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FINAL ASSESSMENT REPORT

PROPOSAL P295

CONSIDERATION OF MANDATORY FORTIFICATION WITH FOLIC ACID

For Information on matters relating to this 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 an 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.

FSANZ reduced the number of regulatory options considered at Draft Assessment to maintenance of the *status quo* and mandatory folic acid fortification. FSANZ's assessment seeks to determine how mandatory fortification can be implemented in Australia and New Zealand as Ministerial advice received in 2005 is that mandatory folic acid fortification is an effective strategy and requested that FSANZ expedite its process.

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.

FSANZ drew on this international experience and selected bread-making flour (consumed as bread and bread products) as the food vehicle for mandatory folic acid fortification in Australia and New Zealand at Draft Assessment. Following further targeted consultation and consideration of the international experience with folic acid fortification and Australian experience with thiamin fortification, FSANZ has refined the approach to specifically require mandatory fortification of bread as the final food consumed. This approach provides a more predictable means of delivering folic acid intake to the target population whilst limiting intake in the non-target population and increases flexibility for industry in meeting the mandatory standard.

This Final Assessment Report therefore focuses on consideration of mandatory folic acid fortification of bread as a means of reducing the incidence of NTDs in Australia and New Zealand and includes:

- an assessment of the potential health benefits and risks of increased dietary intakes of folic acid by the Australian and New Zealand populations;
- technical issues regarding fortification of bread as the preferred food vehicle and level of folic acid concentration to achieve the desired health outcome;
- consideration of alternative approaches to mandatory fortification (as provided by several submitters) to achieve similar levels of effectiveness and safety;
- management of any identified health risks associated with the selected level of fortification;
- a revised cost-benefit analysis;

- associated communication and education strategies;
- monitoring and implementation issues; and
- presentation of a regulatory approach.

This report also addresses issues arising from public submissions and targeted stakeholder consultations.

The Decision

Mandatory fortification of bread[1] 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 80-180 micrograms (µg) of folic acid per 100 grams of bread.

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 the Decision

The reasons for this decision are:

- fortifying bread with folic acid, learns from and builds on international experience of mandatory fortification to reduce the incidence of NTDs;
- bread is an effective and technically feasible food vehicle for mandatory fortification;
- bread and bread products are staple foods consumed widely (more than 80%), consistently and regularly by the target population of women aged 16-44 years;
- fortification of bread will deliver a mean increase in folic acid intake in the target population of 101 µg and 140 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 mandatory fortification of bread with folic acid can deliver benefits that definitively exceed the costs:

[1] Bread is defined as 'the product made by baking a yeast-leavened dough prepared from one or more cereal flours or meals and water.'

- in Australia, when folic acid is added to bread making flour, the net-benefit from all NTDs avoided is $122 million each year ongoing. In the case of live births the net-benefit is $21 million each year ongoing;
- in Australia, when folic acid is added at the later stages of bread production, the net-benefit from all NTDs avoided is $99 million each year ongoing. In the case of live births there is a net-cost of $2 million each year ongoing;
- in New Zealand, when folic acid is added to bread making flour, the net-benefit from all NTDs avoided is $41 million each year ongoing. In the case of live births the net-benefit is $4.3 million each year ongoing; and
- in New Zealand, when folic acid is added at the later stages of bread production, the net-benefit from all NTDs avoided is $39 million each year ongoing. In the case of live births the net-benefit is $2.5 million each year ongoing.

- fortification of bread provides greater predictability in the level of folic acid consumed by the target and non-target groups and therefore greater confidence that the estimated reduction in NTDs will be achieved and that health risks to non-target groups will be minimised;

- fortification of bread provides flexibility for industry in determining the most appropriate and cost effective means of achieving mandatory fortification;

- the cost to consumers is likely to be less than 2% of the price of a loaf of bread;

- the fortification of bread does provide for some consumer choice through access to unleavened breads and unfortified flour; and

- it is consistent with Ministerial policy guidance on mandatory fortification.

Consultation

FSANZ received 148 submissions in response to the Draft Assessment Report for this Proposal during the public consultation period of 3 to 31 July 2006. A full summary of submissions is at Attachment 2.

FSANZ also conducted intensive targeted consultation through a range of consultative mechanisms to discuss key issues and impacts of mandatory fortification with all stakeholder groups, namely the Australian and New Zealand baking and milling industries, supermarket in-store bakery representatives, organic industry representatives, government agencies, and consumer and public health organisations.

There was divergence of views regarding mandatory folic acid fortification both between and within stakeholder groups. Most government submitters supported mandatory fortification on the condition that monitoring is in place prior to implementation. Some public health and consumers groups supported mandatory fortification whereas others were opposed. Industry was opposed to mandatory fortification.

Key issues raised included the effectiveness of mandatory fortification in reducing NTDs (based on the proposed fortification level) being not sufficient to justify population wide consumption of folic acid, possible health risks and future unknown health risks, lack of consumer choice, the impacts on industry, monitoring of mandatory fortification, enforcement and the importance of continuing other NTD risk reduction strategies.

Key issues

Will mandatory fortification of bread with folic acid result in other health benefits?

No other health benefits, apart from a reduced risk of NTDs, have been conclusively associated with an increase in folic acid intake.

Whilst a reduced risk of cardiovascular disease was previously reported as a potential health benefit, a review of current evidence (much of it published early in 2006) does not support this association.

Are there any possible health risks from mandatory fortification with folic acid?

The expected average increase in folic acid intake arising from mandatory folic fortification is unlikely to pose any increased risk of masking the diagnosis of vitamin B_{12} deficiency in older people or in the zinc status of the population. The available evidence also suggests that folic acid is unlikely to interfere with anti-epileptic, antifolate or some anti-inflammatory drugs at folic acid intakes below one milligram per day.

A small proportion of young children (7% of 2-3 year olds in Australia) are expected to exceed the Upper Level of Intake (UL) for folic acid based on the proposed level of fortification. Whilst this is undesirable, it is unlikely to pose a health risk as there is a considerable margin of safety inherent in setting the UL. No comparable data on folic acid intakes among children under five years are available for New Zealand.

In addition to the potential health risks described above, there remains some uncertainty about other potential adverse health effects (e.g. cancer incidence and an increase in multiple births) from increased folic acid. As a result of these uncertainties a risk management approach has been adopted consisting of:

- the requirement to ensure the level of folic acid in the final food meets a specified range, rather than placing the requirement on the folic acid content of the flour;
- a conservative approach to the level of fortification;
- the inclusion of an upper limit in the standard; and
- identifying the need to monitor potential health risks.

These elements together limit the intake in non-target populations, provide greater predictability regarding folic acid consumption and establish a mechanism to inform a review of the standard which is proposed within five years of implementation.

Does mandatory fortification allow for consumer choice?

Under mandatory fortification nearly all breads will be fortified. This will include bread and bread rolls, sweet buns, fruit bread, English style muffins, some flat breads and bread crumbs. Breads which fall outside the definition of 'bread' in the *Australia New Zealand Food Standards Code*[2], will not be required to be fortified with folic acid.

Some unfortified products such as unleavened flat breads, hot plate products such as crumpets and pikelets, pizza bases, and retail flours will provide consumers with other options.

Consumers will be informed about the addition of folic acid to bread through labelling that requires all ingredients of a product to be identified in the ingredient list.

How will industry implement mandatory folic acid fortification?

Mandatory fortification will require all bread to contain folic acid within a prescribed range of 80-180 micrograms (µg) of folic acid per 100 g of bread. Bread manufacturers will need to decide the most suitable and cost effective methods of fortifying for their particular bread production process. Folic acid could be added through the use of flour fortified with folic acid, dry ingredients such as a bread improver[3] fortified with folic acid, a complete bread premix which has been fortified with folic acid, or a folic acid vitamin premix which is added to the dough.

FSANZ will prepare an implementation guide, education materials, and, if required, workshops to assist industry. Industry will have 15 months from when the new standard is gazetted to comply with the mandatory fortification requirements.

How will mandatory fortification be monitored?

Responsibility for establishing and funding a monitoring system extends beyond FSANZ's responsibility under the *Food Standards Australia New Zealand Act 1991*. FSANZ will, however, routinely monitor some elements of the system such as:

- tracking changes in voluntarily fortified foods;
- updating the folic acid composition of foods in 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 consumers' attitudes and behaviour towards fortified foods.

[2] Bread is defined as 'the product made by baking a yeast-leavened dough prepared from one or more cereal flours or meals and water.'

[3] Bread improvers are combinations of ingredients, such as enzymes, emulsifiers and antioxidants that are added to dough to modify its characteristics and those of the bread in order to improve keeping quality, texture and flavour.

Monitoring other elements of the impact of mandatory folic acid fortification, particularly the main outcome measure of a change in the national rate of NTDs, will require involvement of health and regulatory agencies at a Commonwealth, State and Territory level in Australia and the New Zealand Government. Other outcome measures, such as cancer incidence, are already routinely collected and reported and will contribute to baseline data for the monitoring system.

Further information about the elements of and responsibilities for establishing a monitoring system are provided in Section 18 of this report and at Attachment 12.

What other strategies are planned to support mandatory fortification?

FSANZ recognises that mandatory fortification is one strategy in NTD prevention, and that other strategies will continue to be important including the existing voluntary fortification of other foods, the promotion of supplement use and education for women of child-bearing age.

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

FSANZ has prepared a communication and education strategy for mandatory folic acid fortification that aims to increase awareness among all target audiences of the proposed standard for mandatory folic acid fortification and its implementation. To implement the strategy, FSANZ will seek opportunities to collaborate with organisations to provide information and education about the proposed standard to consumers, industry, health professionals and other key stakeholders.

FSANZ has begun to collaborate with a range of organisations as optimal reduction in the incidence of NTDs depends on these strategies being collaborative and sustained.

Implementation

Following completion of the Final Assessment for this Proposal, the FSANZ Board will notify the Ministerial Council of the decision. Subject to any request from the Ministerial Council for a review, the proposed draft variations to the Code (Attachment 1) will come into effect 15 months from gazettal.

To assist industry, enforcement agencies and other stakeholders with the implementation of this mandatory fortification standard, FSANZ will develop an Implementation Guide.

CONTENTS

SEPARATE ATTACHMENTS:

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-conceptional 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 AHMAC[4] reported that mandatory fortification fulfilled their criteria[5] of effectiveness, equity, efficiency, certainty, feasibility and sustainability required for an effective public health strategy and advised Health Ministers to support mandatory fortification as 'the most effective public health strategy for increasing folate intakes'.

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.

[4] *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.
[5] Case studies of public health interventions to increase nutrient intakes were used to generate effectiveness criteria.

In July 2006, FSANZ released a Draft Assessment Report proposing mandatory folic acid fortification of bread-making flour (consumed as bread and bread products) as the preferred regulatory approach. FSANZ received 148 submissions with the majority of public health and government agencies in favour of mandatory fortification and with some public health and consumer groups and industry opposed.

This Final Assessment Report seeks to refine, following public consultation and other targeted consultation activities, the preferred regulatory option as proposed at Draft Assessment to reduce 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, refinement of the preferred food vehicle, management of any identified risks, a revised cost-benefit analysis, associated communication, education, monitoring and implementation issues and recommends a regulatory approach. Issues arising from public submissions and targeted stakeholder consultation have also been addressed where possible in this Report.

Work on developing a monitoring scheme for mandatory folic acid 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.

Refer to the Glossary and Abbreviations and Acronyms 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 reduced the number of regulatory options considered to two at Draft Assessment and for this Final Assessment. These are maintenance of *status quo* (including existing voluntary folic acid fortification) and mandatory fortification.

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.

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.

5-methyl tetrahydrofolate (5-methyl-THF) is the principal form of folate that circulates in the blood. 5-methyl-THF can be synthesised and added to food as a fortificant, however, this form of folate is less stable in the final product than synthetic folic acid.

Serum folate refers to the level of 5-methyl-THF that is present in the blood.

Unmetabolised free folic acid is folic acid that has not been converted to methyl-THF following digestion, and therefore circulates in the blood as a free form of folic acid.

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 5-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 (EAR[6]), a recommended dietary intake (RDI[7]) and an upper level of intake (UL[8]) for each age and gender group. These levels of intake are termed nutrient reference values (NRVs) and have been recently revised by the NHMRC[9].

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 DFEs[10], which reflect 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.

'Women capable of, or planning, pregnancies should consume additional folic acid as a supplement or in the form of fortified foods at a level of 400 µg/day folic acid for at least one month before and three months after conception, in addition to consuming food folate from a varied diet' (NHMRC and NZMoH, 2006).

The adult UL for folate (1,000 µg per day of folic acid) has been set based on the potential for regular intakes above this level, by the elderly in particular, to mask the diagnosis of vitamin B_{12} 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 B_{12} 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 (NZMoH, 1999; ABS, 1999). These surveys were conducted prior to or about the time of the introduction of voluntary fortification.

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[6] 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.

[7] 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.

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

[9] 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

[10] 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*., 2001a; 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.

- **Encephalocoele** – 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 encephalocoele 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*., 2001b).

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 births[11]. 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.

[11] Total births = live births + stillbirths.

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.

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*[12] state that essential nutrients may be added to foods for the purposes of restoration, nutritional equivalence of substitute foods, fortification[13], 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. The Food Safety Authority of Ireland has recently recommended mandatory folic acid fortification of all bread, with a few minor exceptions to provide for some consumer choice[14].

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	Minimum level of fortification (mg/kg)
Canada[1]	Flour (white, enriched[15], enriched white); enriched cornmeal, enriched pasta, enriched pre-cooked rice	1998	1.5 (or 150 µg/100 g)
	Bread (white, enriched)		1.0 (or 100 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 (1996g)

[12] Codex Alimentarius CAC/GL 09/1987 (amended 1989, 1991).
[13] '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.
[14] Food Safety Authority of Ireland. *Report of the National Committee on Folic Acid Food Fortification* 2006 http://www.fsai.ie/publications/reports/folic_acid.pdf
[15] 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.

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 1996e; USFDA 1996f, 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).

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-conceptional 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-conceptional 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-conceptional 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-conceptional, 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 µg[16] 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).

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 regulations[17] 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-conceptional 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-conceptional 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.

Data collected in South Australia suggests evidence of an increase in folic acid supplement use before and in the first three months of pregnancy among women who had given birth in the last three years; although the dose is unknown (Haan pers. comm.). Watson *et al*. (2006a) report that 46% of recent mothers in NSW, but only 36% in Victoria, took folic acid appropriately and an additional 12% and 38%, respectively took some folic acid supplements, although the frequency and dosage is not reported and so it is not known whether this was sufficient to achieve the full benefit. An additional number of women either increased their intakes of naturally-occurring folate or did not alter their intake because they thought it was already adequate. In total, 80% and 82% of NSW and Victorian women who had recently given birth had taken some action to assess their folate intakes. It is not known how many took an inappropriate action.

[16] In New Zealand, 800 µg is recommended as a 400 µg folic acid supplement is not available (NZMoH, 2003).
[17] New Zealand Dietary Supplement Regulations 1985 http://www.legislation.govt.nz/browse_vw.asp?content-set=pal_regs

In New Zealand, results from two different studies found that the proportion of women who reported taking folic acid supplements during the peri-conceptional 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. The lower percentage reporting taking supplements in New Zealand may be due to the fact that the New Zealand studies surveyed all women whereas the Australian studies surveyed women who had recently had a baby.

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 all women of child-bearing age of the appropriate action; knowledge about 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, 2005[18]). 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.

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). The increased availability of folate-fortified foods has occurred independently of the health claim (Lawrence, 2006).

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);

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

- 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 median[19] 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.

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*., 2002c; Metz *et al*., 2002e) 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*., 2005e).

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, 2003b; Victorian Perinatal Data Collection Unit, 2005) since the introduction of voluntary fortification.

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

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 but do suggest that voluntary fortification has had an impact on reducing the NTD rate in Australia in recent years.

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 folic acid 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 encephalocoele 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 target population). The prime focus for achieving a reduction in this risk will be to increase the folic acid content of the food supply.

The health benefits and risks to the non-target population from increased folic acid intake are considered in 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. The completed reviews were subsequently peer reviewed. A compilation of the main findings from the reviews is provided at Attachment 6 and the full text of the literature reviews is available at www.foodstandards.gov.au. An expert scientific group was also convened to obtain advice on a series of questions that arose during the initial assessment process.

To assess the impact of mandatory fortification on the target population and the population as a whole, a comprehensive dietary intake assessment has been undertaken based on the universal addition of folic acid to bread (see Attachment 7a). At Draft Assessment, a dietary intake assessment of mandatory folic acid fortification of bread-making flour was undertaken and this has been included at Attachment 7b. Comments and additional references have been considered and the risk assessment at Final Assessment has been amended, as appropriate.

Box 1: Key findings of the health benefits and risks from mandatory folic acid fortification

There is convincing evidence from a broad range of studies that increased folic acid intake reduces the risk of a pregnancy affected with a **neural tube defect**. Mandatory fortification at the proposed level will further reduce the incidence of NTDs in Australia and New Zealand by 4-14% and 5-15%, respectively.

At the levels of folic acid intake likely from mandatory fortification there is no evidence of an increased risk of **masking the diagnosis of vitamin B_{12} deficiency,** particularly as the diagnosis of vitamin B_{12} deficiency relies on a combination of tests at the clinical level.

Recent evidence concludes that folic acid does not reduce **cardiovascular disease** risk.

Recent evidence accords with FSANZ's conclusion at Draft Assessment that there is no apparent increase in **cancer** risk associated with higher folic acid intakes for the population as a whole. Some studies suggest that an increase in folic acid intake may be protective of cancer, however, the evidence is not conclusive.

Recent evidence does not support an improvement in **cognitive function** from increased folic acid intakes.

The evidence is inconclusive for an increased risk of **multiple births** from increased folic acid intake.

There is no evidence of an increased risk of **folate-drug interactions** at the proposed levels of fortification.

Concerns about **unmetabolised circulating folic acid** arising from mandatory fortification overseas have been raised. No apparent adverse effects have been reported. Consequently, the health significance of this remains uncertain.

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

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 benefits and risks associated with the proposed level of mandatory 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 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 having a pregnancy affected with an NTD (MRC Vitamin Study 1991; Czeizel and Dudas 1992; Berry *et al.,* 1999; Lumley *et al.,* 2001).

5.1.1 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% (see Attachment 4).

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 those NTDs that still occur (Bol *et al*., 2006).

Following the introduction of mandatory fortification in the United States, folic acid intake is estimated to have increased by more 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*., 2005c). 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, 2006c).

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*. (2002a) 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.

5.1.2 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, 2005[20]). Voluntary fortification is likely to have contributed to this fall, particularly as the contribution of folic acid supplement appears limited. 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). From 2004 onwards New Zealand has been collecting data on terminations although these data have yet to be reported.

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%**

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

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 %
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:

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*. (2004b).
4. Persad *et al.* (2002).
5. Ray *et al*. (2002b).
6. USCDC (2004).
7. Honein *et al.* (2001).
8. Lopez-Camelo *et al*. (2005a).

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.

5.2 Masking of the diagnosis of vitamin B_{12} 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 B_{12} deficiency in older people (Capra *et al*., 2005[21]). This could occur by correcting the anaemia that may accompany vitamin B_{12} 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 B_{12} 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*., 2004b; Green *et al*., 2005b). 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 B_{12} deficient.

[21] FSANZ commissioned report available at www.foodstandards.gov.au

Vitamin B_{12} deficiency in older people is mainly due to a reduced capacity to release vitamin B_{12} from food sources (such as foods of animal origin, in particular red meat, dairy foods and eggs, but also foods fortified with vitamin B_{12} such as soy-based beverages and some yeast extracts) during digestion, or alternatively as a result of malabsorption of free vitamin B_{12} 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 B_{12} deficiency due to a reduced vitamin B_{12} intake; vegans more so than lacto-ovo vegetarians because of a complete absence of animal products in vegans' diets. Hokin and Butler (1999a) report that serum B_{12} levels in 11 vegan Australian Seventh Day Adventist ministers was not different from serum B_{12} levels in non-vegan vegetarian ministers. There are no data on the prevalence of vitamin B_{12} deficiency among vegans in Australia or New Zealand (Capra *et al*., 2005).

Vitamin B_{12} deficiency may take decades to develop in adults and affected individuals may be asymptomatic or may present with a wide spectrum of haematological, neurological and/or psychiatric signs and symptoms. Vitamin B_{12} deficiency is recognised through presentation of clinical signs of abnormal haematology or neuropathy and a definitive diagnosis is usually obtained from serum vitamin B_{12} levels. Doctors are advised to consider vitamin B_{12} 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 B_{12} deficiency and the potential to exacerbate the related neurological symptoms (Institute of Medicine, 1998). However, the UL incorporates a fivefold margin of safety 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 B_{12} status (SACN, 2005).

5.2.1 Effects of exceeding the upper level of intake (UL) for individuals who are not vitamin B_{12} deficient

In the absence of vitamin B_{12} deficiency, there is little information on adverse effects which may occur at levels about the UL.

The UL set for adults has been applied to younger age groups on a relative body weight basis. However, vitamin B_{12} 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*., 1999b).

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).

5.3 Cardiovascular disease

Low folic acid intake increases total plasma homocysteine and high levels of homocysteine can damage the inner linings of arteries. Consequently, increased folic acid intake, because of its ability to lower homocysteine, has been investigated for its potential to lower cardiovascular disease risk (including heart disease and stroke) and early evidence strongly supported this association.

More recent evidence, however, from several large trials and some smaller randomised controlled trials all concluded that high folic acid doses (1 mg or more per day) did not reduce cardiovascular disease risk (see Attachment 6).

5.4 Cancer

Folate acts as a methyl donor in the synthesis of purines and ultimately DNA and therefore could affect the development of cancer. A number of epidemiological studies have suggested that people with higher folate intakes have lower rates of various cancers. An alternative hypothesis is that folate might increase progression of pre-cancerous lesions but lower the risk of cancer if no lesion exists.

The association between folate and cancer has been investigated as part of the development of this Proposal in relation to the incidence of all cancers, prostate cancer, breast cancer and colorectal cancer. A summary of the findings from these studies is provided below (also see Attachment 6).

5.4.1 Total cancer

Two recent and large trials investigating the association between folic acid and cardiovascular disease, also reported total cancer incidence among their study participants. A meta-analysis of the results yielded a non-significant increase of 5.6% (95% CI: 0.91-1.23) in the incidence of total cancer. Both trials involved folic acid supplements; in one, the dose was 2.5 mg of folic acid and in the other 800 μg. There are other similar trials underway which will add to the evidence base and possibly clarify the role, if any, of folic acid and cancer.

5.4.2 Prostate cancer

One trial and three cohort studies found no significant association between serum folate levels and incidence of prostate cancer. A large Swedish study, however, did observe a significant association between higher serum folate levels and increased risk of prostate cancer but only among study participants with a particular genetic make-up. In this study, 'higher' folate levels were below the pre-voluntary fortification mean in a Perth cohort.

Based on these findings, and the lack of intake studies, the evidence base is not sufficient to draw a conclusion about the relationship of folic acid and increased risk of prostate cancer.

5.4.3 Breast cancer

Results from five recently reported cohort studies investigating folate intake from diet and supplements and from one intervention trial collectively indicate no effect between folate intake and breast cancer risk. Eight case-control studies and one case-cohort study found mixed results, although three of these reported a protective effect among women at greater risk of breast cancer because of higher alcohol consumption.

Fewer studies have examined the relationship between blood folate levels and incidence of breast cancer but no significant associations have been reported.

These findings indicate that folic acid is not associated with an increased risk of breast cancer (and may reduce the risk among heavy consumers of alcohol).

5.4.4 Colorectal cancer

A 2005 meta-analysis investigating the effect of folate on colorectal cancer found an overall protective effect or no effect based on separate analyses of four different categories of studies including cohort and case-control studies. More recently published results (four cohort studies and one trial) report a slight increase in risk or a slight decrease with higher total folate intake and two studies using serum folate levels as indicators of folate intake reported conflicting results.

In summary, the more recent studies do not alter the conclusion from the 2005 meta-analysis that total folate intakes do not increase the risk of colorectal cancer.

5.4.5 Conclusion

Two large trials using much higher doses of folic acid than is proposed under mandatory fortification do not indicate a gradient of risk for total cancers. For the three specific cancer sites examined, the results of more recent studies do not alter the conclusion reached in earlier reviews (SACN, 2004; SACN, 2005; Sanjoaquin *et al*., 2005f) that there is no apparent increase in risk associated with higher folic acid intakes for the population as a whole. Although many of the studies suggest that some reduction in cancer might occur, most of these are observational and so might be affected by uncontrolled confounding by other factors.

5.5 Cognitive function

Earlier observational evidence suggested an association between low folate levels and increased risk of cognitive decline, dementia and Alzheimer's Disease.

More recent evidence from two studies published early in 2006 report no association between increased folic acid intake or increased serum folate and improved cognitive functioning. In one of the studies, lower red blood cell folate was, however, associated with poorer cognitive performance.

These findings are, however, not sufficient evidence to conclude that low folate levels are associated with cognitive decline.

5.6 Unmetabolised circulating folic acid

The potential impact of an increased intake of synthetic folic acid on unmetabolised circulating folic acid with suggestions of adverse health consequences 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.

5.7 Other effects during pregnancy

The evidence is inconclusive for an association between increased folic acid intake and increased risk of multiple births. Multiple births result in more complications and poorer outcomes than singleton births.

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

5.8 Other potential health risks

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:

- folate-drug interactions;
- interactions with zinc status; and
- a negative impact on the gene pool.

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, 2005[22]).

It is highly unlikely that increases in folic acid intake associated with mandatory fortification would have a negative impact on zinc status in the Australian and New Zealand populations.

One recent paper postulates that an increased folate status in the population is potentially associated with a negative impact on the gene pool. Whilst this is a possibility, this potential outcome does not differ from other interventions that seek to prolong the life of children affected by serious genetically inherited childhood diseases or conditions.

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.

[22] FSANZ commissioned report available at www.foodstandards.gov.au

6.1 Selection of food vehicle

At Draft Assessment, FSANZ drew 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.

Bread-making flour (consumed as bread and bread products) was considered to be a technically feasible vehicle due to the existing mandatory fortification requirement with thiamin in Australia. However, industry expressed considerable concerns at the high degree of impost and technical difficulties associated with fortifying bread-making flour as part of the flour milling process, to the required standard. For example, the level of precision required to meet the proposed range of folic acid amounts to be added. Additionally, the New Zealand milling industry indicated that segregation of bread-making flour would be prohibitively expensive because of the lack of infrastructure. On the basis of New Zealand industry's inability to segregate flours, concerns were also raised about the lack of choice for consumers to select non-fortified flour-based products and the resulting impact on population-wide increases in folic acid intakes beyond that intended through mandatory fortification.

In response to these issues, FSANZ considered alternative mechanisms for delivering folic acid into bread. Industry was canvassed from March 2006 on other means of adding folic acid during the bread-making process, for example in bread improvers, and yeast. At that time industry representatives asserted the addition of folic acid during the bread-making process presented a number of practical difficulties.

FSANZ subsequently sought additional information on alternative mechanisms from a consultant engaged in June 2006 to investigate the feasibility of adding folic acid in the bread-making process as well as advice from the Australian and New Zealand milling and baking industry.

More recent advice from the New Zealand industry has indicated that addition of folic acid during the bread-making process is feasible and provides greater control over the level of fortification going into the product. This has since been confirmed by FSANZ's consultant (see Attachment 10, Appendix 1).

Given the potential for New Zealand consumers to exceed safe folic acid intakes from a broader than intended range of products, it was important to explore alternate means to limit this possibility. Furthermore, the requirement to fortify bread with folic acid, rather than mandating where in the manufacturing process fortification was to occur, was seen as providing a more flexible outcome for industry, particularly in New Zealand, where bread-making flour is currently not fortified with thiamin.

Consequently, following further consultation, FSANZ has refined the approach at Final Assessment to require the mandatory fortification of bread. The mechanism for delivering the folic acid to the bread, however, has no longer been specified.

6.1.1 The suitability of bread as the selected vehicle

Bread is defined in Standard 2.1.1 – Cereals and Cereal Products of the Code as:

the product made by baking a yeast-leavened dough prepared from one or more cereal flours or meals and water.

This definition therefore includes the following products: bread and bread rolls, sweet buns, fruit bread, English muffins, bagels, yeast leavened flat breads and breadcrumbs.

Bread 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 mid to late 1990s indicates that 85% of Australian and 83% of New Zealand women of child-bearing age consume bread (a fall of just 3% of women in the target group who consumed products containing bread-making flour). This level of consumption has been supported by more recent survey data. Bread is therefore a staple, relatively low cost food regularly consumed by the majority of the target population.

Further analysis undertaken by FSANZ as part of Final Assessment also indicated that there are very few differences in the amount of bread consumed or folic acid intakes among women of child-bearing age from different socio-economic groups.

6.1.1.1 Australian Indigenous consumption of bread

Separate analyses by Indigenous identification are not possible because Indigenous people make up only 2% of the population and they were not over-sampled in the Australian 1995 NNS.

Slightly more than one-half of the Australian Indigenous population lives in areas that are classified as ‘major cities’ or ‘inner regional areas’. As such, they have access to the supermarkets and corner stores that serve the populations of these areas.

One-quarter of the Australian Indigenous population live in areas classified as remote or very remote and have restricted access to a wide range of shopping facilities. A survey of remote community store managers, most from the Northern Territory and some from Western Australia, were asked to nominate their 20 top selling items. Seventy-eight items were identified from the 18 store managers that responded. Bread was nominated by 17 of the 18 stores and achieved an average position of 6.1 in the list. By contrast, flour was nominated by only seven managers and had an average position of 10.4 in the list (DHCS, 2005).

Therefore the proposed strategy of fortifying bread would reach Indigenous populations in remote areas where folate status may be poorer.

6.1.2 Stability of folic acid added to bread

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).

6.1.2.1 Storage losses in flour

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).

6.1.2.2 Processing losses

The average loss of folic acid from bread made with fortified flour appears from the literature to be about 25% but may be as high as 40%. To account for these losses in fortified flour, millers would apply an overage of 1.33 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, are in the Food Technology report (see Attachment 10).

6.1.3 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 is expected to have a similar bioavailability. A substantial increase in the folate status of populations exposed to mandatory folic acid fortification reflects its bioavailability[23]. Folic acid consumed 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).

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 the extent of 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 7a) was conducted to compare the increase in folic acid intakes from the current voluntary permissions to the proposed mandatory fortification of all breads. The dietary intake assessment undertaken at Draft Assessment involving the mandatory addition of folic acid to all bread-making flour is at Attachment 7b.

The following two fortification scenarios are used as the basis for this comparison:

- **'Baseline'** - Current folic acid intakes from foods voluntarily fortified[24]; and
- **'Scenario 1'** (Preferred scenario at final assessment) **-** 'Baseline' (except bread) + the introduction of mandatory fortification of all bread at 135 µg/100 g.

The dietary intake assessment scenarios did not take into account naturally-occurring folate in food. There is little evidence to support naturally-occurring folate as protective against NTDs (Green, 2005[25]).

[23] 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).
[24] Food intake data are derived from the 1995 and 1997 Australian and New Zealand national nutrition surveys. Estimates of folic acid intake are based on the current uptake by industry of voluntary permissions outlined in Standard 1.3.2 of the Food Standards Code.
[25] FSANZ commissioned report available at www.foodstandards.gov.au

The NHMRC recommendation of 400 µg per day to reduce the incidence of NTDs is based on additional folic acid from fortified foods or supplements and the model used in this Proposal to estimate the number of NTDs reduced from the introduction of mandatory fortification (see Section 7.1) is underpinned by incremental increases in folic acid intake.

The estimated intakes of folic acid from both fortified foods and folic acid 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

At Draft Assessment, a residual level of 200 µg of folic acid per 100 g of bread-making flour was the preferred option. This equates to a concentration of 120 µg/100 g in the average loaf of bread. Based on this estimate, folic acid concentrations of between 100-170 µg of folic acid per 100 g of bread were modelled with the aim of achieving the same level of effectiveness and safety.

Thus, at Final Assessment, the selected folic acid concentration is 135 µg of folic acid per 100 g of bread.

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 Preferred scenario at Final Assessment

If intakes from voluntary fortification remain unchanged ('Baseline') then fortifying all bread at 135 µg/100 g results in an estimated mean intake of folic acid from fortified foods of 196 µg per day in Australia and 198 µg per day in New Zealand among women of child-bearing age.

However, even with this additional intake, just 4% 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.

6.7.1.3 Preferred scenario at Draft Assessment

The preferred scenario at Draft Assessment indicated that fortifying all bread-making flour at residual levels of 200 µg/100 g would result 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. This additional intake resulted in 5% of women in Australia and 2% in New Zealand meeting the recommended intake of 400 µg of folic acid per day from fortified foods.

A comparison of the two scenarios is provided in Table 3 which shows that both result in very similar mean increases in folic acid intake among the target population.

Table 3: Comparison of estimated mean folic acid intake for women of child-bearing age* from the mandatory fortification of all bread or all-bread-making flour

Model	Concentration of folic acid (µg/100 g)		Mean folic acid intake (µg/day)	
			Australia	*New Zealand*
Baseline		Voluntary fortification	95	58
All bread **Final Assessment**	135 (in the bread)	Increase due to mandatory fortification	101	140
		Voluntary + mandatory	**196**	**198**
All bread-making flour **Draft Assessment**	200 (residual level in the flour)	Increase due to mandatory fortification	100	131
		Voluntary + mandatory	**195**	**189**

* 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 (weighing 60 g and therefore containing 81 µg based on a fortification level of 135 µg/100 g of bread) + 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 among women of child-bearing age* from fortified foods and supplements for Australian and New Zealand

Model	Concentration of folic acid in bread (µg/100 g)	Folic acid intake from fortified foods 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
All bread	135	396	696	398	998

* Women aged 16-44 years.

6.8 Robustness of the estimates used to determine bread consumption and folic acid intakes

In response to concerns raised in submissions at Draft Assessment about the age of the data used to undertake the dietary intake assessment (the 1995 Australian National Nutrition Survey and the 1997 New Zealand National Nutrition Survey), FSANZ collated recent data on bread consumption from a variety of sources in Australia and New Zealand. Although there were difficulties in directly comparing the data due to differences in survey methodologies used, they did indicate that the proportion of the population consuming bread, including the target group, is about 80% in both countries. This is similar to the proportion determined in the 1995 and 1997 surveys (see Section 6.1.1). The quantity of bread consumed has also remained the same (about two slices per day). Attachment 7a provides further details about the surveys considered.

These results support the robustness of the national survey consumption data used to assess folic acid intakes under a mandatory fortification scenario which underpins the assessment of effectiveness and safety of the Proposal and indicates that bread consumption by the target group has not changed significantly in the last decade.

6.9 Alternative approaches to mandatory fortification

In response to submissions received at Draft Assessment, FSANZ assessed two alternative approaches to folic acid fortification. The first considers restricting the types of breads that are mandatorily fortified to enhance consumer choice and the second considers increasing the types of foods that are voluntarily fortified rather than mandatory fortification of all breads.

6.9.1 Restricting breads that are mandatorily fortified in response to concerns about consumer choice

Four options were considered by FSANZ involving various types of bread and these are compared with FSANZ's proposed strategy (Table 5).

Table 5: Per cent of women of child-bearing age* in Australia and New Zealand consuming different bread types

	Proportion of women of child-bearing age* consuming** (%)		
Option	**Australia**	**New Zealand**	**Bread Types Included**
Option 1	29	25	Includes light grain and wholemeal bread.
Option 2	77	73	Includes option 1 + plain white bread and bread in sandwiches and burgers.
Option 3	80	77	Includes option 2 + white high fibre bread and fruit bread.
Option 4	NA	79	Includes all breads except dark grain bread.
FSANZ proposed strategy	85	83	Includes option 3 + dark grain, rye bread, rolls, yeast containing flat breads (e.g. Pita bread, naan bread), focaccia, bagels, fancy bread/topped bread, English muffins, sweet buns, fruit bread, bread in sandwiches and burgers, bread crumbs[#].

NA - Not assessed.

[*] Women aged 16-44 years.

[**] The estimates of consumption by the target group do not include any voluntary fortification permissions.

[#] Does not include bread crumbs for New Zealand.

The results clearly indicate that FSANZ's proposed strategy, involving the mandatory fortification of all breads, will maximise the proportion in the target population consuming folic acid. Consumer choice will be provided by flat breads that don't contain yeast and consumers choosing to purchase flour and bread pre-mixes to make their own bread (see Section 9.3 for further discussion on consumer choice).

6.9.2 Increasing voluntary permissions to increase folic acid intake among the target population and minimise folic acid intake among the non-target population

One option considered by FSANZ involved a small expansion to the range of foods currently permitted to be voluntarily fortified. These foods comprised one brand of low/reduced fat natural yoghurts, some additional breads from one manufacturer and one brand of reduced/low fat/energy frozen meals.

Because no market share data other than bread was provided the dietary intake assessment assumed that all brands of foods in these categories were fortified, thus overestimating the increases in folic acid intakes. These estimates are compared with FSANZ's proposed strategy (Table 6). It was assumed that the market share for breads increased from 15% at Baseline to 20% for this alternative proposal to account for the extra breads that may be voluntarily fortified.

Table 6: Estimated mean folic acid intakes among women of child-bearing age* in Australia and New Zealand for different voluntary and mandatory fortification scenarios

	Mean dietary folic acid intake in µg/day (Increase in folic acid intakes from baseline in µg/day)	
Scenario	**Australia**	**New Zealand**
Baseline	95	58
Extension of voluntary permissions**	103 (+8)	62 (+4)
FSANZ's proposed strategy	196 (+101)	198 (+140)

* Women aged 16-44 years.

** Additional foods includes some breads across a range of types, all low/reduced fat natural yoghurt and all reduced/low fat/energy frozen meals.

The estimated folic acid intakes do not increase appreciably from Baseline for the alternative voluntary fortification scenario. This is due to the small number of consumers of low/reduced fat natural yoghurt (~1%), and all reduced/low fat/energy frozen meals (<1%), and because of the small increase in the bread market that is likely. Thus, the results clearly show that mandatory fortification of all breads with folic acid will maximise intake among the target population.

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).

Fortifying bread with folic acid at a concentration of 135 µg /100 g of bread will result in an estimated 14-49 NTD-affected pregnancies being prevented in Australia and 4-14 NTD-affected pregnancies prevented in New Zealand. This represents a reduction of between 4-14% in Australia and 5-20% in New Zealand (Table 5).

Table 5: Estimated number of NTD pregnancies prevented based on adding 135 µg of folic acid per 100 g of bread in Australia and New Zealand

	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	101	26 **(14-49)**	5	3	18
New Zealand	140	8 **(4-14)**	1	1	5

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

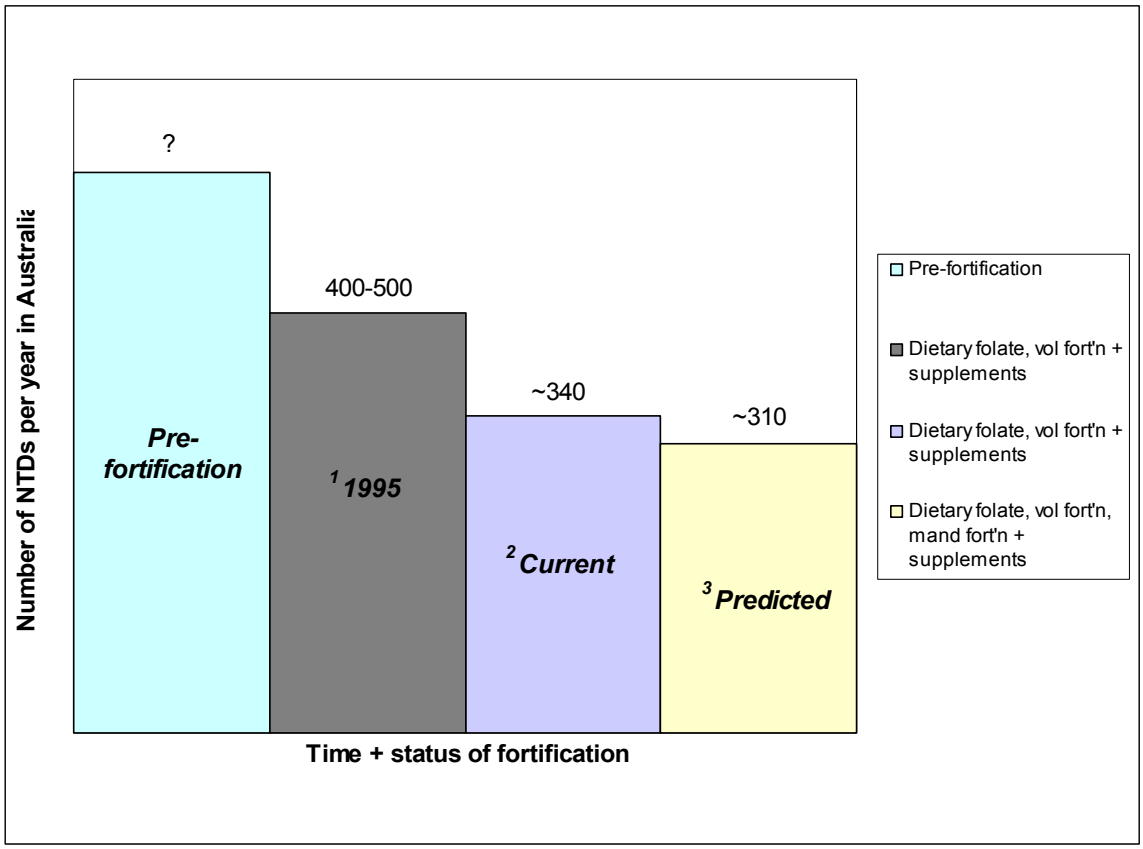
** Estimates of the number of NTDs prevented are based on the approach by Wald *et al*. (2001) (see Attachment 9).

As some Indigenous populations in Australia have double the NTD rate (2.56/1,000 total births) compared with the non-Indigenous population (1.32/1,000 total births) (Bower *et al*., 2006), the fall in NTD incidence among some Australian Indigenous populations may be greater.

It is estimated that up to 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.

The numbers of NTDs have been falling for some years and so the proportion potentially preventable will diminish with time. Where Australia and New Zealand are currently lying in relation to the potential fall of up to 70% of NTD-affected pregnancies from increased folic acid intake remains unknown. The available Australian data on the fall in the number of NTDs since the introduction of voluntary fortification is shown in Figure 1. Lancaster and Hurst (2001) reported the numbers and rates of NTDs in Australia between 1991-95 (pre-fortification) and 1996-97 but concluded that they were likely to be a substantial underestimate; hence the number of pregnancies affected with an NTD pre-fortification remains unknown for this period. The NHMRC (1995) reported 400-500 NTDs per year nationally based on extrapolation of State-based data. This period equates to the time voluntary fortification was introduced. More recently, Bower and de Klerk (2005) reported approximately 340 NTDs per year based on extrapolation of State-based data with good ascertainment rates. Thus, although a similar increase in mean folic acid intake is expected from mandatory fortification as has been achieved with voluntary fortification to date (about 100 µg), the number of NTDs potentially prevented declines because of the increase in the folate status of the population.

Figure 1: Decline in numbers of NTD-affected pregnancies since voluntary folic acid fortification was introduced in Australia in 1996



Sources:
1 NHMRC (1995)
2 Bower & de Klerk (2005)
3 Predicted by FSANZ at Final Assessment.

7.2 Health risks to the whole population

To assess health risks that might arise from mandatorily fortifying bread with folic acid, the folic acid intakes of population sub-groups were 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 UL[26] is shown in Table 6.

[26] The UL (see Section 5.2.2), which is based on masking the diagnosis of vitamin B_{12} 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	Scenario 1: All bread 135 µg folic acid /100 g
Australia		
2-3 years	1	7
4-8 years	<1	3
9-13 years	<1	2
14-18 years	<1	1
19+ years	<1	<1
Women aged 16-44 years	<1	<1
New Zealand*		
15-18 years	0	<1
19+ years	<1	<1
Women aged 16-44 years	<1	<1

* 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 B_{12} deficiency

7.2.2.1 Young children

Vitamin B_{12} 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 the mandatory fortification scenario, the percentage of respondents with intakes greater than the UL declined with increasing age.

Fortifying bread at 135 µg /100 g results in a small percentage of children aged 2-3 and 4-8 years exceeding the UL (7% and 3%, respectively; previously 6% of 2-3 year exceeded the UL based on the Draft Assessment proposal). Of the small proportion of children that are estimated to exceed the UL following the introduction of fortification at this level all are predicted to have intakes below those which would be expected to cause adverse effects. That is, these intakes still remain within the margin of safety. This, combined with the low probability of vitamin B_{12} deficiency within this age group, suggests that fortification up to 135 µg/100 g bread is very unlikely to put children at risk.

Based on assessments conducted for New Zealand children external to FSANZ using different methodologies[27] the results indicate that a similar proportion of New Zealand children 5-14 years would exceed the UL compared to Australian children of the same age.

7.2.2.2 Target group (women 16-44 years)

Only a very small percentage (<1%) of women aged 16-44 years exceed the UL at a fortification level of 135 µg/100 g of bread. This percentage is unchanged from the percentage of women exceeding the UL at Baseline and unchanged from the percentages exceeding the UL at Draft Assessment. 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. The 800 µg supplement recommended in New Zealand in conjunction with fortified foods could lead to 44% of New Zealand women in the target group exceeding the UL. However, due to the low prevalence of vitamin B_{12} deficiency in women of child-bearing age, intakes of folic acid at or above the UL are unlikely to have adverse effects.

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 B_{12} 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 a fortification level of 135 µg/100 g of bread. Only a very small proportion (<1%) of individuals aged 50-69 years exceed the UL at these fortification levels. This is unchanged from the percentage exceeding the UL at Baseline and unchanged from the percentages exceeding the UL at Draft Assessment. Therefore, it is unlikely that at a fortification level of 135 µg/100 g of bread will increase the risk of adverse effects in this population sub-group because of the increased incidence of masking the diagnosis of vitamin B_{12} deficiency.

7.2.2.4 Conclusion on masking of the diagnosis of vitamin B_{12} deficiency

Based on the dietary intake assessment, it is unlikely that fortification of all bread at a level up to 135 µg/100 g of bread will increase masking the diagnosis of vitamin B_{12} deficiency in either the target or non-target populations.

7.2.3 Uncertainties

In the absence of vitamin B_{12} deficiency, there is little information on the potential effects (adverse or beneficial) of an increase in folic acid intakes in the general population 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.

[27] The methodology used to assess folic acid intake among New Zealand children differed from the FSANZ modelling in that it used different levels of fortification, involved a more restricted group of mandatorily fortified foods and excluded the contribution to folic acid intake from voluntary fortification.

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 around 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 bread 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, 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.

Improvements in cognitive function, considered in early literature as a potential positive benefit associated with increased folic acid intakes, have not been confirmed with more recent and robust scientific investigation. The evidence is also inconclusive for a positive effect on birth weight, increased risk of multiple births or reduced incidence of Down Syndrome from increased folic acid intake.

In terms of the potential health risks, there have been no reports of adverse effects on neurological function in older people with low vitamin B_{12} status among countries that have introduced mandatory fortification with folic acid and there are no clinically significant interactions with folic acid intakes up to 1,000 µg/day and therapeutic medicines.

The results of more recent studies on the incidence of all cancers and cancer of the prostate, breast and colorectum do not alter the conclusion reached in earlier reviews (SACN, 2004; SACN, 2005; Sanjoaquin *et al*., 2005e) that there is no apparent increase in risk associated with higher folic acid intakes for the population as a whole. Many of the studies suggest that some reduction in cancer risk might occur, however, most of these are observational and so might be affected by uncontrolled confounding factors.

Despite these conclusions indicating minimal or no risk, 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 at a level of 135 µg of folic acid per 100 g of bread will result in an estimated mean increase in folic acid intake in the target population (women aged 16-44 years) of 101 µg and 140 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 an estimated 4-14% in Australia and 5-20% in New Zealand.

As just 4% 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 the 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 and where raised in submissions or targeted consultations.

9.1 Technical and industry issues for mandatory fortification

9.1.1 Bread production in Australia and New Zealand

In Australia in 2000-2001, there were around 7,000 establishments involved in baking bread and bread products commercially. Based on industry estimates, New Zealand has eight major bakery companies with 19 plant bakeries, and between 2,000-3,000 small bakeries.[28]

The bread baking sector can be categorised into four groups: the corporate plant bakeries, independent bakeries and hot bread shops, franchised hot bread shops, and supermarket in-store bakeries[29]. The market share of these groups is presented in Figures 2 and 3 below.

Corporate plant bakeries account for the majority of bread production, and produce bread for wholesale distribution. Two national bakery companies, Goodman Fielder and George Weston Foods account for 90% of the plant bakery production in Australia, and between 80-85% of the plant bakery production in New Zealand. Supermarket in-store bakeries, traditional and franchised bakeries and hot-bread shops have on-site bread manufacturing and retailing, and represent a growing sector in the bread industry, with franchised hot bread shops representing the fastest growing sector of the Australian baking industry.

[28] Access Economics, report for FSANZ, Attachment 11.
[29] The Australian Baking Industry: A Profile, DAFF 2003; personal communication NZ Association of Bakers 2006.

Figure 2: Australian Bread sector Market Share[30]

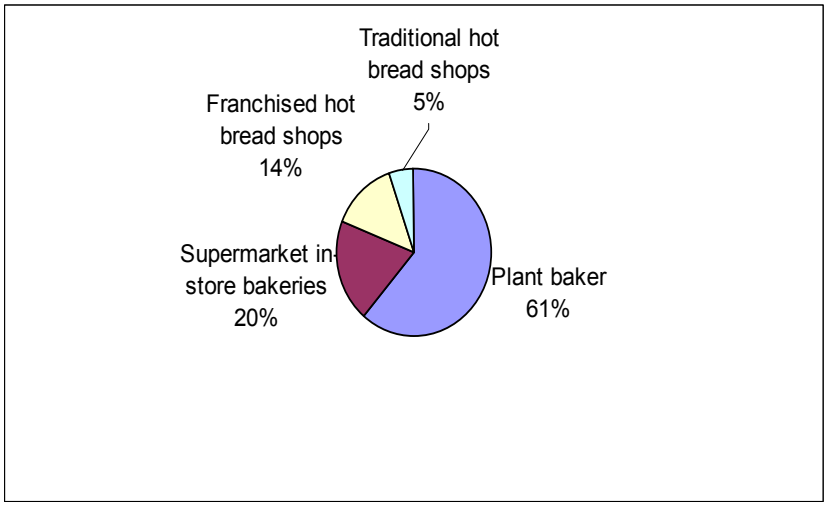
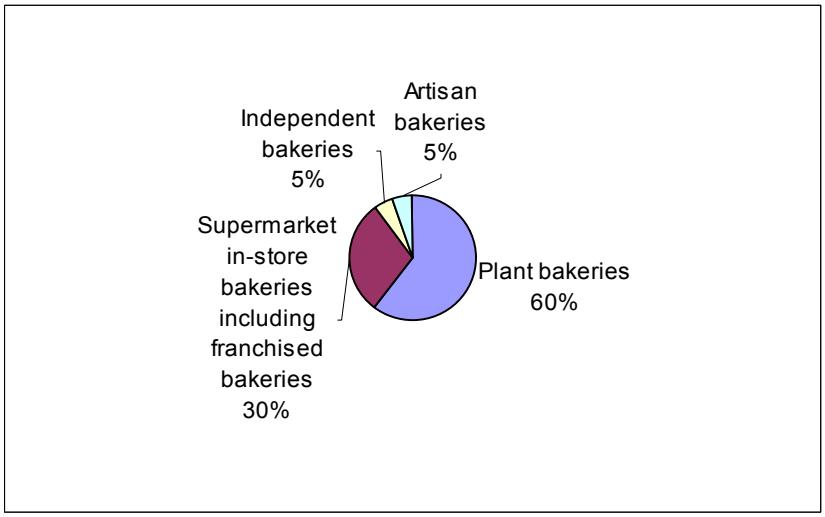


Figure 3: New Zealand Baking Sector Market Share[31]



Bread is produced using one of the following three general methods:

- 'from scratch' baking, where individual ingredients are weighed out and assembled for each batch of bread dough;
- premixes[32], to which flour, water, yeast and salt are usually added.
- frozen dough, where dough produced at a bakery site is on sold in a frozen state, for subsequent proving and baking by the purchaser.

Plant bakeries and a small proportion of independent bakeries, particularly artisan bakeries, characteristically produce bread 'from scratch'. Premixes of bread ingredients are widely used by in-store supermarket bakeries, hot bread shops, and some independent bakeries and franchised hot bread shops.

[30] Brooke-Taylor & Co Pty Ltd, Report prepared for FSANZ, Attachment 10 Appendix 1.
[31] Brooke-Taylor & Co Pty Ltd, Report prepared for FSANZ, Attachment 10 Appendix 1.
[32] Premixes are purchased blends of some, or all, of the dry minor and micro ingredients of bread, such as raising agents, processing aids, additives and ingredients, possibly including bread improvers used for bread, cakes and biscuits prior to developing the dough.

Frozen dough is used in some in-store supermarkets, and is widely used in fast food outlets providing bread 'baked on the premises'.

9.1.2 Bread and bread products

Apart from bread loaves, the bread sector produces a range of products, which include English muffins, rolls and buns, specialty bread, flat bread and breadcrumbs. It is therefore important to ensure that the bakery products required to be fortified under a mandatory fortification standard are clearly differentiated.

Bread is defined in Standard 2.1.1 – Cereals and Cereal Products of the Code as:

> *the product made by baking a yeast-leavened dough prepared from one or more cereal flours or meals and water.*

This definition therefore includes the following products: bread and bread rolls, sweet buns, fruit bread, English muffins, bagels, yeast leavened flat breads and breadcrumbs.

FSANZ will prepare an Implementation Guide to assist industry in complying with the mandatory standard. This will include guidance on identifying products which will be required to be fortified with folic acid.

9.1.3 Bread fortification methods

The method of adding folic acid to bread to meet the mandatory fortification requirement will vary according to bakery production methods, and quality control systems in place. Possible points of addition are:

- flour fortified with folic acid;
- single dry bread ingredient such as a bread improver[33] fortified with folic acid;
- complete premix of dry minor and micro ingredients which has been fortified with folic acid; or
- folic acid vitamin premix which is added to the dough with other dry minor and micro ingredients.

Both bread improvers and premixes are added to the bread ingredients on a weight basis in a batch system, and present a precise means of achieving fortification of bread with folic acid. Similarly, the use of a specific folic acid vitamin premix where the amount of folic acid is matched on a weight basis to the bread produced will also give a high degree of precision in fortification[34]. However, in bakeries where the level of improver or premix used varies from the manufacturer's recommendation, there may not be a consistent fortification level in bread production. The widespread use of bread improvers and premixes in the baking industry provides a controlled method of folic acid fortification for independent and in-store bakeries.

[33] Bread improvers are combinations of ingredients, such as enzymes, emulsifiers and antioxidants that are added to dough to modify its characteristics and those of the bread in order to improve keeping quality, texture and flavour.
[34] Brooke-Taylor & Co Pty Ltd, Report prepared for FSANZ, Attachment 10 Appendix 1

9.1.4 Range of addition

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). The Australian milling industry have also indicated that over-fortification of thiamin estimated at 100% or greater, which is mandatorily added to bread-making flour in Australia, may occur during flour milling[35]. The usual practice of 'overages', suggests that applying a range rather than setting a minimum will reduce the likelihood of greater than desired levels of fortification.

9.1.5 Baking industry capacity for mandatory folic acid fortification

Because of the variation in bakery sizes, production methods and technical expertise available, individual bread manufacturers will make decisions as to the most suitable and cost effective method of folic acid fortification for their particular bread production site.

Plant bakeries, in-store supermarket bakeries and bread franchises will have access to technical support staff with the necessary expertise for decisions relating to achieving the best method of addition of folic acid to their bread products, and the correct level of folic acid. Independent bakeries, however, may not have access to technical support in the addition of folic acid. Folic acid fortification may present a particular challenge to artisan bakers who do not use premixed ingredients or emulsifiers. These groups may require support from the baking industry associations in determining the best method of folic acid fortification for their bread products.

Analytical testing and other methods of verification may be required to confirm the consistent and correct levels of fortificant in the bread. This may have cost implications for bread manufacturers, and is discussed in Section 11.2.2.

There are three, with two being owned by the same company, principal manufacturers of premixes for bakers in Australia and New Zealand, and at least one of these manufacturers have indicated the folic acid fortification of bread premix and bread improvers will not present any particular difficulty.

9.1.6 Domestic and export bread production

In Australia and New Zealand, bread is manufactured domestically to meet local market demands, and little bread is imported into either country. Australian figures from 2001-02[36] show sales from exports of bread products account for less than one percent of turnover in bread manufacturing, however there is a growing export market for frozen doughs and par-baked products for both Australia and New Zealand. The value of sales to meet Japanese Subway frozen dough exports has been estimated at NZ $12M per annum[37]. The addition of folic acid to bread at the bakery level has the advantage of flexibility for bakers in avoiding fortification of products for export.

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[35] Brooke-Taylor & Co Pty Ltd, Report prepared for FSANZ, Attachment 10 Appendix 1.
[36] Bread Research Institute Report on Australian Baking Industry, 2003
[37] Brooke-Taylor & Co Pty Ltd, Report prepared for FSANZ, Attachment 10 Appendix 1

9.1.7 Issues for speciality bakers and bread manufacturers

Mandatory folic acid fortification may be an issue for bakeries producing artisan breads using only 'natural ingredients', and for organic bread manufacturers. Artisan bakers may consider the fortification of their products will not fit with their niche market, and could be seen as detrimental to 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.

Submitters from the organic production sector felt that mandatory folic acid fortification was incompatible with organic food production systems, which did not currently allow organic products to be fortified. A number of submitters asked that organic bread and flour be exempt from mandatory folic acid fortification. A few consumer and industry submitters also considered that folic acid would not be classified as a natural ingredient, and therefore breads could not be labelled as containing all 'natural ingredients'. This issue is discussed further at Section 13.3.2.

9.1.8 Labelling

All packaged bread will be required to list folic acid as an ingredient on the label of the bread. Additionally, folic acid will be required to be listed if it is present as part of a compound ingredient[38] making up more than 5% of the final food.

Labelling for the presence of folic acid will necessitate labelling modifications and as a result incur costs for manufacturers. Labelling was raised as an issue in industry submissions, who noted the time and costs involved in making labelling changes. Some industry submitters requested an extended transition time in order to change over packaging in a coordinated manner with other pending changes to the Code such as Proposal P230 - Consideration of Mandatory Fortification with Iodine, and Proposal P293 - Health, Nutrition and Related Claims.

9.1.9 Product liability and indemnity issues

9.1.9.1 Product Liability under VA of the Trade Practices Act 1974 ('TPA')

Industry submitters raised concerns about the potential product liability exposure for bread and/or flour manufacturers under Part VA of the *Trade Practices Act 1974* (TPA). For example one submitter has expressed concern as follows:

> *……that in relation to the possible health risks (especially in the longer term) FSANZ's proposal may entail, FSANZ is applying a different risk management (i.e. safety) standard to that which industry proposals are required to satisfy. When combined with the fact that FSANZ's proposal will not deliver any protection to manufacturers from long term product liability claims, this is particularly worrying.*

FSANZ has sought advice from the Australian Government Solicitor (AGS) on this issue and was advised that manufacturers are protected from liability where they have complied with a mandatory standard as defined in the TPA.

[38] 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.

It was further advised that where a standard is expressed as a minimum this is not considered to be a mandatory standard for the purposes of the TPA. Currently the Code sets minimum standards for the mandatory fortification of bread-making flour with thiamin and edible oils with vitamin D. FSANZ will be reviewing these standards in the future and will consider this issue at this time.

Alternatively, where a standard requires a range food X must contain between Y mg/kg and Z mg/kg of a vitamin, this may be a mandatory standard. In relation to this example it would turn upon the evidence as to why a range, rather than an absolute value was not possible. In the context of fortification, industry has indicated that the application of an absolute value is not achievable. This is further supported by the US experience previously discussed (see section 9.1.4) where use of 'overages' routinely occurs. The current drafting for folic acid requires bread to contain no less than 0.8 mg/kg and no more than 1.8 mg/kg of folic acid. Consequently, it is arguable that prescribing a range would be considered a mandatory standard within the meaning of the TPA. However, ultimately this would depend on how the Courts viewed the evidence submitted.

9.1.9.2 Other areas of potential liability

Industry also raised other areas of potential liability stating:

> *Even if we did have a defence in relation to an action under the product liability provisions contained in Part VA of the TPA, or subordinate legislation were passed by the Federal Government to deem a mandatory requirement under the Food Standards Code to fortify bread-making flour with folate to be a Mandatory Standard for the purposes of s75AA of the TPA, this would not prevent a successful action against the manufacturer:*
>
> *(i) under Division 2A of Part V of the TPA alleging that the goods were not of merchantable quality or fit for purpose; and/or*
> *(ii) for negligence (on the basis that given what was known at the time, the risk of injury/harm to some members of the public was reasonably foreseeable).*

Ultimately, whether an action is successful under Division 2A of Part V of the TPA and/or for negligence is a matter for the Courts. FSANZ cannot pre-empt any Court decision and notes that certain legal elements would need to be proven. This would be based on submissions made to the Court, together with, any evidence used to support those submissions.

9.1.9.3 Options to address liability issues

There has been a suggestion that FSANZ should seek agreement to have the TPA amended to deem the Code a 'mandatory standard' for the purposes of Part VA of the TPA.

To deem the Code a 'mandatory standard' under Part VA of the TPA would not be workable because not all standards in the Code contain 'mandatory' requirements.

Furthermore, the TPA is administered by the Department of Treasury and the Australian Consumer and Competition Commission (ACCC). A decision to amend the TPA ultimately rests with those agencies.

Also, any overarching government policy as it relates to these agencies would have to be considered as well as any possible inconsistency within the context of an agreement to amend the TPA.

9.1.9.4 Government to provide indemnity

Another two submitters requested that the Government issue an indemnity for incidences that may arise due to any adverse effects of folic acid fortification on consumers. The Australian Government as a matter of policy does not issue indemnities. In addition, the Australian Government does not issue indemnities to third parties dealing with statutory agencies covered under the *Commonwealth Authorities and Companies Act 1997* (CAC Act). FSANZ is a CAC Act body and as such, is not a Commonwealth body for legal and financial purposes.

9.2 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 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.

However, a number of submitters asserted that mandatory folic acid fortification was inconsistent with the Specific Order Policy Principles. Whilst acknowledging the severity of NTDs, they felt the low prevalence did not justify the population wide approach of mandatory fortification. Other submitters stated that mandatory fortification was not the most effective public health strategy to prevent NTDs, and did not deliver sufficient folic acid to the target group, citing folic acid supplementation as a more effective means of NTD reduction.

Some submitters were also concerned that mandatory fortification had potential for detrimental excessive intake of folic acid, and that this needed more consideration by FSANZ.

As stated above, advice from the Ministerial Council is that mandatory fortification with folic acid is an effective strategy. This advice was based on an Expert Panel convened by AHMAC[39] which reported that mandatory fortification fulfilled their criteria[40] of effectiveness, equity, efficiency, certainty, feasibility and sustainability required for an effective public health strategy. They concluded that in considering strategies to increase folate intake *mandatory fortification represents the most effective public health strategy where safety can be assured and there is a demonstrated need*. It is on this basis that FSANZ has undertaken this assessment which is consistent with recently revised Ministerial policy guidance (at Attachment 3) which states that:

> *The Australian Health Ministers Advisory Council, or with respect to a specific New Zealand health issue, an appropriate alternative body, be asked to provide advice to the Australia and New Zealand Food Regulation Ministerial Council with respect to Specific Order Policy Principles 1 and 2, prior to requesting that Food Standards Australia New Zealand raise a proposal to consider mandatory fortification.*

9.2.1 Consistency with Australia and New Zealand national nutrition guidelines

Both the Australian and New Zealand dietary guidelines[41] for all age groups promote eating plenty of cereals including breads with particular emphasis on wholegrain varieties. Therefore, the selection of a broad range of breads as the preferred food vehicle is consistent with, and supports, the current nutrition guidelines and healthy eating messages.

9.2.2 Safety and effectiveness

On the available evidence assessed in this proposal, including overseas experience with mandatory fortification, FSANZ has concluded that the proposed level of fortification does not pose a risk to public health and safety. The level of fortification has been set to minimise any potential health risks as a degree of uncertainty does exist, particularly for the non-target population, from increased folic acid intakes over the longer term. FSANZ recognises that mandatory fortification is one strategy in NTD prevention, and that other strategies for reducing the incidence of NTDs will continue to be important. These strategies include voluntary fortification, folic acid supplement use and education for women of child-bearing age

9.2.3 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

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[39] *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.

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

[41] 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.

9.3 Consumer issues

Mandatory fortification of bread 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 more general literature review regarding the factors that influence health-related attitudes to food.

9.3.1 Choice and availability of non-fortified products

A range of socio-demographic variables influence health-related attitudes to food, for example age (Kearney *et al*., 1997; Worsley and Skrzypiec, 1998; Childs and Poryzees, 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 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 folic acid fortification with the results expected to be available in September 2006 (UKFSA, 2006).

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.

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 importance of consumer choice was raised by a large number of submitters, many of whom opposed mandatory fortification because consumers had little option but to purchase fortified bread products. Some submitters did not feel that purchasing unfortified flour for bread-making provided sufficient consumer choice. The fortification of bread, rather than bread-making flour will however provide a degree of further consumer choice in that flour products which do not meet the definition of bread will not be subject to mandatory fortification.

Some consumers may be opposed to mandatory folic acid fortification, and may wish to purchase unfortified bread. Whilst all commercially manufactured bread will be required to be fortified with folic acid there will be some degree of consumer choice in that retail flours and bread-mixes will not be mandatorily fortified, and consumers will be able to purchase some non-fortified flat breads. Additionally, through the use of labelling, consumers will be informed where products have added folic acid[42].

9.3.2 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) although awareness does not necessarily lead to consumption of folic acid at the recommended time and dose (Watson *et al*., 2006b). Women with some experience with NTDs among relatives are 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).

9.3.3 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.

[42] 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 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 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 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 will provide enough folic acid. This was a concern of a number of submitters, who noted that women of child-bearing age will still require supplementation to reach recommended levels of folic acid at the proposed level of folic acid in bread. Submitters felt strongly that public health campaigns and advice from medical practitioners must 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 not eating bread. However there is little evidence that can be drawn upon to characterise these groups of women. A number of submitters also commented that it was not clear whether only wheat flour, or bread made from wheat, was to be fortified.

The dietary intake data indicate that bread is widely and regularly consumed by the target group. There is unlikely to be any substantial increase in the price of bread, and thus fortification will have insignificant financial impact.

Women whose diets do not normally include bread will not consume the recommended amount of folic acid through mandatory fortification and will require additional supplementation. This may include women who are intolerant to some cereals and therefore avoid wheat and other cereal flour based products. However, all breads using yeast are expected to be folic acid fortified, and therefore commercially produced yeast risen bread made from cereal flours other than wheat will contain folic acid. Women of ethnic and cultural groups who do not eat bread but other primary carbohydrate sources (e.g. rice) will also not receive the increase in folic acid through mandatory fortification. Home bakers that use unfortified retail flour for their home bread baking may also not receive the advantage of folic acid fortification. It will therefore be important that these groups are specific target audiences for the communication and education strategy on mandatory folic acid fortification (see section 17.3).

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

Consumers will be informed about the addition of folic acid to bread 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 choose products according to their preference.

Whilst all packaged bread will be required to list folic acid in the ingredient list, unpackaged bread is currently exempted from this requirement. In these instances, consumers can request information about the presence of specific ingredients in these foods. FSANZ will seek the assistance of retail bakeries in making this information available.

9.4 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.

9.4.1 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, 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 method of adding folic acid to bread will affect the accuracy of fortification, though both the addition of an improver or a premix containing folic acid during dough mixing are considered to be a more precise and flexible means of fortifying bread[43].

The current industry practice of 'overages' to account for losses of folic acid on processing, baking and storage is an additional concern with mandatory fortification. The practice of 'overages' when used under a mandatory fortification scenario may 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). As there is a potential risk for some population groups to exceed the UL of intake for folic acid, this risk will need to be managed when setting the level of fortification.

9.4.2 Voluntary fortification

Folic acid intake from current voluntary fortification permissions formed the baseline for the dietary modelling scenarios. In general, there has been limited uptake of voluntary permissions across the food categories, with the exception of breakfast cereals.

It is uncertain how the use of voluntary folic acid fortification permissions might change following the implementation of mandatory fortification.

[43] Brooke-Taylor & Co Pty Ltd, Report for FSANZ , August 2006 Attachment 10 Appendix 1

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 as defined in the Code, and not to other bread products such as pizza dough and some flat breads that do not meet this definition. However, current voluntary permissions allow cereal flours to be fortified with folic acid. This presents a situation where bread products that do not meet the definition of 'bread' in the Code may also be fortified with folic acid. These voluntary permissions also present the opportunity for food manufacturers to use folic acid fortified cereal flours in the production of foods that are consumed by subsets of the target population who do not eat traditional bread products. 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.

9.4.3 Folic acid supplement use

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)[44] 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-conceptional period, long term exposure to this level of folic acid is unlikely.

However, it is uncertain if some women of child-bearing age will 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-conceptional period is not necessary.

The level of use by children of supplements containing folic acid is unclear. Estimated folic acid intake for children shows that if mandatory fortification is introduced a proportion of children are likely to exceed the UL (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.

[44] In Australia, 800 µg folic acid supplements can be purchased by peri-conceptional 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.

9.5 Summary

A number of risks and issues affecting consumers and industry arising from mandatory folic acid fortification of bread 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 identification of fortified products; and
- the impact on the baking industry who will have to develop quality control systems for the addition of folic acid, and the impact on enforcement agencies who will have to develop manageable systems for establishing compliance in the baking industry.

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 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 Final 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 bread products

This Option requires all bread[45] to be fortified between 80-180 µg (on average 135 µg) of folic acid per 100 g of bread, a concentration that will reduce the rate of NTDs in Australia and New Zealand. Industry will be able to choose how to comply with this requirement. The options for industry include:

(a) adding folic acid to flour used in bread-making; or

(b) adding folic acid at a later stage of bread production, such as to the pre-mix, via improvers or to a vitamin pre-mix.

[45] Bread as defined in the Code – see Section 9.1.2.

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 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 Standard after gazettal. In addition, monitoring for the uncertainties is an important risk management aspect of this Option. Monitoring is discussed in more detail later in this Report. (see Section 18.1).

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

- Bakers and flour millers.
- Industry involved in bread production including pre mixing and baking.
- Specialist producers – e.g. organic, gluten free etc.

11.1.2 Consumers

- Women of child-bearing age i.e. target consumers.
- Other non-target consumers of bread.

11.1.3 Government

- Food standards enforcement agencies of New Zealand and Australian State and Territory Governments.
- Australian, State and Territories and the New Zealand Governments.

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 further cost analysis undertaken by Access Economics in August 2006, looked at the cost differences between the original proposal of fortifying bread-making flour, and allowing the fortification of bread during later stages of the production process.

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 the first Access Economics study.

The following information is based on the two Cost-Benefit Analyses prepared by Access Economics, which are provided in full at Attachments 11a and 11b.

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, productivity 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, 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 also include monitoring mandatory fortification, which were not included in the original Cost-Benefit Analysis have been included in the second analysis prepared by Access Economics.

11.2.2 The benefits

The benefits of the Proposal follow from fortification of folic acid in the final bread product. In the previous report a suitable concentration of folic acid in the final bread could be delivered by fortifying bread-making flour. In this report the option has been broadened to allow choice of how to fortify bread products with folic acid; industry may choose bread-making flour as the vehicle or industry may choose to add folic acid in later stages of the bread making process.

In each case the concentration in the final bread will be the same at an average of 135µg of folic acid per 100 grams of bread. Hence benefits of the Proposal remain as described in the previous report.

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
	µg folic acid				
Australia					
All bread-making flour	200	26.0	5.0	3.0	18.0
New Zealand					
All bread-making flour	200	7.9	1.3	1.3	5.2

Source: FSANZ modelling

The benefits for Australia and New Zealand include:

- 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;
- 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);
- 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.

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

Table 8: Summary of benefits of mandatory fortification for Australia and New Zealand

	Australia (A$)	New Zealand (NZ$)
Live born NTDs (excluding still births and terminations)		
Net value of burden of disease avoided	18,830,889	5,556,952
Health expenditure avoided	569,019	151,285
Avoided long term productivity loss	4,470,093	1,112,839
Other avoided costs	688,820	204,150
Efficiency loss avoided	534,760	93,613
Total benefits (excluding still births and terminations)	**25,093,582**	**7,118,839**

	Australia (A$)	New Zealand (NZ$)
All NTDs (including still births and terminations)		
Net value of burden of disease avoided	101,641,627	36,928,847
Health expenditure avoided	569,019	151,285
Avoided long term productivity loss	21,319,956	5,952,091
Other avoided costs	688,820	204,150
Efficiency loss avoided	1,484,250	285,248
Total benefits (including still births and terminations)	**125,703,672**	**43,521,621**

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 up to 2% per loaf. The price increase would occur because under mandatory regulatory measures all affected businesses typically pass on all or most costs that are incurred at some stage. The cost of reduced choice was not able to be quantified.

The costs to industry of mandatory fortification of all bread with folic acid are different under the two alternative methods for adding folic acid considered by Access Economics. These methods are adding folic acid to bread-making flour, and adding it during a later stage of bread production. Table 9 below sets out the costs under each alternative for industry and government in both Australia and New Zealand.

In the first year, industry in both Australia and New Zealand would incur 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. Industry advised very high costs of writing off existing stocks of labels, even with a twelve month transition period, that have been included in this analysis.

FSANZ has estimated the cost of equipment purchases under the fortification of flour option to be A$264,000. For the purposes of this calculation it was assumed that a folic acid feeder would be purchased by each of the eight largest Australian millers at a cost of A$33,000 per feeder. This was based on independent United States figures. The cost for the bread production fortification option, was estimated by Access Economics on the basis of information by New Zealand industry, at NZ$1,202,000.

We have assumed a cost of equipment in New Zealand under the fortification of bread option, using this same independent United States data, of NZ$80,000. An estimate has then also been included to cost the fact that other smaller producers may purchase equipment at lower cost. The upfront equipment cost for fortification of flour in New Zealand was calculated by Access Economics as NZ$1,470,000.

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.

The cost in the first year for industry under the fortification of bread flour option, is estimated at A$6,586,400 for Australia and NZ$2,385,620 for New Zealand. The upfront costs under the fortification of bread during the production stage, are less, at A$5,738,400 and NZ$996,063 for Australia and New Zealand respectively.

The upfront government costs, which include administration, enforcement and monitoring, are the same whether folic acid is added to flour or during bread production. The costs are estimated at A$1,273,000 for Australia and NZ$60,920 for New Zealand.

The ongoing costs for industry include the cost of maintenance of equipment, folic acid and premix, analytical testing to ensure compliance, administration and cleaning of mill. The cost figures for fortifying flour compared with fortifying bread during production vary considerably in some cases. Under the fortification of bread-making flour option the total ongoing industry costs per year for Australia are A$1,058,592, compared to A$24,486,067 for the fortification of bread option. In New Zealand these costs are NZ$2,377,738 for fortifying bread-making flour and NZ$4,149,593 for fortifying during bread production.

Access Economics took a conservative approach to calculating industry costs by accepting information provided by industry. These costs may be at the high end of a plausible range. FSANZ considers that the actual costs incurred by industry may be somewhat lower then the cost estimates in Table 9.

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). These ongoing, annual costs for government are assumed to be the same whether fortification occurs at in bread-making flour, or during the production of bread. Ongoing administration and enforcement costs for Australia are A$2,210,000 and NZ$88,500 for New Zealand. Monitoring costs have been listed separately and are higher for the second year following introduction of the mandatory fortification proposal. These costs are A$455,000 for Australia in the second year and NZ$485,000 for New Zealand. For all years after the second year, monitoring costs are A$355,000 for Australia and NZ$378,000 for New Zealand.

Table 9: Summary of costs of mandatory fortification

		Australia (A$)		New Zealand (NZ$)	
	Residual folic acid content per 100g of the final food	**Fortification of bread-making flour 200µg**	**Fortification of bread 135µg**	**Fortification of bread-making flour 200µg**	**Fortification of bread 135µg**
Industry - upfront	Labelling	2,486,400	2,486,400	275,620	436,063
	Packaging write off	4,000,000	2,050,000	640,000	500,000
	Equipment	264,000	1,202,000	1,470,000	80,000
Total industry upfront		*6,750,400*	*5,738,400*	*2,385,620*	*1,016,063*
Government – upfront	Administration and enforcement	1,223,000	1,223,000	7,920	7,920
	Monitoring	50,000	50,000	53,000	53,000
Total government upfront		*1,273,000*	*1,273,000*	*60,920*	*60,920*
Total upfront costs (industry and government)		**8,023,400**	**7,011,400**	**2,446,540**	**1,076,983**
Industry – ongoing (per year)	Maintenance	na	591,500	117,600	na
	Folic acid	112,000	-*	23,496	-*
	Premix	51,893	13,773,500	343,200	1,786,818
	Analytical testing	673,077	10,036,567	141,202	2,253,497
	Administration	186,883	84,500	11,200	109,278
	Clean out mill	34,739	0	1,741,040	0
Total industry ongoing (per year)		*1,058,592*	*24,486,067*	*2,377,738*	*4,149,593*
Government – ongoing (per year)	Administration and enforcement	2,210,000	2,210,000	88,500	88,500
	Monitoring – year 2	455,000	455,000	485,000	485,000
	Monitoring subsequent years	355,000	355,000	378,000	378,000
Total government- year 2		*2,665,000*	*2,665,000*	*573,500*	*573,500*
Total costs year 2		3,723,592	27,151,067	2,951,238	4,723,093
Total government – subsequent years (per year)		*2,565,000*	*2,565,000*	*466,500*	*466,500*
Total ongoing costs – years 3 onwards (industry and government) (per year)		**3,623,592**	**27,051,067**	**2,844,238**	**4,616,093**

* - This cost is included in the premix cost figures.
na – figures are not available.

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.

11.2.4 Net benefits

Table 10 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).

Table 10: Net benefits live NTD births

	Australia (A$)		New Zealand (NZ$)	
Residual folic acid content per 100g of the final food	**Fortification of bread-making flour 200µg**	**Fortification of bread 135µg**	**Fortification of bread-making flour 200µg**	**Fortification of bread 135µg**
Benefit	25,093,582	25,093,582	7,118,839	7,118,839
Total upfront costs	8,023,400	7,011,400	2,446,540	1,076,983
Net benefit upfront	**17,070,182**	**18,082,182**	**4,672,299**	**6,041,856**
Total costs year 2	3,723,592	27,151,067	2,951,238	4,723,093
Net benefit year 2	**21,369,990**	**-2,057,485**	**4,167,601**	**2,395,746**
Total ongoing costs - years 3 onwards (per year)	3,623,592	27,051,067	2,844,238	4,616,093
Net benefit ongoing – years 3 onwards (per year)	21,469,990	-1,957,485	4,274,601	2,502,746

Table 11 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 11: Net benefits all NTDs

	Australia (A$)		New Zealand (NZ$)	
Residual folic acid content per 100g of the final food	**Fortification of bread-making flour 200µg**	**Fortification of bread 135µg**	**Fortification of bread-making flour 200µg**	**Fortification of bread 135µg**
Benefit	125,703,672	125,703,672	43,521,621	43,521,621
Total upfront costs	8,023,400	7,011,400	2,446,540	1,076,983
Net benefit upfront	**117,680,272**	**118,692,272**	**41,075,081**	**42,444,638**
Total costs year 2	3,723,592	27,151,067	2,951,238	4,723,093
Net benefit year 2	**121,980,080**	**98,552,605**	**40,570,383**	**38,798,528**
Total ongoing costs - years 3 onwards (per year)	3,623,592	27,051,067	2,844,238	4,616,093
Net benefit ongoing – years 3 onwards (per year)	**122,080,080**	**98,652,605**	**40,677,383**	**38,905,528**

11.2.5 Key findings

Mandatory fortification of bread products with folic acid delivers benefits that definitively exceed the costs.

Considering all NTDs that are avoided by mandatory fortification, substantial net-benefits are achieved in Australia and New Zealand whether fortification occurs through the bread-making flour or at a later stage of bread production.

Considering only the live born NTDs that are avoided, net-benefits are achieved in New Zealand and for fortification of flour in Australia. However net-costs would occur in the case where folic acid is added to the later stages of bread production in Australia. In this case Australian industry can choose the least cost option of fortifying bread-making flour.

The specific key findings from the impact analysis are:

- in Australia, in the case of live NTDs when folic acid is added at the later stages of bread production, the overall impact would be a net-cost of $2 million each year ongoing. However when all NTDs avoided are included in the analysis, the overall impact would be a net-benefit of $99 million each year ongoing;

- in Australia, in the case of live NTDs when folic acid is added to bread making flour, the overall impact would be a net-benefit of $21 million each year ongoing. When all NTDs avoided are considered, the net-benefit increases to $122 million each year ongoing;

- in New Zealand, in the case of live NTDs when folic acid is added at the later stages of bread production, the overall impact would be a net-benefit of $2.5 million each year ongoing. When all NTDs avoided are included, the net-benefits increase to $39 million each year ongoing; and

- in New Zealand, in the case of live NTDs when folic acid is added to bread making flour, the overall impact would be a net-benefit of $4.3 million each year ongoing. When all NTDs avoided are included, the net-benefits increase to $41 million each year ongoing.

12. Comparison of Options

The Options being put forward by this Proposal are Option 1, the maintenance of the *status quo,* and Option 2, mandatory fortification of bread on average at the level of 135 μg folic acid per 100 g bread.

The cost benefit analysis undertaken by Access Economics clearly indicates that Option 2 with mandatory fortification of bread delivers substantial net-benefits to Australia and New Zealand compared with the status quo. Option 2 allows industry the choice of method of fortifying bread with folic acid, including adding folic acid to bread via the bread-making flour, in a pre mix, through the use of an improver or via a vitamin pre mix. Hence industry will be able to choose the most efficient and cost effective method to meet this mandatory fortification requirement.

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

Strategies to manage risks associated with the safety and effectiveness of mandatory fortification (see section 9.4) 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 at a level of 135 µg folic acid per 100 g bread was determined by the dietary intake assessment to achieve effective and safe fortification of the food supply with folic acid.

The fortification level of 135 µg folic acid per 100 g of bread represents the amount of folic acid that is required in the final food, i.e. bread. As previously noted in Section 6.1.2.2, average losses of folic acid during the bread-baking process are 25% but may be as high as 40%. There appears to be no other significant losses of folic acid during processing or storage. Consequently, as the folic acid is to be added during the bread production process, folic acid losses on baking will need to be accounted for by the bread manufacturer and/or the manufacturer of the fortified premix or improver in order to achieve the required level of fortification in the final product. Bread ingredient manufacturers are able to add folic acid to improvers, premixes and folic acid vitamin premixes in precise amounts, and thereby provide a known level of folic acid fortification.

The food standard is drafted on the basis of final bread weight and therefore will mean that bakers are able to choose the most appropriate means of adding folic acid to bread for their plant and operating practices. The essential criteria is that bakers use the appropriate amount of premix, or improver, or folic acid fortified flour, in all relevant batches of bread dough.[46]

Due to the industry's usual practice of adding vitamins and minerals in amounts in excess of a fortification level (i.e. overage), such as the experience in the United States and with thiamin, there is concern that a higher than desired level of folic acid 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.

Therefore, the proposed prescribed range for mandatory folic acid fortification is 80-180 µg of folic acid per 100 g bread. This range allows for a ±35% accuracy of fortification during the bread production process rounded to the nearest 10 µg/100 g (0.1 mg/kg).

[46] Brooke-Taylor & Co Pty Ltd, Report prepared for FSANZ, Attachment 10, Appendix 1

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.

Concerns were raised by submitters at the lack of certainty over the future status of voluntary permissions. Submitters noted the contribution voluntary permissions made to folic acid intakes in the general population, especially children, and some suggested the permission for fortifying breakfast cereals targeting children should be reviewed. Other submitters suggested that the use of existing and further voluntary permissions provided a means of increasing the folic acid intake of women whose diet does not traditionally include bread, or who omitted bread because of food intolerances. Suitable products suggested for further fortification included corn flour and rice.

To provide more regulatory certainty, different options could be considered. Voluntary permissions in some foods, could be made mandatory, levels of folic acid in voluntary permissions could be adjusted, and other permissions that currently have little uptake by industry or significant consumption by non-target groups such as children, could be 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 permissions[47], 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 discuss with industry use of current voluntary fortification permissions and to monitor changes in the use of voluntary fortification permissions to determine if additional regulatory responses are necessary. This is particularly pertinent with regard to the folic acid intake of children. A possible future mechanism for lowering the folic acid intake of children is through reduction in the level of voluntary fortification in foods commonly consumed by children, or removal of permissions. FSANZ 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 voluntary permission will be redundant with the proposal to mandate folic acid fortification of bread.

[47] 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.

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.

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. The implications of mandatory fortification on the current New Zealand recommendation for peri-conceptional folic acid supplement were raised in the Draft Assessment Report. FSANZ noted that 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 Food Safety Authority reported in their submission that they are currently engaged in discussions with the New Zealand Ministry of Health and Medsafe[48], with regard to providing a lower dosage folic acid supplement manufactured to a prescription medicine standard.

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 minerals[49]. FSANZ intends to raise this matter with the respective agencies responsible for providing guidance on supplement use.

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 with folic acid there will be few options for the consumption of unfortified bread products. On the limited evidence available, FSANZ has been unable to identify the extent to which this will be of continuing concern to Australian and New Zealand consumers. The lack of consumer choice posed by mandatory fortification was, however, raised by many submitters, many of whom considered the ability of consumers to make a choice should be maintained. However other submitters acknowledged that provision of consumer choice does not fit the principle of mandatory fortification and that other public health strategies such as seat belt wearing are implemented at the expense of consumer choice.

The views of stakeholders were specifically sought at Draft Assessment as to whether, and how, additional options for consumer choice could be accommodated within the preferred mandatory fortification option. Organic industry groups and some consumers supported an exemption for organic products.

[48] Medsafe – New Zealand Medicines and Medical Devices Safety Authority.
[49] NZMoH (1997).

The Australian and New Zealand industry, and the New Zealand Food Safety Authority, put forward alternative proposals aimed at providing consumer choice through the targeted fortification of products consumed by the target group, rather than mandatory fortification of all bread. The alternative proposals were considered and are discussed in Section 6.9, but did not result in as high a proportion of the target population increasing their folic acid intake as the proposed FSANZ option of fortifying all bread.

The fortification of bread does provide for some consumer choice as flour products which do not meet the definition of bread as defined in the Code will not be required to be fortified with folic acid. Some unfortified products such as unleavened flat breads, hot plate products such as crumpets and pikelets, pizza bases, and retail flours will provide consumers with other options.

FSANZ also intends to monitor the level of consumer awareness and understanding of folic acid fortification as part of the bi-national monitoring systems to track the impact of regulatory decisions on mandatory and voluntary fortification (Attachment 12).

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.

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*.

A number of submitters asked that folic acid be required to be listed on the Nutrition Information Panel (NIP) label in order that women could calculate their daily intake of folic acid to allow for more informed choice. Some submitters also recommended that labelling reflect Nutrient Reference Values (NRVs) and that dietary folate equivalent (DFEs) nomenclature be used.

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.

The incorporation of NRVs and dietary folate equivalents into the Code will be managed as part of a separate review by FSANZ at a future date.

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 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 (Standard 1.2.7 – Nutrition, Health and Related Claims) is currently being drafted under Proposal P293 - Nutrition, Health and Related Claims. The Standard will permit a wider range of claims in the future, including a revised folate-NTD health claim. Transitional Standard 1.1A.2 will cease two years after the gazettal of Standard 1.2.7.

Submitters to the Draft Assessment Report raised several issues in relation to the ability of bread manufacturers to make health claims under provisions proposed by Proposal P293. Some submitters stated that the disqualifying criteria proposed under draft Standard 1.2.7 would preclude many existing breads from making a health claim in its present form. Several submitters also noted that the health claim under Transitional Standard 1.1A.2 applied to listed brands of bread, not to breads generally. The issue of a health claim in relation to NTD reduction and folic acid levels in mandatorily fortified bread has been recognised in the development process of Standard 1.2.7. Disqualifying criteria are being reviewed in order to prevent future anomalies and will be discussed in a Preliminary Final Assessment Report. This report will be released for public consultation in the near future.

FSANZ is proposing to include a consequential amendment to the Code (Attachment 1) to delete the listed brands of bread in the Table to subclause 3(e) in Transitional Standard 1.1A.2 and include a general permission for bread.

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 Zealand[50]. FSANZ is in discussions with the Australian Competition and Consumer Commission and the New Zealand Commerce Commission; to clarify the status of folic acid fortified foods and the use of descriptors such as 'natural food', and 'organic foods' with regards to fair trading labelling requirements.

A number of submitters requested that organic bread and flour be exempt from mandatory fortification. However, there are no agreed criteria for considering a food as organic in Australia or New Zealand at the present time. Therefore a reference to organic foods within the Code would not be enforceable. This issue has implications for the whole of industry and government and it is not feasible to address this within the proposed mandatory food standard. Organic standards bodies have been informed of this issue.

COMMUNICATION AND CONSULTATION

14. Communication and Education Strategy

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 mandatory folic acid fortification and its implementation. Target audiences, communication objectives, key messages and planned activity are detailed in the strategy. The strategy is informed by consumer research, targeted consultations with key stakeholder groups, and issues arising from submissions to FSANZ in response to the Draft Assessment Report. This strategy will particularly focus on developing resource materials and information to assist industry to understand and comply with the new mandatory fortification requirement. Section 17.2 provides further information about the strategy.

15. Consultation

15.1 Initial Assessment

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.

Submitters' views were mixed in relation to a preferred regulatory option. In general, government submitters and organisations and individuals with a direct interest in NTDs supported mandatory fortification. Industry submitters primarily supported extension of voluntary fortification permissions in conjunction with increased health promotion and education strategies to increase folate intakes.

[50] *Trade Practices Act 1974*, State and Territory Fair Trading legislation and *Fair Trading Act 1986*.

15.2 Draft Assessment

There was support from most government and some public health submitters for mandatory fortification, with the importance of having a national monitoring and surveillance system in place prior to implementation highlighted by many submitters. Public health and consumer submitters expressed a range of views both for and against the proposed approach. Submitters raised concerns about lack of consumer choice, possible health risks and future unknown health risks, particularly for children, and the effectiveness of mandatory fortification in reducing NTDs (based on the proposed fortification level) was not sufficient to justify population wide consumption of folic acid.

Industry submitters were opposed to mandatory fortification proposal and expressed concerns about the high degree of impost and technical difficulties in being able to fortify bread-making flour within the required parameters. Industry primarily supported the extension of voluntary fortification permissions in conjunction with increased education and promotion strategies to increase folate intakes.

Key issues raised in submissions have been addressed in this Final Assessment Report where possible and include:

- the choice of food vehicle for fortification, including technical issues for industry fortifying the proposed food vehicle to the required level, and alternative proposals;
- potential health risks associated with an increased folic acid intake particularly long term effects for the non-target population;
- the lack of consumer choice associated with mandatory fortification;
- the cost and resulting impact on industry;
- the requirement for monitoring and surveillance;
- the perceived inconsistency 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.

15.3 Targeted consultation process

During the public consultation period and afterwards, FSANZ also initiated a process of intensive targeted consultation to discuss the key issues and impacts of mandatory fortification.

Issues identified from submissions formed the basis of further targeted consultation with key stakeholder groups, particularly the milling and baking industries. This included FSANZ commissioning an independent consultant, Brooke-Taylor & Co Pty Ltd to consult in Australia and New Zealand regarding the technical capabilities of industry and possible alternative options to flour for fortifying bread.

Key stakeholder groups consulted were the Australian and New Zealand baking and milling industries, the Australian, State and Territory, and New Zealand governments, consumer and public health organisations. Key stakeholder groups consulted were the baking and milling industry, jurisdictions, consumer and public health organisations.

Industry consultations included leading milling and bread manufacturers, milling, baking and bread ingredient manufacturers, Australian and New Zealand peak industry bodies, national and regional baking associations and societies, and organic food associations. Consultations have involved face-to-face meetings, teleconferences, information updates and email correspondence.

Information received has informed FSANZ's process for reviewing and selecting the food vehicle, identification and investigation of risk management issues, further cost-benefit analysis, recommendations for implementation, and the monitoring requirements for mandatory fortification.

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

As part of this targeted consultation process, FSANZ has engaged the 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.

To ensure a consumer perspective on the proposed standard, FSANZ has also undertaken consultation with the FSANZ Consumer Liaison Committee, a group formed to provide a consumers' perspective with members drawn from both Australia and New Zealand.

Given the increased incidence of NTDs among Indigenous population in some regions of Australia, FSANZ has made contact with 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 (Kahui Kounga Kai) have been involved in the consultation process.

15.4 Outcomes from targeted consultations

As indicated above, FSANZ undertook further intensive targeted consultation with key stakeholder groups particularly to gauge their views on the refined approach at Final Assessment. This consultation included public health and consumer organisations, Australian and New Zealand baking and milling industries, the supermarket chains with in-house bakeries, the Australian, State and Territory, and New Zealand governments, consumer and public health organisations.

Australian industry has maintained their opposition to mandatory folic acid fortification and support voluntary fortification of a selected range of branded products in association with education which industry offered to support. New Zealand industry, while opposing mandatory fortification, has suggested that if mandatory fortification were to go ahead, consideration should be given to exempting one or more classes of bread to allow for consumer choice.

In regards to the refined approach, industry has expressed concerns about costs, compliance, enforcement and transitional timeframes. There are concerns about the capacity of the baking industry, particularly with respect to small business bakeries, to meet the required standard.

The supermarket chains prefer the standard to be based on levels of folic acid in bread-making flour. They have argued that if the standard is to change to require folic acid in bread, then a longer transition period will be required to allow time for discussions with suppliers about whether folic acid will be added to flour or into a premix; to conduct recipe testing; and to undertake staff training.

The small bakers represented by the Australian and New Zealand Baking Industry Association (ANZBAKE) stated their position was that reductions in NTDs should be achieved through the provision of free (possibly mandatory) supplements for young women and that they were opposed to mandatory fortification. However, if it was introduced, a longer transition period would be required for similar reasons to those outlined by in-store bakers.

A number of public health and consumer groups in support of the approach at Draft Assessment expressed concern with the proposed move away from fortification of bread-making flour. In particular there was concern that the fortification of bread presented greater compliance and enforcement issues than fortification of flour. Other public health and consumer groups oppose mandatory fortification or support on condition that effective monitoring and review occurs. Monitoring is considered a essential component of mandatory fortification by all stakeholder groups.

15.5 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 bread with folic acid is unlikely to have a significant effect on international trade. This is because bread is principally produced for domestic markets. However, FSANZ recognised that a requirement to mandatory fortify a staple food such as bread may have trade implications that had not yet been identified.

Therefore, WTO member nations were notified of the proposed mandatory fortification regulations in accordance with the WTO Technical Barrier to Trade Agreement by both Australia and New Zealand. No responses to the notifications were received by FSANZ.

CONCLUSION

16. Conclusion and the decision

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 folic acid fortification of bread at a level of 135 µg / 100 g of bread can deliver definitive net-benefits to Australia and New Zealand.

In addition to mandatory fortification, 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 approves the draft variations to the Code for the following reasons:

- fortifying bread with folic acid, learns from and builds on international experience of mandatory fortification to reduce the incidence of NTDs;

- bread is an effective and technically feasible food vehicle for mandatory fortification;

- bread and bread products are staple foods consumed widely (more than 80%), consistently and regularly by the target population of women aged 16-44 years;

- fortification of bread will deliver a mean increase in folic acid intake in the target population of 101 µg and 140 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 mandatory fortification of bread with folic acid can deliver benefits that definitively exceed the costs:

    - in Australia, when folic acid is added to bread making flour, the net-benefit from all NTDs avoided is $122 million each year ongoing. In the case of live births the net-benefit is $21 million each year ongoing;
    - in Australia, when folic acid is added at the later stages of bread production, the net-benefit from all NTDs avoided is $99 million each year ongoing. In the case of live births there is a net-cost of $2 million each year ongoing;
    - in New Zealand, when folic acid is added to bread making flour, the net-benefit from all NTDs avoided is $41 million each year ongoing. In the case of live births the net-benefit is $4.3 million each year ongoing; and
    - in New Zealand, when folic acid is added at the later stages of bread production, the net-benefit from all NTDs avoided is $39 million each year ongoing. In the case of live births the net-benefit is $2.5 million each year ongoing.

- fortification of bread provides greater predictability in the level of folic acid consumed by the target and non-target groups and therefore greater confidence that the estimated reduction in NTDs will be achieved and that health risks to non-target groups will be minimised;

- fortification of bread provides flexibility for industry in determining the most appropriate and cost effective means of achieving mandatory fortification;

- the cost to consumers is likely to be less than 2% of the price of a loaf of bread;

- the fortification of bread does provide for some consumer choice through access to unleavened breads and unfortified flour; and

- it is consistent with Ministerial policy guidance on mandatory fortification;

Monitoring is 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. It is also an important risk management strategy for identifying potential adverse health effects resulting from mandatory fortification in the population as a whole.

The Australian Government Office of Regulation and Review considered the Final Assessment Report for this Proposal and advised in a letter dated 29 August 2006 that the report was compliant with the Council of Australian Government's regulatory best practice requirements.

17. Implementation and Review

17.1 Transitional Period

Upon approval by the FSANZ Board of the proposed draft variations to the Code as presented at Final Assessment, the Ministerial Council will be notified of that decision. Subject to any request from the Ministerial Council for a review, the proposed draft variation to the Code are expected to come into effect 15 months from gazettal.

At Draft Assessment, a 12 month transitional period was proposed. However consultation with industry indicated that a longer transitional time would assist industry in a number of ways. A longer period will allow time for bread manufacturers to make the required changes to manufacturing and labelling. In particular, manufacturers will have more time to determine the most suitable and cost effective method of fortification for their business, establish a supply of fortified ingredients e.g. fortified flour, pre-mixes etc, undertake personnel training and any necessary recipe testing and re-formulation. Additionally, extending the transitional time to 15 months will allow the requirements for mandatory folic acid fortification to most likely coincide with the commencement of mandatory iodine fortification, which is currently being considered as a separate proposal (Proposal P230). Allowing manufacturers the opportunity to meet both of these regulatory changes simultaneously, particularly labelling change, will provide some cost savings for industry.

As noted in the Editorial note to the draft standard, bread manufacturers may also take up the voluntary permission to add folic acid to bread continued in Standard 1.3.2 in preparation for the commencement of the mandatory requirement. Additionally, the transitional period will allow for consumers to be informed about the changes.

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. A proposed approach to monitoring is discussed below in Section 18.1. Extending the transitional period will allow sufficient time to collect baseline data as part of the monitoring system.

17.2 Regulatory compliance issues

The fortification of bread may present challenges in achieving regulatory compliance for bread manufacturers, particularly for small bakeries, and also for enforcement agencies with responsibility for ensuring bread manufacturers are compliant

FSANZ considers that enforcement at the retail level would be analogous to the enforcement of a number of other compositional standards contained within the Code, for example, the requirement for 25% meat content in meat pies, the 10% milk fat requirement in ice-cream and the 50 ml/L minimum fruit requirement in fruit drinks. Advice from one enforcement agency is that the enforcement burden could be reduced by the use of a paper audit trail (in the first instance) rather than food analysis, to demonstrate that the amount of folic acid added complied with the standard. Appropriate production records, maintained in a form consistent with normal food industry quality assurance procedures, could be used to demonstrate to food enforcement authorities that a correct amount of folic acid had been and was being added to each batch of bread.

FSANZ will be developing an industry implementation guide on the proposed Standard for dissemination through the baking industry professional and training associations in New Zealand and Australia. These professional organisations provide expertise and advice to the baking industry, including independent bakers, and have indicated they are the appropriate bodies to assist bakers deal with the issues arising from the requirement to fortify all bread with folic acid[51].

17.3 Communication and education strategy for the preferred regulatory option

FSANZ's communication and education strategy for mandatory folic acid fortification aims to increase awareness among all target audiences of the proposed standard and its implementation.

Optimal reduction in NTDs relies on implementation of a range of complementary strategies which are beyond FSANZ's regulatory role. Such complementary strategies include promotion of increased folate intakes in women of child-bearing age through education, voluntary fortification and supplement use. Some jurisdictions have already recognised the need for ongoing education and/or health promotion activity, and FSANZ supports these efforts.

[51] Personal communication, NZ Association of Bakers & ANZBAKE. August 2006.

The communication and education strategy identifies the following target audiences: consumers, particularly women of child-bearing age; industry, including manufacturers who currently have permissions to voluntarily fortify their product with folic acid, manufacturers who wish to obtain further permissions to voluntarily fortify their product with folic acid, manufacturers of bread who will be required to fortify, the suppliers of bakers such as millers, importers and exporters; health professionals, including those who provide consumer advice on dietary and nutrition issues; government agencies that are responsible for monitoring, enforcement and education; and the media. Subgroups of consumers may need additional advice, support and information, such as people from low socio-economic backgrounds, people from non-English speaking backgrounds, Indigenous Australians, Māori, Pacific People, Asian communities, refugee and ethnic minorities, and others within the community with particular dietary/nutritional needs, for example, people with coeliac disease.

All target audiences require clear, consistent, well-targeted messages about the proposed standard. FSANZ has developed key messages for the different target audiences, drawing on advice from key stakeholders and key themes arising from consultations and submissions. These messages will be delivered through a range of mechanisms, including print and electronic media.

To implement the strategy, FSANZ will seek opportunities to collaborate with organisations to provide information and education about the proposed standard to consumers, industry, health professionals and other key stakeholders. Several submitters have indicated their willingness to work with FSANZ on complementary strategies, and FSANZ has commenced a process to engage with those organisations. FSANZ believes that increasing public awareness of the proposed standard can be best achieved through sustained, collaborative efforts which maximise the effectiveness of available resources.

FSANZ will report on implementation of the communication and education strategy as part of monitoring the standard's implementation.

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 mandate 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 in order to deal with the uncertainties in the data and risk assessment. 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. It is intended that the review would be completed within five years from the date of implementation of a new standard.

At Draft Assessment, FSANZ provided information in relation to the components that could be considered in an overall monitoring framework for folic acid fortification.

However, 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, at Draft Assessment, FSANZ 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). In July 2006 FRSC endorsed the generic monitoring framework. 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, it was recognised that the monitoring system will need to include information on the cumulative impact of both sets of regulatory decisions on consumers.

FSANZ has recently been a participant on a FRSC coordinated expert group for determining a proposed monitoring program for folic acid. This expert group first met in July 2006 and used the proposed monitoring framework from Draft Assessment as a basis for beginning discussions on a monitoring program for folic acid. The expert group will meet again in September 2006 to progress the development of the monitoring system, with the expectation that a paper on the proposed monitoring system will be presented to the October meeting of the Australia New Zealand Food Regulation Ministerial Council (ANZFRMC).

A folic acid monitoring program will also fit into a broader national food and nutrition monitoring program, which has been discussed among various Government departments over recent years.

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 stillbirths 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 essential 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 this is a key part of the risk management strategy for managing the scientific uncertainties. 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 helpful 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 only globally been included in the cost-benefit analysis presented elsewhere (see Section 11.2) because the inter agency discussion on the elements (and hence specific 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.

18.2 Comments on monitoring in submissions

Numerous submissions were received in relation to the proposed monitoring program based on the Draft Assessment Report. There were a multitude of monitoring activities suggested in addition to data collection on the incidence of NTDs, including monitoring of the safety and effectiveness of the fortification program. Monitoring of food consumption data, supplement use, changes to the food supply and many aspects of health status were all noted. The need for monitoring in both Australia and New Zealand was raised.

Many submissions and comments from consultation stated that any fortification strategy must be accompanied by a well funded monitoring system, that includes the collection of baseline data and an ongoing monitoring program with recurrent funding allocated. Some stakeholders indicated support for mandatory fortification only if appropriate monitoring was in place prior to implementation The need to allocate responsibilities for different monitoring tasks was also noted.

The need for monitoring of thiamin fortification was also identified in a number of submissions. After the review of the Code (1998-2000), FSANZ made an undertaking to assess thiamin fortification in the future. The Ministerial Council has also requested this review. This monitoring would also be captured under any national food and nutrition monitoring programs.

18.2.1 Baseline data

Many submissions commented on the lack of baseline data and the need to collect baseline data to determine the current health and food related status in relation to folate prior to mandatory fortification being introduced. There are currently a lot of monitoring activities that could provide some baseline data. This includes monitoring activities conducted by FSANZ and activities conducted external to FSANZ. The baseline data FSANZ has collected and reviewed to date for this Proposal are outlined in detail in Attachments 7a and 7b to this report. FSANZ has also collated data on NTD rates, folate status and other health related data (e.g. vitamin B_{12} deficiency) across Australia and New Zealand. These data will provide some indicators of these issues at baseline.

Data were also been collated by FSANZ on other health related factors such as cancer rates and linkages with cardiovascular disease. Cancer rates are reported by the Australian Institute of Health and Welfare every year, and have been assessed by FSANZ. Therefore, baseline data are available prior to any implementation of mandatory fortification. However, it will always be difficult to attribute any changes in cancer trends specifically to the food supply being fortified with folic acid, as there are many factors that influence the development of cancer.

National Nutrition Surveys (NNSs) are sources of data on food consumption, nutrient levels in the food supply, nutrient intakes and in some cases, supplement intakes. NNSs already conducted will provide baseline data as an indication of these parameters at the time of the survey and prior to the implementation of mandatory fortification. NNSs, as part of an ongoing food and nutrition monitoring system would continue to provide data for monitoring purposes post fortification. A rolling NNS program has been implemented in New Zealand, and a proposed monitoring system is currently being considered in Australia with the new Australian Children's Nutrition and Physical Activity Survey which is proposed to be in the field in the first half of 2007.

FSANZ has collected folic acid concentration data for the food supply in recent years. This has been through such avenues as analysis and the collection of food label information. These data were used to compile the folic acid concentration databases for Australia and New Zealand which was used in the dietary modelling for this proposal. this database will be used to analyse results from the 2007 children's survey,

Attachments

1. Draft variation to Australia New Zealand food standards code
2. Summary of submissions from the draft 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

7a. Methodology and Results of Dietary Modelling at final assessment
7b. Methodology and Results of Dietary Modelling at draft assessment

8. Evaluation of health risk from mandatory folic acid fortification
9. Wald Model: NTD Risk according to increments of folic acid intake
10. Food Technology Report

11a. Fortification of bread with folic acid
11b. Cost benefit analysis of fortifying the food supply with folic acid

12. Development of a bi-national monitoring system to track the impact of regulatory decisions on mandatory and voluntary fortification

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Attachment 1

Draft variation to the A*ustralia New Zealand Food Standards Code*

To commence: on gazettal

[1] **Standard 1.1A.2** *of the Australia New Zealand Food Standards Code is varied by omitting from the* Table to subclause 3(e), *all of the entries under the heading,* Bread, *substituting –*

Bread

To commence: 15 months from gazettal

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

[2.1] *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. Standards contained elsewhere in this Code also regulate claims and the addition of vitamins and minerals to specific foods, such as, the addition of thiamin to flour for making bread (Australia only) and the addition of folic acid to 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, the addition of vitamins and minerals to special purpose foods standardised in Part 2.9 and the addition of iodine to certain salt products in Standard 2.10.2.

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

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

[3.1] *omitting the* Purpose, *substituting –*

This Standard defines a number of products composed of cereals, qualifies the use of the term 'bread', and requires the addition of thiamin to flour for making bread (Australia only) and the addition of folic acid to bread.

[3.2] *inserting after clause 5 –*

6 Mandatory addition of folic acid to bread

(1) Subclause 1(2) of Standard 1.1.1 does not apply to this clause.

(2) Bread must contain no less than 0.8 mg/kg and no more than 1.8 mg/kg of folic acid.

Editorial note:

The maximum limit for folic acid given in subclause 6(2) ensures the addition of folic acid to bread in Australia and New Zealand is in controlled amounts to provide for a safe population intake of dietary folic acid. Subclause 6(2) will be reviewed when sufficient monitoring data are available to assess the impact of this mandatory requirement.

Between gazettal and commencement of clause 6, manufacturers may take up the voluntary permission to add folic acid to bread contained in Standard 1.3.2, in preparation for the commencement of the mandatory requirement in subclause 6(2).

Attachment 2

Summary of Submissions from the Draft Assessment Report

Executive Summary

Background

In July 2006 FSANZ received 148 submissions in response to the Draft Assessment Report of Proposal P295 – *Consideration of Mandatory Fortification with Folic Acid*. There were two options proposed at Draft Assessment to increase the folic acid intake among women of childbearing age to reduce the incidence of neural tube defects (NTDs) in Australia and New Zealand, namely:

Option 1 – Maintaining the *status quo*;
Option 2 – Mandatory folic acid fortification of all bread-making flour;

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

Those in favour of maintaining the status quo expressed concern about a range of issues, including:

- the health risks from increased folic acid are not fully known;
- folic acid supplements will still be required;
- consumer choice is reduced;
- the proposal uses a population-wide approach for the benefit of a small sub-group of the population; and
- the impact on organic breads as the addition of synthetic substances is not permitted.

The low prevalence of NTDs and the reduction in NTD rates were also noted, as was the perception that the implementation of mandatory fortification was a foregone conclusion.

Opposed

Those against maintaining the s*tatus quo* noted the limited effectiveness of voluntary fortification, supplementation and health promotion. Some considered the preferred approach was a long overdue public health measure. It was acknowledged the current uptake of voluntary fortification by industry food is low and uptake of folic acid supplements is inadequate especially by those in lower socio-economic groups and Indigenous women.

It was noted that not all women respond to educational messages and the s*tatus quo* disadvantages women who have unplanned pregnancies. Some individuals and health professionals who had direct experience with NTDs acknowledged the trauma associated with terminating an NTD affected pregnancy.

1.2 Mandatory folate fortification

Support

Those in support of mandatory folic acid fortification recognised its capacity to reach a broad spectrum of the population, particularly disadvantaged population groups who may not respond to education and supplement promotion. The proposed approach was recognised as a safe and effective public health intervention that can reduce the incidence of NTDs, improve serum folate and lower homocysteine. Its success internationally in reducing NTDs was recognised. The potential for mandatory folic acid fortification to positively influence other health outcomes was mentioned frequently, although few references were provided apart from those included in the Draft Assessment Report. The limitations of voluntary fortification were acknowledged, particularly its susceptibility to market forces. The lack of widespread folic acid supplement use among the target group was also acknowledged, despite health promotion.

Against

A significant number of submissions were opposed to the mandatory fortification proposal but did not specify their preference for a regulatory option. Many submitters opposed the preferred mandatory approach because:

- the effectiveness in reducing NTDs based on the proposed fortification level was not considered sufficient justification for population wide consumption of folic acid;
- it did not provide sufficient consumer choice;
- it resulted in 'mass medication' of the population;
- the possible health risks and future health risks are unknown, especially for children and the elderly;
- there are technical difficulties and significant cost implications for industry fortifying the proposed food vehicle to the required level; and
- there is a need for further research and consideration before mandatory fortification is presented as the final option.

Alternative approaches (presented below as a separate issue) were suggested by a number of submitters, particularly industry and one jurisdiction. Many favoured extension of voluntary permissions (as this approach allows for consumer choice) combined with enhanced education, and increasing the level of folic acid permitted in foods (in keeping with the recently revised Nutrient Reference Values).

Many submitters stressed the need for a national monitoring and surveillance system to be in place prior to implementation.

Some submitters considered the proposed approach did not align with the Ministerial Council Policy Guidelines.

The assessment examining the effectiveness of current voluntary permissions was considered inadequate, given the limited data. The recent UK and Irish Food Standards Agency reports were noted as not being considered.

2. Choice of food vehicle for fortification

Those in support of mandatory fortification acknowledged the widespread consumption of bread (or products made from bread-making flour) among the population as a whole, including differing socio-economic groups and the Indigenous population.

Those against mandatory fortification questioned the choice of flour, particularly as a vehicle for women who were gluten intolerant or used alternative staples. Some considered that bread consumption was declining among young women, although there was little good quality data to support this notion. Some submitters noted that 20% of the target group did not consume bread and bread products.

Industry raised specific concerns around the technical difficulties and cost implications of fortifying the proposed food vehicle to the required level (see industry issues below).

Several submissions including food industry called for other food vehicles to be considered or the extension of voluntary permissions to other foods e.g. bread and / or dairy foods.

Some submissions indicated their confusion about the preferred food vehicle e.g. whether it included non-wheat flour and organic flours.

3. Potential benefits and risks of increased folate status

Those in support of mandatory fortification acknowledged the evidence for increased folic acid intake in reducing the incidence of NTDs, in particular the evidence from countries such as the United States and Canada which have implemented mandatory fortification. The proposed approach was recognised as a safe and effective public health intervention; many considered the health risks to be minimal.

Those against mandatory fortification considered that the health benefits and risks were too uncertain, particularly the long term safety, and that the health benefits may be outweighed by the potential health risks. Submitters were concerned about the possible effect of increased folic acid on the non-target population, especially children and the elderly. Some considered that detection of vitamin B_{12} deficiency remained a concern from increased folic acid intake. Several submissions raised the issue that increased folic acid intake may increase risk of cancer (colorectal, breast) as indicated in recent published papers.

4. Level of fortification

Many submitters (including those for and against the preferred option) considered that the level of fortification (200 µg per 100 g flour) was small and therefore the impact on the number of NTDs prevented was minimal. Those in favour, however, acknowledged the need for a conservative approach particularly in light of recent literature which postulates an association between increased folic acid intake and a potential increased risk of cancer.

Industry considered the level of fortification was too precise and stated that it could not achieve this precision via fortification of flour.

5. Impact of fortification on consumer choice

The lack of consumer choice was a key objection to mandatory fortification and was raised often in submissions. Submitters acknowledged the need for maintaining some form of consumer choice. Several suggested organic foods containing bread-making flour should be exempt.

Those in favour of mandatory fortification generally recognised the importance of consumer choice, but believed that loss of consumer choice was a small imposition compared with the broader public health benefit.

A number of submitters considered the level of folic acid must be included on the Nutrition Information Panel to allow women to calculate their folic acid intake, to allow more informed choice. Some submitters recommended labelling includes dietary folate equivalents (DFEs).

NZ industry and the NZ Government noted the strong opposition to mandatory fortification in two recent New Zealand surveys and considered this had not been adequately addressed by FSANZ.

6. Impact of fortification on industry

Those in support of mandatory fortification believed that the cost to millers to fortify flour with folic acid was small compared with the benefits to society. As thiamin is already added to flour in Australia the technology and methods should be in place.

There was, however, considerable industry opposition to the mandatory fortification proposed approach. Industry concerns included the following issues:

- significant costs to industry to upgrade capital equipment, and for labelling and packaging;
- the range of folic acid in the proposed food standard is too narrow for industry compliance;
- analytical testing on site will be necessary with attendant huge costs;
- industry/product liability should there be any adverse health effects on consumers;
- loss of competitive advantage associated with voluntary fortification;
- mandated levels will not allow industry to make a folate health claim; and
- the impact on trade of flour fortified with folic aid.

Industry considered mandatory fortification could result in a loss of export earnings if assurances about folic acid contamination could not be given and due to the costs of mandatory fortification e.g. labelling. This view was supported by NZ Government. NZ industry noted the presence of folic acid on labels will create barriers to export markets with a consumer preference for unfortified products.

Industry noted the costs involved and time required to make labelling changes. Labelling was also seen as a compliance issue by some industry submitters as they would not be sure whether the flour contained folic acid at the correct level.

Specific New Zealand industry issues included:

- few mills had the equipment to fortify flour and some smaller mills would not be able to meet the capital expenditure required and would have to close;
- the concept of 'bread making flour' is not relevant in New Zealand, as generally mills produce one type of flour; and
- monitoring of folic acid in bread would be easily achieved as there are approximately 20 production sites in New Zealand.

7. Data issues

7.1 Dietary modelling

Those against mandatory fortification considered that the data used to assess food intake was out of date and that dietary consumption patterns have changed.

7.2 Modelling of NTDs prevented

Those against considered that mandatory fortification would result in only a small number of NTDs prevented and that NTD rates were falling regardless of mandatory fortification.

Other data issues included:

- the need for baseline data including NTD statistics, nutrient intake, folate status and folic acid supplement use;
- the dietary folate intake was not included, but was considered significant by some researchers; and
- the folic acid intake data did not include folic acid from general multivitamin supplement use.

8. Alternative strategies to increase folic acid intakes

Some submitters were disappointed at the absence of previous Option 2 (increased permissions for voluntary folate fortification) and Option 4 (increased health promotion and education strategies to increase folate intakes) in the Draft Assessment. These options were included in the Initial Assessment.

Those in favour of mandatory fortification acknowledged the limitations of education strategies and the promotion of supplements. The limited uptake of voluntary fortification by industry was also noted.

A range of submitters against mandatory fortification favoured more resources committed to the promotion of supplements in conjunction with targeted education campaigns. Some submitters favoured free or subsidised folic acid supplements for the target group funded by Government. Others believed mandatory fortification may reduce the emphasis placed on alternative strategies.

Food industry provided particular alternative proposals based on increasing voluntary permissions.

9. Folic acid supplements

Submitters noted that women may believe folic acid supplements are no longer necessary with mandatory fortification. Ongoing education and promotion will be needed particularly targeting low social-economic and Indigenous groups. The NZ Government stated that discussions were being held with the NZ Ministry of Health and Medsafe with regard to providing lower dosage folic acid supplements to a prescription medicine standard.

10. Cost benefit analysis (CBA)

A number of submitters from various groups identified issues with the CBA including:

- the cost of monitoring, education and communications needs to be included;
- the costs of fortifying all sources of bread-making flour is not reflected in the report e.g. non wheat based flours;
- costs to industry for labelling and packing costs are inadequate;
- costs to industry do not reflect the costs of providing the precision required with the required range. Costs for equipment and installation are underestimated;
- costs to industry for folic acid analyses are inadequate – laboratories and on site analyses are necessary;
- full export costs are not reflected in CBA; and
- the cost to consumers will increase

One industry submitter stated that the information given to the consultant preparing the CBA was not used.

11. Monitoring

Monitoring was a key issue, both for those for and against mandatory fortification. Adequate long term funding for the wide range of monitoring activities was seen as essential, and many wanted a commitment before the implementation of mandatory fortification. Clarification of responsibilities and funding was needed.

Collection of baseline information was highlighted as extremely important before embarking on a mandatory fortification programme, including baseline data for children.

The need to ensure sustainability and robustness of monitoring was noted. It was recommended that monitoring include rates of NTDs, blood folate, other potential health risks and benefits (cancer, cardiovascular diseases, vitamin B12 deficiency and other birth defects) and changes in voluntary fortification practices.

Those against mandatory fortification noted that monitoring of thiamin and an evaluation of its effectiveness had not been undertaken in Australia.

12. Education and communication strategies

Submitters both for and against mandatory fortification recognised the need for ongoing education and communication and that the agencies responsible need to be clarified and well resourced.

Key messages need to include the ongoing need for folic acid supplements. Education and communications regarding mandatory fortification would be required for the various target audiences including health professionals, key agencies and the public. Many submitters recommended education be targeted particularly to Indigenous and lower socio economic groups and through schools. It was noted a publicly funded national campaign had not been undertaken in NZ.

13. Enforcement and compliance

Enforcement and compliance were not identified as a major issue. This may be because the food vehicle was bread-making flour rather than bread. Some jurisdictions did raise the issue of enforcement indicating:

- that regular monitoring and analysis of flour and bread for folic acid would be an essential component of compliance and enforcement; and
- the range of folic acid permitted to be added to flour may be difficult for industry to maintain and therefore create enforcement difficulties.

14. Implementation and transition period

Industry considered the 12-month transition period to be inadequate for labelling and packaging changes to be made. Several submitters also considered the establishment of a monitoring programme including collection of baseline data and a commitment to funding of monitoring and education needed to be addressed prior to implementation.

15. Consistency with Ministerial Council Policy Guideline on Fortification of Food with Vitamins and Minerals

A sizeable number of submissions commented that mandatory fortification was not consistent with the *Policy Guideline.* Those against mandatory fortification considered that this was not the most effective public health strategy, that supplements would still be needed, acknowledged that the health need is severe but that prevalence is low, that uncertainties remain over excess or imbalance across the population, and that monitoring was an essential activity but that it was not clear who would be responsible for the various aspects of monitoring.

Ref	Submitter	Submission Comments
	Consumers and Consumer & Community Organisations	
	Consumers	
C1	Ms Helen Algar, New Zealand	**Supports Option 2** A parent and foster parent of children with NTDs and a health professional in child health. **Food vehicle / Consumer choice:** Notes many pregnancies are unplanned, and that money is an issue for many young women influencing food choices. Considers folate fortification of a basic food will ensure all societal groups will have access to it.

Ref	Submitter	Submission Comments
		International experience Considers the international evidence is irrefutable and demonstrates benefits for a broad group of people. Considers NZ is lagging behind the world on fortification. Notes the outcomes of folic acid fortification are consistent with current government policy and would have a positive influence over current health spend. Believes the proposal would prevent the difficult choice for parents given a NTD diagnosis prior to birth.
C2	Ms Robyn Anderson, New Zealand	**Supports Option 1** Opposed to mandatory fortification as it would remove consumer choice. Considers voluntary fortification to be a better option to allow for consumer choice.
C3	P Atkinson, New Zealand	**Supports Option 1** Considers neither option proposed presents practical suggestions. However, considers NZ'ers should make their own decisions, and that 'eating well' should lower NTDs. **Education** Considers improving diets should be the simplest, safest and surest way to lessen NTDs. Suggests a comprehensive education / promotion approach using a variety of strategies to increase dietary folate intake, including consultation with those eating a 'poor' diet, multi media strategies, school nutrition education, menus, collaborative approach of health workers, and community based strategies that support healthy eating. **General concerns include:** • 20% of women do not eat bread; • folate fortification could result in excess for some individuals e.g. small children; • considers there is a lack of data provided from NZ on children's folate intake; • the potential for vitamin imbalances (refers to Adele Davis); • the need for monitoring; • are industry/lobby groups/overseas countries 'pushing' folate fortification for their own interests; • the need for consumer consultation – believes the proposal suggests the changes will be implemented and then the public will be informed; and • suggests research include one to one interviews with each women with a NTD pregnancy for dietary assessment.

Ref	Submitter	Submission Comments
C4	Ms Bern Bird, South Australia	**Supports Option 1** **Consumer Choice** Concerned at the personal lack of choice and very concerned about possible harmful impact of mandatory fortification with folic acid on all Australians before it has been fully cleared as a possible carcinogen. Concerned about the limited options for consumers to access non-fortified breads. Requires a clear alternative mainstream choice including wheat based breads. **Health Risks** Considers the science supporting mandatory fortification is incomplete. Concerned over uncertainty about the carcinogenic nature of synthetic folic acid. Notes that fortification of flour/bread alone does not solve the problem as supplements are also required.
C5	Ms Elizabeth Cappello, Western Australia	**Supports Option 1** **Consumer choice** Requests that breads made from stone ground grains remain unfortified to allow personal choice.
C6	Ms Vicki Carnell, New Zealand	**Option 1.** **Food vehicle** Considers flour in an unsuitable vehicle due to the variation in the quantity consumed, and concerned the number potentially adversely affected is greater than those who will potentially benefit. **International experience** Considers there is not a lack of folate in our food, and the addition of folate has been considered and rejected by other countries.
C7	Mr Greg Doherty, New Zealand	**Modified Option 1** Objects to mandatory fortification. Considers a better option would be to subsidise folic acid supplementation, or education and mandatory supply of foods that are rich in folic acid. **Consumer choice** Considers mandatory fortification reduces consumer choice and misleads the consumer to make food choices based on poor evidence that fortification of bread flours is better than choosing wholesome nutrition rich foods. **Health Risks** Views mandatory folic acid fortification as the mass medication of the general population with a substance for which no effective standards have been indicated.

Ref	Submitter	Submission Comments
C8	Mr Tony Downer, NSW	**Modified Option 1** Opposes mandatory fortification on the basis it is beyond the scope and purpose of food standards. **Food vehicle** Notes the Code definition of bread as 'product made by baking a yeast-leavened dough prepared from one of more cereal flours or meals and water'. Considers this very limiting – considers this excludes breads with other ingredients e.g. fruit breads, whole grain breads and possibly flat breads, poppadums etc. Considers the proposal to fortify flour discriminatory and impractical – ignores those with coeliac disease and ethnicities who do not consume 'traditional' bread. Considers a different food vehicle is needed, suggests water is more appropriate to increase reach. **Consumer Choice** Considers mandatory fortification of bread making flour limits consumer choice, is difficult to comply with and enforce. **Voluntary fortification** Considers voluntary folate fortification of any food should be permitted. This would enable consumer and industry choice. Commensurate with this should also be permission for a simple health claim, prescribed by legislation.
C9	Ms Diana Drumm, New Zealand	**Supports Option 1** **Consumer choice** Questions what will be the status of organic bread which currently is free from additives. **Health risks** Questions what is the cumulative effect of folate on the health of all individuals (including non target group) receiving supplementary folate over the course of their lifetime. Notes from the evidence provided it appears that 80% of women in the target age group eat bread. Suggests a person would need to eat 16 slices of bread per day (based on data on bread wrapper and the current dose of folic acid recommended for pregnant /intending pregnant women). **Supplements** Questions whether the supplement dosage will need to be reviewed to reflect an increased intake through breads. Suggests there is potential for complacency over the need for supplements if flour is fortified.

Ref	Submitter	Submission Comments
C10	Ms Kerrie Duff, Western Australia	**Supports Option 2** Ms Duff has spina bifida and has held numerous positions in the spina bifida sector so has a very clear understanding of what it means to live with a NTD. Acknowledges that the benefits of folate in reducing NTDs have been known for quite some time and that mandatory folic acid fortification has been introduced in many countries around the world. Believes Australia and New Zealand must act on this international experience and knowledge. **Food vehicle** Recognises that bread is a staple food and eaten widely, that thiamin is already added to bread, and that voluntary fortification and education has limitations. Also recognises the importance of consumer choice.
C11	Ms Susan Hamp, New Zealand	**Supports Option 1** Disfavours fortifying flour with folic acid. Considers no-one involved in the proposal knows enough yet and recommends the proposal is put on hold until more investigation is completed. **Food vehicle** Believes the potential folate intake will be widely variable due to differing bread intake amongst high and low socioeconomic groups. Suggests those with gluten or wheat intolerance will not receive the folate through fortification of bread making flour as proposed. Concerned fortification of white flour will give false security as white bread is still low in other nutrients (refers to research, Hungary 1992 – reference not provided). **Health Risks** Suggests some health problems will be worsened e.g. those with sensitivities to folic acid including ADHD, those with reactivity to preservatives, asthma, allergy, auto-immunological problems, salicylate sensitivity. Considers adding folic acid to the diet will increase histamines and worsen these conditions. Concerned about the limited choice for consumers with these conditions if bread flour is the fortification vehicle. Concerned about nutrient-drug interactions; considers folic acid will interfere with action of drugs such as Epilim and Tegretol. Refers to New Ethicals 200: Leucovorin (Lederle) Folic Acid analogue to treat megaloblastic anaemia and advanced colo-rectal cancer. Also refers to New Ethical 2000: Pharmacare Folic Acid (Douglas) 0.8 mg 120's. Concerned the large volume of bread needed to be eaten to achieve the recommended folate intake (i.e. to achieve 400 micrograms) is unwise in relation to obesity and diabetes.

Ref	Submitter	Submission Comments
		Considers fortification will worsen neuropathy associated with B12 deficiency (DavidsonLSP, Girdwood RH. Folic acid as therapeutic agent BR Med.J 1:587-91, 1947) and cause imbalance with B group vitamins. **Data** Considers the incidence of NTDs is decreasing. Quotes statistics from Prof Mark Elwood Otago School of Medicine, 1993 and Prof Murray Skeaff (no date or references provided). Believes the proposed levels will be an inadequate amount to prevent any more than 2 NTD a year.
C12	Ms Karuna Keat, NSW	**Supports Option 2** No further comments provided.
C13	Ms Jenny Lindberg, New Zealand	**Supports Option 1** Presents her individual views from an organic midwifery background. **Health Risks** Opposed to mandatory fortification noting the RDI will not be met by fortifying breads and cereals alone, and questions endangering future generations with a genetically modified food.
C14	Ms Teresa McMenamin, New Zealand	**Supports Option 2** Very strongly supports mandatory folic acid fortification of flour for NTD prevention.
C15	Mr Tom Moyle, New Zealand	**Supports Option 1** Comments based on the 'Short Guide'. **Raises concern about:** • the apparent different recommendations for folic acid intake between Australia and New Zealand i.e.400 µg in Australia compared to an 800 µg tablet in New Zealand; • that mandatory fortification will not deliver the recommended daily intake of folic acid by itself; and • why the net dollar benefits reported for New Zealand is as high as it is based on a comparison of population size between Australia and New Zealand.
C16	Mr Tony Osborne, Australia	**Supports Option 1** Opposes mandatory fortification. **Consumer choice** Believes it is a democratic right for consumers to purchase unfortified products as there must be unfortified 'additive free' flour and breads available for consumers who don't wish to consume folic acid. Requests that organic flour or bread should not be fortified. Foods with folic acid should be clearly labelled.

Ref	Submitter	Submission Comments
C17	Mr Steve Porteous, New Zealand	**Supports Option 1** Does not agree with mandatory fortification; no supporting information provided.
C18	Ms Christine Richards, NSW	**Supports Option 2** Supports the proposal as a mother and grandmother and hospital worker.
C19	Ms Annette Roehrer, Tasmania	**Supports Option 2** Considers this to be a proven, safe, feasible, inexpensive and long overdue public health measure, with positive results in other countries.
C20	Ms Victoria Sandoval, Guatemala	**Supports Option 2** Provides personal support for the International Federation for Spina Bifida and Hydrocephalus submission which strongly supports mandatory food fortification.
C21	Ms Jennifer Scott, New Zealand	**Supports Option 1** Considers the proposal needs to be put on hold to allow further time for research to be done individually by NZ and Australia. Questions whether the two countries require the same regulations. Acknowledges the importance of folate at conception and in early pregnancy. **Consumer choice** Considers consumer choice is essential. **Food Vehicle** Considers the promotion of breads could increase trends such as obesity and diabetes. Notes that high starch diets (the food pyramid) are now being questioned and dietary choices are changing. **Data** Considers the proposal has been based on faulty or out of date research. Notes the need for up to date food consumption data. Questions what research has been undertaken recently. Notes there has been a steady decline in NTDS world wide and lower incidence in indigenous people. Refers to epidemiological studies indicating the role of diet, genetics, reproductive history and environment in NTDs (references not provided). Considers factors other than folate are involved in NTDs. **Health risks** Concerns include: • the potential excess intake of the elderly and children; • the possible masking of B12 deficiency; and • the potential health risks with folate fortification including drug nutrient interactions and for those with high histamine levels.

Ref	Submitter	Submission Comments
		Monitoring Notes the importance of labelling and monitoring. Considers the funds spent on fortification would be better used to include basic nutrition for every child.
C22	Ms Sue Taylor, New Zealand	**Supports Option 1** **Recommends putting decision on hold for further debate.** **Health risks** Considers the nutrition research does not support intake of large amounts of single B vitamins in isolation. Considers we do not have a lack of folate in our food (unlike iodine). Concerned the number of people potentially helped is outweighed by number of people potentially adversely affected. Eventually, negative repercussions may be greater than desired. Suggests naturopaths be involved to ensure all population needs can be appropriately met. **Consumer choice** Concerned at lack of widespread public awareness and consultation despite the proposal considering making a compulsory change to our food.
C23	Mr Geoff Tempest, New Zealand Past member /Chair of the Folate Replenishment Plus Steering Committee during 1900s.	**Supports option 2** Refers to a copy of a paper presented to the 1998 NZ Institute of Food Science and Technology and Nutrition Society NZ Conference, and the Executive Summary of a report by Barry Borman and Sheldon Brown. Notes the full report is available. Notes P295 is very close to the recommendations of this committee made in 1999 which gained full political support, but did not go ahead. Supports FSANZ continuing this work to introduce a measure that has had remarkable success in both USA and Canada. Copy of past correspondence and presentation on Folate Replenishment – Plus Programme provided.
C24	Mr Bob Thursfield, Western Australia	**Supports Option 1** Considers the proposal unbalanced and a compromise. Considers there is a lack of public awareness of the proposal, and that implementation appears to be a foregone conclusion. Concerned that folate food labelling will follow the thiamine labelling which he considers is inadequate.

Ref	Submitter	Submission Comments
		Modelling Considers the proposal is based on mathematical inequity: concerned the 20% who do not eat bread regularly could result in 3-10 NTD affected births per annum. Concerned there is no data on how many may have adverse outcomes through this legislation. (References Max Kamien. MJA 2006; 184(12):638-640, the repeating history of objections to the fortification of bread and alcohol: from iron filings to folic acid.) Questions the legislation for the small numbers affected and who will benefit. Considers many will not benefit significantly and considers it unfair they will be required to take this 'supplement' particularly males, the elderly and children. Considers NTDS are not at epidemic levels or increasing, quotes US and Australian data showing reductions in NTDs (US Dept Health and Social Services – centre for Disease Control (CDC) Publication. MMWR, (Mortality and Morbidity Weekly Report)Sept 25,1998 / 47(37);773-778 and DS Kennedy.eMJA Spina Bifida 1998 http://www.mja.com.au/public/issues/aug17/kennedy/kennedy.html). Considers the proposal sets the level of supplementation too low to be of practical benefit and provides insufficient effect. Queries why the 'low' dose is proposed. Questions what research was used to determine how many would be affected by this dose compared to a larger dose. (References Czeizel AE, Dudas I. N Engl J Med.1992 Dec 24;327(26):1832-5., Prevention of the first occurrence of neural-tube defects by periconceptual vitamin supplementation.). Asks what numbers could have a potential health risk at the proposed level. Believes the proposal will not reduce genetic predisposition for NTDs, or NTDs born to women who are not folate deficient. **Consumer choice** Considers the proposal removes consumer choice and individual responsibility. **Food vehicle** Considers the addition of folic acid to bread may decrease other 'corrective actions'. Concerned that the folic acid will be manufactured overseas rather then in Australia, and may introduce impurities. Suggests funds be diverted into awareness raising and NTD prevention research.

Ref	Submitter	Submission Comments
C25	Ms Tracy-Jean, Victoria	**Supports Option 1** Tracy-Jean has spina bifida, but believes the proposed intervention is excessive for the size of the problem. To support her claims she highlights other more prevalent health conditions. Highlights that the majority of those born with spina bifida survive into adulthood, have normal IQs, are socially continent and are in competitive employment (Saunders 1997). Believes that the positive aspect of those born with an NTD has been omitted from the report. Requests that the report and follow on messages respect those living with spina bifida and in particular minimise the possibility for further discrimination. Saunders A 1997. Living with spina bifida. University of North Carolina Press.
C26	Ms Dianne Webster, New Zealand	**Supports Option 2** Believes there is a community duty to ensure that the public health intervention is available to all not just those who plan their pregnancy and can afford to purchase supplemental folate. Acknowledges the reduction in NTDs in other countries with folate fortification.
	Consumer and Community Organisations	
C27	Association for Spina Bifida & Hydrocephalus, United Kingdom Mr Andrew Russell, CEO	**Supports Option 2** Considers mandatory fortification is socially inclusive and would give all women some level of protection. It would benefit those people who are less privileged educationally and socially. Considers no harm has been demonstrated from the proposed levels over many decades and the evidence shown health benefits. Considers the UK relies on antenatal diagnosis and elective termination of pregnancies as the main prevention 'policy' with approximately 1000 abortions carried out annually in UK due to NTDs. Also notes approximately 50% of pregnant women take supplements pre-conceptually.
C28	Attention Deficit Hyperactivity Disorder Association Inc, New Zealand Ms Jenny Scott	**Supports Option 1** Opposed to Mandatory Fortification **Health risks** Considers the proposal sends a message that supplements remove the need to eat healthily. Fortification of processed flour promotes consumption of the wrong foods as 'good'. Notes the decrease in NTDs in USA since fortification in 1998 but also an increase in other conditions including obesity.

Ref	Submitter	Submission Comments
		Refers to evidence that people from low a NTD country immigrating to US having an increase in NTDs despite the fortification, suggesting other factors are involved (references not provided). Notes the worldwide decrease in NTDs. Considers funds would be better spent on diseases that are increasing. Considers the proposed fortification benefits a small group while a large group are compromised (e.g. people over 50 with low B12). Considers it will be difficult to control due to the wide variation in flours consumed. Also considers supplements can upset the balance of other nutrients. **Consumer choice** Mandatory fortification of all flour denies consumers the right of choice.
C29	Australian Consumers' Association (ACA) Ms Clare Hughes	**Supports Option 1** Cannot support Option 2 for the reasons below (although is not theoretically opposed to mandatory fortification). ACA does not believe the devastating impact of NTDs is sufficient justification for short consultation and a quick decision. Also disappointed only two options were proposed. ACA's preferred approach is to delay fortification decisions until more data is obtained, along with increased education. Considers the proposal is a population wide solution for a small number of women. Considers there is insufficient evidence that mandatory folate fortification of bread making four will reach the target group. Notes most women will not achieve the 400 ug daily recommendation through food so will need supplements. Suggests the proposal will still disadvantage low socio economic women and women with unplanned pregnancies. **Health risks** Believes there is still sufficient scientific uncertainty about the risks associated with increased consumption of folic acid to postpone mandatory fortification. ACA is concerned bread making flour will increase unmetabolised folic acid levels of some young children. **Food Vehicle** Considers there is no evidence FSANZ has considered alternatives to bread making flour or conducted dietary modelling of other potential food vehicles. Therefore stakeholders are unable to make an informed decision.

Ref	Submitter	Submission Comments
		They request dietary modelling of other vehicles e.g. certain breakfast cereals (excluding children's cereals), other cereal products, low fat milk or dairy products. **Voluntary fortification** Concerned FSANZ does not plan to reconsider voluntary permissions for folate as this makes it more difficult to ensure non target groups do not consume excessive amounts, especially young children. ACA believes FSANZ must reconsider current voluntary permissions e.g. for children's breakfasts cereals. **Consumer choice** Concerned the proposal limits choice. Mandatory fortification is supported in principle as long as it does not place others at risk. ACA is not confident evidence in the Draft Assessment Report (DAR) provides adequate assurance against negative effects of increased levels of unmetabolised folic acid. **Labelling** If mandatory fortification is introduced ACA supports the inclusion of folate on the Nutrition Information Panel (NIP). **Monitoring** Dietary modelling has been based on National Nutrition Survey (NNS) data now 11 years old, and permission of voluntary folate fortification has been introduced. There appears to be no funding committed go extensive and ongoing monitoring. ACA is unable to support mandatory fortification without a commitment to extensive monitoring being established (lists the surveillance required). **Education** Mandatory fortification will require accompanying education. Proposal does not clarify whether extra funding is available for education or whether agencies / organisations will be expected to take this on. Considers resources and funding for education should be allocated prior to a decision. Requests FSANZ further consider new research since the Initial Assessment Report (IAR) and conduct dietary modelling of alternative foods.

Ref	Submitter	Submission Comments
C30	Crippled Children's Society (CCS), New Zealand Mr Lyall Thurston	**Supports Option 2** CCS has been leading NZ Folate Awareness campaign seeking mandatory fortification of flour with folic acid since 1990s. Considers fortifying flour with folic acid is consistent with international experience and research to reduce NTDs. Considers this proposal is a long overdue public health opportunity. Joins ASBHA in urging FSANZ to implement this proposal.
C31	Coeliac Society of Australia Mr Graham Price	**The Society does not have a view on the benefits or other wise of folic acid fortification.** **Food vehicle** Considers the proposal does not define bread making flour so assumes this will include gluten free bread making flour. If folic acid fortification of flour is mandated, the Society requests that this be clarified and made clear if gluten free flour is included.
C32	Coeliac Society of Western Australia Ms Necole Rowe	**Supports Option 2** **Food vehicle** Notes individuals with coeliac disease will not benefit if this is restricted to wheat based bread making flour. The Society requests that specific consideration be given to this group. Alternatively specific targeted promotional activities should be considered for individuals with celiac disease.
C33	Consumers' Institute of New Zealand Ms Belinda Allan	**Supports Option 1** Acknowledge mandatory fortification will reduce the incidence of Neural Tube Defects. **Consumer Choice** Concerned mandatory fortification of bread making flour will limit choice as it will be difficult to buy unfortified products. Notes a New Zealand Food Safety Authority (NZFSA) study in 2005 where 84% thought mandatory fortification should not apply. Over 75% of the study group emphasised consumer choice is very important. Suggests FSANZ investigates alternative food vehicles e.g. bread improvers are used in fewer products than bread making flour. Alternatively, suggests exemptions such as organic flour, as if this is not exempt this would affect the organic certification. **Health risks** Concerned the nutrient imbalances and excesses may result. Notes the DAR refers to uncertainties associated with mandatory fortification such as elevated blood folate levels in young children and masking of B12 deficiency in elderly.

Ref	Submitter	Submission Comments
		Monitoring Any fortification strategy must be accompanied by monitoring of nutrient levels in the population, including comprehensive baseline data. Monitoring must be well funded based on these uncertainties. **Education / Communication** Notes the lack of publicly funded awareness campaign in NZ. Believes education should commence before mandatory fortification is considered. Education must be clear supplementation is still needed to reach recommended levels.
C34	Diabetes United Kingdom Ms Cathy Moulton	**Supports Option 2** Provides similar comment on the draft report to that provided to the proposal by the Scientific Committee on Nutrition in the UK. Notes that many women do not start taking folic acid supplements early enough because of unplanned pregnancies or lack of knowledge. Notes that women with diabetes have a much higher risk (3-4 fold) of giving birth to a child with an NTD than women without diabetes. Diabetes UK therefore recommends that women with diabetes should have the higher dose of 5 mg folic acid per day, and asks that this issue be addressed. References provided.
C35	GE Free New Zealand Ms Claire Bleakley	**Supports Option 1** with full labelling of fortified breads required Cannot support mandatory fortification on the basis of : **Consumer choice** Considers the proposal limits consumer choice, all consumers will have to bare the associated costs and increased costs may decrease consumption. Organic breads could not be sold under organic standards if fortified (this also creates a barrier to free trading). **Health Risks** Considers the merits and health benefits of mandatory fortification are uncertain, would be of little benefit and could give a false sense of security. Drug-nutrient interactions: considers folate supplementation could increase seizure/bipolar/pain episodes due to interaction with anticonvulsant medication. Considers folic acid taken concomitantly with other specified drugs can reduce folic acid absorption. Refers to drug / nutrient interactions when high doses of folic acid (amount not quantified) are taken concomitantly with both phenytoin and pyrimethamine. Considers supplemental folic acid can adversely affect absorption of zinc.

Ref	Submitter	Submission Comments
		The possibility that a genetic engineering process could be used to produce folic acid causes serious concerns. Requests clarification on the source of the synthetic folic acid to be used. **Supplements/education** Believes an education programme re diet and the use of folic acid supplements is the best option. **Provides references**
C36	Genetic Support Council WA Inc. Ms Sharon Van der Laan	**Supports Option 2** Considers voluntary fortification has not been successful in improving folate intake so far. Considers mandatory fortification of bread making flour would provide protection against NTDs for all women regardless of social factors, indigenous status, and whether pregnancies are planned or unplanned. Considers in countries where folate fortification is mandatory no adverse effects have been reported and a decline in NTDs has been reported. **Monitoring** Monitoring of effectiveness and safety is needed. **Education** Not all NTDS will be avoided; must ensure appropriate resources are available for education.
C37	Green Party Aotearoa New Zealand Ms Sue Kedgley MP	**Modified Option 2** Does not support mandatory fortification as proposed because it removes consumer choice, is involuntary mass medication with no control group, and does not provide sufficient folic acid for optimum NTD prevention, therefore folic acid supplements are still required. **Alternative proposal** to include: • exemption for organic flours; • exemption for non-wheat flours such as rye, rice, spelt; • fortification at the bakery stage rather than at the milling stage; • education to the target group to increase dietary folate from natural sources and folic acid supplements; • change to dietary supplement regulations to allow higher levels of folic acid in dietary supplements from the current 300 ug maximum; • clear labelling of fortified products including information on the risk of a vitamin B12 deficiency; and • an awareness campaign to educate primary healthcare practitioners about the risks of vitamin B12 deficiency, particularly in the elderly. The reasons for the exemptions and fortification changes are to preserve consumer choice, and provide alternatives for those who wish to avoid fortified foods.

Ref	Submitter	Submission Comments
C38	Grey Power Marlborough Inc, New Zealand Mr Dennis Paget	**Supports Option 1** Consider the proposal should be delayed until such time as a confident decision is arrived at and a programme can be undertaken with no doubt to its efficacy and safety. **Health Risks** Expresses concern over potential detrimental effect of the proposal on the elderly population. Raises the following questions: • is the Government aware of the possible detriment to health and still going ahead with the proposal? • is there commercial gain being made by some unannounced party? • has adequate research been undertaken in NZ to determine effects on the elderly? • will there be publicly funded screening of the elderly to determine B12 status? **International experience** They note UK has revoked their decision to proceed through a doubt that it will be safe.
C39	International Federation for Spina Bifida and Hydrocephalus Ms Pia Wurzer/Mr Pierre Mertens	**Supports Option 2** Strongly supports mandatory flour fortification with folic acid. International Federation policy provided which includes support for fortification of staple food with folic acid to reduce the incidence of NTDs, promotion of the health benefits of folic acid and further research into the prevention of NTDs.
C40	International Federation for Spina Bifida and Hydrocephalus Mr Lieven Bauwens	**Supports Option 2** Strongly supports mandatory folic acid fortification for the following reasons: • based on scientific research, mandatory fortification of staple foods is the only non-discriminatory prevention measure to prevent neural tube defects;. • reaches all women of childbearing age before they become pregnant, providing maximum protection against NTDs for all children, especially as many pregnancies are unplanned; • reduces the number of associated terminations, which they oppose; • has been shown to be safe; • latest research shows no increase in twinning and no delayed diagnosis of vitamin B12 deficiency; • considers there is growing evidence for folic acids role in preventing other congenital anomalies including cleft lip/palate, heart defects, stroke, Alzheimer's, Down syndrome and some forms of cancer;

Ref	Submitter	Submission Comments
		• does not rely only on public education programs and public awareness about folic acid, therefore everyone benefits regardless of social class or income; and • international experience has shown a significant decrease in the prevalence of NTDs, for example USA and Canada. Attached the International Federation for Spina Bifida and Hydrocephalus Policy Statement on this issue.`
C41	Judith Maher, consumer representative for the Consumers' Health Forum of Australia and member of the Breast Cancer Network of Australia	**Supports Option – 2** No further comments made.
C42	National Council on Folic Acid, USA Ms Adriane Griffen	**Supports Option 2** Applauds the DAR P295. Considers mandatory fortification to the proposed levels is proven, safe, extremely feasible, inexpensive and long over-due. Notes since introduction in US in 998 NTDs have decreased by 26%. Notes more than 50 countries where folic acid fortification of flour is mandatory.
C43	New Zealand Organisation for Rare Disorders John Forman	**Supports option 2** Strongly supports immediately fortifying food supply with folate. **Health risks** Believes evidence of benefit is very strong and any risk of harm is minimal to negligible. Considers the proposal to be a significant public health initiative. Argues there is a moral duty and possibly a legal duty on both governments to implement folate fortification through FSANZ to protect the community. Compares folate fortification with other important public health initiatives such as pasteurisation of milk to demonstrate that failure to implement this proposal would be negligent.

Ref	Submitter	Submission Comments
C44	Open Forum for Health Information, New Zealand Ms Patricia Holborow	**Supports Option 1** **Data** Concerned there is not enough information to indicate safety, whether prevention of NTDs will be achieved, and whether the proposed approach is sufficiently cost effective to counteract the possible effects of excess for the general population. Considers two actions are needed before the proposal goes ahead: • research into the effects of excess folate including original research and the research currently available; • economic comparison of NTDs and side effects of excess folate. Consider a decision delayed is better than a wrong decision.
C45	Soil & Health Association of New Zealand Mr Steffan Browning	**Supports Option 1** Believes mandatory fortification with folic acid is contrary to the FSANZ Act 1991 in particular Objectives 1 (a) and (b) and Objectives 2 (a), (c), (d). **Health risks** Believes a healthy diet negates the need for fortification. Considers adequate science has not been met by FSANZ and NZFSA nor does it appear to be impartial or precautionary. Conscious of links between environmental toxins (e.g. dioxin) and NTD and stresses other causal effects on NTD occurrence must be taken into account when or before considering a dietary solution. It is known that high doses of folic acid can have adverse effects. Questions why unhealthy individuals appear not to have been considered when mentioning potential adverse effects. **Supplements** No comprehensive promotion and education strategies to increase folate intakes have taken place in New Zealand thus no appropriate study base exists on which to use or discount that option in the initial assessment (Option 4). **Consumer choice** Mandatory fortification will reduce choice for those wanting to avoid additives therefore considers it is in opposition to the FSANZ Act. Real informed choice will allow a consumer to have fortified or non-fortified items. An exemption for organic foods would allow consumer choice.

Ref	Submitter	Submission Comments
		Impact on industry Small businesses will have difficulty in equipping facilities to implement fortification and this would be a barrier to fair trade as promoted in FSANZ Act. Organic processing standards forbid the addition of synthetic vitamins. Mandatory fortification has repercussions for organic producers, the addition of synthetic vitamins would be contrary to consumer expectations and have significant implications on trade in organic produce. An exemption for organic products will give both countries greater trade options. **International experience** Critical of FSANZ's Publication: *Mandatory Folic Acid Fortification* in that it shows a bias towards a mandatory fortification outcome in referring to the US & Canada.
C46	Spina Bifida Association, Washington DC Ms Cindy Brownstein	**Supports Option – 2** Strongly supports mandatory fortification of flour with folic acid. Believes that the costs to millers of adding folic acid to flour are small compared with the enormous public health benefit. Described their association's recent involvement in working with corn producers to ensure that corn meal entering the US was fortified with folic acid.
C47	Spina Bifida Foundation of Victoria Mr Peter Hudson	**Supports Option 2** States that the burden of disease is significant for many of those with spina bifida and their families. Acknowledges that mandatory fortification at the proposed level will not achieve the maximum possible reduction of NTDs. **Education** **C**ommunity education will be critical to ensure that women who could become pregnant are aware of the recommendation to take folic acid supplements daily, particularly women who are younger, less educated and of lower socio-economic status. Recurrent government funding will be necessary to implement the education and key stakeholders such as the spina bifida organisations are well placed to form partnerships with government to assist in providing the education. **Monitoring** Very important that recurrent funding is made available to monitor the outcomes of mandatory fortification such as the incidence of NTDs and other birth defects, blood levels of folate and the incidence of stroke, heart disease and various cancers as well as new developments on the health affects of folic acid. For monitoring to be effective it must be consistent, systematic, robust and sustained.

Ref	Submitter	Submission Comments
C48	Spina Bifida Group of NSW Ms Anita Fisher	**Supports option 2** Considers mandatory fortification is the only way to ensure equal access to folic acid regardless of education or financial situation. **NTD incidence** Estimated that about 5000 people in Australia have spina bifida and each year about 315 pregnancies are affected by a NTD. Considers research clearly shows that the correct dosage of folate can prevent up to 70% of cases of NTDs. Suggests the current prevention methods have not been as successful as possible and need to be reconsidered. Refers to a recent meeting of medical specialists from NSW spina bifida clinics who noted the increased prevalence in spina bifida over the past year. **Health risks** Considers fortification with folate is safe. Believes mandatory fortification will ensure the majority of women in Australia will have access to folic acid as part of their daily diet. **International experience** Fortifying flour is consistent with international experience and research to reduce the incidence of NTD. **Voluntary fortification** Refers to FSANZ Folate Fortification Consultation Initial Assessment Report October 2004 as highlighting how education and voluntary fortification programs have not been as successful as possible. **Supplements** Concerned supplements are of limited use as many women are reluctant to take supplements if they are not intending to get pregnant. Notes at least 40% of pregnancies are unplanned, so mandatory fortification offers some protection against this. Notes supplement use is highest amongst well educated women & those who have the financial means;..
C49	Spina Bifida Hydrocephalus Queensland Mr Bill Shead	**Supports Option 2** **Health benefits** Notes that whilst mandatory fortification will not prevent spina bifida completely in Australia or NZ it will reduce the incidence. This is especially the case when women do not supplement their diet with folic acid. **International experience** Considers the experience of sixty or so other nations who have introduced mandatory fortification attests to both the value of mandatory fortification and the lack of any negative consequences of it.

Ref	Submitter	Submission Comments
	Industry	
	Food Manufacturers	
I1	Allied Mills Australia Pty Ltd. Mr J. Di Leo	**Modified Option 1** Considers that mandatory folate fortification in Australia is premature. Considers insufficient study has been carried out to warrant fortification for all Australians. **Food Vehicle** Questions the choice of flour as the food vehicle rather than a supplement to increase folate intake in the target group. **Health Risks** Considers the following uncertainties have not been addressed: • the long term effect on the community (non-target groups); • women with gluten intolerance; and • evidence from prominent dietitians and nutritionists. **Impact on industry** Should folate be mandated across Australia, Allied Mills would comply with mandatory fortification, but must have the following provisos: • compensation from the Government for additional costs incurred ($650,000 capital costs and $40,000 ongoing costs for equipment, testing and labelling, to be given prior to the programme); • Allied Mills cannot be held responsible for accurate levels of folate addition as flour is released daily from bins in the mills, but laboratory test results may not be available for several weeks; • Allied Mills must have Government indemnity for all incidences that may arise from any adverse effects of flour folate fortification on consumers (including all future health concerns/future litigation); and • the mandatory fortification and testing of flour must be industry wide. **Supplements / Education** Preferred strategy is for education in the school system and folate supplements supplied free of charge, funded by the Government, directly to the target audience.
I2	Axiome Pty Ltd Mr David Bill	**Preferred option not stated.** **Form of folate for fortification** Refers to an application submitted in July 2005 to amend the FSANZ Code to approve L-Methylfolate, calcium as a permitted form of the vitamin, Folate. Notes this is now on the FSANZ work plan but has not commenced. Notes there is currently only one permitted form of folate, folic acid, approved for fortification of food. This is considered a pro-vitamin rather than a vitamin as it needs reduction before it can function as a coenzyme.

Ref	Submitter	Submission Comments
		In comparison, L-Methylfolate is the predominant natural form in foods and the essential form that occurs and is stored in the body. It does not mask B12 deficiency. This would provide an alternative form of folate for fortification. Therefore, proposes that FSANZ prioritise and expedite the assessment of application A566 as is permitted under sections 24 and 36 of the FSANZ Act 1991.
I3	Fonterra Co-Operative Group Ltd. Ms Sonia Chandra	**Supports a modified Option 1** Opposes the mandatory fortification approach being implemented. **Preferred Option** Extension of permissions for voluntary fortification first alongside a comprehensive education and communication programme. Mandatory fortification should then be investigated as a final option only. View aligns with Dairy Australia and the general industry position. **Ministerial Council Policy Guidelines** Considers the preferred option contradicts the Specific Order Policy Principals**,** specifically that the assessment of the most effective public health strategy, and demonstrated population health need taking into account both the severity and prevalence, have not been taken into account. **Data** Considers justification for mandatory fortification is based on outdated and insufficient data. Considers there is insufficient evidence to proceed with this proposed choice. Notes 2006 news poll data from the Australian Food and Grocery Council (AFGC) indicated women of childbearing age consume on average only 11 slices of bread a week i.e. meeting only one day's folic acid requirement per week. **Health Risks** Considers FSANZ has not conducted appropriate evaluation and surveillance of the current voluntary scheme, or investigated uncertainties due to limited evidence, or given detailed consideration to practical implementation. Considers these gaps could lead to health risk. Notes the uncertainty around chronic exposure to increased folic acid beginning in childhood. Considers research into a safe dose has not occurred. Acknowledged FSANZ have recognised the potential risks but have not addressed these satisfactorily. **Monitoring** Considers the cost and responsibility for monitoring and enforcing compulsory folate addition is inadequately acknowledged. A funding and responsibility plan is needed.

Ref	Submitter	Submission Comments
		Considers the problem of a validated testing method and means of measuring levels of folic acid have been overlooked. **Consumer choice** Considers the proposal restricts consumer choice. Considers NZ and Australian consumers may respond negatively to mandatory fortification for the benefit of a certain segment of the population. **Transition period** Fonterra supports an 18 month phase in time to cope with the changes. **International experience** Notes UK has delayed the development of their mandatory fortification with folic acid due to emerging evidence. The Scientific Advisory Committee have requested more time for safety research on benefits and risks. **Voluntary fortification** Believes extension of this option combined with education and promotion is the most effective strategy. This would encourage industry to create a wider range of products, raise awareness of the health issues and advertise the benefits of the nutrient. Considers voluntary fortification plus a health promotion campaign has not been adequately trialled and evaluated. **Food vehicles** Considers it likely that using several vehicles would have a greater impact than fortification of a single food. Only 120 food vehicles are currently approved. Dairy products are not included which is considered inconsistent with Std. 1.3.2. Considers dairy products are also a staple food for the target group and recommends dairy foods be given the opportunity to add folic acid if desired. Notes folate containing milk powder and folate enriched milk are available. **Communication and education** Refers to FSANZ stating voluntary fortification was not very successful. Considers the approval process and approved health message are very limiting and promotional initiatives inadequate. Consumer research suggests using more positive folate messages and more flexible wording through a variety of communication mediums. Considers marketing of fortified foods is very difficult as the prescribed health claim is a very negative message on a product. Broader health claims would make folate fortification more attractive to industry. The lengthy application process on a case by case basis needs review.

Ref	Submitter	Submission Comments
		Considers the following is needed alongside voluntary fortification: • increased communications and education; • freeing up of the wording on the health claims; and • simplifying the application process.
I4	George Weston Foods Ltd (GWF) Ms Fiona Fleming	**Supports a modified Option 1** Supports extension of voluntary permissions as proposed in the Initial Assessment. Does not believe that mandatory fortification of bread-making flour will address the reasons noted in the Draft Assessment for women not following advice to increase supplemental folic acid. Believes voluntary fortification as part of a national education campaign will increase the folic acid intake of women more effectively than the proposed mandatory fortification programme due to restricted bread consumption of the target group. **Alternative Industry Proposal** Supports the Australian Food and Grocery Council alternative folic acid fortification proposal combined with monitoring of effectiveness. Considers this will meet recommendations of AFNMU (Abraham & Webb 2001). **Recommendations** • consult with industry on most effective mechanisms to deliver folic acid to the target population; • immediately introduce an extensive national education programme; • immediately ensure supplements are available for young women; • promote consumption of folic acid fortified bread and products; • encourage food manufacturers to fortify new products with folic acid that are consumed by the target population; • collect national baseline data on NTDs to measure reduction in NTDs as a result of government initiatives; • conduct a national nutrition survey for consumption patterns; and • revisit the mandatory fortification proposal in two years by which time government may have the benefit of research needed to justify mass medication of the population through the food chain. **Consultation** Considers the shortened consultation period was inadequate with a four week consultation period. Considers issues raised in the Initial Assessment are still relevant and the following have not been adequately addressed by FSANZ: • the lack of consumer choice • the lack of baseline and ongoing monitoring data necessary for tracking the long term effectiveness of mandatory fortification • inconsistencies of the proposal with the Ministerial Council Policy Guidelines

Ref	Submitter	Submission Comments
		• the need for ongoing and wide reaching health promotion and education strategies supported by government • targeted consultation • the issue of the indigenous population apart from stating they have an increased rate of NTDs; this should be addressed before a final decision is made on mandatory fortification. GWF is one of the largest plant bakers in Australian and can provide information on products or market data for the dietary modelling. **Cost Benefit Analysis (CBA)** The level of fortification in the preferred regulatory option differs from that in the CBA therefore considers the CBA is now not relevant. GWF is willing to work with Access Economics (AE) to provide updated cost information based on the revised levels of folic acid fortification. The proposal is using the expression 'flour for bread-making'. The figures provided to Access Economics for the CBA will fall short of the real cost as they relate only to wheaten flour. Issues in the CBA are: • the report only considers fortification of flour derived from wheat; • the report only assesses the cost of compliance for providing a minimum level of folic acid and failed to identify that the range required by the standard would require a greater level of precise machinery and computing systems. GWF is willing to work with AE to provide update cost information based on the proposed range; • the report does not include the significant proportion of non-wheat derived flour in Australia that is imported, and it is unlikely the supplier will add folic acid for Australian needs; • the report does not take into account compliance for small speciality bakeries to ensure folic acid is added to non-wheat flour; • the report did not consider that the figure of 25% used for calculating overages was for purposes of calculation, and real figures vary from mill to mill and can be up to 100% in relation to thiamine. Required overages may be even larger with folic acid; • figures for packing costs do not accurately reflect information given to AE. No attempt has been made to cost wasted packaging and its disposal; • the method adopted by AE for determining labelling costs was done on per tonne basis. Considers the only relevant way to determine this is the number of stock keeping units (SKU's) x average cost of SKU = total cost; • it is not clear how the figures for total testing costs were estimated, and questions regarding frequency of testing necessary to meet the proposed range were not asked; • the report did not take account of the adverse impact on export markets; and

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		• the report did not account for loss of sales for industry when consumers chose to purchase other products not containing folic acid. **Consistency with Ministerial Council Policy Guidelines** Considers there may not be a demonstrated significant population health need based on: • the level of NTD rates in Australia and New Zealand which are not high compared to international levels; • the lack of information on folate deficiency or the benefits from increased folate. Mandatory fortification is noted as 'an' effective method, rather than 'the most effective strategy'. Current proposal is not the most effective public health strategy to address the health problem because minimal amounts of added folic acid will be delivered to the target population, a targeted voluntary permissions programme with education and promotion will be more effective, and the indigenous population should be a specifically targeted group because of their high NTD rate. Agrees that bread-making flour is consistent with national nutrition policies but other vehicles are also consistent e.g. milk and yoghurt, fruit and vegetable juices, breakfast cereals and other products. Combing these with some fortified breads would be more effective. Believes that the potential for detrimental dietary excesses or imbalances of vitamins and minerals has not been adequately explored. Estimates that to reach an intake of 400 ug folic acid, women would need to consume 10.3 slices of white bread, 11.9 slices of wholemeal bread, and 18.5 slices of grain bread. Notes Green et al 2003 states that it is impossible to fortify foods to a level that ensures women reach 400 ug folic acid per day without exposing some people to excessive amounts of folic acid. Maintains there has not been an adequate assessment of voluntary fortification. **Data** Considers a number of the key pieces of essential data for baseline and ongoing monitoring of a fortification programme are incomplete, out-of-date or nonexistent. These include the national nutrition data for Australia and NZ, NTD statistics for both countries, nutritional status for both populations including folate and B12 status, and current national data on folic acid supplement use. Notes limited data exists on the folate status of Australian and New Zealand populations and considers this vital to assess whether mandatory fortification is needed.

Ref	Submitter	Submission Comments
		No accurate national register of NTD rates in Australia or New Zealand, and only South Australia has mandatory reporting of NTDs, and WA and Victoria are the only other states with reasonable statistics on NTD related terminations. Considers it essential that accurate data is collected at least 12 months before implementation of fortification for baseline data. Considers the Draft Assessment does not clearly define the recommendations set out by the National Health and Medical Research Council (NHMRC*)* in the new Nutrient Reference Values (NRVs), which actually recommend 800 ug folic acid a day for women of child-bearing age. If 50 % of the RDI is to be added per reference amount of food under the NRVs, then food manufacturers could double the amount of folic acid added to these foods. This will increase the folic acid in bread to above the proposed mandatory level. **Dietary Modelling** Considers the calculation of the level of folic acid in bread as proposed is not correct. Notes in the 33 breads produced by GWF the flour content varies from 26% to 65% wheaten flour with an average of 47% wheaten flour. Some grain breads contain approximately 30% wheaten flour. . GWF provides estimates of the levels of folic acid in bread which range from 52 µg folic acid in soy and linseed to 130 µg in standard white bread. GWF also notes that intakes based on two slices of bread a day will also add variation. Based on the thiamine experience, it is considered there could be overages over 300 ug /100 g level. Does not agree with the calculated figures used in DAR Scenario 1 dietary modelling. Considers the average increase in folic acid amongst women of children bearing age will be between 43 and 78 ug per day, and 30% of the population will consume half this. Considers that folic acid intakes from mandatory fortification will not increase as much as proposed because of lower bread consumption in the target group than dietary modelling estimates. **International Experience** *Codex Alimentarius* Considers mandatory fortification with folic acid is inconsistent with Codex Alimentarius fortification principles in that bread consumption by the target group is variable and not stable, consumption of fortified bread will not provide sufficient folic acid for optimum NTD prevention, and fortification will result in 3-6% of children. Considers no country is currently fortifying all bread-making flour. ReadyBake Canada has confirmed that white flour is the only flour enriched. ReadyBake estimate that 60% of their products are made with enriched white flour. Intake of grain products is rising.

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		Refers to the recent report of the National Committee on Folic Acid Fortification by the Food Safety Authority of Ireland which recommends bread rather than flour or all flour containing foods as the vehicle of choice for mandatory folic acid fortification in Ireland. Notes in the UK a decision on mandatory fortification has been delayed due to the risks associated with masking of B12 deficiency and interaction with epileptic drugs. No other country has introduced mandatory fortification with an upper limit for addition. The levels of fortification are also lower than those proposed by FSANZ. Does not believe there is strong evidence from other countries that mandatory fortification will be appropriate for Australia**.** Does not believe US and Canadian rates can be compared with Australia and NZ because we don't have an accurate national register, the US decline in rates is not due to mandatory fortification alone, Canada had higher rates of NTDs than Australia and NZ at baseline, and Chilean rates do not include terminations. **Supplements** Concerned that women may believe they are getting sufficient folic acid from mandatory and voluntary fortification. Lack of knowledge and awareness among women of child-bearing age with regard to folic acid supplements is a significant issue. Important to target those capable of becoming pregnant not just those planning a pregnancy. Notes an increase in supplement use in south Australia after a campaign in 1994. Promotes a targeted sustained national education campaign, promotion of supplements and range of voluntarily fortified foods targeted to women of child-bearing age. Notes the lack of a publicly funding campaign in NZ, and questionable monitoring of Australian campaigns. Notes folic acid supplements are highly bioavailable, therefore the most effective way to increase folic acid intake. **Voluntary fortification** Considers there is a lack of evidence for market failure. Notes the recommendations of the Australian Food and Nutrition Monitoring Unit's report (Abraham & Webb 2001) recommended that the implementation of the folate fortification programme be improved and that there be a coordinated strategy for monitoring and evaluation. Considers the impact of voluntary fortification coupled with supplement promotion and education has been positive, (references given), and further improvements could be made.

Ref	Submitter	Submission Comments
		Use of the folate health claim has been limited. There is a need for a simpler claim that is more easily understood by consumers. Questions data on voluntary fortification permissions uptake. Believes there would be increased uptake of voluntary permissions if the Code allowed wider voluntary permissions. Notes increases in folate intake are higher in women than men with voluntary fortification, which suggests this strategy is better targeted to women than men. Supplies a table of GWF folic acid fortified breads and the levels of fortification. Considers removal of voluntary permission for bread and replacement with mandatory fortification will result in lower levels of folic acid in bread. **Health risks** Considers there is reasonable evidence to warrant concern over negative health effects including cancer, cognitive decline, unmetabolised folic acid and masking of B12 deficiency (references supplied for all). Notes the UK is undertaking further analysis of nutrition data for fortification even though they have more accurate and current information than Australia. Believes the masking of vitamin B12 deficiency is a concern and presents data from a number on references on the prevalence of vitamin B12 deficiency and lack of direct assessment of risk associated with increased folic acid intake in older individuals or children (references provided). Believes there is concern in the scientific literature regarding the increased risk of cancer from higher folate levels (Kim 2004 and Van Guelpen 2006). Believes there is definite cause for concern at the potential impact of an increased intake of synthetic folic acid on unmetabolised circulating folic acid. Notes a number of researchers have expressed concern. **Food vehicle** Does not believe there is one food vehicle that will deliver effective amounts of folic acid to the target population. Does not believe bread-making flour is a suitable vehicle. Notes bread consumption in the target group (see below). Sub-groups of the target market will not be reached by the fortification e.g. those who cannot eat wheat products, cultures who eat rice as their staple, those who do not eat bread because of a perception that it is unhealthy and causes weight gain, and those who choose grain breads will receive lower levels of folic acid than those who consume white bread.

Ref	Submitter	Submission Comments
		Considers using thiamine fortification as a justification for choosing flour as the food vehicle was not appropriate because thiamine is added at higher levels than the dose suggested for folic acid, NZ does not fortify with thiamine, has no infrastructure, and new dosing equipment would be required for folic acid in order to meet the upper limit. Australian National Nutrition Survey data was conducted 11 years ago and does not represent current bread intakes amongst women of child breading age. From five sets of bread consumption data collected by GWF, the total daily average bread consumption is two slices per day. Between 25-33% of women of child-bearing age are consuming equal to or less than one slice (average 30g) per day (summary of surveys provided). **Impact on Industry** *Industry and technical issues* Information provided to Access Economics was on the basis of 100 or 200 ug folic acid /100 g flour, not on a range, and is therefore invalid. Costs will be significantly higher with a range as proposed. Overages are not only a result of accounting for processing and storage losses. To ensure the required amount of thiamine is present in flour overages of between 25% - 1005 are needed depending on the particular mill. *Legal Liability - potential product liability* Notes comments on legal liability must be read in light of the concern about the lack of clear evidence regarding the safety, particularly long term, of folic acid fortification for those outside the target group. Section 68 of Food Standards Australia New Zealand Act 1991 provides protection for the Commonwealth and FSANZ against being sued because of consumption of food, and states compliance with a standard is not a defence against a product liability action. *Product Liability Provisions in Part VA of the Trade Practices Act (TPA);* Under this legislation, there is a non-excludable right to bring an action for loss against the manufacturer for any injuries suffered as a result of a defect in its goods. If, as a result of eating bread, people become sick, have an increased risk of contracting a disease, the diagnosis of a disease is prevented or made more difficult, and medications are adversely affected, the manufacturer will be liable for the full loss suffered by those affected, unless it can rely on one of the statutory defences. There is a defence under the TPA in relation to product liability provisions, where the goods only have the defect because there was compliance with a mandatory standard for them (s75AK(1)(b)). For the purposes of product liability thiamine would not appear to be a mandatory standard as the manufacturer is free to exceed the minimum requirements of the standard.

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		With regard to the folic acid fortification range, it is unclear whether this would be viewed as a mandatory standard for the purposes of s75AA of the TPA. *Other areas of potential liability;* f there was a defence under product liability provisions in Part VA of the TPA, or legislation was passed by the Federal Government to deem mandatory fortification a Mandatory Standard for the purposes of S75AA of the TPA, this would not prevent a successful action against the manufacturer under Division 2A of Part V of the TPA or for negligence on the basis that the risk was reasonably foreseeable. *Inability to use warning statements on packaging;* Warning mechanisms can minimise liability. Bread manufacturers would need to consider placing prominent warnings on their product regarding such issues as possible relationship or effect between folic acid and cancer risks, multiple births, efficacy of anti-convulsive medication, increased rate of cognitive decline, masking of Vitamin B12 deficiency, and delay in early diagnosis of dementia. Any warning statement would have to identify the specific health issue, but such a warning would be prohibited under the current Food standard 1.1A.2, and proposed 1.2.7. *Options to address liability issues;* FSANZ must ensure that there is agreement from the Commonwealth to pass appropriate legislation to deem the Code to be a mandatory standard for the purposes of Part VA of the TPA. Agreement must also be given to amend the Code so that warning statements in relation to the risk from folic acid fortification will not be an illegal health claim. **Labelling** Fortification of all flour used for bread making will require changes to packaging of all products using bread-making flour. Once folate is added to flour industry must by law immediately change the packaging of all products to reflect the new ingredient. Existing packaging stocks must be discarded. Time is needed to revise packaging ready for the changeover. This exercise could well take six months and involve considerable costs in off site storage of packaging. Fortifying organic flour limits choice and creates issues for those reaching the niche markets. Adding a synthetic vitamin to organic products and labelling them 'natural' or 'organic' does not align with what the product represents. **Consumer choice** Considers consumer choice is limited. Considers the comments that consumers can purchase non fortified flour to make their own bread are unrealistic, impractical and will produce an inferior product.

Ref	Submitter	Submission Comments
		Considers there is no choice available under the preferred regulatory option as all bread will be fortified. Natural and organic products will be affected and such claims will not be possible under mandatory fortification. Believes findings of NZ consumer research on mandatory fortification by Hawthorne, 2005 should have been taken into consideration when making a decision, and reveals a need for an Australian study. Retail flour which is not bread-making flour will produce an inferior loaf. Concerned that consumers may change consumption patterns to avoid fortified products. Ingredient labelling does not provide informed choice as it does not tell the consumer how much folic acid they are consuming. **Communication and education strategy** Considers a legally binding commitment from the governments involved is necessary for successful communication and education strategy. The Aboriginal population have twice the rate of NTDs compared to the rest of the Australian population and would benefit from a separate, targeted programme. **Transition period** Transition period of 12 months is not adequate and requests a four year changeover period for packaging due to: • the large number of SKU's affected across the food industry; • competing demands of food companies for the time from advertising agencies and print houses to make the necessary changes; • very large print runs which take time; • the extensive approval process required as part of the Trade Practices and Food Code compliance programmes, sampling and review of new packages. Also to minimise costs GWF wishes to simultaneously make other changes to packaging to take account of other changes to the Code i.e. Country of Origin, Nutrition, Health and Related Claims, Mandatory Fortification with Iodine, and changes to the NRVs. **Monitoring** There needs to be agreement with organisations responsible for monitoring that this will occur. Notes no monitoring programme was set up in the US to evaluate effectiveness of its mandatory folic acid fortification programme.

Ref	Submitter	Submission Comments
		Monitoring of thiamine and voluntary fortification of folic acid has been insufficient, and GWF is concerned the same situation will be repeated with mandatory folic acid fortification. **Proposal objective** Lack of clear measurable objectives means that the effectiveness of the proposal cannot be assessed. Suggests the objective could be rewritten as 'The goal is to reduce the incidence of NTDs by (x%) over a (x) period increasing dietary folic acid intakes in women of child-bearing age by (x) amount). **FSANZ Act** Considers the proposal does not meet the objectives in Section 10 of the FSANZ Act 1991 regarding the: • protection of public health and safety due to the potential risks; • provision of adequate information relating to food to enable consumers to make informed choices; • prevention of misleading or deceptive conduct: the target group may misguidedly decrease supplement use under mandatory fortification; and • inconclusive evidence of other health benefits from increased folic acid intakes. **Attachments** • GWF Bread consumption Patterns – Australian Women of child-bearing Age (July 2006) • References
I5	Independent Fisheries Ltd. (IFL) Ms Paulette Elliott	**Preferred option not specified** Questions mandatory fortification if the level is not sufficient to reduce the incidence of NTDs. IFL is a manufacturer of frozen fish and seafoods, and added value frozen foods. **Food Vehicle / Impact on Industry** Flour used in predusts, batters and crumb produced from returned bread would be affected by mandatory fortification as labelling changes would need to made; this would potentially affect hundreds of products. The 12 month transition period would not be enough time to make changes to some frozen products with a 2 year shelf-life unless there was an additional stock in trade provision.
I6	National Foods Ltd. Ms Katrina Strazdins	**Supports a modified Option 1** Supports an extension of the range of foods currently permitted to voluntarily add folate, to include common foods such as milk and yoghurt. Strongly believe mandatory fortification is not in response to a 'significant' population health need, but a population sub-group need only.

Ref	Submitter	Submission Comments
		Modelling Considers dietary modelling predicts that mandatory fortification will result in approximately 13% of children and adolescents in Australia consuming above the established Upper Limit for folate on a daily basis. Evaluation of mandatory fortification in the US has found 16-32% of children aged 4-8 yrs and approximately 20% of children 1-3 yrs have folate intakes above the Upper Limit set by the Institute of Medicine (Lewis, et al 1999). Considers there is a lack of food consumption, nutrition and monitoring data on folate fortification, the incidence of NTDs and preventative activities, and incomplete data on status and voluntary folate fortification of the food supply. Considers education programs and activities render it impossible to determine the true benefit of voluntary folate fortification to date, and therefore the need for alternate strategies, such as mandatory fortification. Notes the National Nutrition Survey (NNS) data is more than 10 yrs old. NZ data is marginally more recent yet it does not cover all population groups, most notably children and cannot be assumed to be reflective of both Australia & NZ now. National Foods questions the usefulness of this old data and questions 'is this the best available scientific evidence?' Notes dietary modelling shows men will have a far greater increase in folate intakes than women and this is consistent across all age groups. Not only is the difference higher for men, but also the actual folate intake is 42% higher. Questions the inability of mandatory fortification to target women of child bearing age. **Health risks** Considers NTDs are a public health issue relevant to a specific population sub-group only (about 20% of the Australian & NZ population). Concerned mandatory fortification will affect the entire Australian & NZ population. Considers elderly people also have the potential to be negatively affected by mandatory fortification, as do men. Believes a combined approach (voluntary fortification plus the extension of current range of foods permitted to include folate) has the ability to reduce NTDs with minimal negative impact on safety. Concerned about the consequences of the entire population having high intakes of synthetic folic acid and high levels of unmetabolised folic acid in the body as a result, over their entire lifetime, are unknown.

Ref	Submitter	Submission Comments
		Believes that implementing such a significant strategy with unknown long term consequences for the general population is a risk to public health and safety and contradicts the FSANZ key objective, particularly as baseline folate nutrition and food composition data are unknown. As the detrimental effects of Vitamin B12 deficiency can take more than a decade to emerge and mandatory folate fortification was only introduced internationally in 1998, considers there is no data available on the impact of low Vitamin B12 status. Concerned that the mandatory fortification proposal goes against Ministerial Council Policy Guidelines for Mandatory Fortification in that it may not deliver 'effective' amounts of added vitamins or minerals to the specific target population to meet the health objective. **NTD incidence** Notes NZ monitoring of NTDs only includes the birth prevalence not terminations. **International experience** US has only reduced the incidence of NTDs by 27% - significantly less than the predicted 41% reduction, whereas Western Australia has seen a 35% reduction in rates of NTDs since voluntary fortification was introduced. **Consumer choice** Considers mandatory fortification has the potential to mislead consumers through minimal labelling requirements & decreased consumer choice. Is especially concerned that the success of reducing the incidence of NTDs is still reliant on voluntary fortified foods and folate supplementation to meet their daily folate requirements. Concerned that folate will only be required to be listed in the nutrition information panel when a nutrition claim is made about its content. This method of identification relies on the consumer being 'savvy enough' to look for folate in the ingredients list. Increasing consumer choice encourages a competitive market place to the general benefit of consumers. **Impact on industry** Considers the proposal may facilitate an anti-competitive environment for food manufacturers e.g. organic and all natural claims will no longer be possible on such foods containing synthetic folic acid. Mandatory fortification can also limit manufacturer's competitive advantage as there is no point of differentiation amongst folate-containing bread and associated products. **Monitoring** Considers monitoring is imperative, relevant to the target audience.

Ref	Submitter	Submission Comments
		There is a lack of monitoring of voluntary fortification, and education campaigns have not been sufficiently monitored to assess their effectiveness. Without full and thorough monitoring of food consumption as well as health outcomes, it is impossible to ensure any form of fortification is both safe and effective. Whilst FSANZ have outlined the need for education programs to encourage women of childbearing age to increase their consumption of dietary folate and supplements, no agency has taken responsibility or detailed how this will be conducted. **CBA** Notes the Draft Assessment Report did not account for monitoring costs in the CBA, nor has any government agency taken responsibility for this program. **Voluntary fortification and education** Considers data available for voluntary fortification, and education shows it has been successful, if not more so than mandatory fortification. Complementary education is needed. Lack of data for voluntary fortification makes it impossible to deduce that mandatory fortification is 'the most effective' strategy for reducing NTDs. Notes a lack of ongoing campaigns targeting folic acid fortified food consumption. Under the voluntary folate fortification framework, data from 1996-1999 showed that manufacturers did increase the number of folate containing foods each year. This coincided with the folate education and awareness campaigns which ceased after 1999 (Abraham & Webb, 2001). This demonstrates that education campaigns can help create consumer demand & provide an incentive for manufacturers to market suitable products. **References** Lewis, et al 1999 Abraham & Webb, 2001
I7	Sanitarium Dr Geoff Drewer	**Supports a modified Option 1** Increased voluntary permissions, with education, remains Sanitarium's preferred option. Considers this was dropped as an option after the Initial Assessment without convincing evidence this would not work. **Voluntary fortification** Suggests voluntary permissions should include dairy products, and be considered for peanut butter and nut/seed spreads. Believes this should be trialled and assessed before mandatory fortification. Considers voluntary permissions are limited, some only allow 5-10%RDI, and often a claim is not allowed which will have affected the uptake of voluntary permissions.

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		Health risks Considers it unclear whether those classified as B12 deficient would readily absorb folic acid fortificants. Considers the lack of reported adverse effects does not constitute an argument for total safety as in USA no systemic surveillance of health outcomes appears to have been instituted. Considers the limited information suggests mandatory folate fortification may delay symptoms in those with low B12 status. **Impact on food industry** Food industry could suffer the loss of a competitive advantage if fortification becomes mandatory. If fortified products are not able to be promoted as such, this is a further competitive disadvantage. The precision required for folate addition is radically different from the original proposal. The Initial Assessment Report (IAR) proposed a minimum level of folate, in favour of a band of levels. This will void the current cost benefit analysis and have major cost implications for flour millers. Considers the predicted benefit in reduced NTDs is unlikely to result in any perceived increased value of bread. Food manufacturers are therefore unlikely to be able to pass on any costs. Also the mandated levels are such that most breads will not be able to make a folate claim. **Modelling** There is limited data on folate intake (e.g. trend data) as the NNS is almost a decade old. Limited data indicates NTDs are falling with voluntary fortification. There is no data to indicate whether some individuals may be less inclined to take folate supplements on the false assumption bread fortification is adequate. **Consumer choice** Concerned the general population who are not deficient in folate may not be given the choice of an unfortified product.
	Industry Associations	
I8	Australian Food and Grocery Council (AFGC)	**Supports a Modified Option 1** Recognises and acknowledge 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.

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	Mr David Roberts	**Regulatory Options** ***Status Quo*** Supports a modified Option 1 with additional permissions and changes to the application and claim conditions for folate, for the following reasons: • industry is the best place to identify foods consumed by the target group, market trends, and to develop appropriately fortified foods; • the current process for approval to use a folate health claim is overly prescriptive, and the mandatory nature of wording has reduced its use on products otherwise permitted to make the claim; and • wider permissions are needed to address the identified health need. ***Mandatory Fortification*** Rejects the proposed mandatory fortification option for the following reasons: • failure to meet FSANZ objectives • failure to provide a balanced risk/benefit economic assessment which fails to address the costs of: - requiring fortification of all flour not just wheat flour; - imposing an upper limit to the fortificant; - monitoring of the health outcome; - costs associated with increased twinning; and - the adverse impact on export markets. • implications for the organic produce industry; • dietary modelling fails to take account of the new (higher) nutrient reference values for folic acid; • liability issues for food businesses have been ignored and • the false claim that voluntary fortification has failed. Consider that due to the above, FSANZ has made an incorrect decision in recommending the mandatory addition of folic acid to bread-making flour. In addition, AFGC rejects the proposal as: • it indiscriminately increases folate intake of the entire population; • removes consumer choice; and • fails to meet the Ministerial Council policy guidance. Consider that if the proposal to mandate the addition of folic acid to bread-making flour is to be implemented, that a clause be inserted in the standard that permission revert to voluntary after 4 years, should there be no demonstrated health effect of a reduction in NTD pregnancies across Australia and New Zealand. **Alternative proposal** AFGC propose: • widening permissions to fortify foods known to be consumed by the target population; • continue to provide health education on the importance of folate in healthy pregnancies; and

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		• simplify the wording of the health claim and the application process, to increase industry participation. Consider foods likely to take up such permissions are low fat yoghurts, milk drinks and milk substitutes, breads and ready to eat meals. Consider populations with special needs, such as indigenous Australians should have specific targeted options available to them. For example, folate fortified flour for use by indigenous communities as already provided by one company. Recommend that FSANZ model intakes based on the additional data provided by AFGC in order to determine the effectiveness of the AFGC proposed approach. **FSANZ Objectives** Considers the proposal fails to meet the FSANZ objective to reduce NTDS by the maximum extent possible. Notes FSANZ figures that just 5% of women of child bearing age in Australia (2% NZ) would meet the recommended intake of 400µg through this level of fortification. Provides figures of approx 4 million women of childbearing age in Australia, around 250,000 conceptions annually. Considers the proposal offers maximum protection to only 3.1% of possible conceptions. Notes ongoing supplements are required in addition to food fortification. **Food vehicle** Notes around 20% of women of childbearing age do not consume products containing bread making flour. AFGC data June 2006 indicates the average consumption of bread in women of childbearing age was 11 slices per week (i.e. sufficient to meet only one day's requirement per week). **Cost Benefit Analysis** Considers the Access Economic report is flawed and incomplete (see above). Notes the assessment only costs fortification of wheat flour, but the Food Standard Code does not limit the definition of flour to wheat flour. Understands the proposal would cover bread making flour from maize, tapioca, brown rice, potato and soy flour. Also considers the assessment failed to account for the significant proportion of non-wheat flour imported into Australia. Notes the need to account for the compliance costs by small bakeries to add folic acid to non-wheat flour. To meet the mandatory upper and lower limits would require new pharmaceutical grade machinery and computing systems to accurately and consistently dispense folic acid.

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		As the incidence of twinning is an order of magnitude greater than NTDs (15.1/1000 vs. 1.32/1000) the lifetime costs of a twin should have been modelled, plus the additional health burden of complications associated with producing twins. **Organics** Organic standards would not allow organic labelling of synthetic folic acid was added. **Modelling** Notes the new nutrient reference values for folate are higher than existing values within the Food Standards Code for the purpose of making a claim. Therefore all foods currently making a claim as a source of folate will have to increase folate fortification to continue to claim. Considers this was not considered in the FSANZ modelling. **Liability issues** Contends that mandatory fortification creates a liability for companies given the uncertainties about health risk, especially from long term exposure to higher intakes particularly from childhood onwards, as acknowledged by FSANZ. This will require increased insurance premiums for food industry, which has not been considered in analysing cost benefits. Recommends if the proposal proceeds, the standard incorporate indemnity for flour millers should future adverse health events occur as a result of mandatory fortification. **Voluntary fortification** Considers voluntary fortification has not failed and refers to FSANZ figures indicating a 19% increase in mean serum folate concentrations for women, and a fall in NTD rates of between 10-30% reported in SA, WA and VIC since the introduction of voluntary fortification. **Previous recommendations from Initial Assessment** AFGC considers none of the industry actions proposed at IAR have been acted on by FSANZ i.e.: • folate supplements be made available through a Government subsidy; • industry incentives be considered for voluntary fortification of certain foods; • existing permissions to fortify be reviewed with a view to widening permissions; • a trans–national program of monitoring NTD pregnancies and birth outcomes; • monitoring of the food supply to be part of the rolling NNS; and • convene a workshop on detection of folate in the food matrix prior to any decision to mandate folate fortification.

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I9	Australian Self-Medication Industry Mr Jonathan Breach	**Supports Option 1** Cannot support the proposal for mandatory fortification. **Supplements** Concerned with some potential errors of assumption in the proposal regarding the supplemental use of folic acid. Considers the DAR lacks consideration of folic acid intake from multivitamins not marketed specifically for the periconceptual period. Considers it is an incorrect conclusion that the high proportion of unplanned pregnancies, lack of knowledge among women of childbearing age, and supplement availability and cost, is an impediment to the effectiveness of supplements as a strategy to reduce NTDs. Believes this does not take into account where folic acid intake is a passive activity rather than a consciously decided one. There is a need to examine whether a distinction is needed between those consciously taking a folic acid supplements compared with those taking a multi vitamin not specifically aware of the folic acid content. Refers to the data from Bower et al (2005) compared to MacLennon et al (2006). Data in the 2 papers appears to be inconsistent regarding the use of folic acid supplements. Suggests the intake of folic acid supplementation is underestimated in the Bower et al study (no reference provided for MacLennon). Provided information on multi vitamins specifically marketed to women but not for periconceptual / maternity usage on eMIMS data base. The mean daily dose from these brands is 357 µg folic acid (range 200-500). This suggests the assumptions in the FSANZ proposal (6.7.2) may be underestimating the true amount of folic acid intake from supplements at 200 µg . Considers that a significant proportion of the target group may be unconsciously taking >200 µg through supplements. Questions the assumptions and accuracy of modelling to justify mandatory fortification of flour. **Consumer choice** Considers the proposal also removes consumer choice and provides no exemptions for manufacturers to provide unfortified breads. Also raises the potential for health claims on foods that are inappropriate for increased consumption e.g. foods high in sugar and fat. **Education** Concerned the proposal may convey a message that additional supplements are no longer necessary.

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		Education through labelling would be critical to include how much folate is provided in each specific food. Also need education that fortified breads will not meet the full folic acid requirements for pregnancy. Considers the ongoing need for supplements defeats the purpose of mandatory fortification. Believes there is capacity to increase the use of multivitamins with more certainty than the unpredictable and variable intake of bread-flour products.
I10	Complementary Healthcare Council of Australia (CHC) Ms Trixi Madon	**Supports Option 1** **Food vehicle** The CHC notes the FSANZ preferred approach to fortify bread flour is more limited than overseas which has a wider food base e.g. all flour from different cereals and other food products e.g. pasta (Draft Assessment Report). The CHC seeks further information on why a narrower food base was considered appropriate for Australia and New Zealand. The CHC does not consider that the 'blanket' approach of mandatory fortification, the costs involved and the potential impacts on other population sectors is warranted. The CHC suggests that many women do not consume significant amounts of bread for dietary reasons e.g. low carbohydrate diets. This is likely to affect a significant proportion of the target population in addition to other factors outlined in the report e.g. food allergies and cultural factors. It is not only the food industry that is potentially affected by the proposal but also complementary medicines currently regulated as therapeutic goods. A negative outcome from mandatory fortification could impact on the complementary medicine industry as consumers do not necessarily differentiate between the different sources of folic acid. **Definition of 'bread' and 'bread-making flour'** Notes the Draft Assessment Report proposes the fortification of bread making flour which is also used in a variety of other food products. The CHC draws to FSANZ attention that the proposed standard does not define 'bread' as including other bakery products that include bread making flour. Considers that under the current proposal anyone using fortified flour to make unleavened bakery products would be in breach of the Food Standards Code. The CHC notes that the draft assessment was only based on consideration of wheat bread-making flour used as an ingredient in commercially produced products. Notes in Australia that the major proportion of flour used in bread making and other bakery products is made from wheat, however this is not what the standard provides for.

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		'Flour to make bread' must be interpreted to mean any flour used to make bread by anyone. **Data** The CHC does not consider FSANZ has established actual consumption patterns by the target population on which to base the effectiveness of fortification; e.g. on women of child-bearing age. The CHC notes that the dietary modelling data is over 10 years old and consumption patterns may have changed substantially in this time. The CHC notes that folic acid supplement usage has not been taken into account in the dietary modelling. The CHC acknowledges that the NNS does not include comprehensive data on supplement use or that there are any other large scale surveys undertaken that provide this information. Nevertheless, the CHC considers that as a precautionary approach FSANZ must include an estimate of usage in recognition of the significant number of supplements containing folic acid available in the market. The CHC draws to FSANZ attention that complementary medicines are used by: 1. 74% of the population 2. 92% of females aged 20-24 3. Over 80% of females over 14 4. Over 60% of males over 14 *(Figures from Cardinal Health's Roy Morgan Research 2005)* **Folic acid stability** Notes any monitoring program must not just analyse the average amount of folic acid in, for example, a loaf of bread but also the even distribution of folic acid in a loaf. This has implications for ensuring that consumers actually get the amount stated in any given portion of bread eaten. The CHC understands that folic acid is unstable under heat. As a substantial amount of bread is consumed as toast, the assessment report does not appear to include any data on the loss of folate in bread when it is toasted. **Monitoring** Monitoring must form an essential component of the proposal, and must be established to commence at the time the standard comes into effect. Any monitoring program must include tracking in changes of folic acid supplement use and consumer attitude to supplements as well as fortified foods, as supplement usage will be an integral message when raising awareness of fortification. Any health education information must continue to advise women to take folic acid supplements. **Ministerial Council Policy Guidelines** The consultation document does not adequately address the Ministerial Council on the addition of vitamins and minerals.

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		The CHC does not consider that an appropriate assessment of alternative strategies has been undertaken to establish if fortification is the most effective public health strategy to address the issue. Nor does the CHC consider it has been established that effective amounts of added folic acid will be delivered to the target group. **Cost benefit analysis** The CHC has concerns with the assumption of the cost benefit analysis noting that there is no consideration of non-wheat flour industry costs, domestic flour supply, the costs of monitoring and enforcement or communication activities. The CHC questions the costs to industry as it is assumed that only wheat millers have been considered and not other grain or seed flours used to make bread.
I11	Dairy Australia Ms Jacinta Orr	**Supports a modified Option 1** Believes voluntary fortification supported by appropriate health promotion campaigns using a variety of mediums has not been adequately trialled. **Modelling** Concerned the preferred option is being put forward in the context of insufficient information to assess current dietary consumption. Current food composition data is out of date, and range of food products has changed significantly since the last NNS 11 years ago. It is not expected there will be dietary information on groups other than children for several years. Questions if we do not know how much folic acid the population is consuming, how can we be sure people are not getting too much? Notes the DAR statement 'it cannot be concluded that mandatory fortification is without risks given the limited evidence available and recognised uncertainties'. Particularly concerned with potentially high intakes in children. Notes the US has estimated 15-25% of 1-8 year olds had folic acid intakes exceeding their Tolerable Upper Intake Level under the current fortification programme (Lewis et al., 1999). Notes the DAR acknowledges some children will exceed the upper limit but intakes remain within the margin of safety. **Ministerial Council Policy Guidelines** Believes the proposed approach contradicts the Ministerial Council Policy Guidelines which state 'to ensure added vitamins are present in food at levels that will not result in detrimental excess or imbalances'. **Consumer choice** Considers voluntary fortification will allow increased choice through a variety of products.

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		Education / Supplements Considers mandatory fortification does not meet the Ministerial Council principles as it has not been proven to be the most effective public health strategy to meet the health need. Mandatory fortification will still need supplements and education including a significant public health investment. Highlights that WA voluntary fortification and education has reduced NTDs incidence of over 35% (DAR, and Abraham and Webb 2001) compared to the proposed mandatory fortification of bread making flour estimated to lead to an 8% reduction. **Monitoring** Considers monitoring is essential. The DAR provides insufficient information regarding monitoring and review periods. Considers joint sharing of costs adds complexity. More clarity and detail of the requirements of a timely monitoring system is needed**.**
I12	Flour Millers Council of Australia Mr Graeme Lukey	**Supports a modified Option 1** Supports extended voluntary fortification and education. Does not accept that mandatory fortification with folate is the most effective public health strategy to address the current health problem. Believes enhanced voluntary fortification is the most effective strategy along with an education initiative to targeting the target population. **Modelling** Notes NNS is more than 12 years old and suggests 80% of the target population consume bread. Therefore 20% of the target population does not consume bread. Unfortunate that important issue which is highly reliant on consumption levels across the population, must rely on data which is quite old. **Health risks** Believes FSANZ has failed to address the latest information available regarding the risks of adverse health outcomes making it difficult to address the safety of exposure to the non-target group i.e. young children and the elderly. Considers this could influence a final balanced consideration. Believes the FSANZ proposal does not recognise that a percentage of the population including unhealthy individuals, children and the elderly will consume greater than 1000 µg f folic acid per day. Believes the proposal alters the underlying requirement not to jeopardise the safety of food supply and causes a proposed CBA to be invalid. Considers that despite folic acid being available at adequate levels, some have limited ability to utilise this (e.g. genetic makeup of individuals). Concerned vegetarians and vegans (population at risk of vitamin B12 deficiency) could have this condition masked by high folate intake.

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		Considers FSANZ is going into this despite acknowledging that the risk to public health and safety is uncertain and with the full knowledge that short-term monitoring in the US has not been undertaken. Particularly concerned that there could be unpredicted and unknown risks through long term exposure to folic acid intake. **International influence** FSANZ approach proposes a range of folic acid addition. Notes the US experience delivers overages up to 160-175% of that predicted. The US experience confirms that despite higher than expected levels of folic acid intake due to overage additions of folic acid, the reduction in NTDs is less than expected. Believes the limited data in Australia for reduction in NTDs under voluntary fortification compares favourably with US which has mandatory folic acid fortification. Suggest that based on US experience, the expectation for reduction in incidence should be at the lower end of the quoted range. **Monitoring** A comprehensive monitoring program is essential. Essential that any fortification program develops baseline data prior to introduction and that appropriate monitoring of safety & outcome is continued. Notes the poor 'track record' of government monitoring in the past (i.e. mandatory thiamin fortification). **Food vehicle** Using the existing technology, flour millers cannot achieve the tolerance range proposed by FSANZ (+/-10%) and therefore under this circumstance bread making flour is not a technically feasible food vehicle for mandatory folic acid fortification. Supplied data suggests a best expectation of +/-35% tolerance for existing technology, with 70% of results falling outside of a +/-10% tolerance. Considers heavy reliance on a single food vehicle is not the best strategy to reach the target population especially since various news poll surveys demonstrate the target population is generally cautious about the amount of bread they consume and the average slices consumed per week equated to about one day's requirement only. Considers bread making flour is likely to be more successful in reaching non target populations. Notes there have been previous restrictions to the fortification of a number of food types which could be well targeted to the target population (e.g. dairy products).

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		Impact on industry Notes current flour mill ingredient delivery systems are not capable of delivering to the FSANZ proposed range of 230-280µg per 100g of flour, as noted above. Provides costings of state of the art micro ingredient facilities which would satisfy operation limitations at flour mills, although notes no guarantee can be given that the addition tolerance proposed by FSANZ could be achieved. Risk of long term liability and potential impact through increased liability insurance premiums is of concern to industry. Given the risks of adverse health outcomes as a result of mandatory fortification, the flour milling and food industry would require full indemnity from prosecution as providers of product that they were legally obliged to fortify with folic acid. A number of flour mills could not afford to undertake such a large cost and would not be able to comply and thus be at risk of prosecution. Flour millers have worked hard to produce 'pure' foods for marketing & perceived health reasons, eliminating where possible all 'additives' from flour such as bleaches and preservatives. Therefore, the industry believes that a level of trust exists in Australian flour that does not exist with US and UK flour. Disappointed that key advice offered to FSANZ during consultation has not been understood or acknowledged in producing the DAR, especially given the central role the flour milling industry is expected to play in the proposal. **Cost Benefit Analysis** Considers the FSANZ proposal does not ensure the safety of food supply. Concerned the costs of a monitoring program acknowledged by FSANZ as essential were noted as not being part of the CBA. Provided costings for a theoretical delivery system which represents a capital cost of $42 million dollars if implemented across all flour mills in Australia & NZ and with annual operating costs of $25 million. Believes FSANZ estimate of 1% increase in the cost to consumers does not account for costs previously unidentified. For these reasons, believe the CBA is incomplete & invalid. **Consumer choice** Does not accept consumer choice of either consuming fortified bread or avoiding bread altogether as a genuine choice for those who want to include unfortified folic acid bread products in their diet.

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		Also considers that consumers might become complacent about seeking folate from other sources (e.g. green leafy vegetables) if they see bread products as satisfying their requirements. **Voluntary fortification** Notes voluntary fortification has been demonstrated to be successful based on data from FSANZ, despite the limited education, limited food types permitted and limited level of fortification. Notes that mean folic acid intake from voluntarily fortified foods among women of childbearing age in Australia is estimated to be 95µg, essentially the same as the expectation from the mandatory approach. Believes this is a strong statement of potential for an enhanced program of voluntary fortification. For these reasons dismissal of an enhanced voluntary fortification program seems premature as it is an effective public health strategy which could satisfy the stated goal for folic acid fortification. Questions why greater consideration and effort has not been applied to an increased voluntary fortification programme e.g. increased range of food stuffs at higher levels of fortification. Considers voluntary fortification does not pose a potential health and safety risk to those individuals who may well suffer adverse health outcomes as a result of supplemental folate intake. Also allows potential to adjust the product mix and fortification levels in consultation with industry, based on consumption and NTDs monitoring data. Also has the added benefit of allowing two sets of distinct data to be available for ongoing evaluation of any effects of folic acid inclusion in the diet. This will allow easy monitoring of both high and low intake subgroups.
I13	Food Technology Association of Victoria Inc Mr David Gill	**Supports Option 1** **Health Risks** Refers to reports (not specified) whereby the growth of some cancers can be accelerated by folate. Has concerns regarding people with epilepsy, the possibility of multiple births and long term effects of consumption of folate by the general non-target population. These must be thoroughly investigated and resolved prior to proceeding with mandatory fortification. Questions the effect on folate consumption of the target population as well as the non-target population if voluntary fortification with folate is to continue. Notes no data is presented on the folic acid content of bread when toasted. Folic acid decomposes at 240-250°C, which is much lower than the surface temperature of toast during toasting.

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		It is reported (reference not specified) that young women of child bearing age, mainly for weight reduction/maintenance reasons, are not regular consumers of bread nor would they consume the amount of bread required to ensure sufficient folate levels. Considers over 10 slices per day would be required to achieve even a proportion of the folate requirement. **Consumer choice** The ethical issues of mandatory fortification and removal of choice from consumers should be considered. Questions as thiamin has been added to bread making flour for several years, what are the results of this program? These results should be studied to determine the likelihood of success of an un-promoted, mandatory fortification program without education. Queried whether the target population is confined to a specific geographical area, ethnic group, or indigenous group whereby education or medicinal supplementation may be a more appropriate option. **Impact on industry** Considers the extent of the use of flour for bread making was not thoroughly explored, and the costs of labelling to industry were subsumed into the cost of the flour. Considers little or no account was taken of equipment changes and education/advertising campaigns that will not necessarily result in more sales, but will be expected of industry. Considers there was no indication that Governments were planning a supporting education program. Considers costs to consumers will increase, as any added cost to a raw material is inevitably is passed onto retail prices.
I14	Go Grains Health & Nutrition Ltd, Australia Ms Trish Griffiths	**Supports a modified option 1** Supports extending voluntary permissions for folate fortification to a wider range of foods known to be eaten by the target population together with implementation of public health education programs and continued efforts to encourage the intake of folate supplements by target population. **Health risks** Accepts that increasing folate intake of women in their childbearing years can contribute to reducing the risk of NTDs. Does not support mandatory fortification with folic acid and does not believe it is the most appropriate strategy to reach women of child-bearing age in order to reduce the incidence of NTDs. Concerns with long-term safety of high folate intake across the general population, particularly in the absence of adequate data on the folate status of Australian and New Zealand populations and of current data on folate intakes. State it has not been established that high intakes of folate are not detrimental.

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		Masking of Vit B12 deficiency & increased risk of twinning are concerns that have been raised but remain unanswered. Acknowledges although folate deficiency can increase malignancies including colorectal cancer, at least one paper raises the possibility of high folate intakes leading to increased risk of colorectal cancer[1]. Concerned that in the US/Canada folic acid is mandated at a lower level (140 mg/100g and 150 mg/100 g respectively) than proposed for Australia (230-280 mg/100 g) and therefore overseas safety data is of little relevance to the Australian situation. Believes FSANZ's conservative approach on appropriate levels of folic acid fortification is unlikely to deliver sufficient folic acid to the target population to meet the health objective (i.e. to reduce number of NTDs). Concerned that it could, however result in excess intake amongst children who are traditionally much higher bread consumers. **Voluntary fortification** Supports extending voluntary permissions for folate fortification to a wider range of foods known to be eaten by the target population together with implementation of public health education programs and continued efforts to encourage the intake of folate supplements by target population. Supports increasing the level of folate permitted to be added to voluntarily fortified foods in line with recently revised NRVs. Believes this would provide consumers with choice and make consumption above the Upper Level by non target groups i.e. children, less likely whilst still providing the target group with access to high folate foods. The fact that only 'limited data' exist to assess the impact of voluntary fortification, should not be seen as validation that voluntary fortification has not worked. Where data are available, voluntary fortification has been shown to be effective e.g. falls in the incidence of NTDs in SA, WA and Vic, since introduction. Believes P295 is inconsistent with the Ministerial Council Policy Guideline for Fortification of Food with Vitamins and Minerals. **NTD incidence** Believes a sustained public education campaign needs to be implemented to highlight the importance of folate for women of child bearing age with specific targeted strategies developed for indigenous Australians. **Monitoring** Adamant that an appropriate monitoring and surveillance program should be implemented prior to any change in the status of folate fortification. Does not want the lack of monitoring of thiamin fortification to be repeated with folic acid. A system should be implemented as soon as possible so that the incidence of NTDs is established prior to changes in permissions to fortify foods with folate.

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		Notes FSANZ acknowledges that it is unclear if any surveillance has been undertaken when referring to the apparent lack of side-effects in the US. FSANZ has indicated that responsibility for establishing and funding a monitoring system is outside its responsibilities (DAR) but since discussions with other agencies have yet to take place, there is no indication of commitment to this component of the project. Past experience in establishing monitoring and evaluation procedures is not encouraging e.g. thiamin fortification. Such a strategy is fundamental to any consideration of mandatory fortification. Notes the needs for baseline data to be assessed for 12 months prior to starting fortification in order for the efficacy of the strategy to be assessed and so that the need for continuation of the strategy can be later assessed. This is particularly important given the trend in decreasing NTD rates in some Australian states since introduction of voluntary fortification. Important to note that FSANZ estimates that mandatory fortification will only achieve a reduction of around 9% in NTDs. Questions the ability of FSANZ 'to review the need for mandatory fortification when sufficient monitoring data are available' (DAR) without baseline data being taken. **Food vehicle** Do not believe flour (or bread products) is the most suitable vehicle for reaching the target population. Notes it is not clear from the proposal whether non-wheat based flours and breads will be included. Potentially excludes the population who avoids bread e.g. those with coeliac disease, wheat intolerance or with a cultural avoidance to wheat. **Modelling** Considers information about what Australians are eating is extremely limited. Australia's most recent dietary survey data is 12 years old and the Apparent Consumption data previously collected by the ABS ceased in 1998. Although the latter showed some increase in bread consumption between mid-1980s and the mid-1990's (ABS), more recent data on usage of bread-making flour indicate that this trend has not continued. Question relying on 12 year old NNS for baseline data. Absence of up-to-date information on what Australians are eating is a critical element missing from the assessment process. Recent consumer data include a survey of 250 women conducted by News poll in July 2006 that found women of childbearing age eat only 11 slices of bread a week. Twenty one percent of women eat no bread at all.

Ref	Submitter	Submission Comments
		Three consumer research studies commissioned by Go Grains between 2004 and 2006 show the increasingly negative attitudes to bread, particularly amongst women, probably due to the popularity of low carbohydrate diets. Considers low carbohydrate mentality is still very ingrained, especially in the 18-35 age group. **CBA** If bread making flour from all sources is to be mandatorily fortified with folate then it is not reflected in the cost-benefit report. The issues and therefore costs to be addressed by other industries e.g. the rice industry, are substantially different to those of the wheat industry. References: 1 Van Guelpen B et al 2006, Low folate levels may protect against colorectal cancer, *Gut*
I15	New Zealand Association of Bakers Inc. (NZAB) Ms Marcia Dunnett	**Supports a modified Option 2** Alternative proposal is provided. **Concerns with current proposal** Data Considers it is unlikely the outcomes predicted will be achieved based on current bread consumption patterns. Using data from 1990s does not reflect more recent reductions in bread consumption. The food consumption model assumes a daily intake of 3 – 4 slices of bread per day to achieve the 131 ug folic acid intake projected for the target group. Current estimates of bread consumption for the target group from industry research (GWF and Goodman Fielder formal and informal research) show the target group consume 1 – 2 slices of bread a day rather than the 3 – 4 slices used in the model. Therefore the impact on the target groups is under the threshold of the Wald model, and the number of NTDs live births saved is likely to reduce significantly from that estimated. The mean intake of the target group as projected is less than 200 ug/day, the median is lower than this, and only 2% of target group will meet the maximum effectiveness level of 400 ug folic acid. Notes the anticipated NTDs prevented is 1 live birth and 8 NTD conceptions per year based on the Wald model. **Ministerial Council Policy Guidelines** Considers the proposal is inconsistent with policy principles for mandatory fortification Preferred regulatory option has not been demonstrated to be without risk. The effects of continually exceeding the UL particularly in the very young have yet to be determined.

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		Increased folic acid can mask vitamin B12 deficiencies in older people. The UK Scientific Advisory Committee on Nutrition (SCAN) has yet to promote fortification as it wishes to consider further evidence. Considers the proposal is not the most effective public health strategy as supplementation is still required, and a government funded education campaign has not yet been trialled. No clear evidence that the current proposal will deliver effective amounts of folic acid to meet the health objective. A programme that encourages women to consume grain breads is more consistent with nutrition guidelines than an approach that encourages consumption of all breads. **Impact on Industry** *Export risk* The proposed approach will jeopardise the export of flour based products manufactured in NZ. NZ government has been encouraging flour based companies to move into export markets, as demonstrated by a current government research investment in excess of $18 million. Product for current and future export markets, including frozen pastry and doughs will be affected. These products are produced using bread flour, and may also be affected by the risk of cross contamination at the flour mill. The possible presence of folic acid on the label will be problematic for companies affected. Export crumb products will be affected e.g. fish fillets and meats. Export products destined for Japan and the wider Asia area will be affected. NZ exporters may face a potential loss of export business worth in excess of $67million per annum. Many of the products sold into Asia use NZ's 'green' image for their marketing and the products are sold on the basis that they are 'natural' and contain no additives. Introduction of folic acid into flour will mean that the companies can no longer use this natural marketing approach, with possible loss of sales. This issue is more to meet consumer requirements rather than legislative requirements of the export market country.

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		Consumer choice The choice of flour products will be much more limited than FSANZ proposal suggests as most pastry flour produced in NZ originates from bread flour; a number of cakes are made from bread flour and retail high grade flour is made form bread flour. A number of NZ based flour mills will be unable to treat bread flour in isolation from other flour, therefore all flour will be fortified. There is strong consumer opposition to mandatory fortification as demonstrated by research in 2003 (Brown), and 2005 (Hawthorne). The strong New Zealand response is likely to be driven by the following factors: NZ food regulations until recently did not allow bread to contain artificial additives; NZ has no mandatory fortification, and the NZ public appears to have much stronger views regarding their right to control their food and beverage consumption as demonstrated by the fluoridation of water debates. There are sufficient differences between NZ and Australian consumers to warrant the alternative approach outlined in this submission. **Cost benefit analysis** The cost benefit analysis does not cost: • an education campaign that will be necessary with mandatory fortification; • the cost of monitoring; • the cost of labelling changes including products other than bread. Goodman Fielder indicates that for NZ the labelling costs will be double those estimated. The cost of labelling incurred by the baking industry will be in excess of $1 million. **Other concerns include:** • lack of clarity around the nature of the educational campaign • who will pay the costs incurred by the baking industry in implementing mandatory fortification • what scientific data is available to show that the folic acid from fortified flour will be bio-available in the bread. • how will the levels of folic acid in the flour be monitored in NZ? It is currently very difficult to have the test performed. **Alternative proposal** Recommendation includes: • fortifying a significant proportion of a range of breads (e.g. light grain breads) identified by consumer research as most popular with the target group. NZAB will assist with funding of this research;

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		• fortification at the bakery with the addition of a specific 'folic acid mix' at the same time as bread improvers, as is currently used by George Weston Foods; • include a selection of 'house-brand' breads in order to capture price conscious consumers; and • actively promote an education campaign with government funding and industry support. Consider benefits of the alternative proposal include: • consumer choice is maintained; • a relatively small cost to industry therefore costs passed on to consumers likely to be insignificant; • consumers outside the target group will avoid possible risk from excessive levels; • compliance is relatively easy to monitor by ensuring major plant baking companies are fortifying the agreed number of breads in the selected range, and that key producers of pre-mix and frozen doughs were covered; • an increased ability to control dosage levels, and to avoid potential compliance issues arising from under the Fair Trading Act; • labelling changes are needed only for the specific bread range affected, therefore reducing labelling costs; • an implementation period of less than twelve months; • an increased level of folic acid fortification for targeted bread range, delivering greater benefit to target population • if fortified at a higher level, there would be a reduced need for the target groups to consume supplements to reach the optimum effective level; • industry would support an education campaign that promotes public awareness of fortified breads; • the ability of industry to make an appropriate health claim, critical for a promotion campaign; • a government funded public campaign to promote the role of folic acid in NTD prevention is essential to ensure consumers support the proposed fortification; • the proposed fortification approach would allow time for the reporting from the UK Scientific Advisory Committee on Nutrition, for gathering of further data on NTDs in NZ, the impact of the recommended approach, data on current folate intake of NZ population, further data on risk of reaching UL in NZ children, more information on B12 of elderly New Zealanders, and for gathering further food consumption data to determine the most suitable food vehicle. Acknowledge that fortifying all bread flour is the only way to ensure all bread in NZ is fortified. Disadvantages of alternative proposal include: • compliance issues for artisan bakers (who produce bread from scratch, estimated at less than 5% of the total bread consumed.

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		• may miss the target population who purchase bread from artisan bakers. Notes that NZAB is willing to work with the agencies concerned on the alternative proposal.
I16	New Zealand Flour Millers Association Mr Andy Worrill	**Supports a modified option 2** Supports the alternative proposal from the NZ Association of Bakers. **Impact on Industry** *Technical difficulties* Few mills in New Zealand have the delivery systems that are sufficiently accurate to add folate to flour within the very narrow range of levels specified in the proposal. Some flour will therefore be fortified with folic acid to a level that is ineffectual in achieving the public health objectives of the proposal, and some flour will contain levels of folic acid in excess of the maximum specifications and overdosing will occur. The measured results for mandated thiamin additions to flour vary considerably (62% monthly variances); if this is applied to folate levels could be considerably in excess of maximum levels. The costs of acquisition and installation of these delivery systems are prohibitive, and would be passed onto consumers of flour (indicative costs have been provided to FSANZ recently). Smaller mills will not be able to meet this level of capital expenditure. *Compliance risks* Industry will be placed in the position of being unable to meet its legal requirements if folate is mandated for addition to flour at the proposed levels. With the likely variation in folate levels it is likely levels will fall outside the specifications. Meeting the specifications is not possible without new plant. The inability to meet specifications will have a flow on effect to other industries that are also required to disclose product information. *Impact on export markets* Affected exporters have all confirmed that the noting of folic acid on product labels will create barriers in their export markets. Exporters would also be unable to prevent cross contamination between domestic fortified and export non-fortified flours, resulting in lost markets or rejection of shipped flour. **Consumer choice** The proposal refers to fortifying 'bread flour' with the inference that there are a number of other available flours. The concept of 'bread flour' is misleading, as generally mills produce one type of flour. Any variations are made post production. Therefore the suggestion that flour can be produced as either fortified or non fortified is erroneous.

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		Consumers will in reality have little choice as to whether they purchase fortified or non fortified flour or flour based products. **Food vehicle / Alternative proposal** The Association supports the proposal by the New Zealand Association of Bakers that folate be added to a specified range of breads, yet to be determined. The bakery division of George Weston Foods in NZ currently add folate to flour as part of the bread making process for some of their products. This is achieved by adding a folate mix. This method will provide for very accurate amounts of folate to be added, with less likelihood that over or under dosing will occur. Monitoring of levels of folate in the final bread would be achieved easily as there are approximately 20 production sites in New Zealand. Greater choice will be provided as flour not containing folate will be available for sale.
I17	New Zealand Food and Grocery Council (FGC) Ms Brenda Cutress	**Supports a modified Option 2** **Food vehicle** The assumption that folic acid will be added to bread-making flour only is incorrect, and FSANZ has already been advised that 'all flours' in New Zealand will be fortified as segregation of bread-making flour is not possible. Submits that given the identified risks in the risk assessment, should have reviewed the food vehicle for one with less impact on the general public. Whilst fortifying flour with folic acid is consistent with international experience, there has also been a consumer choice option, which is denied NZ consumers **Ministerial Council Policy Guidelines** The food vehicle, bread-making flour, does not meet the Ministerial Council Policy Guidelines for mandatory fortification as it is does not deliver effective amounts of the added vitamin to the target group to meet the health objective. The target group do not consume bread in the quantities necessary to achieve the mean increase of 131 ug per day (NZ women) recommended in the proposal. On the consumption estimates used by FSANZ for Australia and New Zealand, almost 20% of women in the target group will not receive the beneficial effects of the proposal. Research of bread consumption by the major baking companies also shows that the bread intake of the target groups is 1-2 slices per day, which will result in the ineffective increase (40-80 ug/day), which is contrary to the specific order policy principles that mandatory fortification deliver effective amounts of the added vitamin. The effective intake of folic acid for NTD reduction is 400 ug folic acid/day.

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		This proposal will not achieve this goal in 98% of NZ women and 95% of Australian women in the target group. Folic acid supplementation and consumption of other folic acid fortified foods will still be necessary, yet FSANZ recognises that 50% pregnancies are unplanned, and reliance on supplements is not appropriate, which is a contradiction. More effective strategies need to be adopted. **Consumer choice and labelling** New Zealand consumers will have no ability to consume non-fortified flour under the proposed regulatory option; therefore FSANZ is incorrect in stating that consumers will still be able to purchase non-fortified flours. Believes that FSANZ acknowledges the recent NZ studies which show that that NZ consumers are strongly opposed to the mandatory fortification of bread with folic acid yet notes it is difficult to assess the likely response of consumers to mandatory fortification because of lack of research on likely consumer responses. FGC recognises that other countries have taken a mandatory fortification approach in respect of bread, but there has always been a consumer choice option of non-fortified bread available, which will not be the situation in New Zealand. **Trade and export implications** The proposal will have a significant effect on international trade, particularly NZ manufacturers that export to Asia. Insufficient attention was given by FSANZ to the trade implications of the proposal, and this is required under the FSANZ act. The majority of markets to which flour containing products are exported require unfortified products. Cereal flour and baking mixes, bread doughs and premixes, and cake and pastry contribute $14.2m, $67.3m, and $2.7m to export earnings respectively. Additionally, a proportion of confectionery (contributes $114.7m to export earnings) and a large range of exported crumbed products will be affected by the proposal. The Japanese export market is a particular concern, and as an example a frozen dough exporter has recently had to remove an enzyme in their formulation for the Japanese market, and experienced significant costs of over $1m. The addition of folic acid to breads that make organic or 'natural' claims will be in breach of the Fair Trading Act, and this issue should have been considered in the Proposal. **Technical feasibility** It will be impossible to guarantee the level of folic acid fortification between 230-280 ug/100 g flour. The experience of thiamine in Australia demonstrates the difficulty in controlling dosage levels, and the setting of an upper and lower limit with respect of folic acid is even more difficult. The quantities of folic acid in the final product will be highly inaccurate.

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		Differentiating between Australia and New Zealand Greater cognisance should have been given to issues of particular significance to New Zealand, namely consumer choice particularly in view of the current absence of mandatory fortification in NZ, inability to differentiate bread-making flour, the use of the terms 'natural' and organic, and export implications for NZ manufacturers. **Data** Insufficient attention has been given to the effect mandatory fortification will have on consumption patterns of consumers, and the statement that the limited evidence available suggests a change to consumer's consumption patterns is unlikely is not robust. Incomplete data is a flaw in the proposal, and the following gaps are noted: • relevance of UL to children not clear; • limited data on folic acid status of NZ and Australia populations, and on characteristics of women who will not be reached by mandatory folic acid fortification; • NNS data used was conducted prior to introduction of voluntary fortification. There have been substantial changes to dietary consumption from the mid-late 1990s; • no data on supplement dosage in NZ, or changes in the folate status since introduction of voluntary fortification; and • incomplete data for terminations available in NZ. **Cost benefit analysis** Is considered inadequate because it does not include: • the cost of monitoring including changes in voluntary fortified foods, updating food composition database, tracking labelling changes on fortified foods, tracking changes in food consumption patterns for different demographic groups for key food categories, consumer attitudes and behaviour towards mandatorily fortified foods; • additional enforcement costs from assessing the folic acid levels in the foods because of the variations in folic acid likely from flour fortification; • the cost of reduced choice (no choice in NZ); • the number of SKUs affected because of the food vehicle; • export implications; • communication and education costs; • the costs associated with twinning; and • setting of upper and lower limits will increase technical requirements on the milling industry. **Transition period** A longer transition period would be required as it would not be possible to make the labelling changes to the large number of stock keeping units (SKUs) that will be affected in New Zealand within a twelve month period.

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		Alternative options More time needs to be given to selecting a more effective solution to meet the objective of reducing the incidence of NTDs. Suggested options singly or combination are: • fortifying an identified range of bread that will be consumed by the target audience at the premix stage; and • increasing the range of other foods to which folic acid can be added voluntarily. Industry is willing to work with FSANZ to identify the most effective food vehicle, and in promotion of education messages.
I18	Organics Aotearoa New Zealand Hon. Ken Shirley	**Supports Option 1** Opposed to Option 2 **Consumer choice** Considers mandatory fortification removes individual choice. Interventions should be targeted strictly at the at risk population. Notes the proposal indicates 30% of the target group would not benefit because they lack the absorption capacity. The proposal involves medication of the total population for benefit of a few. **Impact on industry** Processing standards for organic bread do not permit the addition of synthetic vitamins. Mandatory fortification would also interfere with trade built on the principle of minimal intervention. **Education** Mandatory fortification sends the wrong message as it suggests supplementation can overcome the need to eat healthy food. Adding folate to processed flour products is promoting low nutrient carbohydrate eaten to excess already. **Health risks** Concerned at the 'uncertainties associated with mandatory fortification '. Considers the uncertainty of effects has not been adequately addressed. Suggests a more cautionary approach would be more accurate and appropriate. **Rate of NTDs** Notes there has been a worldwide decrease in NTDs over the last 2 decades. **Inadequate consideration of alternatives** Concerned the options in IAR were reduced to two options. Suggests choice would be improved if fortification was confined to certain bread premix or postmix additives instead of all flour. This would allow production of some organic bread products

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		Suggests alternative proposal That Government agencies run publicity campaigns on folic acid supplements creating market opportunities for firms willing to supplement.
I19	Organic Federation of Australia Ltd Mr Andre Leu	**Preferred Option not stated** Requests consideration of the following issues: ▪ will imported certified organic products be required to comply with the proposed regulation? ▪ the affect on exports of certified organic product where the customer does not wish to have a fortified product ▪ suggests as a preference, that a regulation state a minimum folic acid content required in the bread making flour so that product with sufficient folic acid will not require fortification.
	Industry Consultants	
I20	Banks Consultancy Ms Robyn Banks	**Supports a modified Option 1** Recommends FSANZ review the mandatory option and consider increasing the foods that can be voluntarily fortified with folate. **Voluntary fortification** Notes the limited uptake of voluntary fortification by industry. Considers there are currently limited permissions in the Food Standards Code for foods to be fortified with folate. Considers some of these are not permitted to claim the levels of folate added so do not contribute significant levels to the diet. Low fat milks and yoghurts would seem appropriate for the target market**.** **Impact on Industry** Considers the proposed level of folate in flour of 2.6 mg/kg +/- 10% may not be possible to achieve and such a small range will need to be finely controlled. Appropriate mixing will be needed for even distribution especially with dry mixing into flour. FSANZ will need to ensure that the methodology used for analysis of folate is robust enough for such an analytical range. Notes such ranges are usually reserved for macronutrients not micronutrient analysis. Provides a comparison with folate addition to infant formula which has a mandatory minimum and guideline maximum (4-fold variation) that allows for variation of analysis and methodology. Notes it appears other countries that have benefited from mandatory fortification provide a minimum folate addition (not minimum and maximum). Understands folate fortification will apply to all bread making flours, not just wheat flour. Considers this increases the complexity and thus costs, and industry has not provided costs on this aspect of fortification. Considers an appropriate cost-benefit has not been fully applied.

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		Recommendation That any mandatory fortification relies on minimum addition only, in the same manner as thiamin fortification requirements for bread making flour in Australia.
I21	Quentin Johnson, Canada	**Supports Option 2** Fully supports mandatory folic acid fortification, and was involved in the introduction of mandatory folic acid fortification in Canada as a former chairman of the Technical Committee of the Canadian National Millers Association. States that Canada has had other benefits from folic acid fortification, namely reduced homocysteine blood levels, reduced incidence of breast and colon cancer in women, and positive impact on patients with Alzheimer's disease.
	Public Health	
	Academic Individuals and Institutes	
P1	Prof. Mike Daube Professor of Health Policy, Curtin University of Technology	**Supports option 2** Considers: • fortification has been supported nationally and internationally by many major flour and bread companies; • folate fortification has been successfully implemented in some 40 countries; • voluntary fortification, supplementation and health promotion is an unsatisfactory, inadequate and insufficient response; • the proposal will be particularly beneficial to Aboriginal and other disadvantaged communities; and • the proposal is over cautious on the benefits. Overall very strongly supports mandatory fortification of bread making flour at levels proposed, supported by appropriate monitoring and health promotion
P2	Dr Vicki Flood Nutritional Epidemiologist, University of Sydney	**Supports Option 2** **Health risks** *B12 masking* Current evidence about the previously held view that vitamin B12 deficiency may be masked by people who consume large quantities of folic acid indicates that this is very unlikely to occur from doses received from fortified foods, and geriatricians who suspect B12 deficiency would usually measure serum B12, rather than rely on anaemic status (personal communication). Research conducted in the US prior to, during and later in the mandatory fortification of folate found no significant change of prevalence of anaemia among people with low serum B12 (Mills et al 2003).

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		Although a large proportion of people with low serum B12 in 2900 older people from the Blue Mountains (23%) (Flood et al 2006) were identified, no increased association of low serum B12 deficiency amongst people who consumed large amounts of folic acid was seen. *Cancer* Other concerns about side-effects of higher intake have included some mixed research about possible increased risk for some cancer types and unknown side-effects of unmetabolised folic acid, especially in consideration of life time exposure. However, these concerns underpin the need to carefully monitor components of the proposal, which should include food, biomarker and health outcomes. *CVD* Recent randomized controlled trails of B vitamin supplementation among people at risk of CVD indicate that there appears no overall reduced risk of CVD. It is interesting to note that one of these studies did indicate a small protective effect for stroke (RR) 0.75 (95%CI 0.59-0.97) (Lonn 2006) and that in the US, simultaneous to the introduction of mandatory folic acid, there have been 31000 fewer cases of stroke (Oakley et al 2004).
P3	Flour Fortification Initiative (FFI), Rollins School of Public Health, Emory University, Atlanta, USA Prof. Glen Maberly	**Supports Option 2** Notes that effectiveness of the proposal will depend on most of the flour milled in Australia and New Zealand being fortified. Agrees that the ongoing costs to millers are small; estimates $0.3 per 1,000 kg of flour equivalent to 3,400 loaves of bread. Indicates that the following organisations are actively supporting the FFI: AWB Ltd, Allied Mills, Australian Spina Bifida Association, CCS New Zealand, Children Telethon Institute in Western Australia, Manildra Group and the Sydney West Area Health Service.
P4	Dr Mark Lawrence School of Exercise and Nutrition Sciences, Deakin University	**Supports Option 1** Considers the best policy option was not made available (i.e. increased investment in the promotion of folic acid supplements). Considers the options proposed were inappropriately limited to just two of the many possible options available. Does not support mandatory fortification under the belief that it is contrary to Ministerial Council Policy Guidelines on Fortification of Food with Vitamins & Minerals. Considers a public health nutrition intervention is being proposed to attempt to address a genetic defect in at-risk individuals. Thus, a disjunction exists between the cause of the health problem and the nature of the proposed solution. hence raising many scientific and ethical uncertainties.

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		Modelling Notes the DAR states that 26 out of 300-350 affected conceptions will be prevented, this is just 8% of all affected conceptions, i.e. 92% will not be prevented. Also the DAR acknowledges that the target group will still need to consume folic acid supplements to achieve the recommended folic acid intake. This raises the question why are the resources and investment being devoted to the mandatory fortification proposal, instead of being committed to the promotion of folic acid supplements to the target group? Questions usefulness of dietary folate intake data and status in Australia with the last NNS now over 10 yrs old. **Monitoring** Considers it is premature to approve such a proposal without assurances that adequate baseline nutrition information and adequate monitoring and evaluation mechanisms are put in place. Does not believe there is enough evidence that monitoring and a formal review to assess the effectiveness of, and continuing need for the mandating of fortification. Previous experience with mandatory thiamin (& voluntary folic acid fortification) failed to satisfy this criteria. Monitoring must address all potential risks and benefits of mandatory fortification for all population groups and not just the target group. **Health risks** Mandatory fortification is not in the interest of public health nutrition. Concerned public health nutrition risks associated with mandatory folic acid fortification have increased, whilst the potential benefits have diminished. Considers there is a lack of up-to-date or comprehensive risk-benefits analysis for FSANZ to demonstrate benefits exceed the risks. Says it cannot be ensured that the added folic acid will be present in the food at levels that will not result in detrimental excesses or imbalances in the context of total intake across the general population. Mentions many emerging potential health risks (cancers, cognitive decline, twinning etc.) and indicates a precautionary approach is indicated in which we need to learn more about the balance of potential risks and benefits before approving the proposal. **Supplements** Robbins et al have reported that the promotion of folic acid supplements through physicians was more effective in delivering folic acid to the target group than mandatory folic acid fortification.

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		NTD incidence Says NTDs are not prevalent in Australia or NZ and so there is not a demonstrated significant health need to warrant mandatory folic acid fortification. Also states that NTD incidence continues to fall and has fallen by ~1/3 since voluntary folic acid fortification was introduced according to NHMRC Expert Panel Report on folate fortification in 1994. **Consultation** Four weeks insufficient for many stakeholders to review the information made available. Considers the options proposed were inappropriately limited to just two of the many possible options available. The best policy option was not made available (that being increased investment in the promotion of folic acid supplements). **References** Robbins et al 2005 Van Guelpen B, Hultdin J, Johansson I, et al 2006 Kune G,Watson L, 2006. Stolzenberg-Solomon RZ, Chang SC, Leitzmann MF, et al 2006 Troen AM, Mitchell B, Sorensen B, et al 2006 Ulrich CM, Potter JD 2006 Bonaa KH, Njolstad I, Ueland PM, et al 2006 McMahon JA, Green TJ, Skeaff CM, et al 2006 Haggarty P, McCallum H, McBain H, et al., 2006.
P5	Dr L Riddell, Dr M Lawrence, Dr S O'Rielly, Dr S Smith, Dr C Bulter Faculty of Health, Medicine, Nursing and Behavioural Sciences, Deakin University	**Supports Option 1** Support a well resourced and targeted folic acid supplementation program, particularly given the lack of nutrition information available in Australia to make an informed policy decision on mandatory fortification. State three significant limitations of the consultation process associated with the proposal: • incomplete information provided in the Draft Assessment Report e.g. the document refers to few of the 2006 papers in reputable journals reporting the findings of clinical trials raising potential risks associated with carcinogenesis, myocardial infarction or cognitive decline; • lack of time provided for public consultation. Note that the 'typical' consultation period is six weeks and the reduced time of four weeks has severely restricted our ability to undertake a detailed review of the documents; and • restricted policy options, particularly the exclusion of the promotion of folic acid supplements as a viable alternative option, given that just 8% of all NTD conception per years will be prevented from mandatory fortification.

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		General comments include: • implementing a mandatory fortification policy will expose the whole population to raised levels of synthetic folic acid in response a need in a small number of at-risk individuals; • there are currently no data indicating a population-wide deficiency or risk of deficiency within the Australian population; • mandatory folate fortification policy would represent a policy precedent in Australia, particularly as it is based on a therapeutic level of folic acid to prevent NTDs rather addressing a conventional folate deficiency; and • a targeted folic acid supplementation program will have greater efficiency and remove the risk of over exposure within the wider population (noting the upper limit of folate intake set recently by the NHMRC of 1 mg/day for adults). **Health risks** *Folic acid and heart disease* In three large, multi-centred randomised controlled trials, no evidence of benefit of folic acid supplementation was observed for the secondary prevention of cardiovascular disease (Bonaa *et al*., 2006; Toole *et al*., 2004 and HOPE 2 Investigators, 2006) and in one there was a near significant increase in myocardial infarctions (Bonaa *et al*., 2006). *Folic acid and cognition* A recent two year randomised controlled trial of folic acid supplementation found no evidence of a positive effect on cognition in the elderly and provided evidence of a statistically significant increase in time taken in information processing (McMahon *et al*., 2006). *Folic acid and cancer risk* A European longitudinal study observed a significant increased risk of colorectal cancer in individuals with the highest folate intakes over a 4.2 year period (Van Guelpen *et al*. 2006). In a separate US cohort high folate intakes, attributed to supplements, were associated with a significant increased risk of breast cancer (Stolzenberg-Solomon *et al*. 2006). A review of folate intakes and cancer by Ulrich and Potter (2006) highlights the importance of adopting a precautionary approach to folate fortification. *Folic acid and reduced immune status* A study of postmenopausal women in the US observed that 78% had detectable levels of unmetabolised folic acid and a significant increase was observed between increasing levels of unmetabolised folic acid and natural killer cell cytotoxicity (a marker of immune status) with the strength of the associating increasing in women over 60 years old (Troen *et al*., 2006). Unmetabolised folic acid has also been found in the cord blood of newborns and in the serum of 4-day old infants in a country that has not implemented mandatory fortification (Sweeney *et al*., 2005).

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		Consider the argument that there have been no observable risks overseas following the introduction of mandatory fortification is not suitable justification as adequate monitoring has not been implemented (Rosenberg, 2005) and the duration of exposure is not sufficient to fully assess all outcomes. **Monitoring** If implemented, it is essential that there be adequate monitoring and evaluation of this intervention. Concerned that the co-existence of mandatory and voluntary fortification permissions limits the accurate assessment of folate exposure of the population. Prenatal health risks associated with unmetabolised folic acid are unknown so how will authorities know what to monitor. **Recommend**: • a comprehensive and updated risk benefit analysis be conducted (concerned that the cost/benefit document does not include any of the recent literature reporting findings of potential risks); • that baseline information be put in place for dietary folate intake and status of the population and target group, particularly as folate consumption patterns are based on outdated data; and • greater investment in the promotion of folic acid supplements to the target population. **References not already mentioned in the Draft Assessment Report:** Ulrich and Potter (2006) Troen et al 2006 Robbins et al 2005 and others.
P6	Prof. Alastair MacLennan Discipline of Obstetrics & Gynaecology, Women's and Children's Hospital, School of Paediatrics & Reproductive Health Adelaide University, Australia	**Supports Option 2** States that compliance with folate supplementation is low and NTDs rates have changed little in Australia and in countries with similar policies. States that the two policies, mandatory fortification and peri-conceptional supplementation, are both required to reduce NTDs. Believes the population risks are poorly established and that the cost of fortification is low compared to the human and financial costs of NTDs. Refers to an unpublished, but recently submitted, paper: Conlin ML, Maclennan AH and Broadbent JL. Inadequate compliance with peri-conceptional folic acid supplementation in South Australia.

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P7	Dr Peter Nixon The University of Queensland	**Preferred Option not specified** Comments on the 'balanced and conservative' approach taken in the Proposal. **Health risks** *Masking of the diagnosis if vitamin B12 deficiency* States that whilst vitamin B12 deficiency is readily corrected its diagnosis is easily missed when the patient presents with subtle (or even overt) neurological symptoms. However, the risk of increasing vitamin B12 deficiency in the population is negligible given the proposed level of fortification but does highlight the need for better education of the medical profession in this regard. Recommends use of 5-methyl-tetrahydrofolate as a potential fortificant because of its reduced potential for precipitating neurological disease. Acknowledges, however, that this is a more expensive and slightly less stable form of folate. *Potential drug interactions* Agrees that the proposed increase in folic acid intake would not cause any drug interactions. **Food vehicle** Questions the use of bread-making flour in reaching the target audience but does not provide any supporting information. **Data** *NTDs reduced* Believes the proportion of NTDs that are expected to be prevented is 'disappointingly small'. Provides reference to 27 of his own publications in the field of folate metabolism, antifolate pharmacology and clinical pharmacology, and folate nutrition.
P8	Dr Godfrey Oakley Jr & Karen Bell Rollins School of Public Health, Emory University, Atlanta, USA	**Supports Option 2** Considers the evidence presented in the proposal to be sound. **Overseas experience** State that the bakers and millers in the US have had a positive experience with folic acid fortification and they recently discussed with the FDA a regulatory change to increase the type of cereals fortified. Acknowledge that mandatory fortification will not prevent all cases of NTDs but in countries where mandatory fortification is in place it is supplemented by voluntary fortification of breakfast cereals and education programs to increase folic acid supplement intake. It does, however, provide at least some protection to almost all women. In response to the issue of risk, state that there has been no report of harm following mandatory fortification in the US but many reports of benefit.

Ref	Submitter	Submission Comments
		Supplements Do not consider that women need to take folic acid every day to maintain blood folate concentration. **Voluntary fortification** Consider the suggestion to voluntarily fortify more foods to be disingenuous based on a previous lack of commitment to voluntary fortification by industry. Believe that millers and bakers have been aware of the issue for a long time, including the likelihood that mandatory fortification would be recommended; therefore an extension of time is not warranted.
P9	Dr Janet Pritchard Clinical Research Dietitian, Royal Melbourne Hospital and Honorary Senior Fellow, Physiology Department, University of Melbourne and a member on the Food Safety Council, Victoria	**Supports Option 2** **Health Risks** *Upper Limit* The upper limit of folate for adults was based on the potential for folic acid to mask the diagnosis of vitamin B12 deficiency. However the Committee on Medical Aspects of Food and Nutrition Policy of the UK has proposed that the upper levels of folic acid intake were unlikely to be reached with fortification levels of the rate of 240 µg per 100 g of food consumed (COMA, 2000). In establishing fortification levels in the USA, the USFDA came to similar conclusion (USFDA, 1996). The Canadian program undertaken to evaluate the effects of pre- and post fortification with folic acid examined the vitamin B12 status of seniors and found no evidence of a deterioration, nor of improved folate status masking the manifestations of vitamin B12 deficiency (Canada Health, 2003). *Cancer* The 121, 000 nurse subjects in the Nurses Health Study showed that long term folic acid supplementation was associated with a decreased risk of colon cancer in women aged 55 to 69 years of age (Giovannussi et al, 1998). Further experimental evidence suggests that the risk of rectal cancer is significantly reduced in men and women with the highest folate intakes (Freudenheim et al, 1991). *CVD* Reduction in plasma homocysteine levels in the USA following folate fortification was associated with 25,000 fewer deaths from strokes and ischaemic heart disease, a decrease of 3.4% (Oakley, 2003). The mandatory fortification of bread with folic acid could render foods that are voluntarily fortified less attractive to the consumer. As this is unlikely to be good news for the manufacturers of foods currently voluntarily fortified with folic acid, these foods may disappear from the marketplace.

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		According to the most recent dietary data (ABS, NNS 1995)): • women of childbearing age (16-44 years) in Australia consumed a mean intake of 230 µg folate per day; • the majority (65%) of folate was from 95 g of breads, 70 g of cereal products and 89 g of vegetables; • potatoes, dairy products, fruit and vegetable juices, yeast extracts and tea provided the remaining 35%; Regular breads and rolls alone provided 12-14% of dietary folate to 93-94% of the female population of this age group and contributed to over 30% of their dietary energy intake. According to Kamien (2006), 300-350 infants with NTDs are born in Australia each year, a rate of approximately one child in 500 births. Lumley et al (2001) estimated the Australian prevalence data, including terminations associated with prenatal diagnosis of NTD, to be 16 in 10,000 births. Under mandatory fortification women of childbearing age considering pregnancy would require folic acid supplements to reach the folic acid RDI of 600 µg per day. Public health education for NTD prevention therefore should continue. *Is folate deficiency the cause of NTD?* It is believed that NTD is caused by a combination of biological and environmental factors, some of which implicate folate deficiency. *Biological/genetic factors* Wenstrom et al. (2000) considered the question: is hyper-homocysteinaemia a likely factor associated with NTD? Their study reported amniotic fluid levels of homocysteine significantly elevated in NTD pregnancies compared with non-NTD pregnancies. The report proposed a hypothesis: that folate deficiency is associated with hyperhomocysteinaemia: and that the value of periconceptual folate is in lowering maternal plasma homocysteine levels (RCOG 2003). The Royal College of Obstetricians and Gynaecologists (2003) described a homozygous mutation of the enzyme 5,10-methylene-tetrahydrofolate reductase that decreases folate's enzyme activity. This mutation had been implicated in the aetiology of NTDs (Whitehead et al.1995). The authors concluded that the mutation can be overcome by folic acid supplementation, leading to preventable NTDs is those carrying the mutation. Animal studies showing that folic acid corrects neurulation (appropriate neural plate closure) in genetically predisposed embryos, suggests that it acts by true primary prevention (RCOG, 2003).

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		It has been hypothesised also (Hook and Czeizel, 1997) that women lacking a periconceptional diet adequate in folate who are homozygous for cystathionine B synthetase deficiency, an inborn error of metabolism that results in a markedly elevated homocysteine level, have a foetal loss of around 50%, and that dietary folate may aid in producing a potentially viable infant. *Environmental/occupational factors* Low socio-economic status and poor diet have been implicated by many studies (Lumley et al, 2006). Nili and Jahangiri's recent study found that low socio-economic status was the factor with the greatest influence on NTD, with nutritional deficiency due to poverty and poverty related problems pre-disposing mothers to the most important NTD risk factor (p=0.0001). **International experience** Fortification of wheat flour has been introduced in a number of countries including the USA, Canada and Chile. Evaluation of the fortification of food with folic acid by Canada yielded valuable pre-fortification and post-fortification data (Public Health Agency of Canada, 2003) including: • a dramatic decline in early mid-trimester prevalence of NTDs followed (FSANZ p19); • the national NTD rate fell to 0.75 per 1,000 births (live births and stillbirths) from 1.16 per 1,000 in 1989, a fall of 48%; • the rates if change in individual Canadian provinces with different pre- and post fortification rates of NTD were between 78% to 49%. Less than 75% of females aged 16-44 years had a folate intake exceeding the Recommended Dietary Intake (RDI) of 400 µg per day for non-pregnant women; and • less than 10% of women in this age group had a folate intake in excess of the higher RDI for pregnancy (ABS NNS 1995).
P10	Assoc. Prof. C. Murray Skeaff Department of Human Nutrition, University of Otago	**Supports Option 1** Opposes mandatory fortification proposal *Mandatory Fortification* Does not support the proposed approach for mandatory folic acid fortification of bread making flour for the following reasons: • it will cause a negligible decrease in NTD rates; • it will prevent education programs and voluntary fortification, which he considers in a country of New Zealand's population size would achieve far greater reductions in NTD rates; • it does not provide enough folic acid to the target group to produce a substantial reduction in NTDs; • considers New Zealand women have high folate status and there is a low rate of NTD, which suggests that mandatory fortification will have a minimal effect on NTD rates; • a study in China showed that use of a 400 µg/d folic acid supplement did not decrease the rate of NTDs in population with an NTD rate similar to New Zealand (Berry et al).

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		• Therefore, considers this evidence suggests that a lower dose of folic acid (131 µg/d) received through commercial bread flour will not reduce NTD rates in New Zealand; • considers the decline in rate of NTDs in the US and Canada after mandatory fortification is an extension of the declining trends that preceded fortification, and thus the decline in NTD rates attributable to folic acid fortification have been overestimated in these countries (Honein et al and Ray et al); and • the folate status of women of childbearing age in Dunedin, New Zealand, is as good as that of women in the US after fortification (Erikson et al and Ferguson et al), and thus suggests there will be little further reduction in the rate of NTDs with mandatory folic acid fortification of bread flour. Considers that if mandatory fortification must be used, then a higher level of fortification is required to achieve greater gains in preventing NTDs. Questions why a higher level of fortification has not been proposed, particularly when Proposal P295 argues that the risks associated with high folic acid intakes are minimal to the population. *Education and Voluntary Fortification* Considers education and behaviour change, along with voluntary fortification will achieve a greater reduction in NTD rates than the current proposal, and poses minimal risk to the non-target population. *Supplements* Considers promoting the use of folic acid supplements is likely to achieve a greater reduction in NTD rates in New Zealand than mandatory fortification of bread-making flour. Notes that if 25% of women who became pregnant took a 400 µg supplement during the periconceptional period, this would equate to the number of NTD cases prevented under the proposed mandatory fortification option. Considers the above would be achievable with adequate education on the need for folic acid supplements during the periconceptional period, citing the results from overseas programs of education and behaviour change (Wright et al), and a New Zealand survey conducted in 2005 (submitted to NZ Med J). *References* Skeaff M, et al. New Zealand Medical Journal 2003;116:U303 Skeaff M, et al. New Zealand Medical Journal 1998;111:417-418 Berry RJ, et al. New England Journal of Medicine 1999;341:1485-1490 Honein MA, et al. JAMA 2001;285:2981-6 Ray JG, et al. Lancet 2002;360:2047-8 Erickson JD, et al. MMWR 2002;51:808-810 Ferguson EL, et al. Research: Ministry of Health; 2000. Wright JD, et al. Data from the National Health Survey 1998:1-78

Ref	Submitter	Submission Comments
P11	Dr David Spence Professor of Neurology and Clinical Pharmacology, University of Western Ontario and Director, Stroke Prevention & Atherosclerosis Research Centre, Robarts Research Institute, Canada	**Supports a modified Option 2** Acknowledges that vitamin B12 deficiency in the elderly is becoming more apparent than previously assumed affecting 17-20% of people aged over 65 years. Supplements in high doses are required to overcome vitamin B12 deficiency associated with malabsorption in the elderly and are probably more effective than monthly injections. Recommends that the folate supplement dose is increased and that vitamin B12 is mandatorily fortified as well. States that vitamin B12 deficiency aggravates vascular disease by raising levels of homocysteine; causes neuropathy, myelopathy and dementia; and because it impairs position sense it contributes to falls in the elderly. Provides the following references: Andres E, Loukili NH, Noel E, Kaltenbach et al….
P12	Prof. Barry Taylor Department of Women's and Children's Health, University of Otago	**Supports Option 2** Believes the proposal is well thought out and researched, particularly in relation to the search for potential harm. Believes the argument for mandatory folic acid fortification is very strong. As past President of the Paediatric Society of New Zealand (PSNZ), believes that flour fortification will be strongly supported by the PSNZ.
P13	Dr Soja John Thaikattil Student, School of Public Health, The University of Sydney	**Supports a modified Option 2** Supports mandatory folic acid fortification to reduce the prevalence of NTDs. Considers that mandatory fortification ensures that the benefit of fortification is available to all socioeconomic groups, and to those who do not change their dietary habits in response to public education campaigns. Considers extension of voluntary fortification, without mandatory fortification, would leave the management of a public health issue entirely in the hands of the food industry. **Level of fortification** Considers that the level of fortification could be fixed without concern at 280µg/100g of bread making flour, because of the 30% loss during the baking process and 150g of bread made from 100 g of flour, 100g of bread provides approximately 131µg of folic acid. *Upper limit of intake* Considers that although no adverse effects of exceeding the upper limit of intake has been observed in countries with mandatory fortification, it is advisable to limit the consumption of synthetic folic acid above the recommended upper limit in the elderly.

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		Does not consider consumption of folic acid by children in excess of the upper limit to be of concern. **Food vehicle** Considers that mandatory fortification could be extended at a later stage, to include staple foods consumed by ethnic groups who eat little or no bread. Notes that in the US corn grits, cornmeal, farina, rice and macaroni products are also fortified. **Potential health risks** Refers to an article by Boxmeer et al (2006) to resolve the concern of multiple births. Notes that clinicians should be aware of potential folic acid-drug interactions, and monitor and manage their patients accordingly Notes the bidirectional interaction between phenytoin and folic acid. Considers the increased risk of some cancers is still at the level of hypothesis, and that extrapolation of results from animal studies to humans should be interpreted with caution. However, notes monitoring for any increased incidence of cancer and steps to ensure that long term consumption of folic acid does not exceed 1 mg/d (e.g. by reducing the level of folic acid in voluntary fortified foods), would help in keeping the perceived risk to a minimum. Refers to the report prepared by Capra et al (2006) assessing the risk of masking vitamin B12, which concludes that there is no evidence that at intake levels of 1 mg of dietary folate equivalents that masking of vitamin B12 deficiency will occur. Considers that when symptoms, signs and tests specific to vitamin B12 are used for diagnosis of B12 deficiency, the level of folic acid becomes irrelevant. Considers the term 'masking of B12 deficiency by folic acid' is obsolete, as this would only be applicable if B12 deficiency was always marked by megaloblastic anaemia and it was not just a specific and conclusive sign of B12 deficiency, but also the only one. Provides a first draft of clinical practice guidelines for diagnosis of vitamin B12 deficiency Considers there is a case for co-fortification with vitamin B12 as it: • enhances the effect of folic acid fortification, as B12 deficiency leads to 'methyltrap'; • would lead to further reduction in homocysteine by 7%; • would reverse the mild B12 deficiency in the elderly;

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		• would protect other vulnerable groups for B12 deficiency (e.g. vegans and alcoholics); • is inexpensive and safe; and • would resolve the concern about B12 masking in the elderly. Recommends a level for vitamin B12 co-fortification of 10 ug/100g flour. **Education** Notes that it is necessary to highlight other benefits of increased folic acid intakes for the general population as part of public awareness campaigns. Considers the role of folic acid in the prevention of NTDs should be included in the school curriculum as part of the sex education program. Considers public education about B12 deficiency in the elderly should be started, and target those above 40 years of age.
P14	Prof. A. Stewart Truswell Human Nutrition Unit, The University of Sydney	**Supports a modified Option 2** States that the evidence for folic acid preventing NTDS is NHMRC level 1. States that voluntary folic acid fortification has not been taken up by the food industry. States that a significant proportion of Australian women are not taking folic acid supplements before and in early pregnancy, particularly those in lower socio-economic groups (Binns *et al*., 2006). Acknowledges the success in the US from mandatory folic acid fortification – fewer NTDs, higher serum folates (without any decline in serum vitamin B12), fewer cases of folate deficient anaemia, lower serum homocysteines and no side effects. Considers that Australia should add folic acid to all cereal grains, not just bread flour as is the case in North America, because women consume less than half the bread eaten in Australia. References: Binns et al 2006
P15	Prof. Nicholas Wald Wolfson Institute of Preventative Medicine, London	**Supports Option 2** As far as prevention of serious disorders is concerned, cardiovascular disease deserves the greatest attention. Believes the conclusion in the report that there is probably evidence that increased intakes of folate protects against cardiovascular disease is accurate and sound. The assessment of risk of masking vitamin B-12 deficiency through increasing folic acid intake is excellent. Considers it is, in practical terms, probably a non-issue (vitamin B-12 deficiency is unlikely to be affected) and is unlikely to be a problem if doctors do not rely on the presence of anaemia before suspecting or diagnosing vitamin B-12 deficiency. The recommended level of mandatory fortification is reasonable.

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		The recommendation to take blood samples of the population before and after fortification, and measure serum and red cell folate is sensible. Serum homocysteine could be measured as well. It is sensible to continue to recommend folic acid supplementation and education in addition to mandatory fortification. However, considers 5 mg of folic acid should be recommended, not 0.4 mg. The extra level of protection women will achieve through taking 5 mg of folic acid a day prior to pregnancy is substantial (about 80% preventative effect compared with about 50% with the lower dose of 0.4 mg).
P16	Lyn Watson, Mother and Child Health Research, La Trobe University and Prof. Gabriel Kune, Professor of Surgery, University of Sydney	**Supports Option 1** Opposes the mandatory fortification proposal. **Health Risks** It is possible that with the proposed level of fortification, and the precedent from the US that overages (addition of more folate than mandated) will occur, and in conjunction with use of multivitamin supplements result in intakes in excess of the recommended upper limit in certain age groups. There is already some concern about this in children aged 1-3 years where the RDI is 150 µg per day and in the older population. The possible impact of folate on cancer promotion or acceleration incidence (Ulrich, 2006) is supported by emerging findings in cancer studies, both of which showed increased risks associated with high levels of folate intake. (Van Guelpen, 2006; Kune, 2006). There is evidence that the NTD affected births occur in women with an abnormality in homocysteine metabolism and not a deficiency in folate per se (Mills, 1995). Mandatory fortification with its population-based approach is likely to defer other strategies such as ascertainment of genetic susceptibility which would result in a more targeted approach. **Monitoring** Expressed concern that at present no established funding has been set aside for population monitoring of the mandatory fortification. This goes beyond the responsibility of FSANZ (P295, Attachment 12, p6). No decision should be undertaken without committed, dedicated on going funding for this process. **Ministerial Council Policy Guidelines – Mandatory Fortification** Notes these state that 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'. Considers that whilst neural tube defects are undisputedly severe health problems their prevalence is not high, affecting in the order of about 1/800 pregnancies or about 300-350 per year in Australia. Many of these (~80%) naturally abort or are terminated. The mandatory folate acid fortification program aims to reduce around 26 pregnancies per year, a

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		population effect of less than 0.1% over a lifetime.
P17	Anthony Wright and Paul Finglas Institute of Food Research, Norwich Research Park, Norwich, United Kingdom	**Supports Option 1** **Health Risks** Notes the anticipated exposure of the systemic blood plasma circulation to unmetabolised folic acid may have been underestimated. Humans are unique amongst all other animals in that they have a comparatively poor ability to reduce folic acid. This may lead to saturation of a liver folate pool and feedback suppression of the ability to clear newly absorbed folic acid from the hepatic portal vein, inevitably leading to increasing circulating concentrations of unmetabolised folic acid. Unmetabolised folic acid may: • precipitate or exacerbate hypo-methylation, thus affecting *inter alia* the efficiency of neurotransmitter synthesis (cognition) and DNA methylation (gene expression); up-regulate dihydrofolate reductase enzyme activity, which may be accompanied by increased pyrimidine production (the rate limiting step for DNA synthesis), potentially predisposing cells to an 'accelerating' effect that may be detrimental in the context of cancer; • reduce the cytotoxicity of Natural Killer cells – thus raising concerns of unintended influences on what may be considered a first line of host defence against carcinogenesis. Attachment 6 of the FSANZ report states 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.'* Notes new research shows the complete opposite: smaller multiple doses result in a far greater concentration of unmetabolised folic acid in the plasma (Sweeney et al., 2006). Considers wider consideration should be given to the potential effects of mandatory folic acid fortification on the 10-30% of elderly with B12 depletion/deficiency, rather than a narrow focus on whether the haematological clinical signs of B12 deficiency due to pernicious anaemia (the minor cause of deficiency) can be 'masked'.
P18	Human Nutrition Cluster, Massey University, New Zealand Dr Jane Coad and Dr Janet Weber	**Supports a modified Option 1** Supports the proposal in principle and agrees that mandatory fortification with folic acid has potential to reduce the incidence of pregnancies affected NTDs. However express the following concerns: **Baseline data** Fortification should not begin until a baseline survey has been undertaken. 1997 NNS dose not provide adequate baseline data in terms of present food consumption, and does not include collection of biochemical indices of folate and vitamin B12 status, both of which are essential baseline data. Baseline data will also need to be collected for children.

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		Food vehicle and level of fortification The estimated increase in folic acid consumption among the target group will only prevent a small number of NTDs. Recommends folic acid be added to a wider range of foods to increase coverage to the target population and reduce risk of over consumption by heavy consumers of one product. Would like to see an estimated increase of greater than approx. 100µg / day (131µg in NZ). Understand the need to avoid over consumption, but points out the decision to discount addition of 300 µg / 100g folic acid to bread making flour was based on a modelled intake exceeding the UL for children. Refers to the DAR noting the relevance of the UL for children is not clear. The UL is based on potential to mask B12 deficiency which is very uncommon on children. Notes there was no relevant data related to the folate UL for children, so the actual UL value is the result of adjustment based on relative body weight (NHMRC/MOH, 2006). The use of body weight is not a direct reflection of folate metabolism and is very conservative approach given that the folate RDI for children is greater that what would be expected based on relative body weight calculation. The usual intake of children is in excess of the UL for several nutrients, and as there are no observed adverse effects it can be argued that many of the ULs for children represent a commitment to produce UL as apposed to providing evidence based recommendations (Zlotkin, 2006). Notes the UK committee has not published a UL for children for folate (EGVM, 2003). The level of fortification in the DAR results in an estimated increased intake comparable to what was predicted in the US (approx 199µg / day); However the baseline folate intake was higher than in NZ. The actual increased intake in US appears to have been significantly higher (approx 200µg /day) possibly due to overages and increased voluntary fortification. Biochemical indices of folate status suggest that this increase was seen at all ages. Acknowledged there has been no indication of adverse effects among any age group in US. Requests that FSANZ revisit the level of fortification, ideally by widening the foods to be fortified, but at least increasing the level of folic acid to be added to flour to +300µg / 100g. **Monitoring** It is imperative commitments be gained from other agencies to take part in monitoring. It is of concern that the costs of blood tests are not yet included. Blood tests should be a high priority for funding. Cancer incidence also needs to be added to the factors to be monitored. **Other ways to increase folate intake** Considers the majority of NTDs will not be prevented at the proposed level.

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		Agrees a public health campaign aimed at individual behaviour is unlikely to increase intake sufficiently to eliminate all potentially preventable NTDs, but it is clear the NZ campaign could be more fully resourced and additional methods used. Recommends a social marketing campaign along with freely available supplements for the target group. Suggests the level of folate in multi vitamins also needs to be reconsidered.
P19	Menzies Centre for Health Policy, The University of Sydney/The Australian National University Dr Stephen Leeder	**Supports Option 2** Highlights that fortification of flour with folic acid is supported by strong evidence and that international experience has indicated that it is a feasible, inexpensive and safe measure that prevents NTDs. In Australia and New Zealand it will boost current strategies that aim to reduce the incidence of NTDs through education and supplement use.
P20	Telethon Institute for Child Health Research Prof. Fiona Stanley	**Supports Option 2** Mandatory fortification should provide Indigenous women with increased intake of folate and assist in reducing of NTDs among the Indigenous population. Acknowledge the continuing need to recommend peri-conceptional folic acid supplementation and education and these will need to be adequately funded. **Monitoring** Strongly support the need to monitor the effectiveness and safety of fortification. Although the data for many of the monitoring activities are already routinely collected, there will need to be commitment from the Commonwealth Government and States and Territories to undertake supporting activities. Data linkage at the state level would also be valuable in assessing the contribution of assisted reproductive technologies to multiple births. It is essential that there is an independent monitoring body to coordinate all monitoring activities, review international research on folate and health and evaluate the effectiveness and safety of fortification in Australia and New Zealand. **Voluntary fortification** Aware that some segments of industry do not support mandatory fortification and instead want extension of voluntary fortification. But voluntary fortification has not been widely embraced by industry. Considers recent data supplied by food industry indicating that women did not eat much bread were based on small and biased samples and are inadequate evidence to oppose mandatory fortification.

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		Oddy *et al*. (in press) indicate that in a sample of 450 recently pregnant women, the majority do eat bread, although a national nutrition survey would provide more sound information.
P21	WA Birth Defects Registry Carol Bower	**Supports Option 2** **Health Risks** Notes an increase of 100 µg daily is consistent with the new nutrient reference values for Australia and New Zealand and, in view of the recent literature raising concerns about the potentiation of cancers by high folate levels, this cautious approach is prudent, as it will result in very few people in the population having high folate levels due to fortification. Whilst this small increment in folate intake will have a relatively small effect on neural tube defect (NTD) prevention, it will limit potential risks of unduly high levels. **Consumer Choice** Notes that consumer choice may be limited by the proposal to fortify all bread-making flour and supports the FSANZ proposal to conduct research into consumer attitudes and behaviour towards fortified flour. **Monitoring** Considers there is a need for states, territories and federal bodies to enable and contribute to monitoring. Monitoring should include not only an obligation to obtaining national data on trends in NTD (including terminations of pregnancy) and national nutrition surveys that include measures of blood folate, but also monitoring of other potential risks and benefits that are outside FSANZ's responsibilities, including trends in cancer, cardiovascular disease, vitamin B12 deficiency, other birth defects and multiple births. Data on many of these conditions are already routinely collected in Australia and New Zealand. Considers monitoring data must be available for a period prior to fortification as well as once it is in place. Recommends a body be established and functioning before fortification is begun, to guide activities and ensure adequate funding for them. Then, such a body should review the monitoring data for Australia and New Zealand as well as data from other countries and, using all the available evidence, assess the risks, benefits, adequacy and effectiveness of fortification in Australia and New Zealand and make recommendations based on the evidence. Supports the FSANZ initiative to monitor voluntary fortification, which should include detail on when and where particular fortified products are available.

Ref	Submitter	Submission Comments
	Health Professionals and Specialist Health Units	
P22	Sheryl Boulos Registered Nurse, Sydney, New South Wales	**Supports option 2** Paediatric nurse who notes the financial, emotional and physical costs of NTDs. Considers the proposal will improve public health as well as reduce the incidence of NTDs.
P23	Denise Campbell The Children's Hospital at Westmead	**Supports Option – 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P24	Dr Jin-Gun Cho Senior Registrar in Respiratory Medicine, Westmead Hospital	**Supports Option 2** Fully supports mandatory fortification at the proposed level as safe and inexpensive with encouraging experience in other countries.
P25	Anne Chok Pharmacist, Westmead Hospital	**Supports option 2** No supporting information provided.
P26	Christine Cook and Kate Sladden New Zealand Registered Dietitians	**Support Option 1** Unable to support option 2 until more information is available about possible effects of high folic acid intake. **Submission used the Ministerial Council Policy Guideline to assess the proposal.** *Severity and prevalence of health need* Consider the health need is severe but of low prevalence. Notes the prevalence is dropping. Considers there is a comparative lack of evidence about folate status of Australian and NZers, and little evidence of deficiency. *Assessment of the most effective public health strategy* Acknowledged lower social economic women are less likely to buy supplements or folate fortified foods. Referred to Murray Skeaff estimates that the same reduction as expected in the FSANZ proposal could be achieved if 25% of pregnant women took 400µg supplements. Referred to the increases in women using folic acid supplements correctly after large scale education campaigns in UK, Netherlands, Western Australia and South Carolina (additional references provided as below).

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		Noted a 30% fall in NTDs (including terminations) in WA from 1996-2000 (reference provided below) achieved through combination of voluntary fortification and an education campaign. Note the level of fortification will still require supplements. Concerned women will be falsely reassured by mandatory fortification and not take supplements or use other fortified foods. *Consistency with national nutrition policies and guideline:* Promotion of bread and cereals is consistent with guidelines. However consider the proposal will not be consistent with policies as it does a not address a population nutrient deficiency (as does iodine). *Will not result in excess or imbalance across general population* Consider it is very difficult to assess whether safety can be assured and that groups exposed to excess of the Tolerable Upper Intake Level (TUIL) will be safe over a period of many years. Considers the level proposed by FSANZ to avoid excess to population groups, delivers too little folic acid to be effective as an independent measure. Considers the comment (Murray Skeaff NZMJ 2003) that mandatory fortification with folic acid continues to be an uncontrolled clinical trial is still relevant. *Ensure mandatory fortification delivers effective amounts with the specific effect to meet the health objective in the target population:* Concerned there is no recent population data regarding bread intake in Australia and NZ – as the NNS were done in 1995 and 1997. Also the Asian population is not included as a subgroup in the NZ NNS. An estimate of the folic acid content of bread as proposed indicates some will receive an extremely low dose. Overall consider the proposal does not meet the Specific Order Principles for mandatory fortification. A low level has been selected to avoid excess in some groups, resulting in many women in the target group receiving a negligible amount. **Monitoring** If mandatory fortification proceeds surveillance must include: • analysis of the fortified foods to monitor levels; • red cell folate estimates in groups exceeding the TUIL e.g. adolescent males; • red cell estimates in women of childbearing age who are not wheat consumers e.g. Asian women, those on wheat free diets; • terminations, stillbirths and live births affected by NTDs; • availability of unfortified flour; and • impact of increasing obesity on NTD incidence. **Education** Recommends education campaigns include a communications plan and receive enhanced funding. **Labelling** Considers the NIP must state total folate/folic acid content

Ref	Submitter	Submission Comments
		<u>Additional references not in DAR:</u> Lawrence M. Aust NZ J Public Health 2005;29:328-30 Ludcock MD. Br Med J 2004; 328 (7433: 211-14) Barry K. MPH Dissertation, University of Auckland , 2003. COMA. *Folic Acid and the prevention of Disease*. London; Dept of Health ;2000 Bower C, Blum L, O'Dea K et al. Aust &NZ J Public Health 2002; 26:150-151. Stevenson R, Allen P, Pai G et al. Paediatrics 2000; 106:677-683. Bower C, Ryan A, Rudy E et al. Aust&NZ J public Health 2002;26:150-151 Van Guelphen B, Hultdin J, Johansson I et al. GUT 2006; 0001-7 Ray JG, Wyatt PR, Vermeulen MJ et al. Obstet Gynecol. 2005; 105(2):261-5
P27	Dr Helen Crowther Haematology Registrar, Westmead Hospital, NSW	**Supports Option – 2** Considers mandatory folic acid fortification proposal is feasible, cost-effective and a long overdue public health measure to prevent NTDs in Australia. States that the benefit of mandatory folic acid fortification has been demonstrated internationally, and believes this should be mandated as soon as possible.
P28	Julie Dicker Spina Bifida Clinical Nurse Consultant, The Children's Hospital at Westmead	**Supports Option – 2** States that if flour products were fortified with folic acid, many young couples would be prevented from the agonising decision as to whether to terminate a pregnancy affected by an NTD. Notes that termination of a pregnancy is not an option for many people, and those who choose termination may be psychologically affected for life. Notes that children born with an NTD require significant medical intervention and lifelong medical care.
P29	Rebecca George The Children's Hospital at Westmead	**Supports Option – 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P30	Sarojini Giannikos Surgical Liaison Nurse, NSW	**Supports Option 2** Notes Australia / NZ should have the same health benefit as America / Canada.
P31	Dr Hasantha Gunasekera	**Supports Option – 2** Strongly supports mandatory folic acid fortification of bread-making flour, noting that the planned level of fortification is lower than internationally.

Ref	Submitter	Submission Comments
	Paediatrician, The Children's Hospital at Westmead	Considers there is no scientific evidence of adverse outcomes, at the proposed levels of fortification. Believes that fifteen years after clear 'Level 1' evidence from the MRV randomised controlled trial is sufficient time to adopt mandatory fortification policy. Believes public health interests should not be overridden by commercial food interests.
P32	Dr Elisabeth Hodson Paediatrician, The Children's Hospital at Westmead	**Supports Option 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P33	Caroline Hooimeyer Trainee Nurse, Australia	**Supports Option 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P34	Michelle Irving The Children's Hospital at Westmead	**Supports option 2** **Health risks** Notes effectiveness of folate in preventing NTDs was established over 15 years ago in *Lancet.* **International experience** Currently, dozens of countries worldwide have adopted this practice in an attempt to reduce the estimated quarter of a million babies born each year with this debilitating condition which is so easily preventable. Reference: Wald, N 1991 Prevention of neural tube defects: results of the Medical Research Council Vitamin Study, *Lancet,* vol. 338, iss. 8760, pp.131-137
P35	Paul Isaac Aged and Chronic Care Network, Sydney West Area Health Service	**Supports option 2** **Health risks** Scientific evidence of the health benefits is strong i.e. a substantial reduction in NTDs. Also growing indications of a role in reducing heart attacks and strokes. Understands no significant negative health implications arise from folate consumption. Considers benefits will far outweigh the costs. **Food vehicle** Flour is the ideal vehicle for folate as it is consumed by almost all Australians across all socio-economic groups.

Ref	Submitter	Submission Comments
		Supplements Assertive public information campaigns along with availability of supplements have not substantially increased the intake of folate to suitable levels amongst target groups. In particular, these education campaigns and dietary supplements tend to reach only the higher socio-economic groups. **Impact on industry** Thiamin is already added to flour so the technology and methodology to add folate to flour already exist at minimal additional cost. **International experience** Believes Australia should follow the example of the 50 plus countries which already have mandatory fortification of flour with folate.
P36	Alison Jones Head of Occupational Therapy and Chair of the Clinical Support Program Allied Health, The Children's Hospital at Westmead	**Supports Option 2** Acknowledges the current voluntary permissions for folic acid in Australia and New Zealand. Highlights the effectiveness of mandatory fortification in the US in reducing NTDs and believes there is strong evidence that folate can also help heart disease and possibly the progression of Alzheimer's disease.
P37	Dr Michael Jones The Children's Hospital at Westmead	**Supports Option 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P38	Dr Heather Knox General Practitioner, Sydney	**Supports Option 2** Believes that mandatory fortification would reduce the fear and guilt experienced by women who realise they are pregnant but have not been taking folic acid early in their pregnancy. Highlights an opportunity that fortified Australian flour exported to less developed countries such as Vanuatu may help to overcome the nutritional deficiencies experienced in these countries.
P39	Pamela Lopez-Vargas The Children's Hospital at Westmead	**Strongly supports option 2** Notes effectiveness has been established through randomised controlled trial (notes Lancet 1991), and international practice.

Ref	Submitter	Submission Comments
P40	Dr Angie Morrow Paediatrician, The Children's Hospital at Westmead	**Strongly supports Option 2** Considers effectiveness was established over 15 years ago in randomised controlled trails published in the Lancet (Wald N.1991). Dozens of countries worldwide have adopted this practice to reduce this condition.
P41	C Nichol Centre for Kidney Research, The Children's Hospital at Westmead	**Strongly support option 2** Considers effectiveness was established over 15 years ago in randomised controlled trails published in the Lancet (Wald N.1991). Dozens of countries worldwide have adopted this practice to reduce this condition.
P42	Dr Vaughan Richardson Neonatal ICU, Wellington Hospital, New Zealand	**Supports Option 2** Believes P295 will only have positive benefits for the health of children but also our ageing population. Considers the benefits of folate supplementation have been known for a long time and this process needs to be treated with urgency.
P43	Anne Rowe Nurse, Australia	**Supports Option 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P44	Cathie Slarke, Kim Yap, Michelle Mendonca, Jeanne Beattu, Chandra Ramjahn and Dr Fiona Kwok Westmead Hospital	**Supports Option 2** Considers it is well known that adequate consumption of folic acid before and after pregnancy reduces up to 70% of NTDs in babies. In countries where mandatory folic acid programs have been implemented e.g. US, Canada, Chile, plus 40 countries there have been no adverse effects reported.
P45	Dr Rosemary Stanton	**Supports option 1** Opposes mandatory fortification proposal. Considers mandatory fortification is appropriate when there is a proven deficiency, but reports there is no evidence of population wide deficiency of folate in Australia. Notes that the proposed level of folic acid fortification does not negate the need for women at risk to take a folic acid supplement, and thus questions the reasoning behind adding folic acid to food when a supplement will still be required.

Ref	Submitter	Submission Comments
		Potential health risks Provides references for new research on possible adverse effects of adding folic acid that have been published since the FSANZ paper, and considers that these need to be taken into account. **Education** Considers the cost of mandatory fortification would be better spent on an education campaign highlighting the importance of including natural sources of folate in the diet and the need for women at risk of becoming pregnant to take an appropriate supplement. Considers the statement regarding the amount of cooked spinach or raw broccoli that would need to be consumed to obtain the equivalent of 400 µg of folic acid is 'unwise' as it: • makes the invalid assumption that someone would seek to meet their folate requirements from one specific food; • denigrates the total contribution that foods like broccoli and spinach make to the total diet; and • is not difficult to consume 400 µg of folate following the Australia Guide to Healthy Eating. **References** Van Guelpen B, et al. Gut 2006 Apr 26 Kune G, et al. Cancer and Nutrition (in press) Stolzenberg-Solomon RZ, et al. American Journal of Clinical Nutrition 2006;83:895-904 Ulrich CM, et al. Cancer Epidemiol Biomarkers Prev. 2006;15(2):189-193
P46	Premala Sureshkumar The Children's Hospital at Westmead	**Supports Option 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P47	Dr Bobby Tsang Paediatrician, Northshore Hospital, New Zealand	**Supports Option 2** Supports primary prevention with folate supplementation. Acknowledges, however, that many women do not take folate consistently or early enough even if pregnancy is planned. Believes that another potential benefit of folate is pregnancies affected with Down Syndrome (Eskes 2006), particularly in younger mothers where no screening is offered. Eskes TK 2006 Europ J Obstet Gynecol Reprod Biol 124(2):130-3.

Ref	Submitter	Submission Comments
P48	Dr Max Watson Public Health Nutritionist, Victoria	**Supports Option 1** Notes that in his co-submission to the Initial Assessment Report a number of concerns were raised with respect to mandatory fortification. Considers that the Draft Assessment Report did not adequately consider these matters or matters raised by many other submitters. Considers it extraordinary that compliance with addition of folic acid is rated 'low-medium'. Acknowledges that while technically this is a legal responsibility of the States, he considers the guidance from FSANZ has been poor and appears to be a complete abrogation of any responsibility for public health.
P49	Ms Narelle Williams Centre for Kidney Research, The Children's Hospital at Westmead	**Supports Option – 2** Acknowledges the effectiveness of increased folic acid intake in preventing NTDs and the uptake of mandatory folic acid fortification internationally.
P50	Ms Linda Willis works in the antenatal area in a Sydney hospital	**Supports option 2** **Supplements:** Notes many women only learn of the benefits of folate supplements too late, some months into their pregnancies.
P51	Cathy Yip Registered Nurse, Sydney, New South Wales	**Supports option 2** Paediatric nurse who notes the financial, emotional and physical costs of NTDs. Considers the proposal will improve public health as well as reduce the incidence of NTDs.
P52	Researchers Centre for Kidney Research, The Children's Hospital at Westmead	**Support Option 2** Notes it effectiveness has been established over 5 years ago (Lancet 1991), and has been adopted by dozens of countries.
P53	Spina Bifida Unit and RPAH Spina Bifida Clinic, The Children's Hospital at Westmead Dr Carolyn West	**Supports Option – 2** Notes that folic acid is the only primary prevention known for NTD, and that antenatal diagnosis with the choice to terminate is a secondary intervention and a very traumatic decision for the parents. Also notes the huge impact of disabilities from NTDs on the child and family, stating that:

Ref	Submitter	Submission Comments
		• NTDs lead to many medical complications as well as disability including mobility, continence of bladder and bowel and cognitive deficits. • These medical conditions require complex medical management programme extending over a lifetime, carer support, special education requirements, and job support. • More than 50% will be on the Disability Support pension after leaving school. Notes the international success in reducing NTD rates following mandatory folic acid fortification, and believes that there is no evidence of significant side effects from folic acid at the recommended level. Notes that prevention of 26 NTDs a year means that in 10 years there will be 260 healthy, active members of society without an NTD as a result of this primary prevention strategy under mandatory fortification.
P54	The Children's Hospital at Westmead, including the Advocacy Committee Dr Antonio Penna, Chief Executive	**Support Option 2** The information provided is so compelling it would be a gross injustice not to protect the lives of future children. The health budget supports fortification given the economic argument.
	Public Health Organisations	
P55	Australian Medical Association ACT Ms Josie Hill	**Supports Option 2** Supports the reasons given in the DAR Proposal. **Monitoring** Before introduction of the proposed mandatory fortification monitoring must be resolved. Effectiveness and safety issues must be monitored. Monitoring must include an updated NNS as the current data is over 10 years old. Commitment to ongoing monitoring over time is needed. Must address nutritional status of other sectors of the Australia population including women of childbearing age, Aboriginal and Torres Strait Islander people and older people. Notes the costs of establishing and maintaining a monitoring system are not included in the cost benefit analysis. Australian Medical Association has called for a National Nutrition Centre to undertake such monitoring, and to work with FSANZ on issues around mandatory fortification. While AMA considers it is ideal to address these issues prior to fortification it does not believe this should lead to a delay in advancing moves towards mandatory fortification of bread making flour.

Ref	Submitter	Submission Comments
		Communication / Education Doctors and other medical professionals are ell placed to assist with the 0 to fortification. **AMA supports the points in the DAR including :** • Australia has high rates of unplanned pregnancies and the period prior to pregnancy is the most important to folic acid intake; • the cost of supplements is a barrier to some; • folic acid supplement uptake may be affected by cultural factors; and • costs to the Australian bread making industry will not be prohibitive with much of the infra structure in place.
P56	Australian Medical Association (AMA) Queensland Ms Colleen Smyth	**Support Option 2** Provides AMA Queensland position statement on folate fortification. Notes the following: • although AMA Queensland supports initiatives to increase consumption of either folate rich (naturally occurring as well as fortified) foods or supplements, these initiatives do not reach all members of the community; • folate has been identified as a modifier in the link between alcohol and breast cancer. Research has indicated that women with a high alcohol consumption and moderate-high levels of folate consumption had no increased risk of breast cancer, as opposed to those women who had a high alcohol consumption rate and low folate intake (ref 5); • adequate folate intake may also decrease the risk of colorectal cancer (ref. 6), however it is unclear whether dietary fibre is a confounding factor in this relationship; • folate has been linked to lowering serum homocysteine levels, which may reduce the risk of stroke and ischaemic heart disease. It has been suggested that since the introduction of mandatory folate fortification in the US, there have been fewer strokes and heart attacks (ref8) (although other reports suggest that while there are inverse associations, they are not significant (ref. 9)); and • a number of other countries have taken up folate fortification with impressive results: - In the US, where fortification rates are low there has been a 30% decline in neural tube defects (ref 3) - In Canada and Chile, where a higher rate of fortification is used there has been a decline in neural tube defects by 50% and 70% respectively (ref 4)

Ref	Submitter	Submission Comments
P57	Central and Southern Regional Genetics Service, Wellington Hospital	**Supports Option 2** **Supports the proposal for the following reasons:** • it is a safe and effective public health measure to reduce NTDs and to improve serum folate and lower serum homocysteine concentrations in the adult population; and • other interventions such as voluntary fortification, peri-conceptional supplementation and dietary modification, either alone or in combination do not produce the desired public health outcomes. **Comments on proposed process** Wheat flour and wheat products are the ideal vehicle for increasing folic acid intake in the whole population. Suggests that a level of 245-280 µg of folic acid per 100 g flour is likely to be effective in reducing the incidence of NTDs in the NZ and Australian populations. Acknowledge that target groups will still need to be exposed to a continuing education program. **Provides the following comments on true incidence of NTDs:** • does not believe that the incidence of NTDs is low because ascertainment is low; • improved data collection in 2004 allowed for recording of virtually all NTDs in terminations of pregnancy by the Abortion Supervisory Committee in New Zealand; • preliminary analysis of the data indicate that in 2004, the number of second trimester terminations for 'NTD/CNS malformation' was 41 and the number of live births 12 (Stillbirth figure is outstanding). This indicates that the true population incidence is likely to be between 50 and 60 per annum (Dixon and Borman, pers. comm.). • a surveillance system is now in place to monitor the incidence of NTDs in NZ live births, stillbirths and terminations. **Consumer issues** Based on international experience there is no evidence to suggest an adverse reaction from consumers to this public health initiative **Additional references to those referred to in the Draft Assessment Report:** Yang 2006 Davey Smith and Ebrahim 2005 Oakely et al 2004 Chan and Haan 2000 Grosse et al 2006

Ref	Submitter	Submission Comments
P58	Centre for Population Health, Sydney West Area Health Service (SWAHS) Mr Stephen Corbett	**Supports a modified Option 2** Considers mandatory fortification with folic acid safe and effective and long overdue. Supports mandatory fortification to 200µg / 100 g in the final product. Considers it unlikely that the status quo will maximise the benefits. Notes voluntary fortification and education programs have resulted in marginal increases in mean folate but these remain significantly below recommended levels. The limited effectiveness of these methods has made mandatory fortification necessary. **Food vehicle** The preferred approach contains some inherent inequities. It will be less effective in women for whom bread making flour products are not a staple food. There is ambiguity in Standard 2.1.1 and the amendments regarding the term 'flour for making bread' as this may include flours other than wheat-based. However the DAR appears to refer to wheat based flours only. Concerned not all women will consume sufficient bread making flour products to have a sufficient impact on folic acid intakes. This is likely to include women where rice or cornmeal are staple e.g. Asian / South American, plus those with celiac disease and women on low CHO diets. Notes African women in USA still have red blood cell folate levels below the national objective (Centre for Disease Control and prevention). SWAHS is a very culturally diverse area and home to many Asian women. This population may be disproportionately affected by the inequity. Notes in NSW and SWAHS folate intakes are likely to be well below recommended levels. Consumption of dietary sources of folate is inadequate. More than half the population eat less than the recommended fruit; only 8% of NSW and 5% SWAHS residents eat the recommended vegetable each day. Ninety-eight percent of NSW residents eat less than the recommended 5-7 serves of breads and cereals. (NSW Health, 2006. NSW Population Survey 2005 Report on Adult Health). It is also likely to be less effective in women in lower level of education and income. The current system of education is also likely to have inherent inequities and has been most effective in women of higher socioeconomic status. A significant proportion of SWAHS are less well educated and lower socio economic status. Action needs to be taken to address these inequities within the preferred option or sub-optimal benefits are likely in this subgroup of the population.

Ref	Submitter	Submission Comments
		Recommendations • clarify 'flour for bread making'; • consider expansion of voluntary fortification to include rice and cornmeal (which have been fortified in USA); • consider a mandatory education programme; • suggest a mandatory nutrition claim for food fortified to 200µg /100g and meeting other nutritional criteria; • ensure monitoring of adverse effects – to include regular NNSs, data on NTDs and terminations, surveillance data particularly for children; and • ongoing community and industry consultation.
P59	Dietitians Association of Australia Ms Sue Cassidy	**Supports Option 1** Cannot support Option 2 for the following reasons: **Monitoring** • DAA has significant concerns that appropriate monitoring will not be undertaken. Until a commitment is made by all the Australian and NZ Governments for a comprehensive, nationally coordinated extensive monitoring and review programme, plus continuing education DAA cannot support mandatory fortification. **Strategy** • DAA recognises mandatory folic acid fortification is a valid public health strategy for the target group but considers this is only part of the solution. DAA calls for an immediate comprehensive public health approach and baseline data. **Consistency with Ministerial Council policy** Concerns about consistency with Ministerial Councils Policy Guidelines include: • questions whether the small % of conceptions and cases represents a population health problem; • dietary modelling has shown that the proposal to achieve a residual level of 200 ug of folic acid in 100 g bread will not deliver the amount shown to be effective (400 ug) to prevent NTDs; and • ongoing education is outside the scope of regulatory system. The Governments of Australia and NZ must take responsibility for this to meet the objectives. **Labelling** DAA considers dietary folate equivalents must be listed in the NIP as well as the ingredient list. **Education** Concerned women may incorrectly assume they do not need supplements, recommends education at schools. **Food vehicle** Considers it is estimated 20% of women of child bearing age do not eat breads.

Ref	Submitter	Submission Comments
P60	Global Health Institute, Sydney West Area Health Service Ms Jan Kang	**Supports option 2** States that mandatory fortification is a public health issue for NTD prevention with no negative health implications such as twinning and masking B12 deficiency. Supports mandatory fortification as a means of delivering equity Supports folate in all bread, pasta and noodles to reach the widest population and ensure sufficient folate in women. Mandatory fortification is the only viable and equitable option to reach all women of child bearing age. Is particularly important for social justice for women from disadvantaged socio-economic groups who can not afford folate supplements including migrant and refugee women with limited English who may have difficulty accessing health messages. Mandatory fortification initiatives around the world have been achieved at minimal cost to millers and provide a worthwhile public health benefit. Mandatory fortification should not be a commercial issue for the flour or grocery industry, but focussed on public health benefits for future generations of Australians and New Zealanders.
P61	Manufactured Food Database (MFD) Ms Lyn Gillanders and Ms Alannah Steeper	**Supports Option 1** Notes FSANZ has presented only two options for the folic acid fortification. MFD considers that other alternatives should be considered including better understanding of the usual consumption of foods by the target group. **Health risks** It is unclear from the 1997 NNS data the number of slices of bread consumed by the target age group. Have some concerns that non-target groups would be exposed to levels greater than Tolerable Upper Intake Level (TUIL**).** It has been estimated that 10% of adults aged over 65 years of age have Vitamin B12 deficiency in New Zealand. There is general agreement that gastric atrophy in the 75 plus years is a significant cause of Vitamin B12 deficiency. The rapid aging of the New Zealand population including this vulnerable group which may have Vitamin B12 deficiency masked by folate fortification must be considered. **Consumer choice** Mandatory fortification leaves no choice for consumers who may wish to avoid this level of fortification. In addition there may be some involuntary exposure as some flour manufacturers have indicated that they will find it difficult to separate out milling of bread-making flour from general purpose flour. **Impact on industry** The food industry will be obliged to pass on cost of fortification to consumers and this may have some impact on their profitability so food manufacturers may resist fortification.

Ref	Submitter	Submission Comments
		Monitoring It is possible that folate fortification will be seen as being 'healthy' and there may be much greater uptake of voluntary fortification. The converse may also be true. MFD recommends that it is essential to undertake another NNS to determine the current level of folate in the population with ongoing commitment to further surveillance. **Food vehicle** If bread is fortified at the FSANZ current proposal level we estimate the target group would need to consume 4-6 slices a day to achieve the desired intake. MFD considers that the predicted consumption of 4 – 6 slices a day of folate fortified bread to achieve an intake of 200 μg folate is an unrealistic goal for the target age group (and if 400 μg was the target intake double this amount of bread would need to be consumed).
P62	New Zealand Dietetic Association (NZDA) Ms Jan Milne	**Supports Option 1** **Food vehicle** Bread making flour would be a suitable vehicle to target women in lower socioeconomic groups who are less likely to take up voluntary fortification measures. FSANZ assumes that women in the target group would eat 4 slices of bread daily. The Manufactured Food Database (MFD) estimates that the target group would need to eat 4-6 slices of bread daily to achieve a daily intake of 200 ug folic acid. Dietitians do not believe that this is a realistic estimate of current intake or expectation of the target group. Bread making flour does not assist population groups who consume very little, if any, wheat breads such as Asian women and those with coeliac disease or wheat intolerances. FSANZ could consider mandatory fortification of a similar alternative such as wholemeal (light brown) bread. Could also review the US example of not fortifying wholegrain breads due to their higher content of B group vitamins (Lawrence 2005). **Health risks** The effect of folic acid intake above the upper level is thought to be safe, however there is no evidence documenting the long-term effects of un-metabolised circulating folic acid and some consider mandatory fortification of folic acid to be an 'uncontrolled clinical trial'. **Monitoring** Considers baseline measurements should include the current intake of the proposed vehicle, folic acid intake prior to fortification, and serum folic acid levels considering in particular: • women of childbearing age;

Ref	Submitter	Submission Comments
		• groups that may consume large amounts of the proposed vehicle (children and adolescents who on average receive 22% of folate from bread , Maori and Pacific Island populations who receive additional dietary folate from potato, kumara and taro); • those who consume little or no products made from the proposed vehicle; and • women who have or had a NTD pregnancy. **Education / Promotion** NZDA supports a targeted, adequately funded, health promotion campaign to explain why increased folic acid is necessary for women of childbearing age noting: • this would increase knowledge of foods containing folate and those fortified with folic acid, and the importance of folic acid supplements in this target group; and • large-scale education campaigns undertaken in the UK, Netherlands, Western Australia and South Carolina showed increases of women taking folic acid supplementation to be 14%, 16%, 24% and 27% respectively (Auckland Regional Public Health Service Submission, July 2006). **Ministerial Council Policy Guidelines** The mandatory fortification of folic acid does not meet all of the criteria of the 2004 policy guideline for fortification of food with vitamins and minerals as established by the Australia New Zealand Food Regulation Ministerial Council (ANZFRMC). Notes: • while the severity of NTDs is beyond dispute, the prevalence in New Zealand (NZ) is low; • FSANZ estimates that fortification at the proposed level will reduce the number of NZ pregnancies affected by NTDs to 4-14 annually. Only a small number of these pregnancies would result in live births of children with NTDs; • NZDA questions whether such a large population approach is appropriate to achieve a very small reduction in live NTD births; • mandatory fortification would not be consistent with national nutrition policies and guidelines, as it would not address a known population nutrient deficiency; and • fortification at proposed rates is not guaranteed to meet the effective dose of folic acid to the target group, as it is unlikely they will consume 4-6 slices of bread each day.
P63	New Zealand Food Composition Database (NZFCD) , New Zealand Institute for Crop and Food Research	**Supports Option 2** **Modelling** Considers the proposal will have a big impact on the database ability to provide representative data on levels of folic acid and /or folate dietary equivalents. Would like to see more clarity around what will be required from government agencies, manufacturers, national food data bases and industry data bases. Three key issues are raised:

Ref	Submitter	Submission Comments
	Mr Jason McLaughlin	• **Labelling**: all foods with the fortified bread making flour must be analysed and declared on the NIP. Manufacturers should be advised to declare this as DFE. The reporting format of folate content of foods should be part of the standard / law for consistency. • **NRVs**: these should be standardised for Australia and NZ. NRVs and information of the NIP should both be in Dietary Folate Equivalent. • **Monitoring**: resources required to update NZFCD will require a formal partnership with FSANZ, NZ Food Safety Authority and others.
P64	New Zealand Nutrition Foundation Ms Sue Pollard	**Supports Option 1** Cannot support the mandatory fortification of bread flour at this time. Recommends more time be allowed to address the issues raised before a final decision is made. **Health Risks / Science** Notes the long-term effects of a lifetime of folate supplemented bread are not known. There are known risks for children and the elderly. Notes folic acid is involved in both the synthesis and expressions of DNA and RNA and in protein and amino acid metabolism. The mechanism of the action of folic acid in NTD is associated with methylation of DNA and RNA. Notes this connection remains an unproven cause of NTDs. Notes folate in the upper intake range has been reported to be a factor in other disorders (not specified). *Health benefit analysis* Notes the reference below which indicates mothers with the highest folate levels were the most obese and the most insulin resistant. Raises the question whether insulin resistance will be exacerbated by the fortification of refined flour and products that increase glycaemic load, but not balanced by other B vitamins and fibre as whole grain unfortified wheat products would be. Asks could the situation be exacerbated rather than helped by fortification with one micronutrient? Notes the UK Scientific Advisory Committee on Nutrition has delayed recommending mandatory fortification in order to further investigate possible risks. **Food vehicle** Weight conscious women in the target group may not eat bread in sufficient quantities while a young male may take in excess through breads / cereals. **Monitoring** Suggests monitoring for effectiveness will be problematic. Questions how can evaluation determine if the measure has worked if the net benefits in NZ are a reduction of 4-14 of 70-75 pregnancies or 2 live births per annum?

Ref	Submitter	Submission Comments
		The cost of monitoring, and education, has not been included in the cost benefit analysis. Notes work is still in progress (NZ Crop and Food) to develop folate composition analysis methods which are sufficiently accurate. **Industry Issues** Stability of folic acid in flour is unclear. Believes if all flour is fortified there are possible effects on the organic foods credibility and food exports. **Consumer issues** A public education programme has not been tried first. There has been insufficient public debate and with current knowledge it will be difficult to have informed debate. Considers the public are not comfortable with the principal of mandatory fortification via food, especially a staple food for such a small subsection of the population (cite effect on risks and prices). Consumers need to be given a clear rational explanation of the need, the benefits, risks and costs. Additional Reference not in DAR : Yajnik, Chittaranjan, *Nutritional Control of Foetal Growth*. Nutrition Reviews Vol 64, Supplement 1, May 2006, 50-51 (2))
P65	Nutrition Australia Ms Nola Caffin	**Supports Option 1** Notes mandatory fortification would provide equity of access. **Health risks** Considers the impact of this proposal will be small due to the very low incidence of NTDs, and it is hard to justify exposing the whole population to higher levels. Considers little information is available on long term effects Notes the positive effect on cardiovascular disease is now under question. **Modelling** Considers there is not strong evidence that the Australian population is deficient in folate. Acknowledge there is lack of up to date information on intake or blood levels. Notes fortification will not be sufficient to reach required intake and other strategies must continue. These strategies have already led to a decrease in NTDs. Strategies need to be targeted. **Monitoring** Supports the need for monitoring, but funds need to be specifically allocated for this.
P66	Public Health Association of Australia	**Supports Option 2** PHAA is strongly in favour of women using folate supplements if they are planning a pregnancy or in their first trimester.

Ref	Submitter	Submission Comments
	Dr Jane Freemantle	There is a diversity of opinion within the membership of PHAA about the advisability of mandatory fortification of flour with folate. Some members are concerned about the lack of baseline data to assess the efficacy of the proposal and others are concerned that the safety of folate fortification has not been fully established. All of PHAA supports the proposal for monitoring the effects of folate fortification but notes the need for this to be appropriately funded. With these provisos and lack of unanimity, the Board of the PHAA acknowledges that the assessment undertaken by FSANZ seeks to address the issues raised in paragraph 17 of the PHAA policy on 'Periconceptional folate and the prevention of neural tube defects' (revised 2004 and adopted at the PHAA AGM 9 October 2004 - attached to submission). As such the PHAA accepts the recommendation that mandatory fortification is the preferred approach to further reduce the incidence of NTDs. **Health risks** Draws attention to paragraphs 10 and 11 of the proposal, in particular that mandatory fortification raises concerns because it results in everyone in the population being exposed to increased levels of folate. As NTDs are not very common, the benefit for a few needs to be balanced against the potential risk of harm for many. Potential risks raised are: - that high doses of folic acid may mask the diagnosis of vitamin B12 deficiency, although acknowledge that this has not occurred in the US (Mills *et al*., 2003); and - that high folate levels may impair anticonvulsant therapies (NHMRC, 1993); and - twinning rates may be greater in women with increased folic acid intake (Li *et al*., 2003; Waller *et al*., 2003). **The PHAA recommends that:** • food fortification, health promotion and education policies and programs are evaluated to determine their effectiveness and public health impact, including the incidence, prevalence and presentation of unfavourable outcomes; • policy in this area should be reviewed regularly to take into account changes in the understanding of all outcomes, as relevant, reliable data become available; • state and national governments identify ways in which folate supplementation can be funded so that women are not financially disadvantaged; • information be made available in plain English and other commonly used languages at all primary care services, particularly general practice on: the NHMRC recommendations for folate intake in the format of tablets, the natural dietary sources of folate, fortified food sources. Appropriate foodstuff preparation advice should also be available; and • information should be made available at all primary care services, particularly general practice, on the availability of and access to genetic counselling services.

Ref	Submitter	Submission Comments
		References provided
P67	The Paediatric Society of New Zealand Ms Rosemary Marks	**Support Option 2** **Food vehicle** International experience has now demonstrated that wheat flour and wheat products are the ideal vehicles for increasing folic acid consumption in the whole population, not just the target group (reproductive age females). **Health benefits** The benefits are not confined to a reduction in incidence of a preventable birth defect - Neural Tube Defects (NTD) but also include improving serum folate concentrations in the adult population and reducing levels of serum homocysteine (a risk factor for stroke and heart attack). Mandatory fortification is also likely to reduce the incidence (and cost) of serious congenital heart disease. The benefits of folic acid fortification have been known for many years. So far 52 countries have recognised the value of folic acid fortification for their population and proceeded with this. **Education** Even at the proposed level of fortification, the target groups will still need to be exposed to a continuing public education programme, as they will also need to take some level of supplementation and/or consume more folate-rich foods.
P68	The Royal New Zealand Plunket Society Inc Ms Angela Baldwin	**Supports Option 2** with the provision that prior to implementation - A **monitoring** system be established to: • evaluate the impact on NTDs in NZ; and • assess any adverse health outcomes due to overexposure particularly in the very young (0-5) and the elderly. **Health Risks** Plunket considers it prudent and appropriate that FSANZ establish more certainty around risks identified in the consultation document (5.2.2), and assess any impact of the recommended and exceeded levels of folic acid on the unborn infant and the breastfeeding infant.
	Public Health Consultants	
P69	Rutishauser, Coles & Rutishauser Consultants Ms Ingrid Coles	**Supports Option – 1** Ms Coles-Rutishauser opposes mandatory folic acid fortification for two reasons: • inconsistencies with the *Policy Guideline on Fortification of Food with Vitamins and Minerals;* and • lack of prior allocation of funding to monitor the outcome of mandatory fortification.

Ref	Submitter	Submission Comments
		Inconsistencies with the Ministerial Council Policy Guideline Mandating folic acid fortification to prevent NTDs is based solely on the severity of the condition rather than the prevalence (affecting .01% of the population in any one year). Since there is little information on the longer term benefit to the whole population of increased folic acid intake, the basis for the decision to do so should be clearly stated and not appear to suggest that it is likely to be of benefit to a sizeable proportion of the population. The AHMAC commissioned Expert Panel provided no evidence that current folate intake is detrimental to health nor that nutrient requirements could not be met by realistic dietary practices. Although most women do not meet the NHMRC recommendation of 400 µg of folic acid peri-conceptionally it is not evidence of folate deficiency in the population since this recommendation is a public health strategy and not a dietary requirement. Although acknowledging that the data are limited on folate status of the population, they do not indicate a deficiency in the population nor do they indicate that nutrient requirements for folate cannot be met by realistic dietary practices. Recent evidence indicates that most NTDs occur in women whose erythrocyte folate levels are within the conventional normal range but who have raised levels of homocysteine. This also suggests that folate deficiency of dietary origin is not the primary cause. Consequently, it should be made clear that mandatory fortification with folic acid is proposed, not because the folate content of the Australian diet is deficient, but because of the strong inverse relationship between the incidence of NTDs and erythrocyte folate levels in women with NTD-affected pregnancies. There is evidence that the proportion of women taking folic acid supplements has increased (Lawrence *et al*., 2001; Bower *et al*., 2005) and that there has been an increase in serum folate in the general population (Hickling *et al*., 2005). These changes and the apparent in the number of NTDs (400-500 in the mid 1990s, NHMRC 1995) to the current estimate of 300-350. **Monitoring** Unless funds are specifically allocated to monitoring mandatory folic acid fortification, previous experience based on prior recommendations (such as the NHMRC 1995) indicates that this will not occur. A careful costing of what an effective system would cost, by an independent group, should have been an essential component of the cost-benefit analysis. DoHA's recent announcement (19 July 2006) of $1M per year for the collection of food and nutrition data on all population sub-groups is not sufficient to provide the funds needed to monitor mandatory fortification. For example, the cost of monitoring folate status alone would be approximately $0.5 million.

Ref	Submitter	Submission Comments
		Other comments Whilst acknowledging that AHMAC requested FSANZ to assess only mandatory fortification, it is not appropriate that better targeted options (such as voluntary fortification and education) will not be assessed with equal care and diligence. Considers that voluntary fortification as currently permitted, together with inclusion, in the secondary school curriculum, of information about the role of folic acid in preventing NTDs are likely to be more effective, than mandatory fortification, in the target group while maintaining consumer choice. **Additional references to those referred to in the Draft Assessment Report:** Lawrence et al 2001 Mills et al 1995 Queensland Health 2002 Scott 1999
P70	Peter Ranum, Consultant (on cereal fortification programs around the world)	**Supports Option – 2** Consultant working for Unicef, USAID and others. Believes that there is no voluntary fortification program in the world that works effectively, primarily because businesses change their level of fortification practice in response to their competitors.
	Government	
G1	Department of Agriculture, Fisheries and Forestry Mr Richard Souness	**Supports Option 1** Supports strategies aimed to decrease incidence of NTDs. Does not dispute the evidence linking adequate folic acid intake by women of childbearing age and reduced risks of NTDs. Believes that prior to implementation of any public health strategy all options need to be thoroughly examined to ensure the best way forward is identified. **Regulatory option** Primary concern is the omission of the options that were outlined and supported by DAFF in the IAR, namely extension of permissions for voluntary fortification (Option 2) and increased health promotion and education strategies to increase folate intakes (Option 4). Considers a more thorough examination of extension of voluntary fortification permissions is warranted as voluntary fortification contributes significantly to folic acid intake - notes voluntary folate fortification contributes 95 µg to the daily intake of the target group, while the estimated increase in folic acid intake with mandatory fortification is only 100 µg. Continues to support education strategies (Option 4 at IAR) – evidence from WA indicates an education campaign in conjunction with voluntary fortification is effective in reducing NTDs (Bower et al, 2004).

Ref	Submitter	Submission Comments
		Mandatory Fortification Considers mandatory fortification of bread-making flour at the level of 200 µg per 100 g flour is unlikely to achieve the stated objective – as only 5% of Australian women will achieve the recommended intake, and the proposed food vehicle may not be consumed in adequate amounts by the target group. Considers it may create a perception that mandatory fortification will alone meet the needs of the target group. Notes issues around efficacy of mandatory folic acid fortification appear not to have been further addressed. **Data** Concern at the apparent lack of information about folate status, folate intakes and dietary patterns of the target group. **Health risks** Considers the mandatory fortification may cause adverse health effects at the population level for the potential benefit of a population subgroup. Considers lack of information on the consequences of long term high-level intakes of folic acid in target group and the general population, including masking of B12 deficiency. Notes references including some alternative views on folate in pregnancy and breast cancer (*British Medical Journal*, 2004). Also a study subsequent to the IAR linking low folate status and low risk of colorectal cancer (*Gut International Journal of Gastroenterology and Hepatology*, 2006). **Ministerial Council Policy Guidelines** Questions the degree to which these have been satisfied specifically assessment of the most effective public health strategy, ensuring added vitamins / minerals will not result on detrimental excesses / imbalances and ensuring mandatory fortification delivers effective amounts to the target population. **Food vehicle** Concern at the apparent lack of research or investigation into the most appropriate food vehicle to meet the requirements of the target group. Notes industry data showing that on average the target group consumes 11 slices of bread per week, although on any given day half the women in the target group consume no bread, and up to 21% do not eat bread at all. **Impact on industry** Considers mandatory fortification may limit the opportunity for industry to develop new vehicles for voluntary fortification – as some individuals will exceed the upper limit.

Ref	Submitter	Submission Comments
		Considers mandatory fortification may reduces industry incentive to participate in new and more effective public health strategies due to burden of costs associated with this proposal. **Consumer choice** Considers mandatory fortification may eliminate products containing bread-making flour from the diet of people wishing to consume unfortified products – as it eliminates consumer choice. **Monitoring** Reiterated that a robust monitoring framework with a definite timeframe needs to accompany mandatory fortification.
G2	Department of Health South Australia (SADH) Ms Joanne Cammans	**Supports Option 2** **Regulatory option** Strongly supports mandatory fortification of all bread-making flour with folic acid at a level of 230-280 µg of folic acid per 100 g bread-making flour. Supports mandatory fortification for the following reasons: • only option which ensures that food fortified with folic acid is equally available to all socio economic groups, including those who are most at risk; • evidence to support the connection between adequate folic acid intakes in peri-conceptional women and reduced NTDs; • evidence for adverse health effects is minimal and controversial; • is a simple and affordable public health intervention strategy; • voluntary fortification and education campaigns have been tried in the past but have failed to significantly and sustainably affect the number of NTD pregnancies; and • creates a level playing field for bread manufacturers. **Food vehicle** Considers the choice of bread-making flour is satisfactory as it is consumed at reasonably high levels by most women in the target group. Considers fortifying at the lower than optimal level of 400 µg is a satisfactory compromise initially in addressing concerns regarding possible unknown adverse health effects while contributing to a reduction in NTDs. Concerned that optimal results are unlikely at the proposed level of 200 µg folic acid per 100 g flour. Considers the range of folic acid permitted to be added to flour may be difficult for industry to maintain in their processes and therefore create enforcement difficulties. The practicality of consistently staying within this range needs to be ensured prior to implementation.

Ref	Submitter	Submission Comments
		Considers clarity is required on the safety issues that may ensue if the upper limit of the proposed range is breached. It is assumed from the research presented that these would be minimal and equivocal and therefore the necessity of having an upper limit is questioned. **Health risks** Questions if excess folic acid does build up in the body. **Impact on industry** Notes that Australian manufacturers have systems in place to add thiamin to flour and therefore will not have high implementation costs when adding folic acid. **Monitoring** Recommends that outcomes from this fortification program be monitored to provide evidence to consider further fortification interventions with higher doses of folic acid. Considers evidence on the bioavailability of folic acid from bread, i.e. that it does translate to raised folic acid in the blood, needs to be gathered as part of the monitoring program.
G3	Department of Human Services Victoria Mr Victor Di Paola	**Support Option 2** Supports, in principle, Option 2 to mandate the fortification of food with folic acid for the prevention of NTDs. Support is provisional on FSANZ addressing their concerns regarding consumer choice, voluntary fortification permissions and monitoring to capture all adverse and beneficial effects of folic acid fortification. Notes that 20% of the target group don't consume bread, and that an additional strategy is required to capture this segment of the population. Notes that mandatory fortification may raise awareness of the importance of peri-conceptional folate intake from supplements, leading to a greater overall impact on incidence of NTDs than that by fortification alone. Considers consumer surveys will be essential to determine this indirect impact of mandatory fortification, particularly those who do not eat wheat based flour products. **Consumer choice** Considers consumer choice is inherent in Australian and New Zealand culture. Considers FSANZ request in the DAR to explore ways to extend consumer choice within the mandatory option does not fit the principle of mandatory fortification. However, acknowledge that there are people who will not necessarily benefit from increased folic acid (e.g. children, older people) and that they should be given the opportunity to choose. This does not seem to have been considered when the Ministerial Council Policy Guidelines for mandatory fortification were developed, and this guideline may need to be reviewed.

Ref	Submitter	Submission Comments
		Considers consumers need information before they can make an informed choices, though notes there is no apparent plan for providing this information. Considers there are very few non-wheat based bread products available, therefore this option does not constitute consumer choice. Considers bread is a suitable fortification vehicle. Suggests changing the draft variation from fortifying all bread-making flour to wheat flour, to allow a range of non-fortified and low fortified products such as breads made from rye and spelt. Suggests another option to allow some consumer choice is unfortified bread-making wheat flour to allow consumers bake their own unfortified bread at home. **Education** Considers a public education program, with committed long-term funding, must accompany mandatory fortification and must include information on which foods are fortified, and the importance of folate for NTD prevention. Considers FSANZ should develop information on folic acid fortified products and alternative options. Education programmes should include those targeted at high risk groups e.g. Indigenous and lower socio economic groups. Notes that Victoria has a steering committee to develop an awareness strategy with a broad public health approach, and will build on the efforts of other States. **Labelling** Folic acid stated in the NIP would provide consumers with a user friendly means of ascertaining whether folic acid was present in the food, and how much folic acid they were consuming per day in relation to the recommendation. **Voluntary permissions** Considers establishing the levels of folic acid in the food supply post mandatory and voluntary fortification will be problematic. Proposes that either certain voluntary permissions are mandated or that companies voluntarily fortifying products with folic acid must provide information on the level of folic acid in their products and notify when they make changes to their products. **Monitoring and evaluation** Considers it imperative that a consistent accurate nationwide birth defects register that accounts for all NTD pregnancies is in place to measure the primary outcome. Notes that a strategy to address this is currently underway through AHMAC.

Ref	Submitter	Submission Comments
		Considers this must be functional before implementation of folic acid fortification to ensure baseline information is captured. Need to monitor potential side effects, as identified in the DAR. Notes that the monitoring framework developed by the FRSC sub group outlines the broad parameters to be included in a monitoring programme for mandatory fortification. Notes that the Cost Benefit Analysis in the DAR did not include monitoring costs. Considers the analysis should be reviewed to determine true financial costs. Considers a federal monitoring system must be designed and funded through the AHMAC formula, and implemented no later than the end of the transition period. Notes there is a history of failure to implement adequate monitoring systems with fortification, as demonstrated by thiamin fortification, despite ministerial policy and recommendations from regulatory bodies. Voluntary folate fortification has also been insufficiently monitored in the interim evaluation (Webb 2001), possibly due to lack of funding. In addition, the US there has been a lack of monitoring and evaluation of their mandatory fortification program. (Rosenberg 2005). Considers an assurance by FSANZ that monitoring of folic acid fortification is planned is not sufficient. Considers there must be long term commitment to monitoring effects of folic acid fortification. A review of monitoring should occur: • two years post first nutrition survey to establish population wide folic acid intakes, the appropriate use of bread as a fortification vehicle, the continued use of voluntary permissions, efficacy of fortification on NTD prevalence, and review of available evidence. • every five years evaluating folate intake, status and potential adverse effects, and review of the available evidence • this periodic monitoring to continue for a minimum of 30 years, and preferably for two generations. Considers a protocol should be in place to address any potential adverse effects and which outlines the process for reversal of mandatory folic acid fortification if required.
G4	New Zealand Food Safety Authority Ms Carole Inkster	**Supports a modified Option 2** Submission supported by Ministry of Foreign Affairs and Trade (MFAT), Ministry of Economic Development (MED), and the Ministry of Consumer Affairs. The Ministry of Health (MoH) supports the submission in principle. NZFSA does not support FSANZ's preferred regulatory option for reasons presented below.

Ref	Submitter	Submission Comments
		Consumer Choice Refers to NZFSA (2005) and NZ Association of Bakers (2004) research on consumer attitudes to mandatory fortification that found the majority of respondents did not support mandatory fortification. Considers that given the level of resistance to fortification in the New Zealand population, consumers must have choice between fortified and unfortified bread products. Notes the current proposal would not provide consumer choice. Comments that FSANZ did not undertake any research on consumer attitudes to fortification before the DAR was released. Notes that consumer acceptance is essential to the effectiveness of any mandatory fortification program. Considers there is potential for consumer backlash to the addition of iodine to food as a result of FSANZ's preferred option. **Health risks** Australian consumption data may not be accurate for NZ populations. Only appropriate to use Australian consumption data for NZ children if no suitable New Zealand data and modelling. The percent of NZ children exceeding the UL could be far greater than 6% because all flour in NZ may be fortified with folic acid in NZ due to the inability of NZ flour mills to segregate bread making flour. Children will be exposed to much higher levels of folic acid than previous generations. It may be in future generations of children that adverse effects become apparent. No monitoring of young children has been undertaken in North America. Both of these countries provide some consumer choice between fortified and unfortified bread. Removing bread from the diet of young children as an option for avoiding fortified bread would not be consistent with the New Zealand National Nutrition Guidelines. **Labelling** NZFSA and Ministry of Health recommend the level of folic acid be included in the NIP as a mandatory requirement. The Ministerial Council Policy Guidelines for mandatory fortification give scope for including folic acid in the NIP. The requirement to declare folic acid on the ingredient label will not enable women to calculate the amount of folic acid they are getting from fortified foods, and therefore the level of supplementation necessary to reach 400 µg folic acid per day. Any reference to folic acid on food labels should use the term folic acid and dietary folate equivalents so that the public becomes aware of the new terminology.

Ref	Submitter	Submission Comments
		With education consumers will understand the level of folic acid consumed. The interchangeable use of folic acid and folate and the different recommended levels referred to in the Code creates confusion and should be clarified. Levels of folic acid stated in the NIP will have inherent accuracy limits carried over from the limits of the folic acid in the bread-making flour. Products voluntarily fortified with folic acid may currently state the average folic acid value on the NIP with no tolerance levels given. This makes it difficult for consumers to calculate their overall intake of folic acid. The NZFSA ESR report titled 'Fortification Overages of the Food Supply – folate and iron' indicate women could be getting anything from less than one third up to three times more of the average amount declared for folic acid from voluntary fortification. **Impact on industry** The cost of equipment for adding folic acid to the flour and for duplicating the storage capacity for fortified and unfortified flour would be significant in New Zealand. Understand that some mills may have to close because the costs required to add folic acid would make them unviable. The point at which folic acid is added in the milling process may vary depending on the production process in each mill. It would be difficult to obtain a homogenous mix in bread-making flour particularly for small artisan type mills. Bakeries generally make wholemeal flour by blending white flour and wholemeal. Considers the draft standard creates an issue for wholegrain and wholemeal breads, as these breads contain less flour than white bread and thus would contain less folic acid. Alternatively if flour for bread-making is intended to catch the wholemeal flour component of the bread as they are ingoing ingredients, then additional folic acid would be needed to top up at the bakery so that 'wholemeal' flour contained the correct level of folic acid. Consider this is not a sensible outcome. Cross contact/contamination may be an issue during the milling process as flour particles may get lodged through the process. The mills would therefore not be able to say the product was folic acid free. **Dietary modelling** Consider there are several uncertainties around FSANZ's estimate of baseline folic acid intakes of the target population. The exclusion of naturally occurring folate from baseline intakes in not justified given that folate intakes could be converted to dietary folate equivalents. As reported by Russell et al (1999) the median daily intake of folate from food for New Zealand females was 212 µg which equates to approximately 127 µg folic acid.

Ref	Submitter	Submission Comments
		This figure is considerably higher than the FSANZ baseline median daily intake of 21 µg. Russell also states that folate food composition data used in this survey may lead to an underestimate of folate intakes. Voluntary fortification is likely to be more widespread since the 1997 NNS, resulting in greater potential total folate intakes. FSANZ scenario proposes that women consume one 40 g serving of folic acid fortified breakfast cereal and two slices of bread plus a 200 µg supplement to achieve 400 µg folic acid per day. However, data from the 1997 NNS show New Zealand women are unlikely to consume one serving of breakfast cereal per day. **Trade issues** The MED are concerned the preferred option may harm New Zealand companies that export, or that are associated with the export of flour based products, particularly for the Asian markets. This could potentially include pastry and frozen dough, and bread-crumb containing products e.g. fish and meat. The preferred option does not consider the effects on bread and bread product exports in the New Zealand baking sector. MFAT request a copy of the draft notification to World Trade Organisation (WTO) before it is sent to the WTO plus prior warning of the date this is likely to occur. **Monitoring** Monitoring programme needs to be established prior to implementation of mandatory fortification. Considers monitoring has not been adequately addressed in the DAR. It is not clear how FSANZ will contribute to a monitoring system which is the Ministry of Health's responsibility in New Zealand. Key issues in developing a monitoring programme for folic acid: • comprehensive monitoring programme should have been developed as part of the DAR including consultation with all relevant agencies; • Ministry of Health's existing monitoring activities are not as comprehensive or frequent as would be required for health and nutritional status; • monitoring frequency, schedule, sample size, target populations and biochemical tests need to be considered; • costs of establishing and implementing ongoing monitoring will be substantial and should have been included in the cost-benefit analysis; • the time for gazettal is insufficient to establish a monitoring programme to collect baseline data before the transition period; and • the monitoring process needs to include education of the public and health practitioners.

Ref	Submitter	Submission Comments
		A suitable comprehensive monitoring programme for New Zealand should be developed and established, and include baseline measurements. *Measuring folate status* Consider blood samples is the only way to objectively measure folate status, and have not been done before in the New Zealand NNS, and may not be included in future surveys. Measuring serum folate is cheaper and more feasible than RBC folate at a population level The next NNS is scheduled to being in late 2007 and will collect data over 12 month period. This survey may not provide sufficient data for baseline measures of folate status and does not include children under 15 years of age. Some participants of the survey may be consuming foods with additional folic acid depending on the timing of mandatory fortification; therefore the results of the 2007 NNS are not ideal for providing baseline folate status data. If the NNS was used to collect baseline measures, further regular monitoring would be needed for the next NNS in another 10 years. The 2002 National Children's Nutrition Survey (NCNS) did not measure folate status. Baseline measurements of children aged 2-14 years will need to be conducted before implementation. Two studies (Watson & McDonald 1999 and Ferguson et al 2000) can be used as part of the baseline measures. *NTD monitoring* New Zealand has a comprehensive monitoring system for NTDs (the New Zealand Birth Defects Monitoring Programme) and is able to detect any change in the occurrence of NTDs over time. **Enforcement** Testing of fortified bread-making flour or bread will be pivotal to the outcome of the proposal and an essential component of compliance and enforcement. There are three different tests available to test for folic acid and folate in food. For testing on site the ELISA kit would be the most commonly used test. Each site would be required to set up testing facilities with the necessary equipment and trained personnel which would be a cost to industry. Sample testing takes up to 8 hours for an urgent test and up to several days if samples are out-sourced e.g. Agriquality. In this case the results of tests may not be available before the product leaves the site, due to the quick turnaround time of milled flour and bread. Some tests measure natural folates as well as folic acid and others measure folic acid only.

Ref	Submitter	Submission Comments
		Education Education campaigns need to target health professionals and women of child bearing age. Campaigns to health practitioners need to be in place well before the implementation of the proposal, so that they disseminate the right advice. Education campaigns must be on-going and monitored for effectiveness in reaching the target audience. Needs to dispel expectation in the target group that sufficient folic acid for NTD prevention can be achieved from consuming fortified foods. The public needs to be educated about the benefits of folic acid. Ongoing education will be required to encourage women in the target group to meet the nutrition guidelines for bread and cereal consumption, to ensure optimum folic acid intake through food fortification. **Communication strategy** Well designed communication strategy is required, targeted to young women and care givers, and in collaboration with key stakeholders, and must be responsive to the concerns relating to the proposed standard. Communication strategy needs to be tailored to each country, and have a high level of acceptance by health authorities and providers in jurisdictions. Standard should be a joint initiative with relevant health authorities as part of ongoing strategy for NTD preventions. **Organics and natural** New Zealand Commerce Commission (NZCC) considers there may be implications in the proposal standard with regards to fair trade and labelling issues. The NZCC requests the opportunity to discuss these issues further before any decision to adopt the preferred option. **International experience** Notes that the United Kingdom Food Standards Agency Board has not put forward a preferred option for improving the folate status of young women and the publication of the Scientific Advisory Committee on Nutrition (SACN) report on folate and disease prevention has been delayed. After further review of the available evidence, the advice of SACN will be finalised and the final report published. The Food Safety Authority of Ireland has recently recommended that bread be mandatorily fortified with folic acid at a level of 120 µg per 100g bread. The report also recommends that an implementation committee be established to decide the point at which folic acid will be added to the bread (milling or bread-making), with a 12 month time period. Notes the greatest reductions in the rate of NTDs after mandatory fortification have been in countries where the rate is much higher than the current rate in New Zealand, e.g. USA and Canada.

Ref	Submitter	Submission Comments
		In the USA unenriched cereal-grain products provide consumer choice. **Supplements** NZFSA has had preliminary discussions with the Ministry of Health and Medsafe regarding the supply of a lower dose folic acid supplement as a registered medicine that would meet the current folic acid requirement for women. Note it is unlikely that a lower dose folic acid supplement will be available by November 2007. NZFSA will continue to work with the Ministry of Health and Medsafe to look at alternative options, and update FSANZ of developments. **Form of folic acid** FSANZ must specify the form of folic acid to be used in mandatory fortification as the DAR reports varying degrees of stability with the different forms of folic acid. **Alternative proposal** The New Zealand Government suggest the following alternative approach to mandatory fortification: • mandatory fortification of a selected range of bread products that have been identified as being consumed regularly by the target group; • folic acid added to bread during the bread-making process; • declaration of the amount of folic acid in the NIP; and • the remainder would be consistent with FSANZ proposed approach i.e. folic acid supplements, and ongoing education strategies. Consider this option should be investigated before considering a move to fortify all bread. Reasons for supporting this alternative proposal: • as bread-making flour in New Zealand is used in many other food products beside bread; • does not put the non-target population at risk; • allows consumer choice; • could potentially allow for higher levels of fortification with the potential for further reductions in NTD affected pregnancies; • more cost-effective option for the New Zealand flour milling and bread baking industries; • adding during the bread baking process would provide better quality control compared with adding folic acid at the mill; • would not impact on export of bread and bread products; • would involve all bread manufactured in large bakeries, in-store bakeries etc, where only those artisan bakeries may not be captured which are estimated to account for no more than 5% of total bread sales in New Zealand; and • intended to limit consumer backlash to mandatory fortification with iodine. Note that their alternative proposal does not identify the specific range of bread products to be fortified. NZFSA to provide further information on this in the near future.

Ref	Submitter	Submission Comments
G5	NSW Food Authority and NSW Health Mr Bill Porter	**Supports Option 2** Support the conclusion and preferred regulatory option presented at Draft Assessment, noting there is strong evidence that folate fortification is a safe and effective public health measure. **Safety and effectiveness** Studies in many countries, including Australia, have documented the failure of voluntary fortification and supplement programs to achieve more than modest increases in preconception consumption of folic acid by women of childbearing age. Population based surveys in Victoria and Western Australia have demonstrated modest increases in serum folate in women of childbearing age in Australia following the introduction of voluntary fortification. The masking of the diagnosis of vitamin B12 deficiency does not seem to have occurred in countries where folate fortification has been introduced. The need for the development of robust surveillance systems for NTDs to accompany this new standard has been recognised by all participants in the debate. **Food vehicle** International experience in over 40 countries has demonstrated that wheat flour and wheat products are ideal vehicles for increasing folic acid consumption among the entire population. The food standards code should be changed to make clear the meaning of 'flour for making bread', restricting it to wheat bread making flour and to limit the required folate levels to the white wheat flour component of flours including meals for making bread. It should be noted that there are a number of breads on the market at present where folate is added as a part of a premix by the baker, not at the end of the milling operation by the miller. Whilst this would enable mandatory fortification of folic acid 'across the board', the economics and the practicality of such a process appear to have been considered too difficult. Data from the NSW Health Survey indicate that over 94% of women in the target age group consume some bread and 72% consume over 1 slice per day. **Supplements** Results from the most recent NSW Health Survey indicate that 32.8% of the mothers of young children took folate supplements in the peri-conceptual period, a similar figure to that found in Western Australia after an intensive education campaign. For mandatory fortification to be effective as a strategy it is essential that the present rate of supplementation by peri-conceptual women be maintained.

Ref	Submitter	Submission Comments
		Accordingly it would seem appropriate that the variation to the standard, if accepted, be accompanied by a commitment by all relevant parties to maintain at least the current commitment to promotion and education strategies on supplement use. **Impact on industry** Industry need to know that the expense and effort required to introduce mandatory fortification has resulted in tangible benefits, and it will be important to ensure there is no decline in the use of periconceptual folic acid supplement use. **Cost benefit analysis** The Access Economics report appears to discuss only wheat flour, and not flours derived from other grains, legumes or other seeds. The report also seems to consider fortification only at the mill and not at the bakery. It does not appear that a case has been made out for requiring all flours intended for bread making to be fortified, and the costs involved seem to be unquantified except in the case of white wheat flour at the mill. **Health claims** Health claims with respect to folate are expressly permitted by transitional standard 1.1A.2, which applies to a finite list of brands of bread, and not to breads generally. For manufacturers not having a named brand in the standard, a health claim will not be permitted. The NSW Food Authority proposes that standard 1.1A.2 be amended to delete specific brands and to include fortified bread generally. The draft health claims standard proposes generic disqualifying criteria for a health claim on folate. The most significant impact of these criteria for bread will be the reduced sodium level, which will preclude many existing breads from making any folic acid/NTD claim if the health claims standard is introduced in its present form. NSW proposes that FSANZ review the disqualifying criteria for health claims with respect to bread. It does not seem reasonable to require bread manufacturers to provide the food vehicle for folic acid fortification and then to deny the ability on some brands to inform the consumer of the intended benefit in relation to NTD.
G6	Office of Population Health Genomics, Department of Health WA Dr Peter O'Leary	**Supports Option 2** Strongly supports the introduction of mandatory fortification of bread-making flour with folic acid to decrease the incidence of NTDs, and considers maintaining the status quo is unsatisfactory in achieving this aim. Considers mandatory fortification of staple foods with folate is the only option that increases the folate intake of women regardless of socio-economic, education or indigenous status, family planning or geographical location.

Ref	Submitter	Submission Comments
		Health risks There have been no reported adverse effects from mandatory fortification. No cases of masking of vitamin B12 deficiency have been reported in any country where mandatory fortification has been implemented. **Education** Extensive education campaigns fail to reach fifty percent of women of reproductive age due to the equivalent rate (50%) of unplanned pregnancies and socio-economic factors. Individuals with coeliac disease are unlikely to have improved folate status as a result of mandatory fortification and specific promotional activities regarding supplementation should be considered for this group. **Cost benefit analysis** Our estimates agree with the independent health economic analysis conducted by Access Economics that predict, based on the Burden of Disease cost of $7.0 million, the benefits to the Australian health system would exceed $30 million per year.
G7	Population Health Division, Department of Health and Human Services Tasmania Ms Judy Seal	**Supports Option 2** Supports mandatory fortification of bread-making flour with folic acid as outlined at Draft Assessment. Believe a population-wide intervention is justified due to the severity of the condition and the cost to the community of caring for affected individuals, and the distress that occurs with the proportion of pregnancies that are terminated when antenatal detection occurs. Acknowledges that mandatory fortification is only part of the solution and that continued promotion of supplements to women during, and prior to, pregnancy and voluntary fortification will be required. Notes that the mandatory fortification component of the multi-strategic approach to reducing NTDs will most benefit segments of the population who are not reached by advice to take folic acid supplemented, including unplanned pregnancies, and who do not want to buy more expensive brands of foods. **Food vehicle** Support the choice of bread-making flour as the food vehicle in the absence of realistic suggestions of food vehicles that would reach a greater number of women. Acknowledge that other population subgroups eat more bread than women of child-bearing age; however bread appears to be the most widely consumed food among the target group. **Data** Acknowledge that the data used for modelling are over 10 years old and need to be updated. However, these data were used to model iodine intake through the use of iodised salt in bread in Tasmania.

Ref	Submitter	Submission Comments
		The predicted increases in iodine intake have matched our observations (unpublished data) suggesting that bread consumption is relatively stable over time. **Voluntary fortification** Recommend voluntary permissions for fortification with folic acid are reviewed once mandatory fortification has been fully implemented. Consider that where voluntary permissions are not regularly used that these permissions should be withdrawn. If they are widely used and making a valuable contribution to folic acid intake then consideration should be given to making these permissions mandatory. **Monitoring** Consider it essential that appropriate monitoring is implemented to complement the mandatory folic acid fortification program. The Australian Health Ministers Conference noted the need to establish an up-to-date and ongoing nutrition monitoring and surveillance system in Australia. Strongly recommends that monitoring folate status and folate intake is linked to this broader nutrition monitoring and surveillance system. Considers periodic review and comprehensive monitoring, including for potential adverse health risks, of any mandatory fortification program is essential for public confidence. **Consumer choice** Whilst the issue of consumer choice is worthy of consideration, support mandatory fortification to provide the greatest good for the greatest number; similar to seatbelt legislation.
G8	Population Health Services Branch, Queensland Health Mr James Stephanos	**Cautionary support of Option 2 with provisions** Cautiously supports the preferred approach of mandatory fortification of bread-making flour with folic acid, particularly with the specified range of addition to avoid overages. This support is on the understanding that: • current baseline data, which includes up-to-date dietary intake data is obtained; • adequate lead in time is allowed for the collection of the baseline data; and • adequate monitory of both voluntary and mandatory permissions is conducted, and that all voluntary permissions are reviewed once mandatory fortification has been fully implemented. Expressed the following concerns: • will the proposed mandatory fortification reach all at risk groups, particularly Indigenous and lower socio-economic groups, given that the dietary modelling was unable to be specifically consider these groups;

Ref	Submitter	Submission Comments
		• the scientific uncertainty about long-term exposure to synthetic folic acid and the effects of unmetabolised circulating folic acid; • the use of US experience to justify the potential lack of adverse risks where no plans for monitoring were made; • will only benefit a small proportion of the population, and provide limited choice for the non-target population; • the potential for broadening voluntary fortification permissions for folic acid in the future, as some population groups are likely to exceed the upper level of intake with mandatory fortification; • the cost benefit analysis does not include costs to government of health promotion, education, monitoring and surveillance; • the lack of current baseline data to compare future monitoring and surveillance activities; and • that only 5% of women would reach the recommended 400 μg of folic acid with the proposed mandatory fortification, and that supplements and education are still necessary to achieve maximum benefit. Requested clarification on the: • range of intakes of bread, cereals and other fortified foods used in the dietary modelling; • 'margin of safety' used for children that are likely to exceed their upper level of intake for folic acid; • results of the two consumer response studies conducted in New Zealand; and • details on the proposed communication and education strategy. Recommends: • current baseline data, particularly up-to-date dietary intake data is obtained; • labelling of folic acid in the NIP be mandated; • consumer choice is provided for by excluding organics and speciality breads; and • consideration be given to the amount of folic acid the population would consume if they followed the recommended consumption of breads and cereals.

Attachment 3

Policy Guideline
Fortification[52] 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 were 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;
   (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.

[52] 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.

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:

1. 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.
2. Be required only if it is assessed as the most effective public health strategy to address the health problem.
3. Be consistent as far as is possible with the national nutrition policies and guidelines of Australia and New Zealand.
4. 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.
5. 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

The specified health objective of any mandatory fortification must be clearly articulated prior to any consideration of amendments to the Food Standards Code to require such mandatory fortification.

The Australian Health Ministers Advisory Council, or with respect to a specific New Zealand health issue, an appropriate alternative body, be asked to provide advice to the Australia and New Zealand Food Regulation Ministerial Council with respect to Specific Order Policy Principles 1 and 2, prior to requesting that Food Standards Australia New Zealand raise a proposal to consider mandatory fortification,

The assessment of public health strategies to address the stated health problem must be comprehensive and include an assessment of alternative strategies, such as voluntary fortification and education programs.

Consideration should be given, on a case by case basis, to a requirement to label foods that have been mandatorily fortified by including the information in the Nutrition Information Panel of the food label.

An agreement to require mandatory fortification also requires 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 subclinical 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 restoration[53]).

  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.

[53] 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 voluntary 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.

Attachment 4

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 1996b; USFDA 1996c; USFDA 1996d). 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 1996a). 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*., 1999a).

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 USCDC 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 (USCDC, 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 (USCDC 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 (USCDC, 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*., 2005d) 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*., 2005b).

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, 2006b).

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 B_{12} 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 B_{12} 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 B_{12} 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 B_{12} 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*., 2003b). 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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Attachment 5

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 *Folate – make it part of your day* 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: *Folate and neural tube defects prevention project* 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	*'Folate before pregnancy'* 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-conceptional period
NSW Health	*How diet can prevent birth defects* 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-conceptional period
Health Department of WA	Folate Program Phase 2: *Folate awareness campaign*	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	*Victorian Folate Campaign*: 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 (Chan *et al*., 2001; Abraham and Webb, 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 foods[54]. 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).

[54] 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)	5th percentile (μg/day)	Median (μg/day)	95th percentile (μg/day)
Australia			
15-18	44	77	240
19-29	44	67	266
30-49	12	44	281
15-49	**12**	**57**	**273**
New Zealand			
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 (Skeaff *et al*., 2003; NZMoH, 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-conceptional 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
Australia				
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*
New Zealand				
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-conceptional 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*., 2002d; Hickling *et al*., 2005f).

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*., 2002b; Flicker *et al*., 2004c). 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*., 2002a).

In a similar study in Perth involving adults aged 27-77 years, the authors (Hickling *et al*., 2005b) 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 incidence[55] 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, 2003a). 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, 2005[56]). 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; USCDC, 2004; Liu *et al*., 2004a).

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 prevalence[57] 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.

[55] 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.
[56] FSANZ commissioned report available at www.foodstandards.gov.au
[57] 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*., 2005[58]
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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[58] FSANZ commissioned report available at www.foodstandards.gov.au

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Attachment 6

Potential health benefits and risks of increased folic acid intake

Numerous diseases and conditions have been investigated in the literature which assess the potential health benefits and risks of increased folate intake; either dietary folate and/or folic acid from supplements. This paper draws together the main findings from these studies and draws conclusions where possible. This paper has been updated since the Draft Assessment Report for *Proposal P295 – Consideration of Mandatory Fortification with Folic Acid*.

Where data are available the health benefits and risks arising from the international experience of mandatory folic acid fortification have been included.

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 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. Data have also indicated that there was already an apparent decline in NTD rates prior to the introduction of mandatory fortification in the United States (USCDC 2000). This decline is difficult to interpret because of the uncertainties in the data, although it appears to be significantly influenced by the extent of NTD terminations (i.e. previous NTD rates data may not have included those affected pregnancies that were eventually terminated).

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*., 2004c). In Nova Scotia, Canada, Persad *et al*. (2002) reported a 54% decrease in NTD incidence during the same period (from 2.58 per 1,000 to 1.17 per 1,000 births) and Ray *et al*. (2002c) 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 in the United States, 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*., 2005b) 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*., 2005a). Among women aged 20-39 years, mean serum folate increased from 10.3 nmol/L to 26.0 nmol/L (Dietrich *et al*., 2005a). 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, 2006a).

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*. (2005b) 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.

2. Masking the diagnosis of vitamin B_{12} deficiency

Concerns have been raised about the potential for increased folic acid intakes to delay the diagnosis and eventual treatment of severe vitamin B_{12} deficiency in older people. Vitamin B_{12} deficiency is associated with a spectrum of clinical manifestations: haematological, neurological and psychiatric. The theoretical risk is that increased folic acid intake may prevent or delay the appearance of macrocytic anaemia, a haematological symptom of vitamin B_{12} deficiency. However, the more serious neurological complications (that are not influenced by folic acid intake) can occasionally progress to an irreversible form, and are known to occur in the absence of anaemia in some 20 to 30% of cases (SACN, 2005). Practitioners are advised to consider vitamin B_{12} deficiency as a possible cause when presented with individuals who have clinical signs of anaemia or neuropathy.

Vitamin B_{12} 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 B_{12} levels have neurological pathology (Lindenbaum *et al*., 1988; Savage and Lindenbaum, 1995; Campbell 1996 cited in European Commission, 2000).

Vitamin B_{12} deficiency is most common in elderly people, mainly due to a reduced capacity to release vitamin B_{12} from food sources (such as foods of animal origin, in particular red meat, dairy foods and eggs, but also foods fortified with vitamin B_{12} such as soy-based beverages and yeast extracts) during digestion, or alternatively as a result of malabsorption of free vitamin B_{12} from the gut caused by gastrointestinal dysfunction. Very little deficiency in this age group is caused by inadequate dietary intake of vitamin B_{12}.

Diagnosis of vitamin B_{12} deficiency and screening for the condition does not depend solely on identification of macrocytic anaemia in older persons. Other tests, unaffected by folic acid intake, are used for confirmation of the diagnosis. This process commonly involves identification of a low serum vitamin B_{12} level followed by further discriminating biochemical tests.

The upper intake level (UL) for folate (1,000 µg per day of folic acid) in adults (see Figure 1) has been set based on the potential to mask the diagnosis of vitamin B_{12} 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 Prevalence of vitamin B_{12} deficiency in Australia and New Zealand

There are no representative national population studies of prevalence of vitamin B_{12} deficiency in older persons in Australia or New Zealand, although there are a small number of published studies (and one unpublished) of serum B_{12} levels that provide estimates of the prevalence of vitamin B_{12} deficiency in older persons.

Serum vitamin B_{12} is a crude indicator of vitamin B_{12} 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 B_{12} deficiency that has recently been used in overseas surveys in combination with serum vitamin B_{12} to assess the prevalence of vitamin B_{12} 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 B_{12} levels alone consistently show a small to moderate prevalence of vitamin B_{12} deficiency among older members of the community (see Table 1 below). 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. Vegetarians are also at risk of vitamin B_{12} deficiency due to a reduced vitamin B_{12} intake; vegans more so than lacto-ovo vegetarians because of a complete absence of animal products in vegans' diets (Hokin and Butler, 1999b).

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 B_{12} 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 B_{12} 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 B_{12} deficiency. At doses less than 5,000 µg/day (330 – 2,500 µg/day) there are only eight well-documented cases.

The NHMRC and NZMoH (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 B_{12} 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 B_{12} deficiency, the fact that pernicious anaemia may develop earlier in some ethnic groups, and uncertainty about the prevalence of vitamin B_{12} 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 B_{12} 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.

Given the apparent prevalence of vitamin B_{12} 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 B_{12} (< 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 B_{12} deficiency.

Table 1: Australian and New Zealand serum vitamin B_{12} levels

Study Group	Results	Author
Australia		
Perth 299 men aged over 74 years	14 % were deficient[1]	(Flicker *et al*., 2004b)
Perth 273 women aged over 69 years	6% were deficient[1]	(Flicker *et al*., 2004a)
New South Wales 371 males and females aged over 49 years	22% had serum B_{12} levels below 185 pmol/L	(Flood.V.M. *et al*., 2001)
Seventh Day Adventist Ministers 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, 1999c)
New South Wales 177 children in years 10 to 11	22.5% had serum B_{12} <220 pmol/L No difference between vegetarians and non-vegetarians:	(Pearce *et al*., 2006)
Indigenous Australians (SE Queensland) 365 adults men age 42 years	89 with homocysteine levels >15 µmol/L has mean serum B_{12}=343 pmol/L and 276 with elevated homocysteine had mean serum B_{12}=324 pmol/L	(Shaw *et al*., 1999)
New Zealand		
Dunedin 216 women (aged 18 – 45 years)	2% were vitamin B_{12} deficient (< 60 pmol/L)	(Ferguson *et al*., 2000)
Dunedin 140 boys (aged 14 – 19 years)	1% were vitamin B_{12} deficient (< 60 pmol/L)	(Ferguson *et al*., 2000)

[1] Deficiency not defined in study, reference range 140 – 646 pmol/L

2.2 International experience with folic acid fortification and vitamin B12 deficiency

There are no data on adverse effects on neurological function, especially in people aged 65 years and over with low vitamin B_{12} status from countries that have introduced mandatory fortification (SACN, 2005).

Data from population-based surveys in the United States and in Canada undertaken before and after the introduction of mandatory folic acid fortification found that the proportion of people who had poor vitamin B_{12} status without anaemia did not change significantly from the pre-fortification period to after full implementation (Health Canada, 2003; Mills *et al.,* 2003).

3. Cardiovascular disease

There is a well established inverse dose response relationship between the intake of folic acid and total plasma homocysteine (tHcy). The level of tHcy increases with age and is higher in men than women and in individuals with folate-associated genetic defects, particularly if these defects are associated with a low folate status.

High levels of tHcy can damage the inner lining of arteries, indicating that high tHcy levels may be associated with an increased risk of cardiovascular disease. In a meta-analysis conducted by the Homocysteine Studies Collaboration (HS Collaboration, 2002) the authors found 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. The ability of folic acid to lower tHcy levels has therefore lead to the development of a hypothesis that increased folic acid intakes may lower the risk of adverse cardiovascular disease events. However, several recent and large randomised controlled trials have now examined this relationship. Despite showing that increasing folic acid levels lowered tHcy, this did not lead to a reduction in cardiovascular disease as was hypothesised.

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 B_6 and B_{12} (Bonaa *et al*., 2006b). The Heart Outcomes Prevention Evaluation (HOPE) 2 study involving 5,522 participants given folic acid (2,500 µg) and vitamins B_6 and B_{12} 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*., 2006d).

A number of other recent smaller randomised controlled trials (<700 subjects) also provide a measure of support to the findings of the above three studies. Two six-month randomised controlled trials investigating the effect of 1 mg/day folic acid intake on restenosis rates provide differing evidence on this health endpoint. One study (553 participants) found decreases in post-angioplasty cardiovascular events for those (Schnyder *et al*., 2001), while another (636 participants) found an increase in these events over the study period (Lange *et al*., 2004). Both of these studies reported a decrease in tHcy levels for the test group compared to the placebo group. Others have used much higher doses. A recent study on 283 patients demonstrated that 5 mg/day of folic acid produced no significant change in cardiovascular events over a four year period (Liem *et al*., 2003; Liem *et al*., 2005) and a study using 15 mg/day found no difference in cardiovascular events in patients with chronic renal failure during an average of 3.6 years of follow-up (Zoungas *et al*., 2006).

Therefore, when the results of the three large trials are put together with the results of the smaller trials, the overall trend shows that there is no significant impact of supplementary folic acid given alone or in combination with vitamins B_6 and B_{12} on cardiovascular disease outcomes. From this evidence, it can be concluded that although elevated homocysteine levels are associated with an increase in cardiovascular disease events, the use of folic acid to lower serum tHcy does not have any measurable impact on cardiovascular disease risks.

4. Cancer

Folate acts as a methyl donor in the synthesis of purines and ultimately DNA and therefore could affect the development of cancer. A number of epidemiological studies have suggested that people with higher folate intakes have lower rates of various cancers (Kim, 2004). Despite this, Kim (2004) warns that it is too early to regard folate as a cancer chemopreventive agent and that more work is needed. In particular, he raises the question that folate might increase progression of pre-cancerous lesions (such as a colonic adenoma) but lower the risk of cancer if no lesion exists. Two studies testing the effect of 1-5 mg of folic acid daily on the recurrence of pre-invasive colonic lesions over 12-24 months have had opposite results (Davies *et al*., 2006) and so this hypothesis is still open.

As part of the development of the current proposal, an update of the epidemiological literature was commissioned (Bower and de Klerk, 2005[59]) using an earlier review from the United Kingdom Scientific Advisory Committee as a starting point (SACN, 2004). This update was released with the Draft Assessment Report. A draft update of the SACN report was released in October 2005 (SACN, 2005). This section of the Final Assessment Report contains a further update of the epidemiological literature to July 2006.

The previous reviews have examined the question of the relationship of folate to cancer development in general and both studies measuring natural folate only and studies measuring total folate (natural folate and folic acid from supplements) have been grouped together (SACN, 2005). However, the focus of the current proposal is to add folic acid to the Australian and New Zealand diet through mandatory fortification. Therefore the current update is restricted to studies measuring total folate because this is nearest approximation to the situation under consideration and excludes studies that measured intake of natural folate alone, except where they were referred to specifically in submissions. Studies measuring serum folate were also included as other information allows an assessment as to whether the levels might reflect consumption of folic acid from supplements.

This update is restricted to cohort studies and the result of two cardiovascular trials using high doses of folic acid and includes the earlier studies for completeness. Reports of serum levels were considered separately from intake-based reports because the difference in bioavailability of folate and folic acid might mean that intake studies might not yield the same associations as serum studies.

The focus of this update was studies describing incidence in a general population sample and excludes mortality studies. Studies focusing on subgroups such as those with a family history of cancer, particular genotypes or dietary patterns were excluded.

[59] FSANZ commissioned report available at www.foodstandards.gov.au

4.1 Total cancer

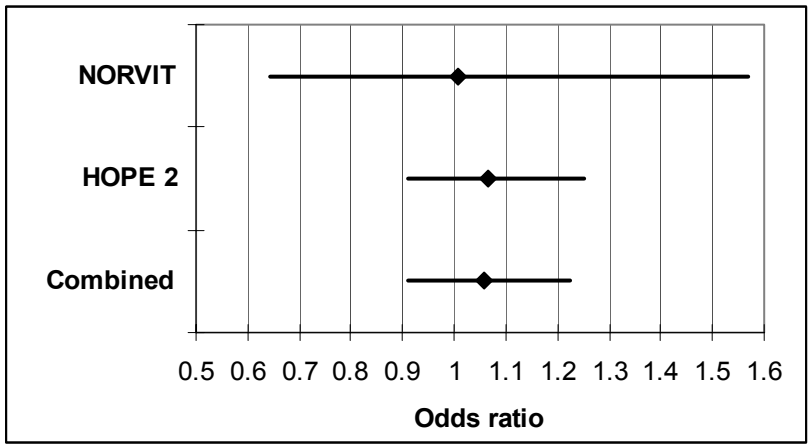
Two trials of the folic acid-cardiovascular disease hypothesis have report total cancer incidence in their participants. Meta-analysis of these two results yields a combined relative risk (RR) of 1.056 (95% Confidence Interval (CI): 0.91-1.23). This is a non-significant 5.6% increase in the incidence of total cancer (Table 2; Figure 1).

The high doses are worth noting in relation to the current proposal. In particular, the HOPE 2 trial used a dose that is more than double the UL of 1 mg/day for adults (NHMRC and NZMoH, 2006). There are other similar trials underway and their results assessed when they become available.

Table 2: Randomised controlled trials (RCT) using high doses of folic acid

Study	Authors	Description	Comparison	Relative Risk
HOPE 2	(Lonn *et al*., 2006f)	Five year trial conducted in 13 countries; 5,522 men and women 55 years and older with vascular disease or diabetes over 5 years.	2.5 mg folic acid plus 50 mg B_6 plus 1 mg B_{12} vs. placebo	Incident cancer except basal cell carcinoma: RR=1.06 (95% CI: 0.91-1.23)
Norvit	(Bonaa *et al*., 2006a)	Three year factorial designed trial conducted in Norway; 3,749 men and women 30-85 years who had survived a heart attack	0.8 mg folic acid vs. placebo with or without 40 mg B_6 and 0.4 mg B_{12}	Incident cancer RR=1.02 (95% CI: 0.65-1.58)

Figure 1: Incidence of all cancers in two trials testing high doses of folic acid plus vitamin B_{12} plus vitamin B_6 versus placebo over 3-5 years



4.2 Prostate cancer

Four studies have reported results relating to serum folate levels and prostate cancer, but only one cohort study (Stevens *et al*., 2006a) has reported data for total folate intake and incidence of prostate cancer (Table 3). In a 9-year follow-up, Stevens *et al*. (2006) report a RR=1.11 (95% CI: 1.01-1.22) for the highest versus lowest quintile of total folate intake, with no evidence of a dose response relationship. Because this study spanned the introduction of mandatory folic acid fortification in the United States, the analyses were presented for the two time periods.

Prior to fortification, those in the highest quintile of intake had a non-significantly higher risk (RR=1.1, 95% CI: 0.98-1.26) whereas post-fortification the highest quintile had a slightly lower risk (RR=0.92, 92% CI: 0.79-1.06) than the lowest quintile of intake.

In the HOPE 2 trial using 2.5 mg folic acid (which is more than double the UL for folic acid) and other B vitamins there was a non-significantly increased incidence of prostate cancer over five years (Lonn *et al*., 2006e). Three cohort studies have described the relationship between serum levels of folate and incidence of prostate cancer (Table 3).

The Australian study reports that higher levels are protective (Rossi *et al*., 2006c) whereas the two earlier Scandinavian studies report an inverse association. The results from the three serum studies were not statistically significant. The notable feature of these three studies is their low serum folate levels compared to the high level achieved with daily intake of 2.5 mg folic acid in the HOPE 2 trial. The observation that the 20 nmol/L difference in serum level in the HOPE 2 study is associated with the same size of non-significant increment in risk as the 4 nmol/L difference in the Scandinavian studies would tend to suggest that these results do not reflect an underlying gradient of risk.

The serum folate levels described in a Perth cohort (Hickling *et al*., 2005d) provides a context for interpreting the results shown in Table 3. Between 1995/6 and 2001, mean serum folate levels increased from 16.8 nmol/L to 23.1 nmol/L (7.4 µg/L to 10.2 µg/L) in men and women aged 27-77 years (Hickling *et al*., 2005c). This period spans the introduction of voluntary fortification in Australia. Hence the post-voluntary fortification serum folate levels in Australia are approximately the same as that of the placebo group in the HOPE 2 study but double the mean levels of the two Scandinavian studies. Therefore it seems unlikely that many of the participants in the Busselton or Scandinavian studies were taking supplements and so their results would not seem to be relevant to the consideration of mandatory fortification with folic acid in Australia and New Zealand.

Table 3: Studies of folic acid or total folate intake or serum folate and the incidence of prostate cancer

Study	Authors	Description	Comparison	Relative Risk
ACS Study Cancer Prevention Study II Nutrition Cohort	(Stevens *et al*., 2006b)	9-year follow-up of 5,158 men; 99% in the highest quintile used supplements	Highest vs. 2nd lowest quintile of diet + supplement intake (<223 µg/day vs >640 µg/day.	RR=1.11 (95% CI: 1.01-1.22)
HOPE 2	(Lonn *et al*., 2006g)	Randomised controlled trial comparing 2.5 mg folic acid plus 50 mg B_6 plus 1 mg B_{12} vs. placebo in 5,522 (3,962 male) patients 55 years and older with vascular disease or diabetes over 5 years.	Intervention: 42 nmol/L Placebo: 22 nmol/L	Intervention vs. Placebo: RR=1.21 (0.86-1.72)
Busselton Cohort Study	(Rossi *et al*., 2006e)	Cancer morbidity sub-cohort, 23 year follow-up of 466 men and 569 women since 1969. Approximately one-third of the group had serum folate < 10.2 nmol/L and another third had levels >13.5 nmol/L	Per 4.5 nmol/L increment in serum folate	RR=0.85 (95% CI: 0.66-1.11)#

Study	Authors	Description	Comparison	Relative Risk
Northern Sweden Health & Disease Cohort	(Hultdin *et al*., 2005)	4.9 year follow-up, mean serum folate 9 nmol/L	>10.3 versus <5.85 nmol/L	RR=1.3 (0.72-2.24)
Alpha Tocopherol Beta Carotene (ATBC) trial	(Weinstein *et al*., 2003)	Nested case-control study of 224 incident prostate cancer cases among male smokers aged 50-69 years participating in the Finnish ATBC trial; diagnosed over 5-8 years of follow-up.	>10.79 vs. ≤6.87 nmol/L	RR=1.2 (0.74-1.94)

These results were presented as the risk for the low versus high intake group and have been converted so that all results in the table show the risk for the high versus low intake group.

A paper by van Guelpen *et al*. (2006) was mentioned in submissions received in response to the Draft Assessment Report. This is an additional analysis of the data from the 4.9 year follow-up of the Northern Sweden Health and Disease Cohort Study shown in Table 3 (Hultdin *et al*., 2005). Van Guelpen *et al*. (2006a) examine prostate cancer incidence in relation to MTHFR667 genotype. In the CT heterozygotes, risk was non-significantly higher in those with higher serum folate levels at baseline. This relationship was significant when the CT herterozygotes were grouped with the TT homozygotes (TT homozygotes have a higher risk of neural tube defects). As mentioned above, the 'higher serum folate levels' in the Swedish study are less than the pre-voluntary-fortification mean levels seen in a Perth-based cohort (Hickling *et al*., 2005a) and so the relevance of this paper to the Australian situation is unclear.

In summary, the only study with intakes that are relevant for consideration to mandatory fortification reported a non-significant 11% increase in risk; the serum studies all report a non-significant associations ranging from a 15% decrease to a 20% increase in risk with higher levels. Given this, and lack of intake studies, the evidence base is not sufficient to allow a conclusion to be drawn regarding the relationship of folic acid to the incidence of prostate cancer.

4.2 Breast cancer

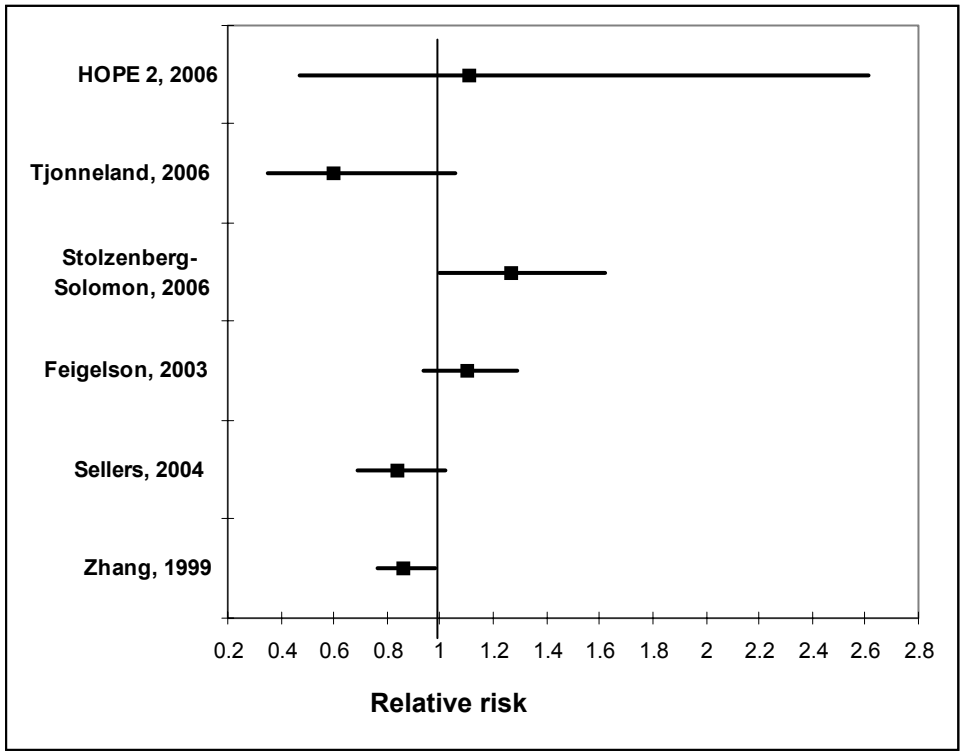
Presenting the results of cohort studies of breast cancer is more complex than for prostate cancer because authors often report updates or conduct sub-analyses on the same group of participants (e.g. by family history status) and so a number of papers do not represent separate studies. To update the review, only one paper describing the intake result of each cohort study was included, with the preference given to a paper describing intake from post-menopausal women or the longest reported follow-up. Similarly, only the most recent paper describing a relationship with serum folate was selected.

Table 4: Cohort studies describing the relationship between total dietary folate (diet plus supplement intake), a trial of folic acid and incidence of breast cancer

Study	Authors	Description	Comparison	Relative Risk
HOPE 2	(Lonn *et al*., 2006b)	RCT in 5,522 (1,560 female) patients 55 years and older with vascular disease or diabetes over five years.	2.5 mg folic acid plus 50 mg B_6 plus 1 mg B_{12} vs. placebo	Intervention vs. Placebo: RR=1.11 (0.47-2.61
Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial	(Stolzenberg-Solomon *et al*., 2006)	25,400 post menopausal women, 691 incident cases over five year follow-up	Intake from diet + supplements >853 µg/day vs. <335 µg	RR=1.27 (1.0-1.62)
Danish Diet Cancer and Health Study	(Tjonneland *et al*., 2006)	24,697 post menopausal women, 388 incident cases over five year follow-up	Intake from diet + supplements > 400 vs. < 300 µg	RR=0.6 (0.35-1.06)
Nurses Health Study	(Zhang *et al*., 1999b)	16 year follow-up, 95% in highest quintile of intake used supplements, results for post-menopausal women are presented here	Highest vs. 2nd lowest quintile of diet + supplement intake	RR=0.86 (95% CI, 0.76-0.98
ACS Study Cancer Prevention Study II Nutrition Cohort	(Feigelson *et al*., 2003)	Five year follow-up, 66,561 postmenopausal women, 1,303 incident cases, highest two quartiles almost exclusively represent folate from supplements (>320 µg/day)	Highest vs. lowest quartile of diet + supplement intake	RR=1.10 (0.94-1.29)
Iowa Women's Study	(Sellers *et al*., 2004a)	Fourteen year follow-up , 3,355 women aged 50-69 years, 1,823 incident cases	Intake > 50th centile vs. intake less than 10th centile	RR=0.84 (0.69-1.02)#

These results were presented as the risk for the low versus high intake group and have been converted so that all results in the table show the risk for the high versus low intake group.

Figure 2: Trial and cohort studies describing the relationship between serum folate and incidence of breast cancer



It is evident that the results of these cohort studies fall close to the no-effect value of 1.0 although a formal meta-analysis has not been done (Table 4 and Figure 2). Other papers from several of these studies report that higher intakes of folate protect against breast cancer in women who consume alcohol but not in non- or low level drinkers.

Fewer studies have examined the relationship of blood folate levels and incidence of breast cancer. Blood was drawn from a subset of the Nurses Health Study participants. Compared to those with a mean baseline folate level <10.4 nmol/L, those with a baseline > 31.7 nmol/L had a lower risk of breast cancer over RR=0.73 (0.5-1.01) during six years of follow-up (Zhang *et al*., 2003). Other studies in this cohort indicate that supplement use was common (Zhang *et al*., 1999a). Wu *et al*. (Wu *et al*., 1999a; 1999b) describe breast cancer incidence in two cohorts recruited from a blood bank. Among those recruited in 1979, the mean baseline folate level was 8.2 nmol/L and the relative risk for breast cancer was 0.93 for the highest versus lowest quintile. The low serum levels in this group suggest that supplement use was not common. The Busselton Study (Rossi *et al*., 2006b), which also reported low baseline levels, found that higher serum folate was associated with a lower risk of breast cancer over 20 years of follow-up (RR=0.71, 95%CI: 0.44-1.16).

Eight case-control studies and a case-cohort study examining the relationship of folate to breast cancer, most of which were included in the 2005 review by Bower and de Klerk (2005). Two of these found no association, five found a protective effect and three found a protective effect only among alcohol drinkers.

Excluded from the above were a cohort study which did not include a measure of supplement use (Shrubsole *et al*., 2004), two other analyses from the Iowa Women's Study (Sellers *et al*., 2001; Sellers *et al*., 2004b), a recent report from the Nurses Health Study that reported results by oestrogen receptor status and alcohol intake (Zhang *et al*., 2005) and two case-control studies of serum or erythrocyte folate that collected samples after the cancer was diagnosed (Beilby *et al*., 2004; Hussien *et al*., 2005). Two reports of breast cancer mortality were also excluded because mortality rates are only partly affected by incidence (Charles *et al*., 2004; Rossi *et al*., 2006a).

In summary, despite having very different levels of folic acid intake, the cohort studies and the trial report relative risks close to the no effect value of 1.0, some slightly above and some slightly below, although a formal test of heterogeneity has not been done. The only study of serum folate in the range that would be expected in Australia and New Zealand following fortification reports a lower risk in those with higher baseline levels of folate. Hence adding folic acid to the Australian and New Zealand intake would not appear to increase the risk of breast cancer and may reduce the risk among heavy consumers of alcohol.

4.3 Colorectal Cancer

Sanjoaquin *et al*. (2005d) performed a meta-analysis of the effect of folate on colorectal cancer risk using papers published up till January 2004 and including only the most recent paper from cohort studies. Within the categories of cohort and case-control studies, they conducted separate analyses for studies that ascertained natural folate intake only and studies that ascertained total folate (natural folate plus folic acid from supplements). For all four sets of study, they found either an overall protective effect or no effect on the risk of colorectal cancer. Among the cohorts: high total folate had little effect (RR=0.95, 95% CI: 0.81-1.11 for the highest versus lowest quintile of intake) but high natural folate intake reduced the risk significantly (RR=0.75, 95% CI: 0.64-0.89). Among the case-control studies, high total folate conferred a non-significant reduction in risk (RR=0.81, 95% CI: 0.62-1.05) whereas high natural folate reduced the risk significantly (RR=0.76, 95% CI: 0.6-0.96).

This update focuses on cohort studies that measured total folate only. The new studies reporting colorectal cancer outcomes since the Sanjoaquin meta-analysis are the HOPE 2 trial (Lonn *et al*., 2006a) and reports from the Swedish and Busselton cohorts (Van Guelpen *et al*., 2006b; Rossi *et al*., 2006f). It is evident that the new data from the HOPE 2 trial lies within the range of results reported by the earlier cohort studies despite its much higher dose (Table 5 and Figure 3). All the results vary around the null value of 1.0.

There was no relationship between serum folate and risk of colorectal cancer in the Swedish cohort (Table 5). The risk of colorectal cancer was the same in the highest and lowest quintiles of serum folate (RR=1.01, and higher (RR=1.81) for the middle group. In the Busselton study, those with higher serum levels were less likely to develop colorectal cancer over 20 years. The low serum levels in these two cohorts in relation to more recent levels in Australia have been noted above.

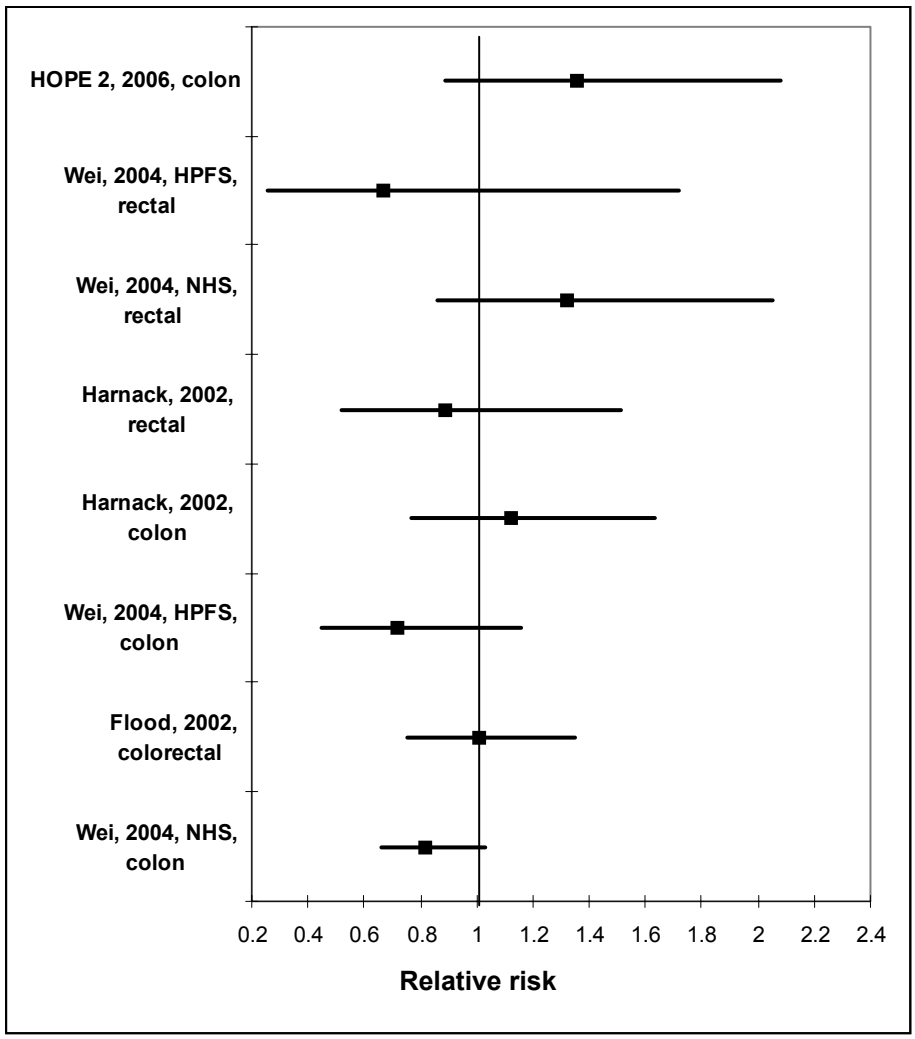
In summary, despite having very different levels of folic acid intake, the cohort studies and the trial report relative risks close to the null value of 1.0, some slightly above and some slightly below. The two serum studies have conflicting results. Hence the more recent studies do not alter the conclusion from the Sanjoaquin *et al*. (2005c) meta-analysis and that total folate intakes do not increase the risk of colorectal cancer.

Table 5: Studies of folic acid or total folate intake or serum folate levels and incidence of colon and rectal cancer

Study	Authors	Description	Comparison	Relative Risk
Nurses Health Study	(Wei *et al*., 2004a)	20 year follow-up, 87,733 women aged 30-55 years (elsewhere it is reported that 95% in highest quintile of intake used supplements), 672 colon and 204 rectal cancers	Highest vs. lowest quartile of diet + supplement intake (>400 vs < 200 µg/day)	Colon cancer: 0.82 (0.66-1.03) Rectal cancer 1.32 (0.86, 2.05)
Health Professionals Follow-up Study	(Wei *et al*., 2004b)	14 year follow-up, 46,632 men aged 40-75 year, 467 colon and 135 rectal cancers	Highest vs lowest quartile of diet + supplement intake (>400 vs < 200 µg/day)	Colon cancer: 0.72 (0.45, 1.16) Rectal cancer: 0.67 (0.26, 1.72)
Iowa Women's Study	(Harnack *et al*., 2002)	13 year follow-up, 598 colon and 123 rectal cancers	Highest vs. lowest quintile diet + supplement intake were 634 vs. 230 ug/day for colon cancer and 463 vs. 282 µg/day for rectal cancer	Colon cancer: RR=1.12 (95%CI: 0.77-1.63) Rectal cancer 0.89 (95%CI: 0.52-1.51)
Breast Cancer Detection Follow up Project	(Flood *et al*., 2002)	45,264 women aged 40-93 years followed for 8.5 years, 490 colorectal cancers	Highest vs. lowest quintile diet + supplement intake (449 vs. 270 µg/day)	Colo-rectal cancer RR=1.01 (95%CI: 0.75-1.35)
HOPE 2	(Lonn *et al*., 2006c)	Randomised controlled trial in 5,522 (1,560 female) patients 55 years and older with vascular disease or diabetes over five years.	2.5 mg folic acid plus 50 mg B_6 plus 1 mg B_{12} vs. placebo	Colon cancer Intervention vs. Placebo: RR=1.36 (95%CI: 0.89-2.08)
Northern Sweden Health & Disease Cohort	(Van Guelpen *et al*., 2006c)	4.2 year follow-up men and women 25-74 years old, 94 male and 132 female cases of colorectal cancer	Quintiles of serum folate examined Lowest < 5 Middle 8-12 Highest >15 nmol/L	Colorectal cancer: RR=1.81 (95% CI: 0.99-3.29) for middle vs. lowest quintile RR= 1.01 (95% CI: 0.47-2.19) for highest vs. lowest quintile
Busselton Cohort Study	(Rossi *et al*., 2006d)	Cancer morbidity sub-cohort, 23 year follow-up of 466 men and 569 women since 1969. Approximately one-third of the group had serum folate < 10.2 nmol/L and another third had levels >13.5 nmol/L	Per 4.5 nmol/L increment in serum folate	RR=0.83 (95% CI: 0.62-1.11)

These results were presented as the risk for the low versus high intake group and have been converted so that all results in the table show the risk for the high versus low intake group.

Figure 3: Cohort studies describing the relationship between total dietary folate (diet plus supplement intake), a trial of folic acid and incidence of cancer of the colon and rectum



4.4 Overall conclusion

Two large trials using much higher doses of folic acid than is proposed under mandatory fortification do not indicate a gradient of risk for total cancers compared to the other studies. For the three specific cancer sites examined, the results of more recent studies do not alter the conclusion reached in earlier reviews (SACN, 2004; SACN, 2005; Sanjoaquin *et al*., 2005b) that there is no apparent increase in risk associated with higher folic acid intakes for the population as a whole. Although many of the studies, in fact, suggest that some reduction in cancer might occur, most of these are observational and so might be affected by uncontrolled confounding by other factors. Therefore, possible benefit from reducing cancer incidence was not included in the cost-benefit analysis.

5. 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. Recently (2006) two studies were completed that challenge the findings of this observational evidence.

A cross-sectional study was conducted by Durga *et al*. (2006) on 818 people aged between 50-70 years, examining the performance of cognitive tasks. Serum folate and tHcy levels had no relationship to cognitive ability, although lower red blood cell folate levels were associated with poorer cognitive performance.

A recently published study by McMahon *et al.* (2006) is the only intervention study that has been identified on this subject. This randomised controlled trial (double-blinded) examined the impact of a placebo or combined folate/vitamin B_{12}/vitamin B_6 therapy (500 μg, 1 mg, 10 mg daily dose, respectively) on the serum tHcy and cognitive functioning of 65+ year old persons. The results showed no significant ($p<0.05$) difference in the cognitive functioning between the placebo and intervention groups.

With the above developments in the area of folic acid intake and cognitive functioning, the evidence base appears to indicate that there is no association between folate intake and risk of cognitive decline. However, the current level of evidence is inconclusive at this stage, and more research is required before the role of folic acid in cognitive functioning can be fully identified.

6. Unmetabolised circulating folic acid

The most common form of folic acid added to food and used in supplements is pterylmonoglutamic acid (PGA). Upon absorption from the gut, all forms of folic acid are ultimately converted to 5-methyl-tetrahydrofolate (5-methyl-THF), which is the circulating form of folic acid in the blood. PGA is efficiently converted to the circulating form and therefore bypasses the majority of metabolic conversion processes within the body.

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

If the daily intake of folic acid from fortified foods were spread over a number of meals, the metabolic conversion processes for folic acid are unlikely to reach saturation point, and thus levels of folic acid in the plasma would be lower than if the same dose were given in a single meal or tablet. However, when considering higher folic acid intakes at a population level, it is also possible that the chronic and regular nature of mandatory fortification could increase the mean population level of unmetabolised folic acid circulating in the blood compared to the *status quo*. It is therefore uncertain to what extent (if any) the metabolic conversion processes for folic acid will become saturated across a population exposed to mandatory folic acid fortification.

There is emerging evidence that increases in serum unmetabolised free folic acid could impact on the human immune system. Troen *et al*. (2006) assessed the folate status of 105 healthy post-menopausal women and found an inverse relationship between serum unmetabolised free folic acid and the cytotoxicity of natural killer cells. However, FSANZ has been unable to identify any other evidence demonstrating that either short-term or long-term exposures to circulating unmetabolised folic acid have an impact on human health (adverse or otherwise) nor what impact such exposures may have at a population health level.

7. Other effects during pregnancy

7.1 Multiple births

There has been some concern expressed in the scientific literature that because of folic acid's role in cell division during early pregnancy, higher levels of folic acid intake within a population may increase the rate of multiple births. As multiple births result in more complications and poorer outcomes compared with singleton births (Kinzler *et al*., 2000), the potential for higher multiple birth rates is a health risk that may be associated with increased folic acid intake.

A Cochrane review of peri-conceptional folic acid intake published in 2001 (Lumley *et al.,* 2001) included evidence showing a non-significant increase in the likelihood of a twin pregnancy. Two good quality studies published since 2001 (Li *et al*., 2003; Vollset *et al*., 2005) involving folic acid supplements of up to 400 µg per day reported no effect on multiple births. However, among five studies, published post-mandatory fortification in the United States (Waller *et al.,* 2003; Shaw *et al*., 2003a; Lawrence *et al*., 2004; Kucik and Correa, 2004; Signore *et al*., 2005), four showed a 2-4.6% annual increase in the rate of multiple births, although other factors such as changes in IVF treatment, or increases in maternal age or supplement intake may also have contributed to this increase. In Australia, this increase would equate to an additional 7.5 per 10,000 extra twin births each year; similar to that which has occurred in the last 30 years due to older maternal age and infertility treatment.

Thus, on the evidence to date the association between increased folic acid intake and increased risk of multiple births remains inconclusive, despite the biological plausibility that folic acid could support foetal growth and development.

7.2 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 however have shown mixed effects (de Weerd *et al*., 2003; Spencer, 2003 cited in Relton *et al*., 2005).

No other evidence has been identified on this subject by FSANZ, and therefore at this point in time the evidence base is considered insufficient to draw conclusions on the association between folic acid intake and birth weight.

7.3 Down syndrome

James *et al.* (1999) indicated that abnormal maternal folate metabolism may be a risk factor for Down syndrome. Folic acid is required to replicate DNA and deficiencies in these pathways can result in irregular gene expression and adverse chromosome separation.

Although a recent review article of eight studies concluded that peri-conceptional folate supplementation may reduce the incidence of Down syndrome (Eskes, 2006), controlled clinical studies in this area are limited and therefore the function of folate remains uncertain. Both genetic and environmental influences appear to play a role although the exact process for this is yet to be determined.

8. 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.

Even though 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 mg/day.

8.1 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 the use of supplemental folate may affect the liver and lower circulating antiepileptic drug levels, while treatment to correct the folate deficiency has occasionally precipitated seizures or increased the frequency/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).

8.2 Anti-folate 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 instead 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 (Dzinjalamala *et al*., 2005).

8.3 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).

9. Interactions with zinc status

There has been some discussion in early scientific literature indicating that folic acid supplementation may have a negative effect on zinc status. However many recent studies have not identified such an effect, including those conducted on pregnant women and pre-term infants (Expert Group on Vitamins and Minerals, 2002). Further, studies using high doses of folic acid (up to 10,000 µg/day for several weeks or months) have shown no adverse effects on the serum or red blood cell levels of zinc in adults (Expert Group on Vitamins and Minerals, 2002).

Given the continued reports of no adverse effects, it can be considered that folic acid fortification is unlikely to have a negative impact on the zinc status of Australian and New Zealand populations.

10. Impact on the gene pool

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

FSANZ has not been able to identify any other study or article that investigates the potential for increased population folic acid intakes to select for particular genetic traits.

11. Summary of the benefits and risks associated with increased folic acid intake

The above discussion highlights several potential risks and benefits from increased folic acid intakes. However, there are also a number of areas in the scientific literature where the outcomes are contradictory and as yet undefined, or inconclusive due to the lack of available evidence.

11.1 Potential health benefits

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 serum tHcy, which has been recognised as a biomarker of increased risk of cardiovascular disease.

More recent studies, however, demonstrate that an increased folic acid intake does not reduce the risk of cardiovascular disease in individuals who had experienced a prior cardiovascular event, despite a concurrent reduction in tHcy levels. Thus the current evidence base does not support an association between increased folic acid intake and reduced risk of cardiovascular disease.

11.2 Potential health risks

It is recognised that excessive intakes of folic acid may mask the diagnosis of vitamin B_{12} deficiency potentially resulting in neurologic damage. However, the available evidence indicates that folic acid intakes up to 1 mg/day (the adult UL) will not mask the diagnosis of vitamin B_{12} deficiency. The relevance of the UL for younger age groups, particularly children, is unclear because vitamin B_{12} deficiency is rare in children.

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

Two large trials using much higher doses of folic acid than is proposed under mandatory fortification do not indicate a gradient of risk for total cancers. For the three specific cancer sites examined, the results of more recent studies do not alter the conclusion reached in earlier reviews (SACN, 2004; SACN, 2005; Sanjoaquin *et al*., 2005a) that there is no apparent increase in risk associated with higher folic acid intakes for the population as a whole. Although many of the studies, in fact, suggest that some reduction in cancer might occur, most of these are observational and so might be affected by uncontrolled confounding by other factors.

11.3 Areas of uncertainty in the scientific literature

The evidence for an association between folic acid and increased risk of multiple births remains inconclusive despite the biological plausibility that folic acid could support foetal growth and development.

Improvements in cognitive function, considered in early literature as a potential positive benefit associated with increased folic acid intakes, has not been confirmed with more recent and robust scientific investigation. Therefore, the current level of evidence remains inconclusive on the role of folic acid in cognitive functioning.

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

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 yet well developed, and cannot therefore be used in an informative assessment of the risks and benefits 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 µg DFE = 1 µg food folate = 0.5 µg of folic acid on an empty stomach = 0.6 µg of folic acid with meals.
Encephalocoele	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 Unites 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 *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).
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 pteroic 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-Ch3H4PteGlu, 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 pteroic 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-conceptional 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