day) decreased from 48.6% prior to the FDA-mandated folic acid fortification to 7.0% post-mandatory fortification. Consumption of greater than 1 mg folic acid occurred only in individuals who regularly consumed supplements containing folic acid (frequency of use was not defined). The proportion of individuals who exceeded this limit rose from 1.3% prior to fortification to 11.3% after mandatory fortification (Choumenkovitch *et al.*, 2002).

Impact on folate status

The US CDC compared folate status data from the National Health and Nutrition Examination Surveys (NHANES): one conducted prior to any fortification of the food supply, between 1988 and 1994 (NHANES III); the other after mandatory fortification in 1999.

The mean serum folate concentration in participating women aged 15-44 years increased by 157%, from 14.3 nmol/L during NHANES III to 36.7 nmol/L in NHANES 1999. For non-supplement users, the mean serum folate concentration increased by 167%, from 10.7 nmol/L to 28.6 nmol/L over this time (US CDC, 2000).

In the above group of subjects, mean red blood cell folate concentration, indicating long-term folate status, increased from 410.1 nmol/L to 713.8 nmol/L, an average increase of 74% (data not adjusted for supplement use). In addition, women with the lowest initial folate values showed the greatest improvement in folate status (US CDC 2000).

Looking at a wider sector of the US population, serum folate data from a US clinical laboratory were analysed from 1994 to 1998. The majority of men and women were aged between 12 and 70. Median serum folate values increased by 50% from 28.6 nmol/L in 1994 (prior to fortification) to 42.4 nmol/L in 1998 (post-mandatory fortification) (Lawrence *et al.*, 1999). These values were not corrected for vitamin supplement intake, however, surveys conducted by the March of Dimes indicate that folic acid supplement use remains relatively unchanged (US CDC, 2004).

Among non-supplement users of the Framingham Offspring cohort, the mean serum folate concentrations increased from 10.4 nmol/L (pre-mandatory fortification) to 22.7 nmol/L (post-mandatory fortification), an increase of 117% in the study population.

The mandatory folic acid fortification program has virtually eliminated the presence of low folate concentrations (defined as serum folate levels below seven nmol/L) from the cohort of older adults, with a decrease from 22% to 1.7% of the cohort exhibiting low folate status since mandatory fortification (Jacques *et al.*, 1999).

More recently published results using the NHANES data indicate similar findings. Comparison of data from surveys in 1988 and 1994 with NHANES 1999-2000 showed that among women aged 20-39 years, mean serum folate increased from 10.3 nmol/L to 26.0 nmol/L (Dietrich *et al.*, 2005) and the prevalence of low serum folate concentrations (<6.8 nmol/L) in the population aged three years or more decreased from 16% prior to fortification to 0.5% after fortification (Pfeiffer *et al.*, 2005).

Overall, the mandatory fortification of the food supply with folic acid has led to a significant positive increase of serum and red blood cell folate levels for all sectors of the US population, including the target group. Despite these improvements, the prevalence of low red blood cell folate continues to be high in non-Hispanic blacks (about 21%) (Ganji and Kafai 2006).

Impact on NTD rate

An average decrease of 27% in pre-natally ascertained NTD-affected pregnancies was found after the introduction of mandatory folate fortification, which the USCDC attributes to the introduction of mandatory folate fortification (USCDC, 2004). Overall, the total number of NTD-affected pregnancies declined from 4,000 prior to the folic acid mandate to 3,000 after mandatory fortification. In addition, various economic models have shown that mandatory fortification results in favourable benefit-to-cost ratios (Romano et al, 1995; Horton, 2003; Grosse, 2004; Grosse *et al.*, 2005).

Potential adverse effects

Studies addressed:

- Masking the diagnosis of vitamin B₁₂ deficiency - A study of 1,573 mainly African American women and men from a Veterans Affairs Centre found that the proportion of people who had poor vitamin B₁₂ status without anaemia did not change significantly from the pre-fortification period (39.2%) to after full implementation of mandatory fortification (37.6%). This study concluded that mandatory fortification did not increase the prevalence of masking the diagnosis of vitamin B₁₂ deficiency (Mills *et al.*, 2003). The introduction of mandatory fortification was found to increase the number of people who would be considered at-risk for masking of vitamin B₁₂ deficiency, however, this value still remains below 1% and no actual cases of masking were reported in the United States.
- Twinning - Out of more than 2.5 million births in California, there has been no reported increase in the incidence of twinning after the mandatory fortification of the US food supply relative to the pre-fortification period (Shaw *et al.*, 2003). Similar results were found when comparing data from over one million births in Texas. A general increase in the prevalence of twinning has been noted to have occurred over the past decade, which was attributed to factors such as increasing maternal age at parity, rather than the fortification program (Waller *et al.*, 2003).

- Cancer – Secular trends show that age-adjusted incidence of breast cancer in women aged 50 years and older and of colo-rectal cancer in men and women aged 50 years and over have declined since 1998 (National Cancer Institute, 2005). There are many possible explanations for this decline but importantly there has not been any evidence of an increase in these cancers since the introduction of mandatory fortification.

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Current approach to increasing folate intake among women of child-bearing age

Analysis of the current approach to increasing folate intake among women of child-bearing age is based on limited data. The available data are generally from regional studies, from incomplete national data collections, or from dated national surveys. Despite these limitations, it is possible to obtain an overall picture of estimated changes in folic acid intake, folate status and the impact on NTD incidence.

1. Overview of folate campaigns implemented in Australia and New Zealand

In Australia, between 1994 and 1999 three health promotion campaigns were implemented nationally (Table 1) in addition to State-based campaigns in Western Australia, South Australia, New South Wales, Victoria and Tasmania (Table 2). There has been no publicly funded awareness campaigns regarding folate and women of child-bearing age in New Zealand (NZMoH, 2003). The Australian campaigns have generally targeted women of child-bearing age and health professionals. In general, the main objectives of the campaigns have been to: increase awareness of the association between folate and NTDs; promote dietary sources of naturally-occurring folate and folic acid supplements; and increase folate intake. It should be noted that most of the campaigns promoted both increased consumption of folate rich foods and folic acid supplementation.

Table 1: Summary of national folate health promotion campaigns in Australia to 2001

Organisation	Name and description of program	Date	Target group	Aim/ objective/ main message
Pharmacy Guild of Australia in conjunction with Commonwealth Department of Health and Aged Care	Folate Initiative <i>Folate – make it part of your day</i> distribution of education material & 35,000 free starter packs of folic acid tablets	Launched February 1996	Women planning a pregnancy	To promote folic acid supplements and folate rich foods (naturally-occurring and fortified)
Kellogg/Northcott Society folate education program	Folate education promoted through television, print and on-pack messages	July through November 1998	Women in child-bearing years	To promote the importance of folate for women in child-bearing years; to promote foods with added folic acid
Australia New Zealand Food Authority (ANZFA)	Folate-NTD health claim pilot Health claim on food labels, ANZFA approved logo, promotional material	1998	Women considering becoming pregnant; food industry	To trial the use of health claim management system, To assess the impact of a folate-NTD health claim

Adapted from (Abraham and Webb, 2001).

Table 2: Summary of State and Territory folate health promotion campaigns in Australia

Jurisdiction	Name and description of program	Date	Target group	Aim/ objective/ main message
Health Department of WA (coordinated by Institute of Child Health Research)	Folate Program Phase 1: <i>Folate and neural tube defects prevention project</i> education materials provided to health professionals	July 1992- December 1994	Women of child-bearing age (20-40 yrs); health professionals	To increase awareness amongst health professionals of association between folate and NTDs; To increase women's folate intake through diet and supplements (0.5 mg) to help prevent NTDs
South Australia Department of Human Services	<i>"Folate before pregnancy"</i> information packs provided to health professionals	October 1994- August 1995	Health professionals; women of reproductive age	To promote dietary sources of folate and folic acid supplements during the peri-conceptual period
NSW Health	<i>How diet can prevent birth defects</i> pamphlet	1995	Women from multicultural backgrounds planning a pregnancy	To promote folic acid supplements (0.5 mg) and increase naturally-occurring folate during the peri-conceptual period
Health Department of WA	Folate Program Phase 2: <i>Folate awareness campaign</i>	Launched November 1996	Women of child-bearing age (18-44 yrs)	Similar to 1992-1994, with supplements promoted more extensively than diet
Victorian Department of Human Services in conjunction with Family Planning Victoria	<i>Victorian Folate Campaign:</i> consumer and professional education strategies to inform of benefits of folate in preventing NTDs; pre-pregnancy checklist	launched 1999	Women of child-bearing age (15-45 yrs); health professionals; women with previous NTD affected pregnancy; teenagers; Koori women and women from multicultural backgrounds	To promote consumption of food fortified with folic acid plus foods high in naturally-occurring folate plus supplements
Tasmanian Department of Health and Human Services	GP and health profession training	unknown	Family Child Youth Health nurses GPs	To raise awareness of folate-NTD link; to promote good food sources of folate.

Adapted from (Abraham and Webb, 2001; Chan *et al.*, 2001)

2. Dietary folic acid intakes

The NHMRC and NZMoH (2006) recommend that ‘women capable of becoming or, or planning pregnancy, should consume additional folic acid as a supplement or in the form of fortified foods at a level of 400 µg/day’ in addition to consuming food folate from a varied diet.

2.1 Voluntary fortification

Dietary modelling has been undertaken to assess the amount of folic acid consumed by the target population following the introduction of voluntary fortification, although an accurate determination is hampered by the lack of up-to-date information on the available fortified foods and food consumption patterns in the Australian and New Zealand populations.

Despite these limitations, the mean increase in folic acid intake from voluntarily fortified foods among women of child-bearing age is estimated to be 95 µg and 58 µg in Australia and New Zealand, respectively. However, the median intake is much lower in both countries – just 57 µg and 21 µg in Australia and New Zealand, respectively, indicating that some women in the target population are probably consuming larger amounts of fortified foods (thus pushing up the mean intake) whereas a greater proportion are probably consuming relatively low amounts (hence the much lower median intake) (Table 3). The lower values for New Zealand reflect the lower uptake of voluntary fortification in that country.

The 95th percentile of intakes indicates that very few women in the target population are consuming the recommended 400 µg/day of folic acid from fortified foods with younger women and women in New Zealand even less likely to do so. Interestingly, in Australia, younger women in the target age range (15-18 and 19-29 years) have a wider distribution of intake than older women (30-49 years); although this may simply reflect the smaller sample sizes in these age ranges.

Higher median intakes of folic acid from voluntary fortification were recently reported by (Bower *et al.*, 2005). Among women who had had a live born baby without birth defects in Western Australia between 1997 and 2000, 56.6% of these women obtained 100 µg or more from fortified foods³⁹. In New Zealand, however, it is estimated that over 60% of women of child-bearing age had not received any additional folic acid as a result of voluntary fortification (Newton *et al.*, 2001 cited in NZMoH, 2003).

³⁹ Folic acid intake from fortified foods was assessed using a quantified food frequency questionnaire.

Table 3: Distribution of folic acid intake from fortified foods among women of child-bearing age since voluntary fortification in Australia and New Zealand*

Age groups of women (years)	5 th percentile (µg/day)	Median (µg/day)	95 th percentile (µg/day)
<i>Australia</i>			
15-18	44	77	240
19-29	44	67	266
30-49	12	44	281
15-49	12	57	273
<i>New Zealand</i>			
15-18	21	21**	158
19-29	21	21**	159
30-49	21	21**	195
15-49	21	21**	177

* The data have been adjusted for within person variation.

** Median intakes for New Zealand are the same as the 5th percentile intakes because more than 50% of respondents did not consume foods containing folic acid based on a single day intake. However, after intakes are adjusted for a second day intake these respondents were assigned a small intake of 21 µg/day which reflects daily variation in consumption patterns.

Sources: FSANZ analysis of the Australian 1995 National Nutrition Survey and New Zealand 1997 National Nutrition Survey; Folic acid content of foods from analysis of labels and manufacturers' data.

2.2 Folic acid supplements

The promotion of folic acid supplements to women of child-bearing age in Australia and New Zealand has continued since the introduction of the voluntary folic acid fortification policy. The promotion of supplements offers a number of advantages over folic acid fortification; either voluntary or mandatory (NZMoH, 2003; Skeaff *et al.*, 2003). These include:

- capacity to deliver the recommended daily amount of folic acid to the target population (in one tablet);
- minimising exposure and potential adverse effects in other population subgroups; and
- preservation of consumer choice.

Supplementation is of most benefit to women planning a pregnancy but to be effective supplements of sufficient dosage need to be taken consistently during the peri-conceptual period.

Supplementation has not been recommended as a sole strategy to reduce the incidence of NTDs because:

- approximately half of all pregnancies in Australia and New Zealand are unplanned (Marsack *et al.*, 1995; Schader and Corwin 1999) and the neural tube develops before many women know they are pregnant (The Alan Guttmacher Institute, 1999; Schader and Corwin 1999; NZMoH, 2003);
- the policy relies upon the knowledge, motivation and compliance of women;

- the cost of supplements may be a barrier for some population groups;
- the use of folic acid supplements may be affected by socioeconomic factors, such that women of higher socio-economic status (de Walle *et al.*, 1999) and with better education (Bower *et al.*, 2005) are more likely to take the recommended folic acid supplements, thus potentially widening socioeconomic inequalities in NTD incidence;
- folic acid supplementation may also be affected by cultural factors, such that women of culturally and linguistically diverse backgrounds have lower uptake levels of folic acid supplement use (Watson and MacDonald, 1999 cited in NZMoH, 2003); and
- the use of folic acid supplements appears to be affected by age, with younger women less likely to use supplements than women over 25 years of age (Bower *et al.*, 2005).

Data from national surveys conducted up to 11 years ago, indicates that only a small proportion of women report taking folic acid supplements (Table 4). In New Zealand, Maori, Pacific women, women of low income, and women with unplanned pregnancies are less likely to consume supplements (NZMoH, 2003).

Table 4: Supplement use among women in Australia and New Zealand, as indicated in historical national surveys

Survey	Folic acid use	Population group	Proportion of sample who report taking supplements	Median dose of folic acid supplement
<i>Australia</i>				
National Nutrition Survey (1995) ¹	Consumed a folic acid supplement on the day prior to survey	Females (15-49 years)	2%	unknown
Population Survey Monitor (1995) ²	Took supplements containing folic acid on the day prior to survey	Females (18-44 years)	10.5%	200 µg*
<i>New Zealand</i>				
National Nutrition Survey (1997) ³	Consumed folic acid dietary supplements in last year	Females 15-24 years 25-44 years	0% 2%	unknown

* Dosage on containers of supplements checked by interviewers

Sources:

1. ABS 1995 in (Abraham and Webb, 2001).
2. Lawrence 1995 in (Abraham and Webb, 2001).
3. Adapted from NZMoH (2003) and Russell *et al.* (1999).

More recent data, however, indicate that the proportion of women consuming folic acid supplements has increased substantially but this might be associated with health promotion campaigns encouraging supplement use. Bower *et al.* (2005) reported that 28.5% of women in their study population (women who had had a liveborn baby without birth defects in Western Australia between 1997 and 2000) had taken 200 µg or more of folic from supplements daily in the peri-conceptual period.

In New Zealand, the proportion of women taking folic acid supplements during the peri-conceptional period ranges from 11-17% (Schader and Corwin 1999; Ferguson *et al.*, 2000). There are no data on dosage in New Zealand.

3. Folate status

The folate status of women of child-bearing age has risen since the introduction of voluntary folic acid fortification in Australia and New Zealand, due to increases in total folate intake, presumably due, in part, to fortification. From limited survey data, the change in food regulation in the mid 1990s appears to have generally increased folate status for both men and women (Metz *et al.*, 2002; Hickling *et al.*, 2005).

Ideally, both serum and red blood cell folate are used to reflect blood folate status. Serum folate reflects recent folate exposure, whereas red blood cell folate is indicative of longer term folate exposure. Whilst serum folate in the individual reflects daily fluctuations in intake, at a population level it is a useful biomarker of folate status. Anticipated increases in serum folate levels from a series of defined folic acid doses have also been used in this report as the basis of quantifying the reduction in NTD risk (Daly *et al.*, 1995).

3.1 Serum folate status

Higher maternal serum folate levels have been associated with a lower risk of NTD-affected pregnancies (Kirke *et al.*, 1993). However, the serum folate level that confers optimal protection against NTDs and other birth defects remains unknown (Lawrence *et al.*, 2006).

There are limited data that measure the impact on serum folate levels of strategies to increase folate intake in Australia and New Zealand (Ferguson *et al.*, 2000; Metz *et al.*, 2002; Flicker *et al.*, 2004). One large study among Victorian adults aged 15-45 years in Victoria reported an increase in mean serum folate concentrations of approximately 19% for women and 16% for men, post voluntary fortification. However, no details were available on the level of folic acid supplement use and as such the change in serum folate levels cannot necessarily be attributed to voluntary fortification. The proportion of study participants with low serum folate levels decreased from 8.5% to 4.1% since fortification (Metz *et al.*, 2002).

In a similar study in Perth involving adults aged 27-77 years, the authors (Hickling *et al.*, 2005) reported a 38% increase in mean serum folate between 1995-96 and 2001. Serum folate was consistently higher in participants who consumed at least one folate fortified food in the previous week compared with subjects who did not.

Recent analysis of data from the Blue Mountains Eye Study (Flood *et al.*, 2006) among an older population found that just 1.9% of women and 2.7% of men aged 49 years or older had 'very low' serum folate levels (< 6.8 nmol/L). De Jong *et al.* (2003) reported that 3% of older women aged 70-80 years in a small New Zealand study had low serum folate (<6.6 nmol/L).

4. Incidence of neural tube defects

The impact of voluntary folic acid fortification on the incidence⁴⁰ of NTDs, should consider the number of terminations affected by an NTD, as well as births and stillbirths. To accurately assess trends it is also important to compare data from extended periods of time (such as several years before the implementation of voluntary fortification in 1995 and several years after) rather than compare the variation in rates from one year to the next which can be quite misleading.

South Australia, Western Australia and Victoria are the only Australian States or Territories with good quality data on terminations. In South Australia between 1991-95 and 1996-97, the incidence of NTDs fell from 1.8 to 1.6 per 1,000 births (Lancaster and Hurst, 2001). Western Australia has reported a 30% fall in NTD rates between the periods 1980-95 and 1996-00 (Bower, 2003b). In Victoria, the NTD rates remained relatively stable between 1999 and 2003, although they reported a fall of 20% between 1997 and 1998 (Victorian Perinatal Data Collection Unit, 2005).

For the period 1999-03, the incidence of NTDs in Australia (based on data from Victoria, South Australia and Western Australia) was 1.32 per 1,000 total births, which leads to an all-Australian estimate of 338 cases annually with about 70% of these terminated (Bower and De Klerk, 2005⁴¹). This incidence rate is higher than rates (including terminations) in the United States, Canada, England and Wales, and other European countries (Botto *et al.*, 1999; CDC, 2004; Liu *et al.*, 2004; USCDC, 2004).

The incidence of NTDs among Indigenous populations in Western Australia is nearly double that of the non-Indigenous population (Bower *et al.*, 2004).

In New Zealand, the birth prevalence⁴² is estimated to be 0.66 per 1,000 (including live births and stillbirths, but not terminations). No complete data for terminations are available from New Zealand. If, however, Australian data for terminations are used (i.e. a similar NTD incidence rate), then the total number of NTDs per annum in New Zealand would be 72.

Between 1996 and 1999, the NTD rate for live births among Maori and Pacific peoples was 0.35 per 1,000 and 0.31 per 1,000, respectively compared with 0.48 per 1,000 in non-Maori (NZMoH, 2003). However, the inclusion of stillbirths raises the Maori prevalence to equal that of non-Maori (0.67 per 1,000 live and stillbirths) although the prevalence among Pacific peoples remains lower (0.35 per 1,000 live and stillbirths) (NZMoH, 2003).

Table 5 shows the differences in NTD rates between Australia and New Zealand, although care needs to be taken in comparing the rates due to differences in reference time periods, definitions and data collection methods including uncertainty regarding the ascertainment of terminations.

⁴⁰ Incidence of NTDs is the number of live births, stillbirths and terminations affected by an NTD expressed as a rate per 1,000 total births.

⁴¹ FSANZ commissioned report available at www.foodstandards.gov.au

⁴² Birth prevalence of NTDs is the number of live births and stillbirths affected by an NTD expressed as a rate per 1,000 total births.

Table 5: NTD rates in Australia and New Zealand

	Reference time period	NTDs per 1,000
Australia		
Total population – South Australia, Victoria and Western Australia ¹	1999-2003	1.32*
Indigenous peoples – Western Australia ²	1996-2000	2.56*
New Zealand		
Total population ³	1999	0.66**
Maori peoples ³	1999	0.67**
Pacific peoples ³	1999	0.35**

* Incidence (i.e. includes terminations) ** Livebirths and stillbirths only.

Sources:

1. Bower *et al.*, 2005⁴³
2. Bower *et al.* (2004).
3. NZMoH (2003).

5. Summary of the impact of voluntary folic acid fortification on health outcomes and related parameters

Although there are limited data on the health outcomes arising from voluntary folic acid fortification, there is evidence of a fall in the incidence of NTDs in some Australian States with concomitant increases in serum folate status (there are no data on trends for either of these indicators in New Zealand). Contributing to this outcome has been increased intakes of folic acid from fortified foods and supplements, although regular folic acid supplement use at the recommended dose of 400 µg/day is not likely to have been widespread except, possibly, in those Australian States with active health promotion campaigns.

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Potential health benefits and risks of increased folic acid intake

This paper discusses the potential health benefits and risks associated with increased folic acid intake. Where data are available the benefits and risks arising from the international experience of mandatory folic acid fortification are included.

1. Potential health benefits

1.1 Reduction in the incidence of neural tube defects

There is convincing evidence from both cohort studies and randomised controlled trials that increased folic acid intake at doses ranging from 400-4,000 µg/day and a related increase in folate status reduces the risk of occurrence and recurrence of neural tube defects (MRC Vitamin Study 1991; Czeizel and Dudas 1992; Berry *et al.*, 1999; Lumley *et al.*, 2001). The following discussion assesses mean increases in folic acid intake and the subsequent impact on NTDs following the introduction of mandatory folic acid fortification in several overseas countries.

1.1.1 Experience in other countries following mandatory fortification

Significant falls in NTD rates have been attributed to the introduction of mandatory folic acid fortification in countries such as Canada, the United States and Chile.

In Newfoundland, Canada, the incidence of NTDs is estimated to have fallen by up to 78% after the implementation of mandatory folic acid fortification, from an average of 4.36 per 1,000 births (including live births, stillbirths and terminations) during 1991-1997 to 0.96 per 1,000 births during 1998-2002 (Liu *et al.*, 2004). In Nova Scotia, Canada, Persad *et al.* (2002) reported a decrease in NTD incidence of 54% during the same period (from 2.58 per 1,000 to 1.17 per 1,000 births) and Ray *et al.* (2002) reported a decline in the number of NTDs in Ontario, Canada from 1.13 per 1,000 to 0.58 per 1,000 pregnancies post fortification. It was anticipated that mandatory fortification would reduce the annual incidence of NTDs in Canada by 22% (Persad *et al.*, 2002) based on an anticipated increase in folic acid intake of 50-150 µg/day among women. In 1997, the Canadian national NTD birth prevalence was 0.75 per 1,000 births (live births and stillbirths) (Minister of Government Services and Public Works, 2000).

In the United States, the Centers for Disease Control and Prevention (USCDC, 2004) reported a 27% fall in the number of NTD affected pregnancies between 1995-1996 and 1999-2000 using data from population-based surveillance systems that include prenatal ascertainment. Rates of spina bifida are estimated to have fallen from 0.64 per 1,000 live births to 0.41 per 1,000 and rates of anencephaly have fallen from 0.42 per 1,000 live births to 0.35 per 1,000 (USCDC, 2004). More recent data on the birth prevalence of spina bifida in the United States indicate that between 1995-1999 and 1999-2003 the rate remained stable, although the rate was significantly lower in 2003 than in 1998. Based on a national survey of birth certificate data (i.e. excluding prenatal diagnosis and terminations), Honein *et al.* (2001) had earlier reported a decline in the birth prevalence of 0.38 per 1,000 to 0.31 per 1,000 births, representing a fall of 19% over the period October 1998 to December 1999.

In addition to a decline in incidence and birth prevalence of NTDs, researchers in the United States have recently reported improved first-year survival of infants born with spina bifida post- fortification (Bol *et al.*, 2006). As a result, the authors suggest that folic acid may play a role in reducing the severity of NTDs.

Following the introduction of mandatory fortification, folic acid intake is estimated to have increased by up to 200 µg/day across the community, including the target group of reproductive-age women (Choumenkovitch *et al.*, 2002; Quinlivan and Gregory 2003). The projected average increase in intake was 70-130 µg /day (USFDA 1993). As a result, the mean serum folate levels in all age and sex groups have more than doubled (Dietrich *et al.*, 2005) and the prevalence of low serum folate concentrations (<6.8 nmol/L) in the population aged three years or more decreased from 16% prior to fortification to 0.5% after fortification (Pfeiffer *et al.*, 2005). Among women aged 20-39 years, mean serum folate increased from 10.3 nmol/L to 26.0 nmol/L (Dietrich *et al.*, 2005). Surveys conducted by the March of Dimes indicate that folic acid supplement use remains relatively unchanged (USCDC, 2004). Despite improvements in folate status across the whole population, the prevalence of low red blood cell folate continues to be high in non-Hispanic blacks (about 21%) (Ganji and Kafai 2006).

The greater percentage decline in Canada compared with the United States reflects the higher baseline NTD rates in Canada at the time mandatory fortification was introduced.

In Chile, Lopez-Camelo *et al.* (2005) reported a marked decrease in the birth prevalence rates for spina bifida and anencephaly by an estimated 51% and 46%, respectively, in the two years following mandatory folic acid fortification in 2000. Induced pregnancy terminations, which are illegal in Chile, were not reported.

1.2 Other potential health benefits from increased folic acid intakes

Possible benefits from increased folic acid intake in the total population may accrue for several diseases and conditions that constitute a considerable health burden in the Australian and New Zealand population. Diseases investigated for a potential inverse association with increased folic acid intakes are cardiovascular disease, some cancers, and diseases associated with cognitive function. These diseases constitute a major portion of each country's burden of disease, with cardiovascular disease and cancers being the leading contributors (Mathers *et al.*, 1999a; NZMoH, 2001). The potential impact on birth weight is also considered.

1.2.1 Reduction in the risk of cardiovascular disease

Total plasma homocysteine (tHcy) increases with age and is higher in men than women and in individuals with folate-associated genetic defects, particularly if associated with low folate status. High levels of homocysteine can damage the inner lining of arteries and thus it has been postulated that it is likely to be associated with an increased risk of cardiovascular disease. In a meta-analysis conducted by the Homocysteine Studies Collaboration (HS Collaboration, 2002) the authors did find strong evidence that an elevated level of tHcy is a modest, independent risk factor for cardiovascular disease (including heart disease and stroke) in healthy populations. Further, there is a well established inverse dose response relationship between intake of folic acid and reduction of tHcy indicating that folic acid may prevent and/or be used in the treatment of cardiovascular disease.

More recent evidence, however, involving four randomised controlled trials confirms that folic acid does not reduce the risk of cardiovascular disease in individuals who had experienced a prior cardiovascular disease event, despite reducing homocysteine levels.

In the first study involving 285 patients with recent transient ischaemic attack or stroke, treatment with folic acid (2,000 µg) did not lower blood markers for cardiovascular disease despite lowering tHcy (Dusitanond *et al.*, 2005). In the Vitamin Intervention for Stroke Prevention (VISP) trial involving 3,680 adults with a prior ischaemic stroke, a high dose of folic acid (2,500 µg) as part of a vitamin B6 and B12 supplement had no effect on recurrent vascular events during the two years of follow-up (Toole *et al.*, 2004). The Norwegian Vitamin (NORVIT) trial involving 3,749 men and women with a prior acute myocardial infarction showed a slight increase in vascular outcomes following treatment with folic acid (800 µg) and vitamins B₆ and B₁₂ (Bonna *et al.*, 2006). The Heart Outcomes Prevention Evaluation (HOPE) 2 study involving 5,522 participants given folic acid (2,500 µg) and vitamins B₆ and B₁₂ did not reduce the risk of death from cardiovascular causes, myocardial infarction or stroke in individuals with vascular disease after a mean follow-up period of five years (Lonn *et al.*, 2006). Therefore, put together these trials indicate no net benefit or risk following supplementary folic acid in combination with vitamins B6 and B12 on cardiovascular disease outcomes. It should be noted that the daily dosage ranged from 800 to 2,500 µg which is much higher than would be delivered by mandatory fortification.

1.2.2 Reduction in the risk of colorectal and related cancers

No randomised controlled trials have been published investigating the association between naturally-occurring folate or folic acid intakes and reduction in risk of colorectal cancer; most of the published evidence is based on cohort studies (Bower *et al.*, 2005⁴⁴). The majority of these studies observed no association between the highest folate intakes and colorectal cancer compared with lowest folate intakes. Doubts have been expressed as to the methodological shortcomings of some studies.

A recent meta-analysis of folate intake and colorectal cancer risk (Sanjoaquin *et al.*, 2005) showed a protective effect for colorectal cancer risk from cohort studies for the highest intakes of dietary folate but the effect became insignificant when naturally occurring folate and folic acid were considered together. A large cohort of Swedish women reported an inverse association between folate intake and colon cancer but not rectal cancer (Larsson *et al.*, 2005).

1.2.3 Breast cancers

Since 1995, twenty epidemiological prospective and retrospective studies have been published on the association between folate intake and risk of breast cancer; however, no randomised controlled trials have been published (Bower *et al.*, 2005). After taking account of the data quality of these studies, there is only possible evidence that high levels of folate intake might protect against breast cancer, particularly among women at greater risk because of higher alcohol consumption.

⁴⁴ FSANZ commissioned report available at www.foodstandards.gov.au

1.2.4 Cognitive function

There has been a substantial increase in observational data that suggests an association between low folate levels, high tHcy levels and the presence of cognitive decline, dementia and Alzheimer's disease. However, studies have not been conducted to determine whether a reduction in serum tHcy minimises or prevents cognitive decline.

Without studies that have directly assessed the impact of tHcy on cognitive function, there is possible evidence of an association between folate intake and risk of cognitive decline. A recent population-based study of older persons in Chicago, observed unexpectedly that cognitive decline was faster in persons with the highest intake of folate (Morris *et al.*, 2005). The observations of Morris *et al.* are opposite to those reported elsewhere and highlight the need for further study into folic acid and cognitive function before any confident conclusions can be drawn.

Two experimental studies nearing completion may provide greater understanding of the association between folate and cognitive function⁴⁵.

1.2.5 Birth weight

Relton *et al.* (2005) reported that maternal folate status may be an important determinant of infant birth weight and it may mediate the negative effects of smoking on birth weight. Previous studies have shown mixed effects (de Weerd *et al.*, 2003; Spencer, 2003 cited in Relton *et al.*, 2005).

1.3 Conclusion of potential health benefits of increased folic acid intake

There is strong evidence from other countries that have introduced mandatory fortification that increases in intake of folic acid up to 200 µg/day are associated with significant reductions in the incidence of NTDs. The extent of the fall in incidence appears to depend on the prevailing background rate of NTDs prior to fortification.

An increased intake of folic acid is associated with a reduction in homocysteine and homocysteine has long been thought to be a biomarker of increased risk of cardiovascular disease. More recent studies, however, found that increasing folic acid intake did not reduce the risk of cardiovascular disease in individuals who had experienced a prior cardiovascular event, despite reducing homocysteine levels. Thus the evidence of an inverse association between increased intakes of folic acid intake and cardiovascular disease, once thought to be probable, has recently been brought into question.

The evidence is inconclusive for a positive effect on cancer or cognitive function even at doses of folic acid much higher than would be achieved through mandatory fortification.

The evidence is also inconclusive for a positive effect on birth weight from increased folic acid intake.

⁴⁵ Durga J., *et al.*, (2005) The effect of 3-year folic acid supplementation on cognitive function. A randomised controlled trial. Plenary session, 5th Homocysteine Metabolism Conference, June 26-30, 2005, Milan.
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2. Potential health risks

The following discussion considers potential health risks and uncertainties associated with increased folic acid intakes, in particular the safety associated with intakes of folic acid up to 1,000 µg/day – the upper level of intake for adults.

2.1 *Masking of the diagnosis of vitamin B₁₂ deficiency*

Concerns have been raised about the potential for increased folic acid intakes to delay the diagnosis and eventual treatment of severe vitamin B₁₂ deficiency in older people. Vitamin B₁₂ deficiency is associated with a spectrum of clinical manifestations: haematological, neurological and psychiatric, and the theoretical risk is that increased folic acid intake may prevent or delay the appearance of the haematological sign (macrocytic anaemia). However, the more serious neurological complications, which can rarely progress to an irreversible form, are known to occur in the absence of anaemia in some 20 to 30% of cases (SACN, 2005). Therefore, diagnosis of vitamin B₁₂ deficiency and screening for the condition does not depend solely on identification of macrocytic anaemia in older persons. Other biochemical tests and neurological tests, unaffected by folic acid intake, are used for confirmation of the diagnosis.

Vitamin B₁₂ deficiency may take decades to develop and affected individuals may be asymptomatic or may present with a wide spectrum of haematological, neurological and/or psychiatric signs and symptoms. Between 11-33% of individuals found to have low serum B₁₂ levels have neurological pathology (Lindenbaum *et al.*, 1988; Savage and Lindenbaum, 1995; Campbell 1996 cited in European Commission, 2000). The suspect deficiency is diagnosed by identification of a low serum vitamin B₁₂ level followed by further discriminating biochemical tests.

Vitamin B₁₂ deficiency is most common in elderly people, mainly due to a reduced capacity to release vitamin B₁₂ from food sources (such as foods of animal origin, in particular red meat, dairy foods and eggs, but also foods fortified with vitamin B₁₂ such as soy-based beverages and yeast extracts) during digestion, or alternatively as a result of malabsorption of free vitamin B₁₂ from the gut caused by gastrointestinal dysfunction. Very little deficiency in this age group is caused by inadequate dietary intake.

The upper intake level (UL) for folate (1,000 µg per day of folic acid) in adults has been set based on the potential to mask the diagnosis of vitamin B₁₂ deficiency and potentially exacerbate the related neurological symptoms (Institute of Medicine, 1998). However, there is a safety margin of five built into the UL, and intakes of folic acid above the UL are unlikely to occur from fortification alone.

2.1.1 International experience

There are no data on adverse effects on neurological function, especially in people aged 65 years and over with low vitamin B₁₂ status from countries that have introduced mandatory fortification (SACN, 2005).

Data from population-based surveys in the United States undertaken before and after the introduction of mandatory folic acid fortification found that the proportion of people who had poor vitamin B₁₂ status without anaemia did not change significantly from the pre-fortification period to after full implementation (Mills *et al.*, 2003).

2.1.2 Prevalence of vitamin B₁₂ deficiency in Australia and New Zealand

There are no representative national population studies of prevalence of vitamin B₁₂ deficiency in older persons in Australia or New Zealand, although there are a small number of published studies (and one unpublished) of serum B₁₂ levels that provide estimates of the prevalence of vitamin B₁₂ deficiency in older persons.

Serum vitamin B₁₂ is a crude indicator of vitamin B₁₂ status but it has been commonly used in surveys of population deficiency. Different threshold levels are used to differentiate between clinical deficiency and less well defined sub-clinical or marginal deficiency, however there has been no consistency in the selection of these threshold levels. It is apparent that the risk of deficiency is likely to be at a higher serum level for certain people, especially as people age (Koehler *et al.*, 1997; Clarke *et al.*, 2003). Therefore, consideration may need to be given to whether threshold levels need to increase according to age. Serum methylmalonic acid (MMA) is a more specific and sensitive indicator of vitamin B₁₂ deficiency that has recently been used in overseas surveys in combination with serum vitamin B₁₂ to assess the prevalence of vitamin B₁₂ deficiency. However, this test is more expensive and is not widely available in Australia or New Zealand.

Surveys conducted in Australia and New Zealand over the past eight years of serum vitamin B₁₂ levels alone consistently show a small to moderate prevalence of vitamin B₁₂ deficiency among older members of the community. Six to twelve per cent of those surveyed were classified as deficient and a further 16-28% classified as at risk of deficiency or marginally deficient (Flood *et al.*, 2004b; Green *et al.*, 2005b). Information as to whether those found to be deficient had associated haematological or neurological sequelae was not collected. Vegetarians are also at risk of vitamin B₁₂ deficiency due to a reduced vitamin B₁₂ intake; vegans more so than lacto-ovo vegetarians because of a complete absence of animal products in vegans' diets (Hokin and Butler, 1999a).

Vitamin B₁₂ deficiency is recognised through presentation of clinical signs of abnormal haematology or neuropathy, or initial discovery of low serum vitamin B₁₂ from blood tests conducted for other reasons. Practitioners are advised to consider vitamin B₁₂ deficiency as a possible cause when presented with individuals who have clinical signs of anaemia or neuropathy.

Given the apparent prevalence of vitamin B₁₂ deficiency in Australia and New Zealand, it is reasonable to assume a considerable level of undiagnosed cases particularly of marginal and asymptomatic deficiency. For example, recently published data from the Blue Mountains Eye Study (Flood *et al.*, 2006) indicated that about half of those with 'very low' serum vitamin B₁₂ (< 125 pmol/L), 'very low' serum folate (< 6.8 nmol/L) and 'moderately low' RBC folate (370-<513 nmol/L) showed a likelihood of having a functional deficiency. The only way to detect this sub-clinical deficiency on a population basis is through screening programs for those at risk, although there is no definitive approach to treatment for this group.

However, small increases in folic acid intake are most unlikely to prevent development of abnormal haematology in pre-disposed individuals at risk of vitamin B₁₂ deficiency.

Table 1: Australian and New Zealand Serum Vitamin B₁₂ Levels

Study Group	Results	Author
Australia		
<u>Perth</u> 299 men aged over 74 years	14 % were deficient ¹	(Flicker <i>et al.</i> , 2004)
<u>Perth</u> 273 women aged over 69 years	6% were deficient ¹	(Flicker <i>et al.</i> , 2004)
<u>New South Wales</u> 371 males and females aged over 49 years	22% had serum B ₁₂ levels below 185 pmol/L	(Flood.V.M. <i>et al.</i> , 2001)
<u>Seventh Day Adventist Ministers</u> 234 vegetarians and 53 non vegetarians mean age 46 years	Vegetarians: 53% had serum B ₁₂ < 171 pmol/L or 73% <220 pmol/L Non-vegetarians: 21% had serum B ₁₂ < 171 pmol/L or 40% <220 pmol/L	(Hokin and Butler 1999a)
<u>New South Wales</u> 177 children in years 10 to 11	22.5% had serum B ₁₂ <220 pmol/L No difference between vegetarians and non-vegetarians:	(Pearce <i>et al.</i> , 2006)
New Zealand		
<u>Dunedin</u> 216 women (aged 18 – 45 years)	2% were vitamin B ₁₂ deficient (< 60 pmol/L)	(Ferguson <i>et al.</i> , 2000)
<u>Dunedin</u> 140 boys (aged 14 – 19 years)	1% were vitamin B ₁₂ deficient (< 60 pmol/L)	(Ferguson <i>et al.</i> , 2000)

¹ deficiency not defined in study, reference range 140 – 646 pmol/L

2.2 Multiple births

Multiple births result in more complications and poorer outcomes compared with singleton births (Kinzler *et al.*, 2000).

A Cochrane review on peri-conceptual folic acid intake was published in 2001 (Lumley *et al.*, 2001), which included evidence showing a non-significant increase in the likelihood of a twin pregnancy. Seven studies published since 2001 have also not found conclusive evidence of an association between folic acid and multiple births. Of these, two good quality studies of folic acid supplements showed an increase in multiple births, although the results from one study were not significant. Of the other five studies, which were post-mandatory fortification studies from the United States, four showed a 2-4.6% annual increase in the rate of multiple births. This increase would equate to an additional 7.5 per 10,000 extra twin births each year. This increase was small compared to the other causes of increased twinning in the population – older maternal age and infertility treatment.

Although several studies have described a trend towards increased risk of multiple births from folic acid supplementation (Czeizel *et al.*, 1994; Lumley *et al.*, 2001), this result was not observed in a large Chinese trial which assessed folic acid supplement use (400 µg/day) in nearly 130,000 women compared with about 115,000 who did not use supplements (Li *et al.*, 2003) nor has the trend been observed in the United States post fortification (Shaw *et al.*, 2003; Waller *et al.*, 2003).

2.3 Cancer incidence

Studies have been conducted on the relationship between folate intake and an increased cancer risk, and of this number, only a small proportion involved an *in vivo* assessment of human subjects. The majority of evidence that suggests a possible association between folate intakes and increased cancer risk is from animal or *in vitro* studies rather than human studies.

Stolzenberg-Solomon *et al.* (2006), followed 25,400 women aged 55-74 years for a median of five years of follow-up. Among those who took more than 400 µg/day in folic acid supplements (either alone or as part of a multivitamin) a 16-19% increase in breast cancer risk. Those in the high versus low quintile of dietary and supplementary folate intake had a 27% increase in breast cancer. This study spanned the period of introduction of mandatory folic acid fortification in the United States but the authors noted that there was no apparent effect associated with it.

By contrast, Tjonneland *et al.* (2006), who followed up more than 24,000 post-menopausal Danish women for approximately five years, found a non-significant 3% increase in breast cancer per 100 µg /day increase in supplementary folic acid intake. When diet and supplementary folate intakes were combined, there was a non-significant 10% decrease in breast cancer incidence with every 100 µg increase in folate intake. Further, folate intakes greater than 350 µg/day from diet and supplements protected against the adverse effect of alcohol on breast cancer risk.

Three earlier studies also reported mixed results. One of these studies (Brink *et al.*, 2005) reported a statistically significant positive association between rectal cancer risk and folate intakes in women. However, Brink *et al.* (2005) also reported an inverse association between rectal cancer risk and folate intakes in men, and no significant association with colon cancer in either sex. The remaining two studies reported a non-significant increase in the risk of breast and prostate cancers with increased folate intakes (Charles *et al.*, 2004; Hultdin *et al.*, 2005).

Despite noting that most studies in humans show a protective effect of folate, Kim (2004) reports that folic acid may increase cancer incidence in animals that are given powerful carcinogens. However, the most recent human study showing accelerated progression of leukaemia with folic acid supplementation, cited by Kim, was published in 1949.

2.4 Other risks

2.4.1 Interactions with zinc

A number of studies have reported that folic acid supplementation has a negative effect on zinc status. However, zinc levels naturally decline during pregnancy, and therefore it has been suggested that the association of folic acid supplementation with reduced zinc levels in the later stages of pregnancy is not necessarily causal (Expert Group on Vitamins and Minerals, 2002).

Other studies have shown no adverse effects of high doses of folic acid (up to 10,000 µg/day for several weeks or months) on zinc status in adults (Expert Group on Vitamins and Minerals, 2002).

2.4.2 Folate-drug interactions

Concerns have been raised in the scientific literature about the potential interaction of folic acid with the following drugs:

- anti-epileptic drugs;
- interaction with other drugs which inhibit folate metabolism such as methotrexate; and
- some anti-inflammatory drugs.

2.4.2.1 Anti-epileptic drugs

Some anti-epileptic drugs have been found to reduce serum folate levels, and on rare occasions have been associated with the development of megaloblastic anaemia in treated individuals. In some individuals supplemental folate may affect the liver and lower circulating antiepileptic drug levels, while treatment to correct the folate deficiency in some individuals has precipitated seizures or increased the frequency or severity of seizures.

However, there appears to be very large individual differences in folic acid sensitivity with drug controlled epilepsy, and case reports have all been associated with very large doses of folic acid (5,000-150,000 µg). A number of studies have also shown no significant changes in seizure frequency/severity in folic acid treated individuals.

The Folic Acid Subcommittee of the United States Department of Health and Human Services has concluded that 1,000 µg/day oral folic acid supplementation is safe for individuals with controlled epilepsy (Expert Group on Vitamins and Minerals, 2002).

2.4.2.2 Antifolate drugs

Some drugs used in the treatment of various cancers, rheumatoid arthritis, and bronchial asthma act as folate antagonists by competing with folate for the same transport system or by targeting the enzymes involved in folate metabolism.

One folate antagonist, methotrexate, is used at low doses to treat rheumatoid arthritis and at high doses in the treatment of cancer. Decreased levels of methotrexate have been reported in association with folate supplements in one controlled trial, but the dose of folate was high (5,000 µg/day) and there were no clinical changes observed (Bressolle *et al.*, 2000).

Larger controlled studies have not demonstrated an impairment in methotrexate efficacy, but rather, have shown a decrease in toxic side effects from the drug when combined with folate supplementation (Morgan *et al.*, 1994).

Recent work has suggested that some anti-malarials that have an antifolate activity experience reduced efficacy in the presence of raised serum folate levels in specific situations (Dzinjalama *et al.*, 2005).

2.4.2.3 Anti-inflammatory drugs

At high doses many non-steroidal anti-inflammatory drugs (e.g. 3,000 mg/day) have anti-folate activity as they act as inhibitors of enzymes involved in folate metabolism (Baggott *et al.*, 1992). However, routine use of low doses of these drugs has not been reported to impair folate status (Institute of Medicine, 1998).

Although, there is the potential for an increased folate intake to interfere with certain medications, available scientific evidence has not demonstrated any clinically significant interaction with therapeutic medicines from folate intakes up to 1,000 µg/day.

2.5 *Uncertainties about increased risks*

2.5.1 Effects of exceeding the upper level of intake (UL) for individuals who are not vitamin B₁₂ deficient

The UL for folic acid has been set on the basis of masking vitamin B₁₂ deficiency at high doses by resolving the haematological signs and potentially precipitating or exacerbating the neurological symptoms (see Figure 1). However, in the absence of vitamin B₁₂ deficiency, there is little information on adverse effects which may occur at levels above the UL. One short-term study reported mental changes, sleep disturbances and gastrointestinal symptoms in healthy volunteers given 15,000 µg folic acid/day for one month (Hunter *et al.*, 1970). Many other studies show 5,000-15,000 µg/day folic acid is not generally associated with adverse effects (although it was noted that it was not the specific aim of most studies to determine adverse effects) (cited in Expert Group on Vitamins and Minerals, 2002; and Expert Group on Vitamins and Minerals, 2003).

The Institute of Medicine concluded that intakes at or above the UL in women of child-bearing age are unlikely to produce adverse effects due to the low prevalence of B₁₂ deficiency in this population sub-group (Institute of Medicine, 1998). Other than interactions with certain medications, no adverse effects have been identified in non-B₁₂ deficient individuals at intakes around 1,000-5,000 µg/day for adults. Therefore, folic acid intakes slightly above, but close to, the UL (but below the Lowest-Observed-Adverse-Effect Level (LOAEL)) would pose little risk.

In the absence of direct evidence of the effect of increased levels of folic acid in children and adolescents, the UL set for adults has been applied to younger age groups on a relative body weight basis. However, as for other population sub-groups, vitamin B₁₂ deficiency is rare in children, and so the relevance of this endpoint and hence the risks to children is unclear. Due to their lower body weight and their consumption of more food per kilogram of body weight when compared to adults, children are more likely to exceed the UL for folic acid if staple foods are fortified.

One estimate of intake in the United States post mandatory fortification indicated that approximately 15-25% of children aged 1-8 years had folic acid intakes above the UL (with a small number of these with intakes 2-3 times above the UL) and 0.5%-5% of adults were consuming >1,000 µg folic acid/day based on folic acid intake from fortified foods or supplements (Lewis *et al.*, 1999). No adverse effects have been reported due to this, although it is unclear if any surveillance is being undertaken, particularly as there was no commitment at the time mandatory fortification was introduced in the United States to monitor adverse health outcomes (Rosenberg 2005).

Figure 1: Upper level of intake for folic acid

The upper level of intake (UL) is the highest average daily nutrient intake level likely to pose no adverse health effects to almost all individuals in the general population. As intake increases above the UL, the potential risk of adverse effects increases. It is based on the most sensitive endpoint of toxicity.

High intakes of folic acid have been shown to resolve the haematological effects of vitamin B₁₂ deficiency and potentially precipitate or exacerbate the related neurological effects. A number of studies have reported the occurrence of neurological symptoms in people with vitamin B₁₂ deficiency who also consumed folic acid supplements. Sufficient data were not available to set a No-Observed-Adverse-Effect Level (NOAEL), however a Lowest-Observed-Adverse-Effect Level (LOAEL) was set at 5,000 µg/day as of the available studies; at intakes above 5,000 µg/day there were more than 100 reported cases of neurological progression of vitamin B₁₂ deficiency. At doses less than 5,000 µg/day (330 – 2,500 µg/day) there are only eight well-documented cases.

The NHMRC (2006) used the LOAEL of 5,000 µg/day to set the UL. An uncertainty factor of 5 was applied to the LOAEL. This uncertainty factor, although considered relatively large compared to uncertainty factors used for other nutrients where there was also a lack of controlled dose-response data, was used because of the severity of undiagnosed vitamin B₁₂ deficiency-related neuropathy, and also due to the use of a LOAEL rather than a NOAEL. A higher uncertainty factor was not considered necessary due to the fact that millions of people have been exposed to self-treatment with folic acid at levels around one-tenth of the LOAEL (i.e. ~400 µg from supplements) without reported harm.

The UL was therefore estimated to be 1 mg folic acid (1,000 µg)/day for adults and is applicable to all adults rather than just sensitive populations (e.g. the elderly) due to the severity and irreversible nature of the neurological effects of vitamin B₁₂ deficiency, the fact that pernicious anaemia may develop earlier in some ethnic groups, and uncertainty about the prevalence of vitamin B₁₂ deficiency in younger age groups (Institute of Medicine, 1998). The adult UL also applies to pregnant and lactating women as there are no data to suggest increased susceptibility in these groups. On the basis of the low prevalence of vitamin B₁₂ deficiency in women of childbearing age, it was concluded that intakes of folic acid at or above the UL in this subgroup are unlikely to produce adverse effects (Institute of Medicine, 1998).

In the absence of any studies on folic acid in children and adolescents, the UL was set for these groups on a relative body weight basis. It was not possible to set a UL for infants. The UL for each age group is as follows:

Age group (years)	Upper Level of Intake (µg of folic acid per day)
1-3	300
4-8	400
9-13	600
14-18	800
19+	1,000

No adverse effects have been associated with the consumption of natural food folates so the UL applies only to folic acid.

2.5.2 Unmetabolised circulating folic acid

Ingested folic acid is enzymatically reduced and then methylated or formylated within the intestinal lumen and enterocytes, and enters circulation from the intestinal cells primarily as 5-methyltetrahydrofolate (5-methyl-THF) monoglutamate.

However, if enough folic acid is given orally (300-400 µg in a single dose/meal) conversion processes become saturated and unmodified folic acid appears in the plasma (Lucock *et al.*, 1989; Expert Group on Vitamins and Minerals, 2002). Folic acid has also been found in the cord blood of infants immediately after birth (Sweeney *et al.*, 2005).

It is likely that if the daily intake of folic acid from fortified foods were spread over a number of meals, levels of folic acid in the plasma would be lower than if the same dose were given in a single meal or tablet. However, it is also likely that mandatory fortification at any level will increase the amount of unmetabolised folic acid circulating in the blood on a population level compared to the status quo.

Although there is no evidence that short-term exposures to circulating folic acid cause any adverse health effects, no research currently exists on the long-term effects (adverse or otherwise) of unmetabolised folic acid circulating in the blood and it is uncertain what impact this might have on public health.

2.5.3 Impact on the gene pool

A recently published paper suggests that higher folate status during the peri-conceptional period could select embryos that carry a particular gene that has been associated with a range of developmental and degenerative conditions. An increase in folate status arising from population-based approaches such as fortification, may increase the proportion of individuals with these genes, and in time, increase the population's dependency on future folate fortification (Lucock and Yates, 2005).

2.6 Conclusion of potential health risks and uncertainties of increased folic acid intake

It is recognised that excessive intakes of folic acid may mask the diagnosis of vitamin B₁₂ deficiency potentially resulting in neurologic damage. However, from the very limited and moderate quality available evidence, most of which was derived from supplement intake, there is insufficient evidence to suggest folic acid intakes up to 1,000 µg/day (the adult UL) will mask the diagnosis of vitamin B₁₂ deficiency. The relevance of the UL for younger age groups, particularly children, is unclear because vitamin B₁₂ deficiency is rare in children.

There is a possible association between folic acid and multiple births based on findings from studies that showed a small per cent increase in twinning (<5%), and the biological plausibility that folic acid could support fetal growth and development.

From the conflicting results and the small number and limited types of studies there is insufficient evidence to establish an association between folate intakes and an increased risk of cancer.

Although, there is the potential for an increased folate intake to interfere with certain medications, available scientific evidence has not demonstrated any clinically significant interaction with therapeutic medicines from folate intakes up to 1,000 µg/day.

The potential impact of an increased intake of synthetic folic acid on unmetabolised circulating folic acid and on the gene pool is only just emerging in the scientific literature. The scientific discussion around these matters is not well developed, and cannot therefore be used in an informative assessment of the risks associated with folate fortification.

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GLOSSARY

Anencephaly	A condition characterised by a failure of the anterior neural tube to close, resulting in the total or partial absence of the cranial vault and brain tissue. Together, spina bifida and anencephaly account for 90% of all cases of NTDs.
Bioavailability	A measure of the body's ability to extract, absorb and metabolise a nutrient expressed as a proportion of the amount in food or supplements.
Birth prevalence of NTDs	The number of live births and stillbirths affected by an NTD expressed as a rate per 1,000 total births.
Dietary folate	The term used to refer to folate that is consumed via the diet, both naturally occurring and folic acid added through fortification. This term does not encompass folate consumed through supplements.
Dietary Folate Equivalents (DFEs)	DFEs is a term used to accommodate the various bioavailabilities of folate. One $\mu\text{g DFE} = 1 \mu\text{g food folate} = 0.5 \mu\text{g of folic acid on an empty stomach} = 0.6 \mu\text{g of folic acid with meals}$.
Encephalocele	A condition characterised by the meninges and/or brain tissue extruding through a defect in the skull. This is the least frequent of the neural tube defects (Lancaster and Hurst, 2001).
Enriched	In the United States, this term refers to the addition of a nutrient to a food that has been lost during the course of food processing or during normal storage and handling, up to the nutrient's level in the food before processing, storage and handling. This process is commonly referred to as 'restoration' in the Australian and New Zealand context.
Estimated Average Requirement (EAR)	The EAR is the daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group.
Folate	Folate is a water-soluble B-group vitamin. The term <i>folate</i> is used generically to refer to the various forms of the vitamin, both naturally-occurring and synthetic, and its active derivatives (Department of Health, 2000).
Folic acid	Folic acid, also referred to as pteroylmono-glutamic acid (PGA), is the most common synthetic form of folate and is the form used in fortification and in the majority of supplements. As its name indicates, folic acid contains a single glutamate moiety attached to pteric acid (Ball, 1998). Folic acid is rarely found occurring naturally in foods (NHMRC, 1995). Other forms of folate that could be used in food fortification in future include 5-methyltetrahydrofolate (5-Ch ₃ H ₄ PteGlu, or L-methylfolate) and mixtures of naturally occurring forms.
Fortification	'Fortification' or 'enrichment' means the addition of one or more essential nutrients to a food for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups.
Health claim	A message that makes a direct link between eating a certain food or food component and reduced risk of a specified disease.
Homocysteine	A sulphur-containing amino acid. Plasma homocysteine concentration increases when folate or vitamin B ₁₂ is deficient.
Incidence of NTDs	The number of live births, stillbirths and terminations affected by an NTD expressed as a rate per 1,000 total births. As data on the number of terminations affected by an NTD is frequently incomplete, some authors use the term 'prevalence'.
Megaloblastic anaemia	An anaemia in which the precursors (megaloblasts) or red blood cells in the bone marrow is impaired. These precursor cells enter the blood stream at a larger size (macrocytic) than normal blood cells, yet they contain a full complement of haemoglobin.

Naturally-occurring folate	A form of folate found in a wide variety of foods including green leafy vegetables, cereals, fruits, grains, legumes, yeast extract, and liver. The term naturally-occurring folate is used in this document, to differentiate it from folic acid added to food in fortification. Naturally-occurring folate generally contains more than one, typically five to seven, glutamate moieties attached to pteric acid (polyglutamate) (Ball, 1998).
Neural tube defects (NTDs)	NTDs are severe congenital malformations of the central nervous system and result from the failure of the neural tube to close during early embryonic development. The two major types of NTDs are anencephaly and spina bifida.
Peri-conceptual period	Refers to the period one month before and 12 weeks after conception.
Recommended dietary intake (RDI)	The RDI is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in a particular life stage and gender group.
Spina bifida	A condition whereby incomplete closure of the neural tube results in the spinal cord being exposed or protruding through a gap in the spine. Over 80% of infants born with spina bifida survive into adulthood, but can develop leg paralysis or weakness, lack of bowel or bladder control and excess fluid around the brain (hydrocephalus).
Stillbirths	The birth of a dead infant of at least 20 weeks gestational age or 400 g birthweight.
Total births	Live births + still births.
Target population	Women of child-bearing age.
Termination	Termination of pregnancy occurring before 20 weeks gestation.
Upper level of intake (UL)	The UL is referred to in this Report in relation to folic acid. The UL is the highest daily nutrient intake level likely to pose no adverse health effects to almost all individuals in the general population. As intake increases above the UL, the adverse potential risk of adverse effects increases.
Women of child-bearing age	For the purposes of this Report, in particular the dietary intake assessment, women of child-bearing age refers to women aged 16-44 years.

ABBREVIATIONS AND ACRONYMS

ABS	Australian Bureau of Statistics
AHMAC	Australian Health Ministers' Advisory Council
AHMC	Australian Health Ministers' Conference
DALY	Disability adjusted life year
DFE	Dietary folate equivalent
EAR	Estimated average requirement
FRSC	Food Regulation Standing Committee
FSANZ	Food Standards Australia New Zealand
LOAEL	Lowest observed adverse effect level
Ministerial Council	Australia and New Zealand Food Regulation Ministerial Council
MRC	Medical Research Council
NATSINSAP	National Aboriginal and Torres Strait Islander Nutrition Strategy and Action Plan
NHANES	National Health and Nutrition Examination Survey
NHMRC	National Health and Medical Research Council
NNS	National nutrition survey
NOAEL	No observed adverse effect level
NRV	Nutrient reference value
NTD	Neural tube defect
NZMoH	New Zealand Ministry of Health
PGA	Pteroylmono-glutamic acid
RDI	Recommended dietary intake
SDAC	Standards Development Advisory Committee
UL	Upper level of intake
USCDC	United States Centers for Disease Control
WTO	World Trade Organization

UNITS

µg	micrograms
mg	milligrams
g	grams