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Mandatory folic acid and iodine fortification in Australia and New Zealand

Supplement to the baseline report for monitoring

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Abbreviations

µg	micrograms
AACR	Australasian Association of Cancer Registries
ABC	Aboriginal Birth Cohort Study
ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
CATI	computer assisted telephone interview
CDAH	Child Determinants of Adult Health
DoHA	Australian Government Department of Health and Ageing
EAR	estimated average requirement
FOBT	faecal occult blood test
FSANZ	Food Standards Australia New Zealand
ICD	International Classification of Disease
IQR	interquartile range
MUIC	median urinary iodine concentration
NATSISS	National Aboriginal and Torres Strait Islander Social Survey
NINS	Australian National Iodine Nutrition Study
nmol	nanomoles
NNS	National Nutrition Survey
NPESU	National Perinatal Epidemiology and Statistics Unit
NTDs	neural tube defects
PHS	Population Health Survey
PHIDG	Population Health Information Development Group
PSM	Population Survey Monitor
RBC	red blood cells
SEIFA	Socio-Economic Indexes for Areas
UIC	urinary iodine concentration
UL	upper level of intake
VHM	Victorian Health Monitor
WHO	World Health Organization

Summary

Food Standards Australia New Zealand (FSANZ) developed a mandatory folic acid fortification standard to help reduce the incidence of neural tube defects (NTDs) (serious birth defects) and a mandatory iodine fortification standard to address the re-emergence of iodine deficiency in the population. These standards, effective from September–October 2009, require the addition of folic acid to bread-making flour in Australia and iodine (via iodised salt) to bread in Australia and New Zealand.

The Australian Health Ministers' Advisory Council commissioned the Australian Institute of Health and Welfare (AIHW) to prepare a report of relevant baseline data for monitoring mandatory folic acid and iodine fortification. The purpose of this supplement report is to provide additional data that were unavailable when *Mandatory folic acid and iodine fortification in Australia and New Zealand: baseline report for monitoring* (the baseline report) (AIHW 2011) was drafted. The supplement is best considered as a companion document to the baseline report.

This supplement has a similar structure to the baseline report and provides data on nutrient intake, nutrient status, health benefits and cancer rates in Australia and New Zealand. Key features of this additional data are outlined below.

Prior to mandatory folic acid fortification

- The consumption of bread has remained relatively stable since 2001.
- Very few (4%) Australian children exceeded the upper level of intake for folic acid and only a small proportion (6%) took supplements containing folic acid.
- About half of all Australian mothers took folic acid supplements just prior to and during their first trimester of pregnancy, as recommended. Supplement usage was lower in mothers without tertiary qualifications and in those living in more disadvantaged and remote areas.
- Based on data from three states, the NTD incidence rate in Australia has decreased from 13.3 per 10,000 pregnancies in 1998 to 10.9 per 10,000 pregnancies in 2008.

Prior to mandatory iodine fortification

- One in four Australian girls (25%) aged 14–16 years had inadequate iodine intake, with girls generally having lower intakes than boys. Few (1%) children exceeded the upper level of intake for iodine and only a small proportion consumed supplements.
- The results from the Aboriginal Birth Cohort Study showed that mild iodine deficiency was present in regional and remote areas of the Northern Territory.
- The results from the 2009–2010 Victorian Health Monitor showed that median urinary iodine concentration (MUIC) of Victorian adults was 79 µg/L, indicative of mild iodine deficiency.

1 Introduction

1.1 Purpose

Food Standards Australia New Zealand (FSANZ) developed a mandatory folic acid fortification standard to help reduce the incidence of neural tube defects (NTDs) (serious birth defects) and a mandatory iodine fortification standard to address the re-emergence of iodine deficiency in the population. These standards, which came into effect from September–October 2009, require the addition of folic acid to bread-making flour in Australia and iodine (via iodised salt) to bread in Australia and New Zealand. These standards were introduced to reduce the incidence of neural tube defects (NTDs) and the re-emergence of iodine deficiency in the population.

Additional information about the introduction of mandatory fortification standards is available in *Mandatory folic acid and iodine fortification in Australia and New Zealand: baseline report for monitoring* (the baseline report) (AIHW 2011) or from FSANZ (FSANZ 2006, 2007, 2008).

The Australian Health Ministers' Advisory Council commissioned the Australian Institute of Health and Welfare (AIHW) to prepare a report detailing relevant baseline data for monitoring mandatory folic acid and iodine fortification, which was released in May 2011. The purpose of this supplement report is to provide additional data that were unavailable when the baseline report was drafted.

The baseline report, together with this supplement, will form the basis for future monitoring to help determine the effectiveness and safety of mandatory folic acid and iodine fortification.

Details of the additional data sources recommended for inclusion as baseline data were outlined on page xiii of the baseline report. Although most of the additional data sources are now included in this supplement, the following remain outstanding as they are at different stages of development and are yet to be analysed or published:

Australia

- consumer behaviour data from the FSANZ Fortification Consumer Survey, including both qualitative and quantitative data (see Section 3.3 of the baseline report for details)
- data on folic acid and iodine intake, including supplements derived from the 2009–10 Victorian Health Monitor (see Section 3.3 of the baseline report for details)
- data on folic acid intake and folate status from the Western Australian Folate Study (see Section 3.3 of the baseline report for details)
- data on folate status from the Aboriginal Birth Cohort (ABC) studies (see Section 3.5 of the baseline report for details)

New Zealand

- data derived from the 2008–09 New Zealand Adult Nutrition Survey on folic acid and iodine supplement use and folate and iodine status (see Section 5.3 of the baseline report for details)
- more recent data, from 2003, on neural tube defect (NTD) incidence

- dietary iodine intake data from 2002 Children's National Nutrition Survey with the use of discretionary iodised salt.

For future monitoring, it is recommended that these remaining data sources, when available, also be considered as baseline data.

Since the publication of the baseline report, other unanticipated data that can be used to monitor the impact of mandatory fortification have become available. These have been included in this report and comprise:

- data on blood folate levels, collected from numerous blood samples, analysed retrospectively at the Royal Prince Alfred Hospital
- data on supplement use from the 2008 National Aboriginal and Torres Strait Islander Social Survey.

1.2 Structure

Following an introduction, this supplement contains four main chapters covering additional baseline data for mandatory folic acid and iodine fortification for both Australia and New Zealand.

This supplement has a similar structure to the baseline report and is based around the five main components of the folic acid and iodine fortification monitoring framework:

1. food composition/food industry compliance
2. nutrient intake
3. nutrient status
4. health benefits
5. adverse health effects.

Further details of the monitoring framework are provided in Section 2.1 of the baseline report.

2 Australian baseline data for mandatory folic acid fortification

2.1 Dietary intake of folic acid

This section includes data on folic acid intakes from the 2007 Australian National Children's Nutrition and Physical Activity Survey (2007 Children's Survey) to complement data from the 1995 National Nutrition Survey (NNS). Data from the Roy Morgan Single Source Surveys (2001–2008) are also provided to show trends in food consumption of major contributors of folic acid intake since the last NNS.

2007 Australian National Children's Nutrition and Physical Activity Survey

This survey provides the most recent national data on folic acid intakes in children aged 2–16 years. Background information including the methodology for the 2007 Children's Survey is outlined in the baseline report in Section 3.3.

FSANZ analysis of the 2007 Children's Survey

FSANZ incorporated relevant data from the 2007 Children's Survey into their DIAMOND (DIetAry Modelling Of Nutritional Data) program. Nutrient intakes were calculated using similar methods to the FSANZ analysis of data from the 1995 NNS. Three measures were determined from food and supplement intakes: mean, 95th percentile folic acid intakes, and the proportion of population groups with intakes above the upper level of intake (UL) for folic acid. The assessment of safety is based on the proportion of population groups with folic acid intakes being above the upper level of intake (UL), as outlined in Table 1.1 in the baseline report. Results were weighted to account for over-sampling of some age groups.

Results

Very few (4%) Australian children exceeded the upper level of intake for folic acid and only a small proportion (6%) took supplements containing folic acid (Table 2.1).

Prior to the introduction of mandatory folic acid fortification, children aged 2–16 years consumed an estimated average of 114 µg of folic acid a day, with a 95th percentile intake of 279 µg/day (FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey data). Further details on folic acid intakes for specific age groups, including 95th percentile intakes are provided in Table 2.1.

The major contributors to children's folic acid intakes are miscellaneous foods, such as yeast, vegetable and meat extracts (48%) and folic acid fortified cereals and cereal products (41%) (Table 2.2). However, there is a gender difference in the contributions of food products to folic acid intake. Boys have a slightly higher folic acid intake from cereals (47%) compared with girls (35%). In contrast, girls have a higher folic acid intakes from miscellaneous products (52%) compared with boys (44%).

Supplement usage in children was captured in the 2007 Children's Survey. Background information is outlined in the baseline report in Section 3.3. For all children aged 2–16 years, only 6% consumed supplements containing folic acid. However, folic acid supplements were the third highest contributor to total folic acid intakes (Table 2.2).

Among population sub-groups, girls aged 14–16 years had the highest consumption of folic acid from supplements, contributing 11% to their total intake.

Table 2.1: Estimated mean and 95th percentile dietary folic acid intakes from food and supplements and proportion above the upper level (UL) of intake of Australian children, by age and sex, 2007

Age (years)	Mean (µg/day)	95th percentile (µg/day)	> UL (per cent)
		Boys	
2–3	107	268	4
4–8	119	302	1
9–13	123	257	<1
14–16	135	400	<1
Total 2–16	**121**	**298**	**1**
		Girls	
2–3	104	279	4
4–8	113	257	1
9–13	103	227	1
14–16	108	320	0
Total 2–16	**107**	**267**	**1**
		All children	
2–3	105	279	4
4–8	116	272	1
9–13	112	241	<1
14–16	122	333	<1
Total 2–16	**114**	**279**	**1**

Source: FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey data.

Table 2.2: Contribution of major food categories to total folic acid intake, including supplements in Australian children, by age and sex, 2007 (per cent)

	Age group (years)				
Food category	**2–3**	**4–8**	**9–13**	**14–16**	**Total 2–16**
			Boys		
Miscellaneous, such as meat, vegetable and yeast extracts	61	48	31	36	44
Cereals and cereal products	32	41	58	54	47
Dietary supplements	3	7	7	6	6
Non-alcoholic beverages	2	3	2	2	2
Cereal-based products and dishes	<1	<1	<1	1	<1
Confectionery and cereal/nut//fruit/seed bars	<1	<1	<1	<1	<1
Special dietary foods	<1	<1	<1	1	<1
			Girls		
Miscellaneous, such as meat, vegetable and yeast extracts	60	53	50	47	52
Cereals and cereal products	31	35	38	37	35
Dietary supplements	5	7	7	11	7
Non-alcoholic beverages	1	3	4	3	3
Cereal-based products and dishes	<1	<1	<1	<1	<1
Confectionery and cereal/nut//fruit/seed bars	<1	<1	<1	<1	<1
Special dietary foods	<1	<1	<1	<1	<1
			All children		
Miscellaneous, such as meat, vegetable and yeast extracts	61	51	48	41	48
Cereals and cereal products	32	38	40	47	41
Dietary supplements	4	7	7	8	6
Non-alcoholic beverages	2	3	3	2	2
Cereal-based products and dishes	<1	1	<1	<1	1
Confectionery and cereal/nut//fruit/seed bars	<1	<1	1	1	<1
Special dietary foods	<1	<1	<1	1	<1

Source: FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey data.

Roy Morgan Single Source data

In the absence of current national food consumption data for adults, trend information from Roy Morgan Single Source Surveys is useful in assessing any changes that may have occurred in the consumption of foods that are considered major contributors to folic acid intake since the previous NNS (FSANZ analysis of Roy Morgan Single Source Survey data).

The Roy Morgan Single Source Surveys are carried out on a weekly basis and include more than 25,000 Australians aged 14 years and above each year of the survey. The sample populations are representative of the Australian population.

Each participant undertakes a face-to-face interview and a follow-up self-completed survey. The questionnaires are periodically revised and updated to ensure the information collected is truly representative of the foods available on the market. All questions are asked of each respondent, helping to build an accurate individual profile of consumers across a large survey sample base. Foods as described by Roy Morgan Research in the Single Source Survey are outlined in Appendix 2.

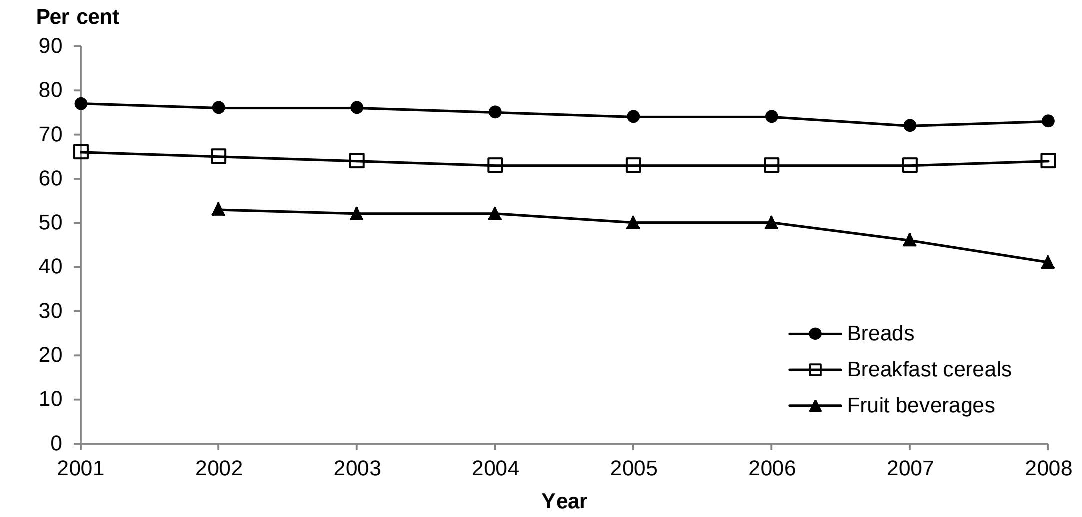
Data are available from 2001–2008 showing the proportion of Australians aged 14 years and over consuming particular foods or food groups in the seven days prior to the survey. The data included foods fortified with folic acid under the voluntary fortification permissions, but the amounts were not reported.

During the development of Proposal P295 (FSANZ 2006), FSANZ identified five main food categories (breads, breakfast cereals, yeast spreads, fruit beverages and soy beverages) that contributed to the population's folic acid intake. The three highest contributors were bread, breakfast cereal and yeast spreads.

Results

During 2001–2008, the main food categories contributing to folic acid intakes consumed by the highest proportion of the population were breads, followed by breakfast cereals and then fruit juices. During this time period, the proportion consuming bread and cereals remained relatively stable, whereas that for total fruit beverages dropped from 50% to 41% (Figure 2.1). Between the sexes, more females consumed breads and cereals than males (Figure 2.2). Further details are in tables A1.1, A1.2 and A1.4. of the Appendix.

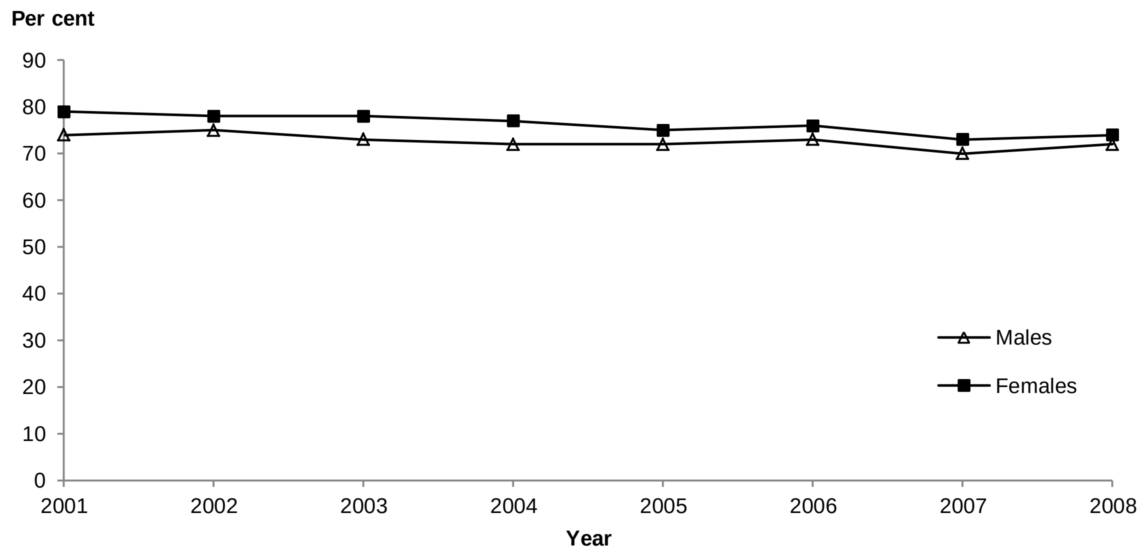
The two other main contributors to folic acid intakes in the Australian population were yeast spreads and soy products (Figure 2.3). Single Source Survey data for 2007–2008 show yeast spreads were consumed by more than 40% of the population and soy products by fewer than 10%, with a slightly higher proportion of females consuming yeast products than males. Further details are in tables A1.3 and A1.5 of the Appendix.



Note: Trend information on total fruit beverages commenced in 2002.

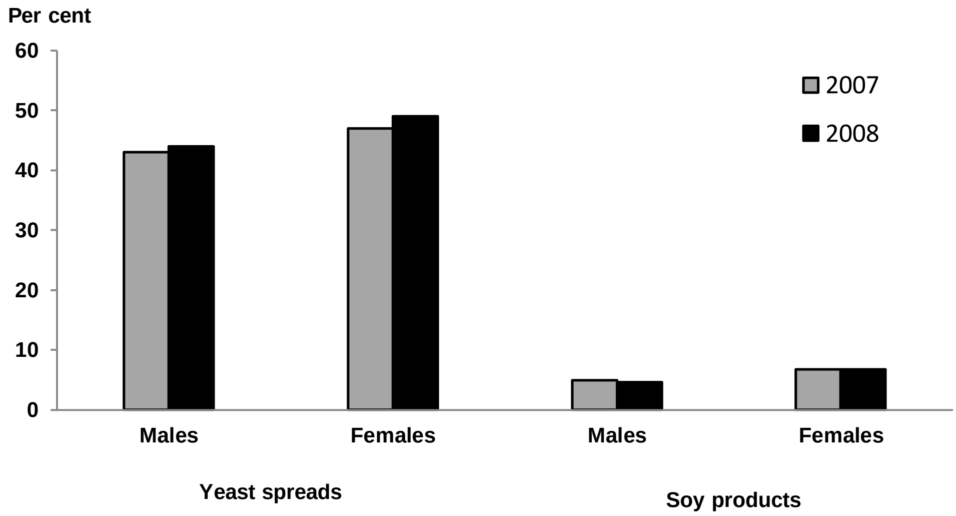
Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Figure 2.1: Proportion of the Australian population who consumed breads, breakfast cereals and fruit beverages, 2001–2008



Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Figure 2.2: Proportion of the Australian population who consumed breads, by sex, 2001–2008



Note: Data are only available for 2007–2008.

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Figure 2.3: Proportion of the Australian population who consumed yeast spreads and soy products, by sex, 2007–2008

2.2 Supplement use in women

About half of all Australian mothers took folic acid supplements just prior to and during their first trimester of pregnancy, as recommended. Supplement usage was lower in mothers without tertiary qualifications, living in more disadvantaged areas (Centre for Epidemiology and Research 2010) and in remote areas (ABS 2009).

New South Wales Population Health Survey

Background information and methodology for the New South Wales Population Health Survey (PHS) are outlined in the baseline report in Section 3.4. The most recent biennial report on child health is from 2007–2008 (Centre for Epidemiology and Research 2010).

In this study, the target population was all children aged 0–15 years living in households with private telephones. A total of 5,171 telephone interviews were conducted with parents or carers of children aged 0–15 years. Mothers of infants aged less than 12 months were asked, 'Did you take tablets or capsules containing folate or folic acid in the month immediately before and/or in the first three months of this pregnancy?'

Results

Among mothers of infants aged less than 12 months, around half (55%) took a folic acid supplement in the month before and the first three months of pregnancy, and around a quarter (28%) in the first three months only (Table 2.3). While there was no statistically significant difference by socio-economic status between individual categories, more disadvantaged mothers had lower supplement use (48–51%) compared to least disadvantaged mothers (60–64%) (Table 2.4).

There was a statistically significant difference in use of folic acid supplements between mothers who had tertiary qualifications (66%) and those who did not (47%) (Table 2.5). There was no significant difference by mother's age or country of birth (Centre for Epidemiology and Research 2010).

The proportion of mothers who took supplements has not changed significantly between 2001 and 2007–2008 (Centre for Epidemiology and Research 2010).

Table 2.3: Folic acid supplement use prior to and during pregnancy, mothers of infants 0–11 months, New South Wales, 2007–2008

Response	Per cent
Yes, in the month before and first 3 months of pregnancy	55.0
Yes, in the month before only	3.4
Yes, in the first 3 months of pregnancy only	27.8
No	13.7

Note: Estimates are based on 301 respondents. The indicator includes mothers of infants aged 0–11 months who took folic acid supplements one month before and three months after conception.

Source: Centre for Epidemiology and Research 2010.

Table 2.4: Folic acid supplement use prior to and during pregnancy by SEIFA index, mothers of infants 0–11 months, New South Wales, 2007–2008

SEIFA quintile	Per cent
1st (least disadvantaged)	64.4
2nd	60.0
3rd	50.5
4th	47.8
5th (most disadvantaged)	50.4

Note: Estimates are based on 301 respondents. The indicator includes mothers of infants aged 0–11 months who took folic acid supplements one month before and three months after conception.

Source: Centre for Epidemiology and Research 2010.

Table 2.5: Folic acid supplement use prior to and during pregnancy by mothers' characteristics, mothers of infants 0–11 months, New South Wales, 2007–2008

Mothers' characteristics	Per cent
Less than 25 years	47.0
25 years and over	56.3
Tertiary qualifications	66.3
Without tertiary qualifications	47.1
English speaking background	56.3
Non English speaking background	47.4
All mothers	55.0

Note: Estimates are based on 301 respondents. The indicator includes mothers of infants aged 0–11 months who took folic acid supplements one month before and three months after conception.

Source: Centre for Epidemiology and Research 2010.

Australian Capital Territory General Health Survey

The Australian Capital Territory General Health Survey is conducted using computer assisted telephone interview (CATI) technology every year between February and December. In the 2007–08 ACT General Health Survey, data were collected on folic acid supplement use in the peri-conceptional period (one month before and three months after conception). Mothers of infants aged less than 12 months were asked, 'Did you take tablets or capsules containing folate or folic acid in the month immediately before and/or in the first three months of this pregnancy?'

Results

Of the 49 mothers of infants aged 0–11 months in the ACT sample, two-thirds of mothers reported that they had taken a folate/folic acid supplement in the month before *and* the first three months of pregnancy, with a further 16.5% reporting they had taken a supplement either one month before *or* during the first three months of pregnancy (Table 2.6).

Table 2.6: Folic acid supplement use prior to and during pregnancy, mothers of infants 0–11 months, Australian Capital Territory, 2007–08

Response	Per cent
Yes, in the month before and first 3 months of pregnancy	66.2
Yes, in the month before only	1.9
Yes, in the first 3 months of pregnancy only	14.6
No	17.3

Note: Estimates are based on 49 respondents and so should be interpreted with caution.

Source: 2008 ACT General Health Survey, unpublished data.

2009 Tasmanian Population Health Survey

In 2009, the first Tasmanian Population Health Survey was undertaken as an extension of the 2009 Victorian Population Health Survey, using CATI technology and is a source of information on the health of Tasmanians aged 18 years and over. A total of 6,319 interviews were completed in this survey. A set of questions relating to the knowledge and consumption of folate was included in the survey. Interviews were conducted in November–December 2009, just after the commencement of mandatory fortification. However, these data have still been included as baseline data because supplement usage is unlikely to have significantly changed due to the commencement of mandatory folic acid fortification.

A total of 1,742 females aged 18–54 years were asked about their current consumption of folic acid supplements or multivitamins containing folate, including the main reason for taking a supplement or not, and their principal source of information about folate or folic acid.

Results

More than one in five (23%) women reported taking a folic acid supplement or multivitamins containing folic acid on a daily basis (Table 2.7). A higher proportion of females aged 25–34 years reported taking supplements on a daily basis (31%).

The most common reason for taking a supplement across all age groups was for general health (42%). More than one in five women (25%) aged 25–34 years were taking a supplement because they were pregnant, with a further 13% taking a supplement because they were trying to become pregnant (Table 2.8).

Women obtained information about folate/folic acid mostly from their general practitioner (33%), followed by magazines and newspapers (14%) (Menzies Research Institute Tasmania 2009).

Table 2.7: Women currently taking a folic acid supplement or a multivitamin containing folic acid, by age group, Tasmania, 2009 (per cent)

Response	18–24	25–34	35–50	Total (18–50)
No	77.4	62.7	70.4	69.8
Yes, daily	12.4	31.4	21.8	22.5
Yes, 1–3 times/week	0.7	1.9	2.8	2.1
Yes, 4–6 times/week	2.0	1.5	0.9	1.3
Yes, less often	0.5	0.4	0.5	0.5
Don't know	7.1	2.0	3.5	3.8

Note: Figures may not add up to 100% due to a proportion of 'don't know' or 'refused' responses.

Source: Menzies Research Institute Tasmania 2009.

Table 2.8: Main reason for women taking folic acid[(a)], by age group, Tasmania, 2009 (per cent)

Response	18–24	25–34	35–50	Total (18–50)
I could become pregnant	1.6	5.9	1.5	3.1
I am trying to become pregnant	0.0	13.2	3.2	6.4
I am pregnant	10.8	24.7	5.3	12.9
General health	52.9	25.7	51.3	42.3
Part of a multivitamin	17.5	15.5	21.9	19.1
Other	15.6	15.0	15.0	15.1
Don't know	1.6	0.0	1.8	1.1

(a) For those females currently taking a folic acid supplement or a multivitamin containing folic acid.

Source: Menzies Research Institute Tasmania 2009.

National Aboriginal and Torres Strait Islander Social Survey 2008

The 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) surveyed Aboriginal and Torres Strait Islander people living in private dwellings from August 2008 to April 2009. A total of 13,307 people were sampled, comprising 7,823 adults and 5,484 children (ABS 2009, 2010). A total of 1,470 women with children aged 0–3 years were asked if they took folic acid supplements prior to or during pregnancy.

Results

The NATSISS was designed to produce reliable national estimates. AIHW's analysis of NATSISS data showed that, based on the weighted population, just over a half (51%) of mothers who had a child aged 0–3 years took folic acid prior to or during pregnancy, although the proportion in remote areas was lower (38%) (AIHW analysis, unpublished).

2.3 Serum folate

As noted in Section 2.2 of the baseline report, there is no accepted standard for folate deficiency based on serum folate concentrations. Various cut-off points are used in different studies.

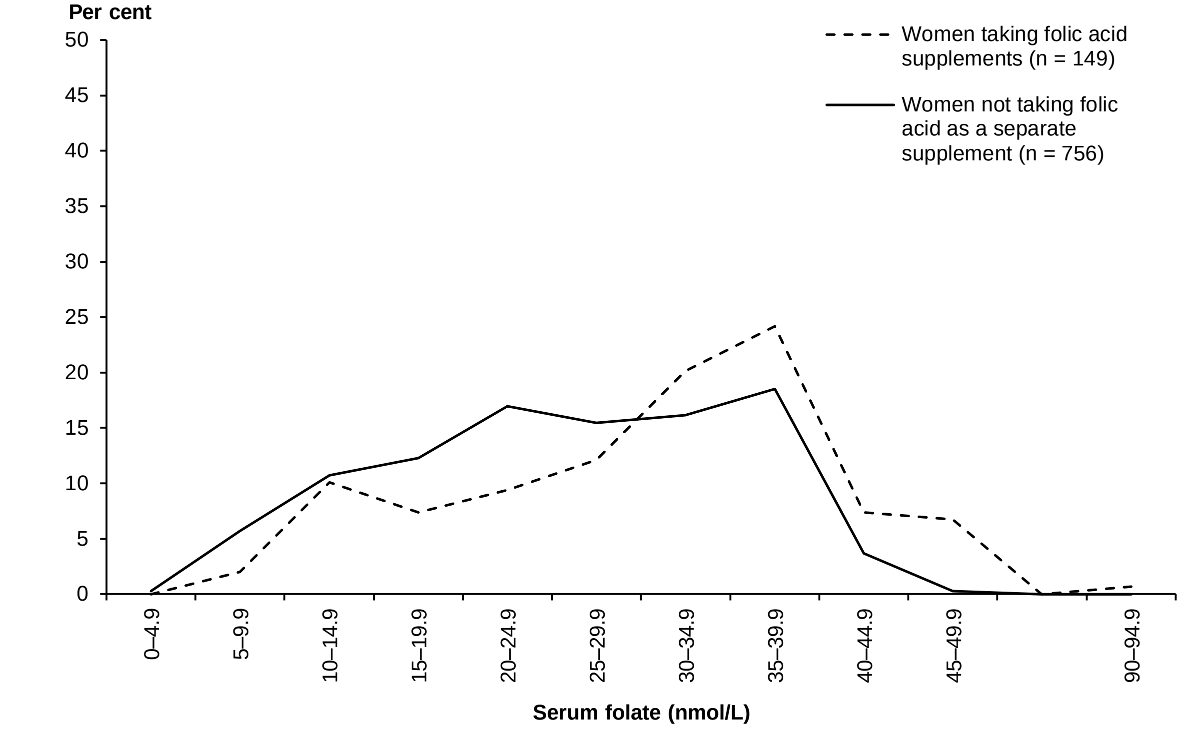
The Childhood Determinants of Adult Health study

Background information and methodology for the Childhood Determinants of Adult Health study is outlined in the baseline report (Section 3.5). Results of the study are currently unpublished but should be available in the future.

This study was designed to provide benchmark data on the health and fitness of Australian schoolchildren. As part of this study, blood samples were taken and serum folate analysed, initially to investigate links between cardiovascular risk and folate status. Subsequently, it also provided a retrospective opportunity to determine folate status among a national cohort of women aged 26–36 years before mandatory fortification.

Results

Frozen serum samples from 996 non-pregnant women, collected from 2004–2006, were analysed for serum folate. Data on supplement usage for 91 samples were missing, and so analysis was undertaken on the remaining 905 samples. A total of 149 (17%) women took a folic acid supplement (87 taking a folic acid supplement and a multivitamin, and 62 taking folic acid only). Preliminary analysis of these data showed that women taking folic acid supplements had higher serum folate levels compared with women who did not take folic acid as a separate supplement (Figure 2.4).



Note: Supplement usage for 91 samples is missing.

Source: AIHW analysis of unpublished Childhood Determinants of Adult Health Study data.

Figure 2.4: Distribution of serum folate levels for non-pregnant women aged 26–36 years, 2004–2006

Retrospective analysis of serum folate levels in a large public hospital pathology laboratory

Brown and colleagues (2011) have examined the impact of mandatory folic acid fortification by undertaking a retrospective analysis of serum folate and red blood cell folate levels in blood samples tested at the Royal Prince Alfred Hospital. The study provides blood folate level data that were recorded before and after mandatory folic acid fortification. For establishing baseline data, only pre-fortification blood folate levels for samples analysed between April 2007 to July 2009 are presented here. For future monitoring, these data will be compared with the post-fortification data (August 2009–April 2010).

One caveat to this study is that the samples are not be representative of the Australian population—the blood samples were taken from a population who had a blood folate test to investigate possible folate deficiency.

Results

Mean monthly serum folate levels pre-fortification, from April–July 2009, ranged from 17.7 nmol/L to 19.4 nmol/L. The reference ranges for this serum folate assay was 7–25 nmol/L. Before the commencement of mandatory folic acid fortification, the prevalence of serum folate levels less than the reference range was 6.2–9.7%. Early post-fortification results show increases in serum folate levels. However, this trend needs to be confirmed in representative population samples.

Methods

De-identified serum folate and red blood cell (RBC) folate levels were retrospectively examined from 20,592 blood samples collected. The analysis was performed at the Royal Prince Alfred Hospital's diagnostic pathology laboratory (a large public hospital, which is part of the Sydney South West Area Health Service). The samples were taken between April 2009 and April 2010, as well as from April 2007 and April 2009. Samples were taken from a variety of inpatients and outpatients, including both males and females, and analysed using a Beckman Unicel DxI 800 random access immunoassay analyser.

2.4 Red blood cell folate

As noted in Section 2.2 of the baseline report, there is no accepted standard for folate deficiency based on red blood cell concentrations. In the Victorian Health Monitor (VHM), the red blood cell cut-off indicative of deficiency was defined as levels less than 317 nmol/L. For the Brown study (2011), the deficiency level was less than 310 nmol/L.

Victorian Health Monitor

Background information on the VHM is outlined in the baseline report in Section 3.3.

Results

A total of 733 females, aged 18–44 years, had a red blood cell (RBC) folate test. From this group, 202 samples were taken pre-fortification and 531 samples post-fortification. Of these women tested pre-fortification (up to the end of July 2009), all had test results over 400 nmol/L. Gibson (2005) cites red blood cell cut-off values from the National Health and Nutrition Examination Survey II, suggesting that levels below 317 nmol/L were indicative of deficiency (Gibson 2005).

Methods

The biomedical examination procedures closely followed the study protocol recommended by the World Health Organization (WHO 1999). Four teams of survey staff administered the survey, with two surveying metropolitan areas and two surveying rural Victoria. The examination was conducted over three weekends from Friday to Monday in 50 randomly selected Census collection districts across Victoria. All participants gave written informed consent to participate upon arrival and were asked to remain on site until all tests were performed. Blood sampling was collected by venepuncture after an overnight fast (10 hours or more). All samples were centrifuged on site to separate out the plasma and serum and were transported daily to a central laboratory for analyses.

Retrospective analysis of red blood cell folate levels in a large public hospital pathology laboratory

Background information and methods on the study conducted by Brown and colleagues are outlined in Section 2.3 (Brown et al. 2011).

Results

Mean monthly RBC folate levels from April to July 2009 ranged from 881 nmol/L to 944 nmol/L for all subjects. Reference ranges for the red blood cell folate assay was 310–1,000 nmol/L. The prevalence of RBC folate levels less than the reference range varied from 0.9% to 3.5%. Samples obtained for three years before mandatory fortification showed the prevalence of RBC levels less than the reference range varied from 2.3% to 3.1%. For women of childbearing age (15–50 years) the prevalence of RBC folate levels less than the reference range varied from 0.4% to 0.6%. Post-fortification results show increases in RBC folate levels. However, this trend needs to be confirmed in representative population samples.

2.5 Neural tube defects

Neural tube incidence in Australia 1998–2008

The baseline report presents data and background information on neural tube defect (NTD) incidence between 1992–2005 (Section 3.7). This supplement provides more recent data, up to 2008 (AIHW NPESU 2011 [forthcoming]), relevant for baseline monitoring.

In all jurisdictions, perinatal data collections gather information about live births and fetal deaths. The data from South Australia, Western Australia, Victoria and New South Wales includes data on early pregnancy terminations. As there are concerns about the completeness of the NSW data, data presented on NTD incidence are from South Australia, Western Australia and Victoria. Data from these states provide the most accurate baseline of NTD incidence prior to mandatory folic acid fortification. Data from New South Wales on socio-economic status of mothers has been included with data from the three other jurisdictions. Further details on the reporting of NTD rates are included in Box 2.1.

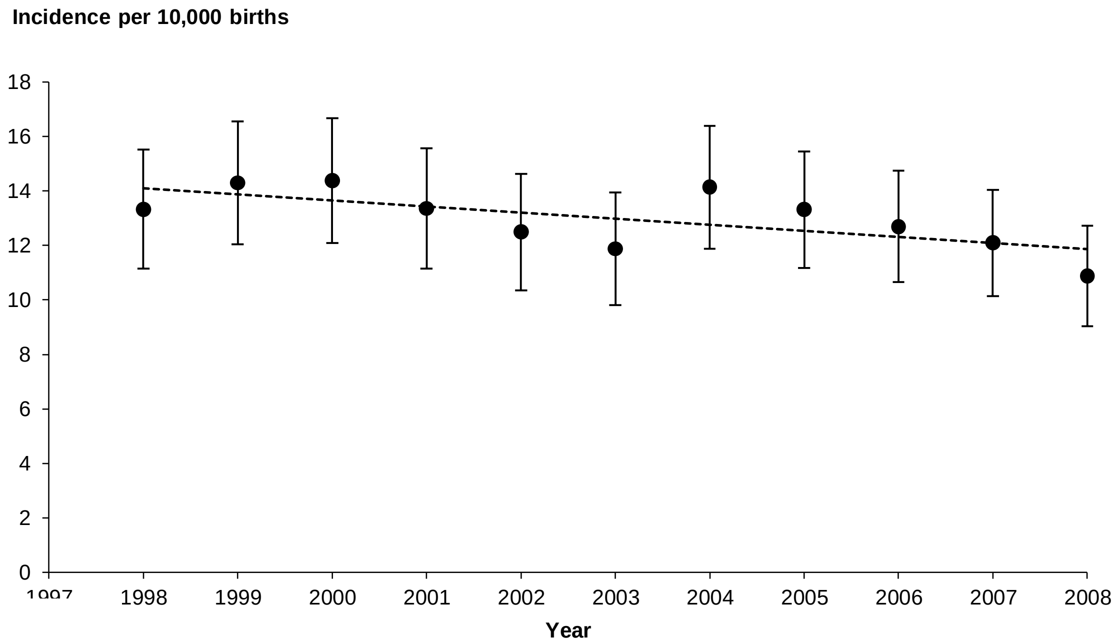
Box 2.1: Prevalence versus incidence of NTDs

The AIHW report on neural tube defects in Australia (AIHW NPESU 2011 [forthcoming]) describes the prevalence of NTDs in Australia. The overall prevalence measure used is defined as the number of NTD pregnancies that 'ended in a birth or a termination of pregnancy for congenital anomaly in a defined population'. It is noted that incidence cannot be measured as it is not possible to establish NTD-affected pregnancies that end in spontaneous miscarriage or therapeutic termination for reasons other than congenital anomaly. While this definition has a particular technical meaning, for the purposes of consistency with the baseline report, this supplement will report on the number of new NTD affected pregnancies and terminations appearing in a defined population in a given time period, and refer to this as 'incidence of NTDs'.

Results

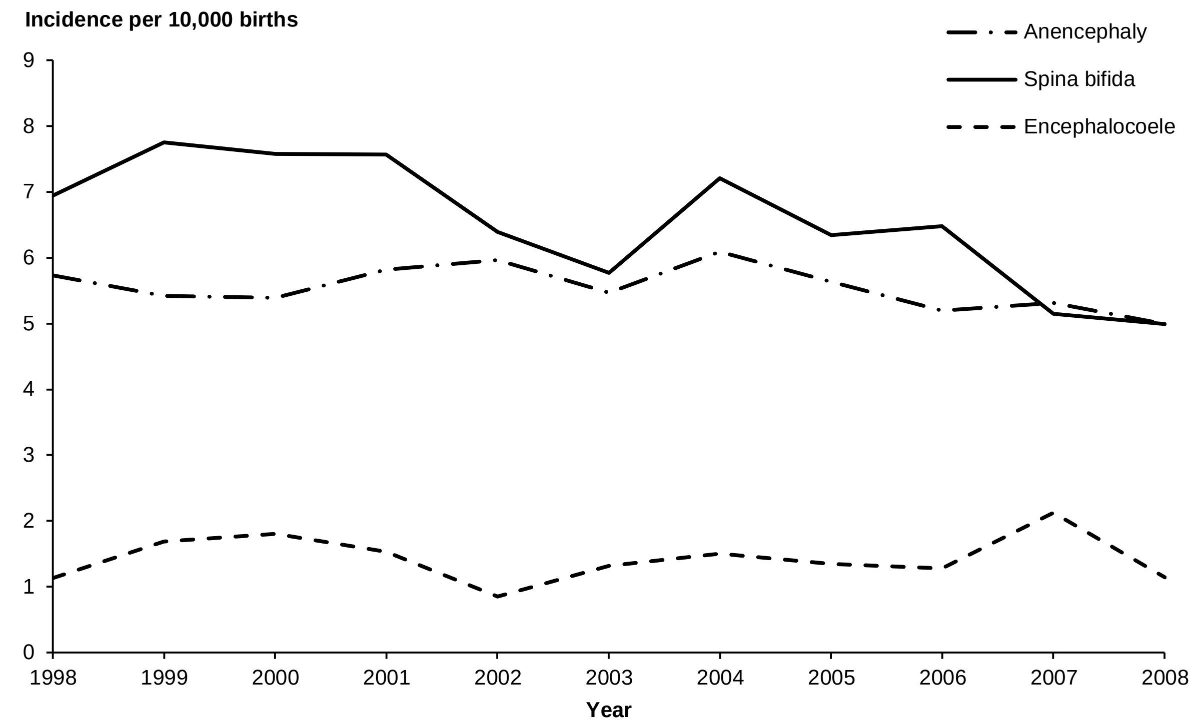
Since the introduction of voluntary folic acid fortification in 1998, there has been a decline in the overall incidence of NTDs, with an average annual decrease of 0.2 per 10,000 births observed between 1998–2008. In 1998, the NTD incidence was 13.3 per 10,000 among pregnancies and the lowest rate was 10.9 per 10,000 in 2008 (Figure 2.5). With the overall incidence of NTDs, there has been a decline in spina bifida between 1998 and 2008, but no appreciable change with anencephaly or encephalocoele (Figure 2.6).

Data available on the incidence of NTDs in socio-economic areas (Table 2.9) help distinguish the NTD incidence in comparison to the SEIFA index of relative disadvantage. Overall prevalence in the 2000–2002 triennium is highest in the most disadvantaged quartile (11.3 per 10,000 total births) and lowest in the least disadvantage quartile (7.8 per 10,000 total births). For the 2005–2007 triennium, the first (most disadvantaged), second and third quartiles have similar rates (10.5, 10.7 and 10.3 per 10,000 total births, respectively) with the fourth quartile (least disadvantaged) the lowest with 9.0 per 10,000 total births.



Source: AIHW National Perinatal Statistics Unit 2011 [forthcoming].

Figure 2.5: Neural tube defect incidence in Australia, based on data from Victoria, Western Australia and South Australia, 1998–2008



Source: AIHW National Perinatal Statistics Unit 2011 [forthcoming].

Figure 2.6: Incidence of anencephaly, spina bifida and encephalocoele in Australia based on data from Victoria, Western Australia and South Australia, 1998–2008

Table 2.9: Incidence of neural tube defects by SEIFA quartile, for New South Wales, Victoria, Western Australia and South Australia, in 2000–2002 and 2005–2007

Triennium	Number	Incidence[(a)]	95% CI
2000–2002			
1st quartile (most disadvantaged)	179	11.3	9.6–12.9
2nd quartile	122	9.0	7.4–10.6
3rd quartile	118	10.2	8.4–12.0
4th quartile (least disadvantaged)	128	7.8	6.5–9.2
2005–2007			
1st quartile (most disadvantaged)	141	10.5	8.8–12.3
2nd quartile	161	10.7	9.1–12.4
3rd quartile	156	10.3	8.7–11.9
4th quartile (least disadvantaged)	174	9.0	7.6–10.3

(a) Per 10,000 total births.

Source: AIHW National Perinatal Statistics Unit 2011 [forthcoming].

2.6 Cancer incidence and mortality

The baseline report presents cancer data from 1982 to 2005 and this supplement presents more recent data, up to 2007 (AIHW Australian Cancer Database and AIHW National Mortality Database). Background information on cancer incidence and mortality is outlined in the baseline report in Section 3.8.

Due to speculation that folic acid may increase the risk of certain cancers (Kim 2004), the incidence and mortality of bowel and prostate cancer have been included to enable any changes to be monitored over time. As stated in the baseline report (Section 2.3), it will be essential to consider all possible causes for any increase or decrease in cancer incidence and/or mortality following the introduction of mandatory fortification.

Bowel cancer

Age-standardised incidence and mortality rates are shown in Figure 2.7 and in Table A1.6 of the Appendix. A summary of these results is provided below.

Incidence

Males

From 1982–2007, the age-standardised incidence rate was relatively unchanged, with an average annual increase of 0.5%, from 66.6 cases per 100,000 males in 1982 to 75.2 per 100,000 in 2007. The highest rate was 79.8 cases per 100,000 males in 2000.

Females

From 1982–2007, the age-standardised incidence rate was relatively unchanged, with an average annual increase of 0.1%, from 51.9 cases per 100,000 females in 1982 to 53.4 per 100,000 in 2007. The highest rate was 54.6 cases per 100,000 females in 2001.

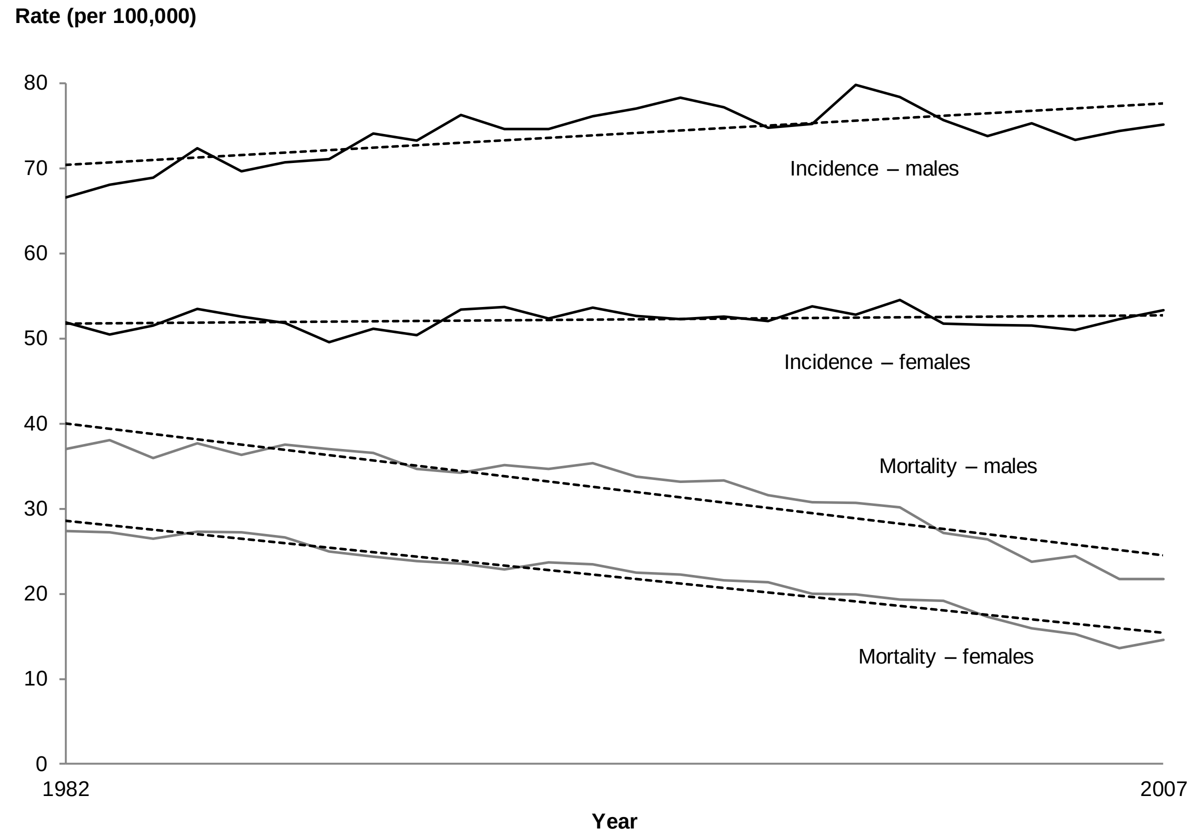
Mortality

Males

From 1982–2007, the age-standardised mortality rate decreased by an average of 2.0% per year, from 37.0 deaths per 100,000 males in 1982 to 21.7 per 100,000 in 2007. The highest rate was 38.1 deaths per 100,000 males in 1983.

Females

From 1982–2007, the age-standardised mortality rate decreased by an average of 2.4% per year, from 27.4 deaths per 100,000 females in 1982 to 14.6 per 100,000 in 2007. The highest rate was 27.4 deaths per 100,000 females in 1982.



Note: The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

Source: AIHW Australian Cancer Database 2007; AIHW National Mortality Database.

Figure 2.7: Bowel cancer incidence and mortality rates, by sex, 1982–2007

Prostate cancer

Age-standardised incidence and mortality rates are shown in Figure 2.8 and in Table A1.7 of the Appendix. A summary of these results are provided below.

Incidence

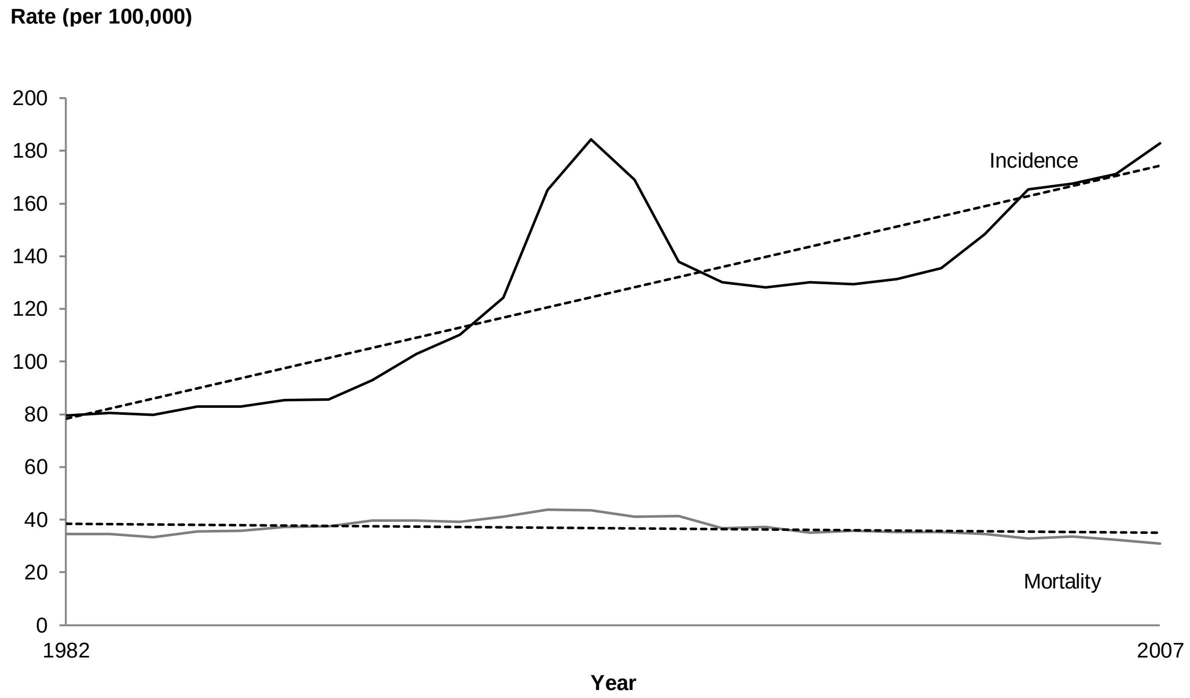
Although the age-standardised incidence rate for prostate cancer increased by an average of 3.8% per year, from 79.5 cases per 100,000 males in 1982 to 182.9 per 100,000 in 2007, rates of prostate cancer in Australia have undergone a number of fluctuations since 1982 (Figure 2.8). Sharp increases in the age-standardised incidence rate began to appear in the early 1990s with the introduction of prostate-specific antigen (PSA) testing for prostate cancer, peaking in 1994 at 184.4 cases per 100,000 males but levelling out by about 1998. Since 2002, there has been a further sharp increase in the number of new cases diagnosed, with rates climbing to a similar peak in 2007:

> The fluctuations in the incidence rate of prostate cancer is thought to be due to the PSA testing, with changes in the rate of PSA testing mirrored by similar changes in the incidence of the prostate cancer (AIHW & AACR 2010:16).

Underpinning the increase in prostate cancer diagnoses is the increasing use of PSA tests. The introduction of testing in the late 1980s was responsible for detecting a large number of previously undiagnosed prostate cancers in the early- to mid-1990s. Following the peak in 1994, incidence rates returned to trends similar to before the introduction of PSA testing. However, incidence data for 2002–2007 show a second significant increase in the detection of prostate cancer. It is unclear if this trend will continue or if incidence rates will return to levels similar to those of the late 1990s (AIHW & AACR 2010).

Mortality

From 1982–2007 the age-standardised mortality rate was relatively unchanged, with an average annual decrease of 0.3%, from 34.5 deaths per 100,000 males in 1982 to 31.0 per 100,000 in 2007. The highest rate was 43.7 deaths per 100,000 males in 1993.



Note: The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

Source: AIHW Australian Cancer Database 2007; AIHW National Mortality Database.

Figure 2.8: Prostate cancer incidence and mortality rates, 1982–2007

2.7 Bowel cancer screening

National bowel cancer screening program

Background information and methodology for bowel cancer screening are outlined in the baseline report in Section 3.9. The data provided below include more recent data and also include faecal occult blood outcomes (FOBT) results for the population group aged 50 years. The baseline report only includes FOBT results for the groups aged 55 and 65 years.

Results

The proportion of people with a positive FOBT result was 6.6%. Males had a higher rate than females—7.7% compared to 5.7%, respectively, and rates increased with age for both sexes (Table 2.10).

Of those who had results from a positive FOBT investigated by colonoscopy and the outcomes reported to the National Bowel Cancer Screening Program Register:

- 4.7% were found to have suspected or confirmed cancer (cancer confirmed by histopathology or cancer suspected at colonoscopy but not yet confirmed by histopathology)
- 15.1% had adenomas confirmed by histopathology
- 32.3% had polyps detected at colonoscopy but histopathology results were not recorded in the register at 31 January 2010
- 48.7% were found to have no cancer or adenoma (Table 2.11).

Table 2.10: National bowel cancer screening program faecal occult blood test positivity rates, by age and sex, 2008

Population group	Positive results	Rate (per 100 valid results)
	Males	
50 years	2,211	6.1
55 years	3,359	6.9
65 years	4,017	9.7
Total	**9,587**	**7.7**
	Females	
50 years	2,116	4.9
55 years	3,079	5.2
65 years	3,209	7.1
Total	**8,404**	**5.7**
	Persons	
50 years	4,327	5.5
55 years	6,438	5.9
65 years	7,226	8.4
Total	**17,991**	**6.6**

Notes

1. Rates are the number of FOBT positive results as a percentage of the total number of valid results.
2. A valid result is either positive or negative. Inconclusive results are excluded.

Source: AIHW & DoHA 2010.

Table 2.11: National bowel cancer screening program outcomes from colonoscopic investigation of positive faecal occult blood test, by age and sex, 2008

Population group	No cancer or adenoma detected[(a)]		Polyps[(b)]		Adenomas[(c)]		Cancer[(d)]		
	Number	%	Number	%	Number	%	Number	%	Total[(e)]
					Males				
50 years	635	47.6	464	34.8	192	14.4	42	3.2	1,333
55 years	896	40.5	831	37.6	400	18.1	83	3.8	2,210
65 years	931	35.6	1,022	39.1	509	19.4	155	5.9	2,617
Total	**2,462**	**40.0**	**2,317**	**37.6**	**1,101**	**17.9**	**280**	**4.5**	**6,160**
					Females				
50 years	828	64.2	330	25.6	106	8.2	26	2.0	1,290
55 years	1,262	61.3	503	24.4	241	11.7	54	2.6	2,060
65 years	1,093	52.3	595	28.5	306	14.7	94	4.5	2,088
Total	**3,183**	**58.5**	**1,428**	**26.3**	**653**	**12.0**	**174**	**3.2**	**5,438**
					Persons				
50 years	1,463	55.8	794	30.3	298	11.4	68	2.6	2,623
55 years	2,158	50.5	1,334	31.2	641	15.0	137	3.2	4,270
65 years	2,024	43.0	1,617	34.4	815	17.3	249	5.3	4,705
Total	**5,645**	**48.7**	**3,745**	**32.3**	**1,754**	**15.1**	**454**	**4.7**	**11,598**

(a) Either (1) no polyps were identified at colonoscopy or (2) the polyps were confirmed as non-adenomatous by histopathology or (3) no cancers were suspected at colonoscopy or (4) the sample was confirmed as non-cancerous by histopathology.

(b) Polyps detected at colonoscopy and sent to histopathology for analysis, but histopathology results not received by register.

(c) Adenomas confirmed by histopathology.

(d) Cancer confirmed by histopathology or cancer suspected at colonoscopy but not yet confirmed by histopathology.

(e) Total number of colonoscopies with outcome data recorded in the National Bowel Cancer Screening Program Register.

Source: AIHW & DoHA 2010.

Discussion

These data may be used at baseline in conjunction with the data on bowel cancer incidence to assess the impact of screening on cancer detection and, therefore, to interpret any change in cancer in the years following fortification.

It will be important to consider all possible causes for changes in the reporting of bowel cancer incidence, including changes in screening methodology, inclusion of other age categories in the screening program and other possible confounding factors.

3 Australian baseline data for mandatory iodine fortification

3.1 Dietary intake of iodine

This section includes data on iodine intakes from the 2007 Children's Survey to complement data from the 1995 NNS and data from the Roy Morgan Single Source Surveys to show trends in food consumption since the last national nutrition survey.

2007 Australian National Children's Nutrition and Physical Activity Survey

Background information and methodology for the 2007 Australian National Children's Nutrition and Physical Activity Survey (Children's Survey) are outlined in the baseline report in Section 4.3.

Discretionary iodised salt use was calculated in this assessment. The assumption was made that if salt was used in food preparation and/or at the table, about 30% of the table salt consumed was estimated as being iodised salt (FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey).

FSANZ analysis of results

The assessment of adequacy of iodine intakes is based on the proportion of population groups meeting the estimated average requirement (EAR) for this nutrient. Recommended intakes for iodine are outlined in Table 1.2 of the baseline report. The EAR for children aged 1–8 years is 65 µg/day, for children aged 9–13 years is 75 µg/day and for adolescents aged 14–18 years is 95 µg/day.

One in four girls aged 14–16 years have an iodine intake less than the EAR. Mean iodine intakes, including supplements, ranged from 119–150 µg/day for children aged 2–16 years (Table 3.1). Compared with boys, girls generally had lower iodine intakes, with 10% of girls having intakes less than the EAR, whereas only 2% of boys had intakes less than the EAR. Girls aged 14–16 years had the highest proportion of inadequate intakes (25%), suggesting this may be a priority area for future monitoring.

The assessment of safety is based on the proportion of population groups with iodine intakes being above the upper level of intake (UL). One per cent of all children aged 2–16 years exceeded the UL for iodine (Table 3.1).

The major food contributors to dietary iodine intake are milk products and dishes (58%), non-alcoholic beverages (13%), cereal based products and dishes (8%) and cereals and cereal products (5%). The other 19 food groups collectively contributed the remaining 16%, with each individually contributing less than 2% (FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey).

A small proportion of children surveyed consumed iodine supplements. As a result, there is little difference in mean intakes with and without supplements (1–6 µg/day more in the supplemented population) (Table 3.2).

Table 3.1: Estimated mean and 95th percentile dietary iodine intakes from food and supplements and proportion below the estimated average requirement (EAR) and above the upper level (UL) of intake, with supplements, by age and sex, for Australian children aged 2–16 years, 2007

Age (years)	Mean (µg/day)	95th percentile (µg/day)	< EAR (per cent)	> UL (per cent)
		Boys		
2–3	128	200	4	5
4–8	126	199	2	1
9–13	156	251	<1	0
14–16	176	284	2	0
Total 2–16	**146**	**243**	**2**	**1**
		Girls		
2–3	124	205	5	6
4–8	111	184	8	0
9–13	122	191	5	0
14–16	122	193	25	0
Total 2–16	**120**	**194**	**10**	**1**
		All children		
2–3	126	203	4	6
4–8	119	194	5	<1
9–13	138	231	3	0
14–16	150	263	13	0
Total 2–16	**133**	**225**	**6**	**1**

Source: FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey data.

Table 3.2: Mean and 95th percentile iodine intakes with and without supplements, for Australian children aged 2–16 years, 2007

Age (years)	Mean (µg/day)		95th percentile (µg/day)	
	With dietary supplements	Without dietary supplements	With dietary supplements	Without dietary supplements
		Boys		
2–3	128	127	200	199
4–8	126	124	199	197
9–13	156	154	251	245
14–16	176	174	284	281
Total 2–16	**146**	**144**	**243**	**240**
		Girls		
2–3	124	123	205	203
4–8	111	111	184	183
9–13	122	121	191	183
14–16	122	120	193	192
Total 2–16	**120**	**118**	**194**	**192**
		All children		
2–3	126	125	203	202
4–8	119	117	194	192
9–13	138	136	231	227
14–16	150	148	263	257
Total 2–16	**133**	**131**	**225**	**222**

Source: FSANZ analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey data.

3.2 Median urinary iodine concentration

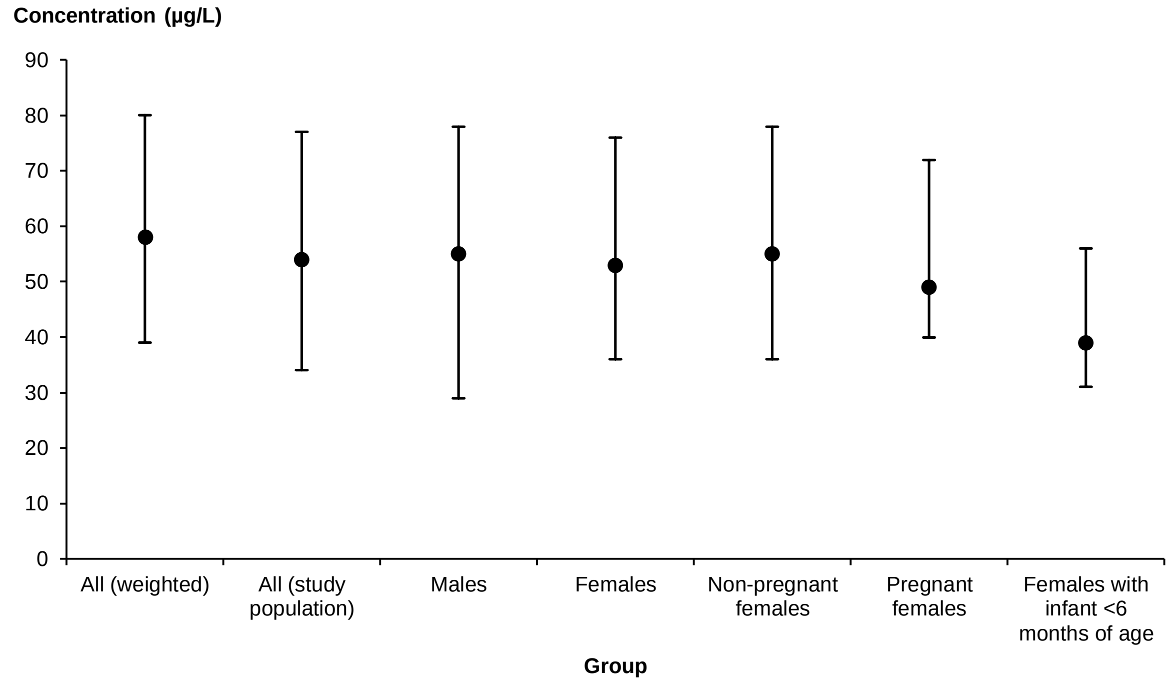
Aboriginal Birth Cohort Study

Background information and methodology for the Aboriginal Birth Cohort Study are outlined in the baseline report in Section 4.5.

The Australian National Iodine Nutrition Study (NINS) indicated that mainland Australian children, aged 8–10 years, were mildly iodine deficient, with a median urinary iodine concentration (MUIC) of 96 µg/L (Li et al. 2008). Due to logistical reasons, the Northern Territory was not included in the NINS. As part of the Aboriginal Birth Cohort study, during the 2005–2008 follow-up, MUICs were determined for young adults aged 16–20 years (mean age 17.8 years) (Mackerras et al. 2011). This study provides data on iodine status in regional and remote areas of the 'Top End' of the Northern Territory prior to the introduction of mandatory iodine fortification.

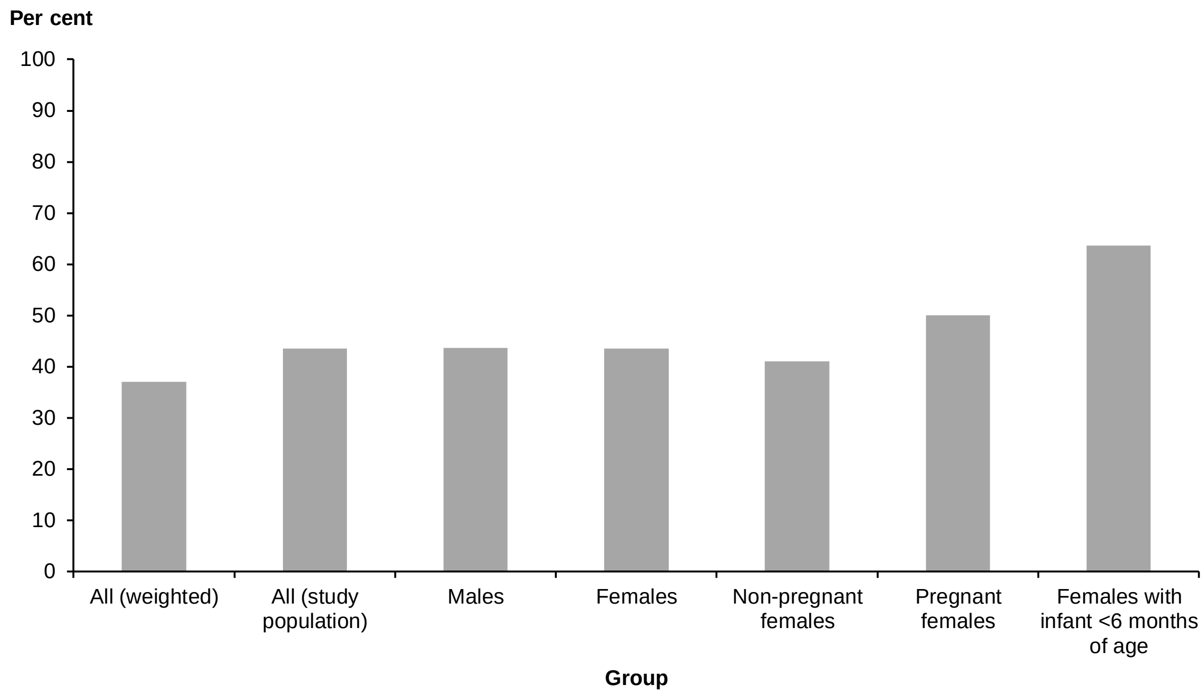
Results

The MUIC for the 376 Aboriginal Birth Cohort participants living in the Darwin Health Region was 58 µg/L, when weighted to the 2006 Census population (Figure 3.1). This is indicative of mild iodine deficiency. The WHO classification for mild iodine deficiency is a MUIC between 50–99 µg/L, and for moderate deficiency is a MUIC between 20–49 µg/L (see Table 2.1 of the baseline report for further classifications). Males had a slightly higher MUIC than females—55 µg/L compared with 53 µg/L. The proportion of samples with a MUIC less than 50 µg/L was similar for both males (43.7%) and females (43.5%). Fifty per cent of pregnant females and 64% of females with infants less than 6 months of age had a MUIC less than 50 µg/L (Figure 3.2). Further details are provided in Table A1.8 of the Appendix.



Source: Mackerras et al. 2011.

Figure 3.1: Median urinary iodine concentrations with interquartile range in the Aboriginal Birth Cohort Study, 2005–2008



Source: Mackerras et al. 2011.

Figure 3.2: Proportion of the sample with a urinary iodine concentration less than 50 μg/L, Aboriginal Birth Cohort study, 2005–2008

Methods

Between December 2005 and January 2008, follow-up tests were done with 367 of the original 686 subjects in the ABC study. Spot urine samples were collected from each subject and analysed at the Institute of Clinical Pathology and Medical Research, Westmead Hospital, Sydney.

Discussion

In this study, 82 repeat spot urine samples were collected from a subset of the participants. This allowed the calculation of a correction factor to be applied to urinary iodine concentrations (UIC) to account for within-person variation. As a result, the spread of UIC concentrations in this study were reduced.

'The overdispersed distribution of UIC based on a single urine sample from each individual has implications for interpreting future UIC surveys in Australia.' (Mackerras et al. 2011)

The MUICs in this study are lower than those reported in other regions of Australia. This study is the first documentation of iodine status in the Northern Territory and the first in a defined Aboriginal population sample.

Victorian Health Monitor

Background information on the Victorian Health Monitor (VHM) is outlined in the baseline report in Section 3.3. The 2009–2010 VHM surveyed participants before and after the commencement of mandatory fortification. In preparation of the legislative requirement to commence mandatory iodine fortification in October 2009, many flour mills began adding folic acid to flour from August 2009. It is likely that some bread would have contained both folic acid and iodised salt from this time. Therefore, for the purpose of the VHM, pre-fortification included the period May 2009 through to the end of July 2009, and post-fortification included August 2009 through to April 2010.

Results

The WHO classification for mild iodine deficiency is a MUIC between 50–99 µg/L, and for moderate deficiency is a MUIC between 20–49 µg/L (see Table 2.1 of the baseline report for further classifications). During the pre-fortification period, 1,006 people between the ages of 18 and 75 years were sampled. During the post-fortification period, 2,544 people aged in the same age range were sampled. Pre-fortification, the MUIC was 79 µg/L (interquartile range 57–103 µg/L), indicative of mild iodine deficiency.

This pre-fortification result will be compared with the MUIC results post-fortification to help determine the effectiveness of mandatory iodine fortification in future monitoring reports.

Methods

The biomedical examination procedures closely followed the study protocol recommended by the World Health Organization (WHO 1999). Four teams of survey staff administered the survey, with two surveying metropolitan areas and two surveying rural Victoria. The examination was conducted over three weekends from Friday to Monday in 50 randomly selected Census collection districts across Victoria. All participants gave written informed consent to participate upon arrival at the testing site and were asked to remain on site until all tests were performed.

A spot urine sample was taken in the morning and transported daily to a central laboratory for analyses of urine albumin, protein and blood. A separate urine sample was sent to Westmead Hospital in Sydney for iodine testing.

4 New Zealand baseline data for mandatory folic acid fortification

4.1 Folic acid intake

Roy Morgan Single Source data

In the absence of current national food consumption data for adults, trend information from Roy Morgan Single Source Surveys are useful in assessing any changes that may have occurred in the consumption of folic acid fortified foods since the previous 1997 New Zealand NNS for adults (FSANZ analysis of Roy Morgan Single Source Survey Data).

The Roy Morgan Single Source Surveys are carried out on a weekly basis and include more than 12,000 New Zealanders aged 14 years and above each year of the survey. The sample populations are representative of the New Zealand population.

Each participant undertakes a face-to-face interview. A follow-up self-completed survey is also carried out on the same population sample. The questionnaires are periodically revised and updated to ensure the information collected is truly representative of the foods available on the market.

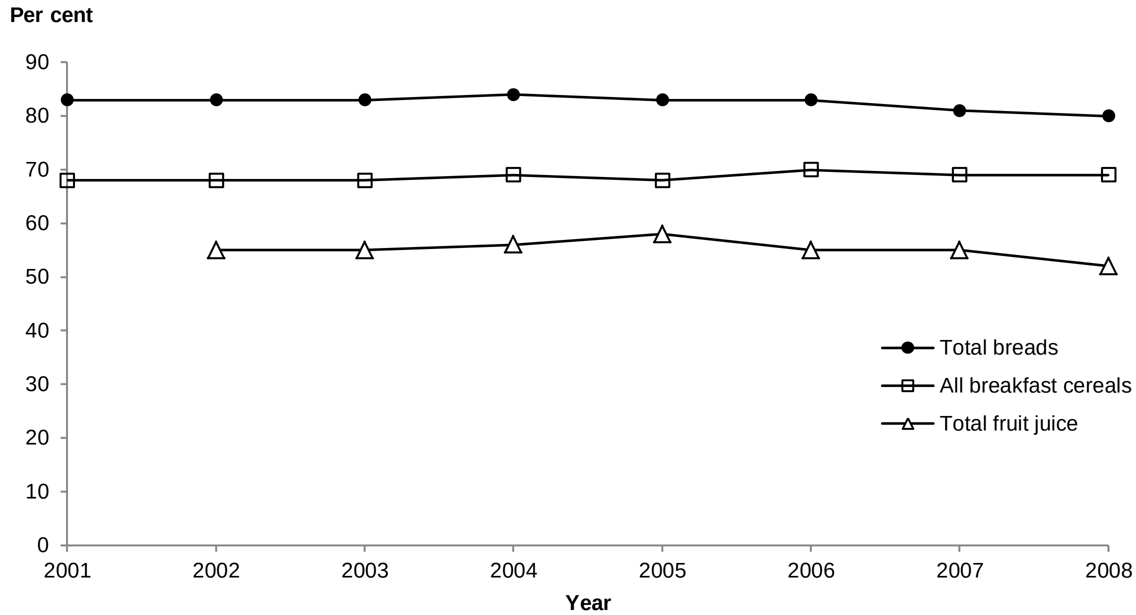
The surveys are unique in that all questions are asked of each respondent, helping to build an accurate individual profile of consumers across a large survey sample base. Foods as described by Roy Morgan Research in the Single Source Survey are outlined in Appendix 2.

Data are available from 2001–2008 showing the proportion of New Zealanders aged 14 years and over consuming particular foods or food groups in the seven days prior to the survey. The data included foods fortified with folic acid under the voluntary fortification permissions, but the amounts were not reported.

During the development of Proposal P295 (FSANZ 2006), FSANZ identified five food categories (breads, breakfast cereals, yeast spreads, fruit beverages and soy beverages) that contributed to the population's folic acid intake from voluntarily fortified foods. The main three contributors were bread, breakfast cereal and yeast spreads.

Results

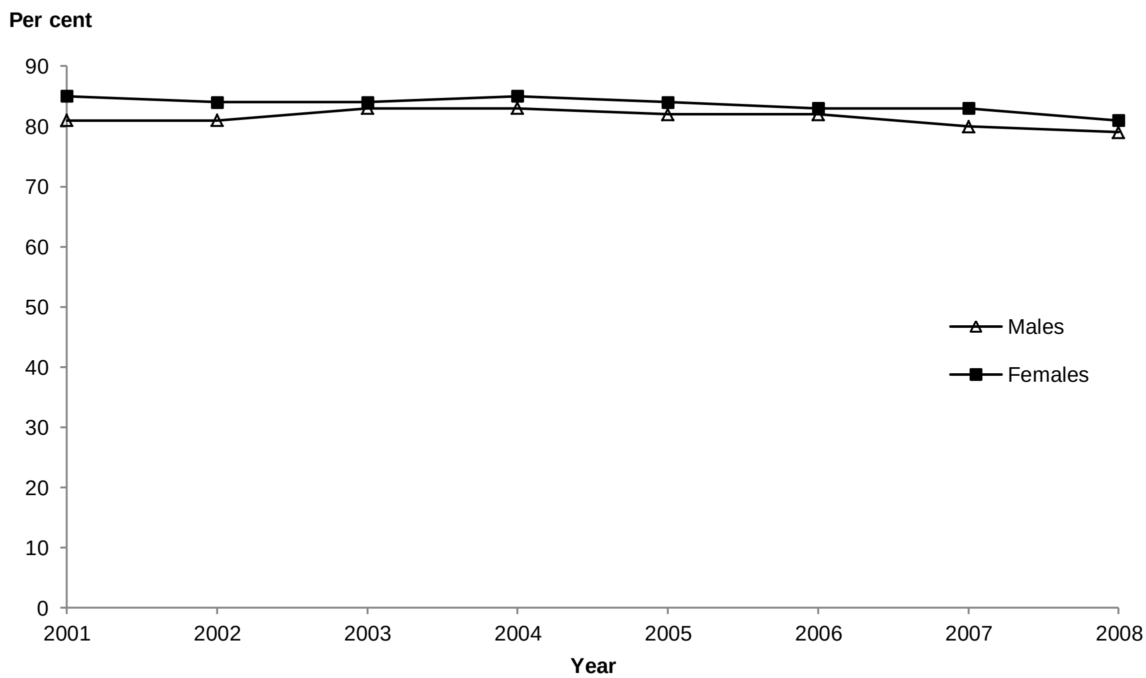
During 2001–2008, of the identified main food categories contributing to folic acid intakes, breads were consumed by the highest proportion of the population, followed by breakfast cereals and then fruit juices. Over this time, the proportion consuming all categories remained relatively stable (Figure 4.1). More females consumed bread than males (Figure 4.2). Further details are provided in Table A1.11 of the Appendix.



Note: Figures are for 'total bread', 'all breakfast cereal' and 'total fruit beverages' (see definitions in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Figure 4.1: Proportion of the New Zealand population who consumed breads, breakfast cereals and fruit beverages, 2001–2008

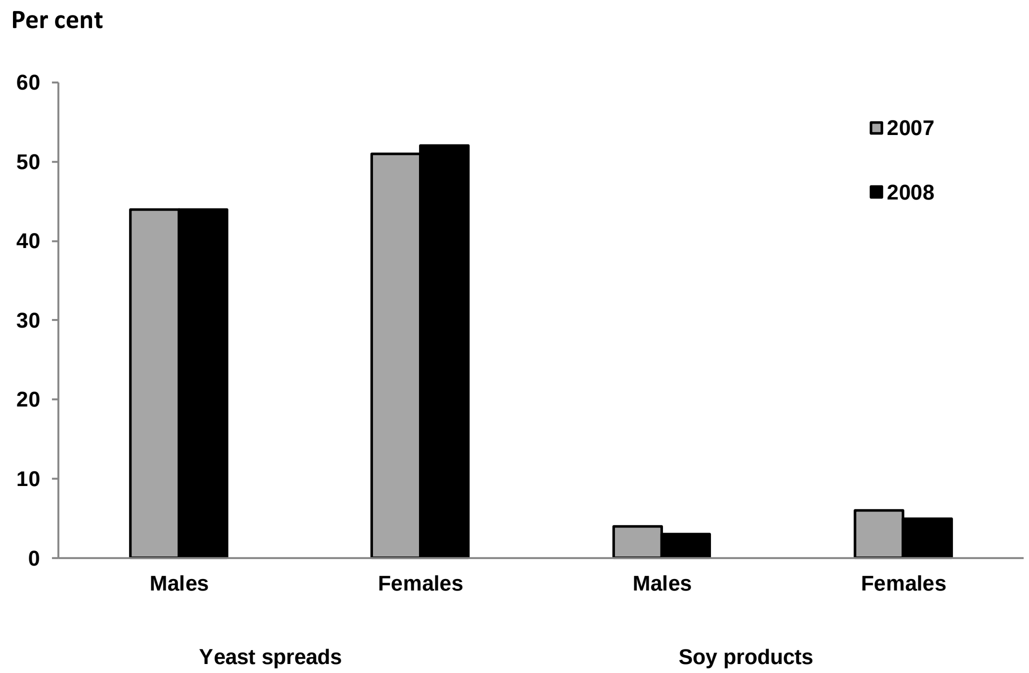


Note: Figures are for 'total bread' (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Figure 4.2: Proportion of the New Zealand population who consumed breads, by sex, 2001–2008

The two other main food categories contributing to folic acid intakes in the New Zealand population are yeast spreads and soy products (Figure 4.3). Yeast spreads were consumed by more than 40% of the population and soy products by fewer than 10% of the population. In addition, slightly more of these two folic acid contributors were consumed by females compared to males. Further details are included in the Appendix in tables A1.13 and A1.15.



Note: Data are only available for 2007–2008.

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Figure 4.3: Proportion of the New Zealand population who consumed yeast spreads and soy products, by sex, 2007–2008

Background

Background information and a description of foods are outlined in the Roy Morgan Single Source Surveys for Australia in Section 2.1.

4.2 Cancer incidence and mortality

The baseline report presents cancer data from 1994 to 2005 and this supplement presents more recent data, up to 2008 (New Zealand Cancer Registry and New Zealand Health Information Service). Background information on cancer incidence and mortality is outlined in the baseline report in Section 5.8.

As noted in Section 2.6, the incidence and mortality of bowel and prostate cancer have been included to enable changes to be monitored over time.

Bowel cancer

Age-standardised incidence and mortality rates for bowel cancer are shown in Figure 4.4 and in Table A1.9 of the Appendix. A summary of these results is provided below.

Incidence

Males

From 1994–2008, the age-standardised incidence rate decreased by an average of 1.7% per year, from 63.5 cases per 100,000 males in 1994 to 49.2 cases per 100,000 in 2008. The highest rate was in 1994.

Females

From 1994–2008, the age-standardised incidence rate decreased by an average of 1.8% per year, from 50.3 cases per 100,000 females in 1994 to 38.6 cases per 100,000 in 2008. As with males, the highest rate was in 1994.

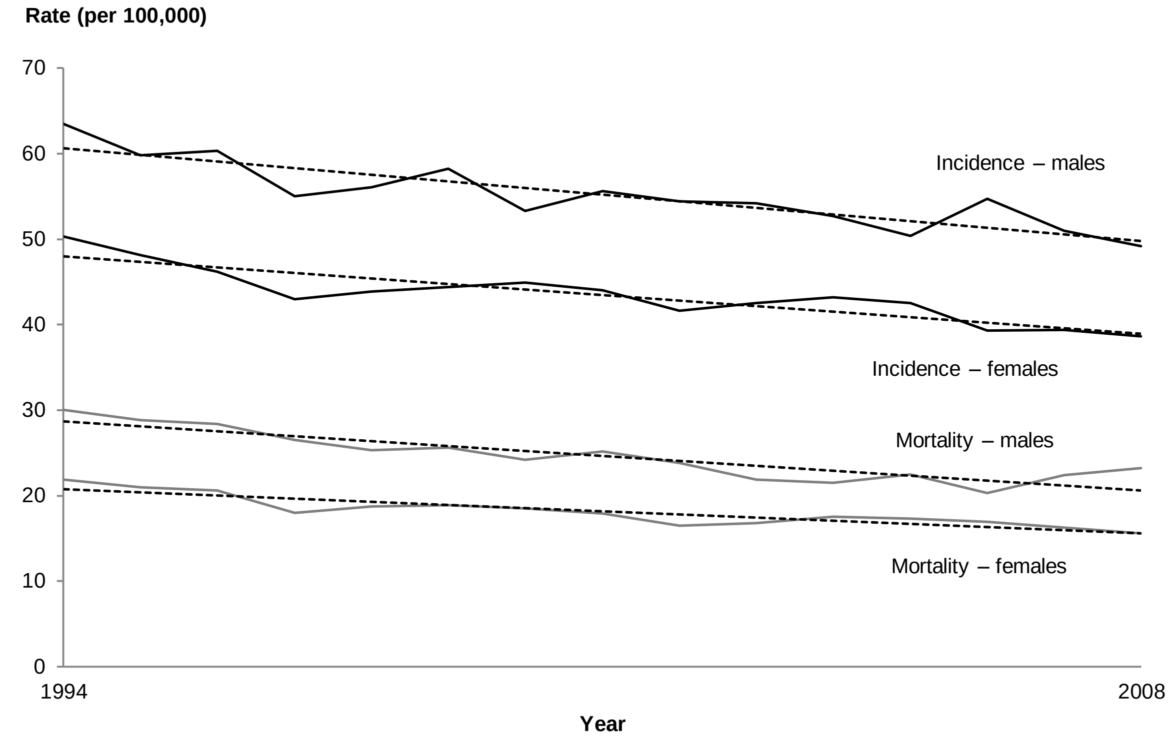
Mortality

Males

From 1994–2008, the age-standardised mortality rate decreased by an average of 1.7% per year, from 30.0 deaths per 100,000 males in 1994 to 23.2 deaths per 100,000 in 2006. The highest rate was in 1994.

Females

From 1994–2008, the age-standardised mortality rate decreased by an average of 2.3% per year, from 21.9 deaths per 100,000 males in 1994 to 15.6 deaths per 100,000 in 2006. The highest rate was in 1994.



Note: Age-standardised to the 2001 WHO standard population.

Source: New Zealand Cancer Registry and New Zealand Health Information Service.

Figure 4.4: Bowel cancer incidence rates and mortality rates, males, females, 1994–2008

Prostate cancer

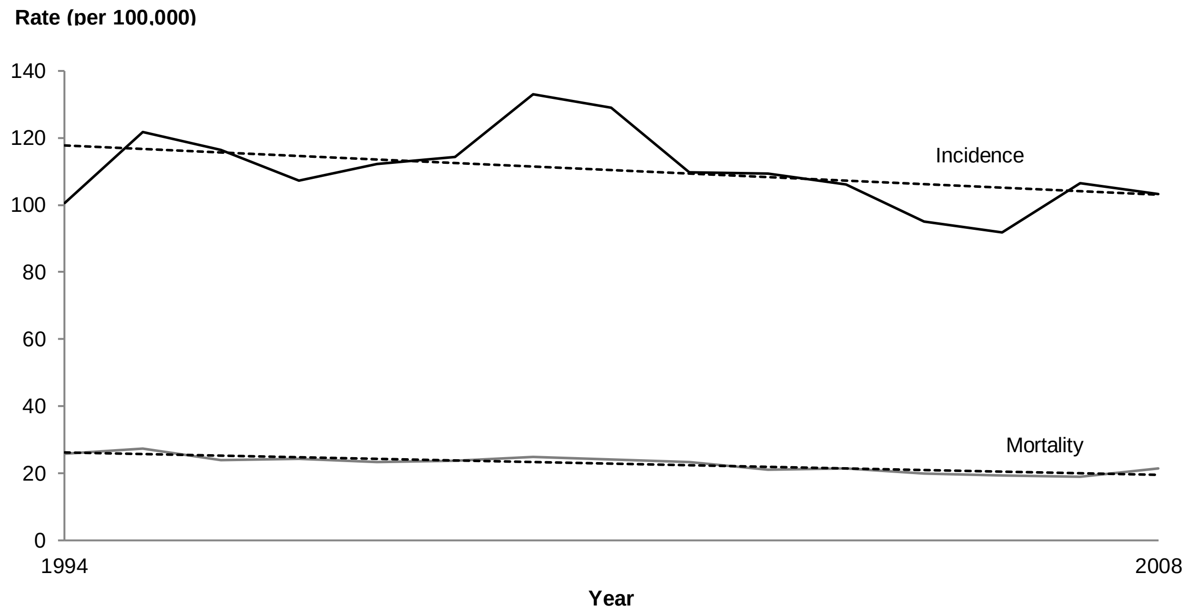
Age-standardised incidence and mortality rates for prostate cancer are presented in Figure 4.5 and Table A1.10 of the Appendix. A summary is provided below.

Incidence

From 1994–2008, the age-standardised incidence rate was relatively unchanged with an average decrease of 0.7% per year, from 100.5 cases per 100,000 males in 1994 to 103.3 cases per 100,000 in 2008. The highest rate was 132.9 cases per 100,000 males in 2000.

Mortality

From 1994–2008, the age-standardised mortality rate decreased by an average of 1.1% per year, from 25.8 deaths per 100,000 males in 1994 to 21.5 deaths per 100,000 in 2008. The highest rate was 27.3 deaths per 100,000 males in 1995.



Note: Age-standardised to the 2001 WHO standard population.

Source: New Zealand Cancer Registry and New Zealand Health Information Service.

Figure 4.5: Prostate cancer incidence rates and mortality rates, 1994–2008

5 New Zealand baseline data for mandatory iodine fortification

2002 National Children's Nutrition Survey

Background information including the methodology for the 2002 National Children's Survey (2002 Children's Survey) is outlined in the baseline report in Section 6.3.

Estimated iodine intakes of children, aged 5–14 years, in the 2002 Children's Survey are presented in the baseline report. This work was done by the University of Otago (LINZ Activity and Health Research Unit) at the request of the Ministry of Agriculture and Forestry (formerly the New Zealand Food Safety Authority) and the results were based on a single day of food consumption data from the 2002 Children's Survey.

Data from the 2002 Children's Survey have now been re-analysed by the Ministry of Agriculture and Forestry using a second day adjusted nutrient intake model and using similar methods to FSANZ's analysis of the 1997 Adult's National Nutrition Survey.

Ministry of Agriculture and Forestry's analysis of 2002 Children's Survey

Estimated iodine intakes from the Children's Survey have been recalculated using FSANZ's DIAMOND (DIetAry Modelling Of Nutritional Data) program. A second day adjusted nutrient intake model was used to estimate the distribution of usual iodine intakes. Iodine intakes were log transformed to normalise the distribution of the data. Mean intakes were adjusted back to the original scale to report intakes for specific age and gender groupings. Consideration must be given to different methodological differences between the analysis conducted by Ministry of Agriculture and Forestry and the University of Otago, which is presented in Section 5.3 of the baseline report.

Dietary iodine intakes with discretionary salt use were not estimated at the time of this assessment. However, assessment of iodine intakes with discretionary salt use from the 2002 Children's Survey is planned for the future. It is recommended that these remaining data, when available, also be considered as baseline data.

Results

The assessment of adequacy for iodine intakes is based on population groups meeting the estimated average requirement (EAR) for iodine. Recommended intakes are outlined in Table 1.2 of the baseline report. The EAR for children aged 1–8 years is 65 µg/day, for children aged 9–13 years is 75 µg/day and for adolescents aged 14–18 years is 95 µg/day.

The Ministry of Agriculture and Forestry analysis showed that the majority (95%) of children aged 5–14 years had iodine intakes less than the EAR. Mean iodine intakes ranged from 43–51 µg/day and the 95th percentile intakes ranged from 65–95 µg/day for all children aged 5–14 years (Table 5.1).

The assessment of safety is based on iodine intakes being above the upper level of intake (UL). No children aged 5–14 years exceeded the UL for iodine. Compared with boys, girls generally had lower iodine intakes, with almost all girls (99%) having intakes less than the EAR, whereas only 90% of boys had intakes less than the EAR (Table 5.1).

Table 5.1: Estimated mean and 95th percentile iodine intakes[(a)] and proportion below the estimated average requirement (EAR) and above the upper level (UL) of intake for New Zealand children aged 5–14 years, 2002

Age (years)	Mean (µg/day)	95th percentile (µg/day)	< EAR (per cent)	> UL (per cent)
		Males		
5–8	47	73	90	0
9–13	51	85	90	0
14	59	96	92	0
Total 5–14	**50**	**83**	**90**	**0**
		Females		
5–8	39	50	100	0
9–13	41	63	99	0
14	43	69	98	0
Total 5–14	**40**	**60**	**99**	**0**
		All children		
5–8	43	65	95	0
9–13	46	76	94	0
14	51	95	95	0
Total 5–14	**45**	**75**	**95**	**0**

(a) Iodine intakes from discretionary salt are not included in these estimates.

Source: Ministry of Agriculture and Forestry's analysis of 2002 National Children's Nutrition Survey data.

Appendix 1

Table A1.1: Proportion of the population who consumed bread, Australia, 2001–2008 (per cent)

Sex and age group (years)	2001	2002	2003	2004	2005	2006	2007	2008
				Sex				
Males	74	75	73	72	72	73	70	72
Females	79	78	78	77	75	76	73	74
Persons	77	76	76	75	74	74	72	73
				Age group (years)				
14–17	78	73	71	71	70	68	69	70
18–29	78	74	74	72	71	73	68	72
30–49	78	79	78	77	76	77	74	75
50–69	78	77	76	75	75	76	74	73
70+	67	70	71	70	69	67	66	67

Note: Figures are for 'total bread' (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.2: Proportion of the population who consumed breakfast cereal, Australia, 2001–2008 (per cent)

Sex and age group (years)	2001	2002	2003	2004	2005	2006	2007	2008
				Sex				
Males	66	65	64	63	62	62	62	63
Females	66	65	65	63	64	63	63	65
Persons	66	65	64	63	63	63	63	64
				Age group (years)				
14–17	68	63	62	60	59	58	59	63
18–29	63	57	58	57	55	53	54	56
30–49	63	64	63	62	62	62	61	63
50–69	69	69	69	68	67	67	68	67
70+	75	74	74	74	74	75	73	74

Note: Figures are for 'all breakfast cereal' (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.3: Proportion of the population who consumed yeast spreads, Australia, 2007–2008 (per cent)

Sex and age group (years)	2007	2008
	Sex	
Males	43	44
Females	47	49
	Age group (years)	
14–17	38	40
18–29	43	40
30–49	46	49
50–69	48	49
70+	43	43

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.4: Proportion of the population who consumed fruit beverages, Australia, 2002–2008 (per cent)

Sex and age group (years)	2002	2003	2004	2005	2006	2007	2008
				Sex			
Males	52	52	51	49	50	46	41
Females	54	52	52	50	50	46	41
Persons	53	52	52	50	50	46	41
				Age group (years)			
14–17	64	62	57	54	57	52	40
18–29	62	60	60	59	57	54	47
30–49	54	53	52	50	52	46	43
50–69	46	46	47	44	45	43	38
70+	40	40	41	39	38	35	30

Note: Figures are for 'total fruit beverages' (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.5: Proportion of the population who consumed soy beverages, Australia, 2007–2008 (per cent)

Sex and age group (years)	2007	2008
	Sex	
Males	5	5
Females	7	7
Persons	6	6
	Age group (years)	
14–17	4	3
18–29	5	5
30–49	6	6
50–69	7	7
70+	5	6

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.6: Age-standardised incidence and mortality rates for bowel cancer, Australia, 1982–2007 (ICD-10 code: C18–C20)

	Incidence			Mortality		
Year	Males	Females	Persons	Males	Females	Persons
1982	66.6	51.9	58.0	37.0	27.4	31.5
1983	68.1	50.5	58.1	38.1	27.2	31.7
1984	68.9	51.5	58.9	35.9	26.4	30.5
1985	72.4	53.5	61.6	37.7	27.3	31.7
1986	69.7	52.6	60.0	36.3	27.2	31.2
1987	70.7	51.8	60.0	37.5	26.6	31.3
1988	71.1	49.6	58.9	37.0	24.9	30.0
1989	74.1	51.1	61.1	36.5	24.4	29.5
1990	73.3	50.4	60.2	34.7	23.8	28.4
1991	76.3	53.4	63.6	34.2	23.5	28.2
1992	74.6	53.7	62.8	35.1	22.9	28.1
1993	74.6	52.3	62.4	34.6	23.7	28.4
1994	76.1	53.6	63.6	35.3	23.4	28.7
1995	77.0	52.6	63.6	33.8	22.5	27.3
1996	78.3	52.3	64.0	33.2	22.2	27.1
1997	77.2	52.6	63.7	33.3	21.6	26.8
1998	74.8	52.1	62.3	31.6	21.3	25.8
1999	75.2	53.8	63.5	30.8	20.0	24.8
2000	79.8	52.8	65.0	30.7	19.9	24.8
2001	78.4	54.6	65.4	30.1	19.3	24.1
2002	75.7	51.7	62.7	27.2	19.2	22.8
2003	73.8	51.6	61.8	26.4	17.3	21.4
2004	75.3	51.5	62.5	23.7	16.0	19.5
2005	73.4	51.0	61.5	24.4	15.3	19.5
2006	74.4	52.3	62.5	21.7	13.6	17.3
2007	75.2	53.4	63.4	21.7	14.6	17.8

Notes

1. Rates are the number of cases per 100,000 population.
2. Mortality data for 1982 to 2007 are tabulated by the year of death.
3. Rates are standardised to the Australian population as at 30 June 2001.

Source: AIHW Australian Cancer Database 2007 and AIHW National Mortality Database 2007.

Table A1.7: Age-standardised incidence and mortality rates for prostate cancer, Australia, 1982–2007 (ICD-10 code: C61)

Year	Incidence	Mortality
1982	79.5	34.5
1983	80.6	34.7
1984	79.7	33.3
1985	83.0	35.7
1986	83.1	35.7
1987	85.5	37.2
1988	85.6	37.6
1989	92.8	39.6
1990	102.9	39.7
1991	110.1	39.3
1992	124.3	41.2
1993	165.1	43.7
1994	184.4	43.6
1995	168.9	41.2
1996	137.8	41.3
1997	130.1	36.8
1998	128.3	37.2
1999	130.2	35.2
2000	129.4	35.9
2001	131.4	35.2
2002	135.5	35.3
2003	148.3	34.5
2004	165.5	32.9
2005	167.7	33.5
2006	171.3	32.5
2007	182.9	31.0

Notes

1. Rates are the number of cases per 100,000 population.
2. Mortality data for 1982 to 2007 are tabulated by the year of death.
3. Rates are standardised to the Australian population as at 30 June 2001.

Source: AIHW Australian Cancer Database 2007 and AIHW National Mortality Database 2007.

Table A1.8: Urinary iodine concentrations in the Aboriginal Birth Cohort Study, 2005–2008

	Urinary iodine concentration (µg/L)			
Group	Number	Median	IQR	<50ug/L (%)
All (weighted) [(a)]	376	58	39–80	37.1
All (study population) [(b)]	376	54	34–77	43.6
Males	183	55	29–78	43.7
All females	193	53	36–76	43.5
Non-pregnant females	158	55	36–78	41.1
Pregnant females	24	49	40–72	50
Females with infant <6 months of age	11	39	31–56	63.6

Notes

(a) Weighted to the 2006 Census Indigenous population.

(b) Study population result shows the unweighted results.

Source: Mackerras et al. 2011.

Table A1.9: Age-standardised incidence and mortality rates for bowel cancer, New Zealand, 1994–2008 (ICD-10 code: C18–C20)

	Incidence			Mortality		
Year	Males	Females	Persons	Males	Females	Persons
1994	63.5	50.3	56.2	30.0	21.9	25.6
1995	59.8	48.1	53.4	28.8	21.0	24.2
1996	60.3	46.2	52.8	28.4	20.6	24.0
1997	55.0	43.0	48.4	26.5	18.0	22.0
1998	56.1	43.9	49.4	25.3	18.7	21.7
1999	58.2	44.4	50.7	25.6	18.9	21.9
2000	53.3	44.9	48.7	24.2	18.5	21.1
2001	55.6	44.0	49.2	25.2	17.9	21.1
2002	54.4	41.6	47.6	23.8	16.5	19.8
2003	54.2	42.5	48.0	21.9	16.8	19.1
2004	52.7	43.2	47.5	21.5	17.5	19.3
2005	50.4	42.5	46.2	22.5	17.3	19.7
2006	54.7	39.3	46.5	20.3	16.9	18.6
2007	51.0	39.4	44.7	22.4	16.3	19.1
2008	49.2	38.6	43.5	23.2	15.6	19.1

Notes

1. Rates are the number of cases per 100,000 population.
2. Mortality data are tabulated by the year of registration.
3. Rates are standardised to the 2001 WHO standard population.

Source: New Zealand Cancer Registry and New Zealand Health Information Service.

Table A1.10: Age-standardised incidence and mortality rates for prostate cancer, New Zealand, 1994–2008 (ICD-10 code: C61)

Year	Incidence	Mortality
1994	100.5	25.8
1995	121.8	27.3
1996	116.4	24.0
1997	107.3	24.3
1998	112.3	23.3
1999	114.3	23.8
2000	132.9	24.9
2001	128.9	24.1
2002	109.8	23.3
2003	109.3	21.0
2004	106.1	21.5
2005	95.0	19.9
2006	91.8	19.4
2007	106.5	19.0
2008	103.3	21.5

Notes

1. Rates are the number of cases per 100,000 population.
2. Mortality data are tabulated by the year of registration.
3. Rates are standardised to the 2001 WHO standard population.

Source: New Zealand Cancer Registry and New Zealand Health Information Service.

Table A1.11: Proportion of the population who consumed bread, New Zealand, 2001–2008 (per cent)

Sex and age group (years)	2001	2002	2003	2004	2005	2006	2007	2008
				Sex				
Males	81	81	83	83	82	82	80	79
Females	85	84	84	85	84	83	83	81
Persons	83	83	83	84	83	83	81	80
				Age group (years)				
14–17	81	79	78	83	78	79	80	78
18–29	81	81	80	82	82	81	80	78
30–49	84	84	85	85	84	84	83	82
50–69	85	84	86	85	84	83	82	81
70+	80	80	80	80	83	82	78	78

Note: Figures are for 'total bread' (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.12: Proportion of the population who consumed breakfast cereal, New Zealand, 2001–2008 (per cent)

Sex and age group (years)	2001	2002	2003	2004	2005	2006	2007	2008
				Sex				
Males	71	70	68	69	68	69	69	69
Females	66	67	68	68	68	70	69	69
Persons	68	68	68	69	68	70	69	69
				Age group (years)				
14–17	70	67	70	66	67	65	64	67
18–29	62	61	60	64	64	64	67	63
30–49	66	67	67	67	66	70	67	69
50–69	73	73	71	71	71	72	72	72
70+	79	79	76	79	76	77	75	77

Note: Figures are for 'all breakfast cereal' (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.13: Proportion of the population who consumed yeast spreads, New Zealand, 2007–2008 (per cent)

Sex and age group (years)	2007	2008
	Sex	
Males	44	44
Females	51	52
Persons	48	48
	Age group (years)	
14–17	40	37
18–29	45	45
30–49	48	48
50–69	50	52
70+	51	52

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.14: Proportion of the population who consumed fruit beverages, New Zealand, 2002–2008 (per cent)

Sex and age group (years)	2002	2003	2004	2005	2006	2007	2008
				Sex			
Males	54	54	56	58	56	55	52
Females	56	56	56	59	54	55	52
Persons	55	55	56	58	55	55	52
				Age group (years)			
14–17	66	69	66	69	63	65	62
18–29	65	65	67	68	68	66	61
30–49	53	53	55	57	54	55	51
50–69	51	50	49	53	48	49	47
70+	44	45	46	48	45	45	42

Note: Figures are for ‘total fruit beverages’ (see definition in Appendix 2).

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Table A1.15: Proportion of the population who consumed soy beverages, New Zealand, 2007–2008 (per cent)

Sex and age group (years)	2007	2008
	Sex	
Males	4	3
Females	6	5
Persons	5	4
	Age group (years)	
14–17	4	5
18–29	6	5
30–49	5	4
50–69	5	4
70+	5	3

Source: FSANZ analysis of Roy Morgan Single Source Survey data.

Appendix 2

Foods as described by Roy Morgan Research in the Single Source Survey

Breads

This food group is classified under the main food category of *Bakery and cereal products*. The types of bread listed under this category are toast, rolls, bread and bagels. There is no category of 'other forms of bread' which may have implications for accurate reporting, as some respondents may have consumed bread types not included in the questionnaire. However, the categories included are likely to capture the major forms of breads consumed.

Breakfast cereals

Also listed under the main food category of *Bakery and cereal products* is a selection of breakfast cereals comprising *Biscuit-type cereals* such as Weet-Bix, *Other cereals* such as corn flakes and muesli, and *All breakfast cereals*. For the purpose of this analysis, a fourth type of breakfast cereal food, *Breakfast bars*, was added and classified under *Snacks* in the questionnaire.

Yeast spreads

Yeast spreads are listed under the main food category of *Spreads*, which includes Vegemite, Marmite and Promite. Data collection for yeast spreads did not commence until 2007.

Fruit beverages

Data on the consumption of non-alcoholic beverages includes questions on fruit juice/drink consumption. In 2001, fruit juices and drinks were treated as a single fruit beverage group. In 2002, the survey question changed to allow the identification of different fruit juice types. The trend information on fruit juice consumption used data from 2002–2008.

Soy beverages

Soy beverages were listed under the main food category of *Non-alcoholic beverages*. The term *Soy drinks* was used and did not differentiate between soy milk and other soy drinks. Data collection for soy beverages did not commence until 2007.

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