

Supporting document 1

2013 survey of the trans fatty acid content of Australian and New Zealand foods

A survey conducted under the Implementation Subcommittee for Food Regulation Coordinated Food Survey Plan with participation from New South Wales, Western Australia, Victoria, South Australia, Queensland, Tasmania and New Zealand.

Executive summary

In December 2011 ministers responsible for food regulation asked Food Standards Australia New Zealand (FSANZ) to respond to a number of recommendations arising from an independent review of food labelling.

One of those recommendations was that the mandatory declaration of all trans fatty acids (TFAs) above an agreed threshold be introduced in the nutrition information panel if manufactured TFAs have not been phased out of the food supply by January 2013.

This survey was undertaken to inform FSANZ's response to the recommendation on TFAs.

TFAs occur naturally in meat and milk from ruminant animals (e.g. cattle) and through manufacturing processes such as hydrogenation. Hydrogenation has been widely used since the early 1900's to produce fat blends for margarine, shortening and deep frying. TFAs can also be formed in food through other manufacturing processes including deodorisation of oils to remove aromatic impurities, and heating of oils at excessive temperatures.

It is clear that TFAs raise the amount of low-density lipoprotein (LDL) cholesterol in our blood, and lower the amount of high-density lipoprotein (HDL) cholesterol. Both these changes increase the risk of coronary heart disease.

The World Health Organization (WHO) recommends that no more than 1 per cent of our daily energy intake (kilojoules) should come from TFAs.

In 2007 and 2009, Food Standards Australia New Zealand (FSANZ) conducted formal scientific reviews of dietary trans fatty acid (TFA) intake by Australian and New Zealand consumers. These reviews concluded that the contributions of TFAs to energy intake for Australian and New Zealander consumers were below the goal of 1% of energy intake proposed by the WHO, and were comparable to or lower than intake estimates from some other countries.

This survey aimed to establish current levels of TFAs in a range of processed and takeaway foods available in Australia and New Zealand.

A total of 500 samples from 39 different product categories were collected from New South Wales, Western Australia, New Zealand, South Australia, Tasmania, Queensland and Victoria, over a two week period in October 2013. Samples were selected to include different

quality products and a range of prices, from lower priced private label products to more expensive products. The range of product categories tested included takeaway foods, fats and oils, snack foods, meat products, and bakery products. Analytical measurements were conducted by three separate laboratories using validated methods for measuring TFAs in foods.

The sampling plan attempted to reflect food products and categories sampled in 2008–09 so a direct comparison of TFA levels could be made where possible. However, some modifications to the 2008–09 sampling plan were made based on previous results, to remove foods that contributed only a low amount of total fat to the diet, and to reduce unnecessary duplication of samples. Some foods were also added to the sampling plan where the 2013 FSANZ industry survey or international studies identified that these foods were high in total fat and TFAs.

TFAs were detected in 36 of the 39 product categories analysed. The highest median concentrations of TFAs were found in edible oil spreads, vegetable oils, croissants, custard baked goods, and prepared pastry. TFAs were not detected in pikelets/pancakes, snack bars and toasted style muesli. While TFAs were detected in most product categories, the median concentrations in Australian and New Zealand foods were generally low. Excluding samples likely to contain ruminant TFA, approximately 86% of the samples had TFA concentrations below 2 g/100 g fat, the limit adopted for manufactured TFAs in Danish legislation in 2003.

Median TFA concentrations were generally consistent with those observed in the 2008-09 survey, with no clear trend toward an increase or a decrease in median TFA concentrations found in Australian or New Zealand foods. Statistically significant ($p < 0.01$) increases in TFA concentration were observed in only one product category—chicken nuggets/products (median concentrations of TFAs in chicken nuggets/products were 0.1 and 0.2 g/100 g food in the 2008–09 and 2013 surveys, respectively). This product category was widened slightly to include other chicken products in the current survey, which may have contributed to this result. No significant changes in TFA concentrations were observed in other product categories.

On the basis that the analytical results did not show an increase in TFA concentrations in Australian or New Zealand foods, it is anticipated that the dietary intake of TFAs remains low, and below the WHO recommended level of 1% dietary energy in both Australia and New Zealand.

On 9 May 2014, the summary results of the 2011–12 National Nutrition and Physical Activity Survey (NNPAS) component of the Australian Health Survey were released. These included new estimates of TFA and energy intake and were based on up-to-date food consumption data and the TFA concentration data available to FSANZ in 2009. The NNPAS results show that TFA intake remains low, with the mean intake of all Australians 2 years and above (1.4 g/day) representing 0.6% of dietary energy. The dairy and meat food groups, together with butters and dairy blends, contributed more than half of the intake, which shows ruminant TFAs continue to be the major source of TFAs in the Australian diet. The updated food consumption data indicate that the mean TFA intake of Australian consumers remains below the WHO recommendation of less than 1% of dietary energy. Updated consumption data for New Zealand are not yet available for dietary exposure modelling purposes.

The NNPAS results support the conclusion that TFA intakes are likely to be low based on the concentrations of TFAs found in food.

The survey results should be considered with the 2013 FSANZ industry survey on the use of TFAs in the New Zealand and Australian food supply, and the 2014 FSANZ systematic and narrative reviews of the health effects of TFAs.

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1 Issue

This analytical survey of trans fatty acids (TFAs) in Australian and New Zealand foods arose as a result of a recommendation from the 2011 Review of Food Labelling Law and Policy. The review called for 'mandatory declaration of all TFAs above an agreed threshold be introduced in the nutrition information panel if manufactured TFAs have not been phased out of the food supply by January 2013'. The Legislative and Governance Forum on Food Regulation (the Forum) noted the recommendation and referred the matter to FSANZ for technical evaluation and advice.¹

2 Purpose of the analytical survey

The aim of this survey was to determine current concentrations of TFAs in a range of processed and takeaway foods available in Australia and New Zealand. It also provided the opportunity to assess the levels of the full range of fatty acids, including saturated fatty acids (SFAs), in the surveyed foods.

The survey was a follow up to previous Implementation Subcommittee for Food Regulation coordinated surveys on TFAs.

3 Justification for the survey

TFAs can be found naturally in meat and milk from certain animals and as a product of fats and oils altered by industrial processes, such as hydrogenation. Hydrogenation has been widely used to solidify liquid vegetable oils to make products such as margarines and shortenings and involves adding hydrogen to the oils.

TFAs are known to raise total blood cholesterol and increase the proportion of low density lipoproteins. Blood cholesterol level is a risk factor for coronary heart disease. This led to previous survey activities conducted in 2005 and 2007, and 2008–09 to assess the levels of TFAs in foods and the safety of estimated intake.

The results of this survey should be considered together with the 2013 FSANZ industry survey on the use of TFAs in the New Zealand and Australian food supply, and the 2014 FSANZ systematic and narrative reviews of the health effects of TFAs.

4 A note on definitions

Throughout this report trans fatty acids are abbreviated as 'TFAs'. This term is equivalent to the term 'trans fat' commonly used in the popular press and other documents.

'Ruminant TFAs' refers to those TFAs that are likely come from the use of ingredients such as beef, lamb and dairy foods, or other naturally occurring non-ruminant TFAs (e.g. in poultry). 'Manufactured TFAs' refers to TFAs likely to come from the use of oils and fats that have been hydrogenated or deodorised or otherwise contain TFAs resulting from food processing.

'Total TFAs' refers to the sum of ruminant plus manufactured TFAs. The range of individual

¹ The government response to the Review of Food Labelling Law and Policy is available at: <http://www.foodlabellingreview.gov.au/internet/foodlabelling/publishing.nsf/content/home>

TFAs is the same in ruminant and manufactured TFAs sources, but the proportions of these individual acids differ. Unless the term manufactured or ruminant TFAs is specified, it should be assumed that the use of TFAs or TFA in the report refers to total TFAs.

'SFAs' in this report refers to all fatty acids that are saturated, that is, those that contain no double bonds between adjacent carbon atoms.

The occurrence, chemistry and nomenclature of fatty acids are explained in further detail in Appendix 1.

5 Previous FSANZ surveys

- 5.1 Review Report—Trans fatty acids in the New Zealand and Australian food supply (FSANZ 2007)

In 2007, FSANZ reviewed the concentrations and dietary intake of TFAs in the New Zealand and Australian food supply. The analytical data were derived from five sources:

- analytical data generated by the NSW Food Authority in a 2005 study of over 250 samples of 50 different food types
- FSANZ data generated in analytical surveys of nutrients in Australian foods conducted since 2001, for approximately 65 samples of around 50 different foods
- data from the South Australian Department of Health for hot potato chips from two fast food chains (16 samples in total)
- for New Zealand foods, analytical data generated in 2006 by the Institute of Environmental Science and Research Ltd (ESR) for 47 samples across ten food categories
- data generated by New Zealand's Crop and Food Research since 2002 for approximately 190 samples of around 60 different food types.

The NSW Food Authority study was the most comprehensive of the data sets available. Generally, five single samples were analysed for each type of food (e.g. five types of potato crisps). Samples surveyed were collected in Sydney and included not only major staple foods such as breads, milk, eggs, fish and meats, but also a considerable number of foods that were considered likely to contain significant levels of TFA (e.g. deep fried foods, pastry products).

The FSANZ data were primarily collected in Melbourne. Categories of foods analysed included edible oil spreads, hot potato chips from fast food outlets, potato crisps, eggs, bread, some cakes, peanut butter, soup mixes, some dairy foods (milk, butter, dairy blend, some cheeses and yoghurts), fresh fish, pastry, tofu and chicken. Most samples represented a composite sample of between five and ten purchases.

The South Australian Department of Health study was a pilot study of TFA levels in chicken nuggets and hot potato fries from two fast food chains (eight individual samples of each food type).

New Zealand data available to FSANZ were generated from a somewhat narrower range of foods and focused largely on those food groups expected to be significant contributors to TFA intakes (spreads, ruminant foods, fried foods and baked goods likely to contain

hydrogenated fats). Most of the samples analysed were New Zealand manufactured foods.

Key findings from the FSANZ 2007 review were that:²

- TFA are not restricted to foods containing significant proportions of industrially produced oils and fats, or where the fat source is of ruminant origin. Both the NSW and FSANZ data showed that TFA can occur in unprocessed foods such as chicken, fish and eggs, and in low fat foods such as pastas, buns and breads. However, TFA levels in those foods tended to be lower, both on a fat basis and a mass basis, than in those foods generally considered to be sources of TFA.
- Foods containing ruminant fat, including milk, yoghurt, cream and ice cream contained TFAs at mean concentrations of around 2 g/100 g fat. Higher levels were found in Australian butter (5 g/100 g fat) and some cheeses (up to approximately 5 g/100 g fat in cottage cheese). Beef and lamb also contained TFAs at mean concentrations of between 1.4 and 2.5 g/100 g fat.
- Other products more likely to contain industrially produced TFAs included edible oil spreads and oils used for deep frying, which contained mean TFA concentrations of approximately 3 g/100 g fat. Fried foods including hot potato chips and fries generally had mean TFA concentrations ranging from approximately 2 to 6 g/100 g fat. Pizza and fish (fresh and canned) contained TFA at mean concentrations of approximately 2.5g/100 g fat.
- Dietary exposure assessment showed that for Australians, the percent contributions from ruminant, manufactured and mixed sources of TFAs were 60%, 24%, and 16% respectively. Between 8–24% of TFA intake was estimated to come from takeaway foods and between 46–84% of TFA intake was estimated to come from foods with a food label. The contributions of TFAs to energy intakes of Australians and New Zealanders were 0.6% and 0.7% of total energy intake, respectively and therefore below the goal of no more than 1% proposed by the WHO. These estimates were comparable to, or lower than, reported TFA contribution to total energy intake estimates from other countries.
- 5.2 Review report—Trans fatty acids in the New Zealand and Australia food supply (FSANZ 2009)

A follow up to the 2007 review report was prepared by FSANZ in 2009. This review drew on analytical data from the 2008–09 survey conducted under the coordinated food survey plan (CFSP) of the (then) Implementation Sub Committee of the Food Regulation Standing Committee (FRSC) with participation from food regulatory jurisdictions NSW, SA, WA and New Zealand. The survey was managed by the NSW FA.

The analytical survey examined 456 samples of takeaway and processed foods collected from a range of supermarkets and takeaway shops in NSW, SA, WA and New Zealand. Samples were analysed for total fat, SFA, polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA) and TFA concentrations. The range of food categories tested in the survey included takeaway foods, fats and oils, snack foods, meat products, and bakery products.

The results of the survey showed that TFA concentrations in Australian and New Zealand

² The full FSANZ review report is available at:
<http://www.foodstandards.gov.au/science/monitoringnutrients/Pages/Monitoring-of-trans-fatty-acids.aspx>

foods were generally low. Twenty-eight percent of samples did not contain detectable levels of TFA, 40% contained levels below 2 g TFA/100 g of fat, and 32% contained more than 2 g TFA/100 g fat. Many of this latter group of foods were those that contained both ruminant and manufactured TFA, such as meat pies and pizzas.

The key findings from the 2009 FSANZ assessment of intakes of TFAs and SFAs were:³

- Mean TFA intake from both ruminant and manufactured sources was estimated to be 0.5–0.6% of total dietary energy, with more than 90% of Australians and more than 85% of New Zealanders having TFA intakes below 1% of energy. This represented a decrease of approximately 0.1% from the previous 2007 review.
- A much higher proportion, around 90–95% of Australian and 97% of New Zealander consumers exceeded the National Health and Medical Research Council (NHMRC) Acceptable Macronutrient Distribution Range (AMDR) for TFA plus SFA intake as a percentage of energy. Mean TFA plus SFA intake was 1.4–1.6 times the upper end of the range for this guideline value (8–10% of energy).

Progress in voluntary initiatives in Australia to reduce TFAs in the food supply was also noted in the 2009 review:

- The majority of respondents had plans in place to manage TFA levels in their products.
- Several companies reported that no further reductions in TFA levels were possible.
- Companies have implemented a range of activities to reduce TFA levels, including replacement of high TFA oils with new oil blends with very low manufactured TFA levels.
- Several manufacturers have reduced TFAs to minimum levels (e.g. less than 0.5 g/100 g food).

6 Methodology

- 6.1 Sample collection

For this survey, a total of 500 samples of takeaway and processed foods were collected from independent retailers, supermarkets and takeaway shops in NSW, Western Australia (WA), New Zealand, South Australia (SA), Tasmania, Queensland and Victoria, over a two week period in October 2013 (refer to Table 1).

Samples (200 g edible portion, or 200 mL volume) were selected to include different quality products and different prices in each product category, from lower priced private label products to more expensive products. Samples were packaged and sent to the laboratory in a way that avoided leakage or cross contamination between samples. Foods requiring refrigeration (e.g. takeaway) were maintained in a chilled state during storage, packaging and transportation.

The sampling plan attempted to reflect food products and categories sampled in 2008–09 to facilitate a direct comparison of TFA levels where possible. However, some modifications to

³ The full FSANZ 2009 review report is available at:
<http://www.foodstandards.gov.au/science/monitoringnutrients/Pages/Monitoring-of-trans-fatty-acids.aspx>

the 2008–09 sampling plan were made based on previous results to remove foods that contributed only a low amount of total fat to the diet, and to reduce unnecessary duplication of samples. Some foods were also added to the sampling plan where the 2013 FSANZ industry survey or international studies identified that these foods were high in total fat and TFAs.

For instance, some product categories from the 2008–09 survey were removed from sampling in the 2013 survey due to their overall low levels of fat; as these would also have contained low levels of TFAs. These foods included corn cakes, dry instant soup, and gravy mixes. Other categories, for example dumplings, were removed because they largely consisted of similar ingredients to another category of foods and were not as widely consumed in the population. Some product categories were also widened to capture a greater array of the products available on the market today. These product category changes included chicken nuggets to chicken products, sweet and sour pork to restaurant style takeaway dishes, potato crisps to potato crisps and corn chips, blended edible oil to vegetable oils, custard Danish to custard based products, pikelets to pikelets/pancakes, and muffins to sweet muffins and banana bread.

The range of product categories sampled and analysed included:

- Takeaway foods – chicken products, crumbed/battered fish fillets, falafels, fried noodle and restaurant style takeaway dishes, hot chips/potato products, pizza and spring rolls.
- Snack Foods – extruded snacks, popcorn and potato crisps & corn chips.
- Fats and oils – vegetable oils, edible oils spreads and oil based dressings.
- Meat and meat products – meat pies and sausage rolls.
- Bread and bakery products – croissant, custard baked goods, donuts, various sweet and savoury style biscuits, shelf stable cakes, sweet muffins and banana bread, pikelets/pancakes, scones and prepared pastry.
- Others – desserts, toasted style muesli cereal, snack bars, dry mix pasta, sauces, nut based spreads, confectionery and dips.

Table 1 Number of food products sampled across different categories

Product category	Product	No of Samples
Takeaway Foods	Chicken Products	21 (5)
	Crumbed/Battered Fish Fillets	21 (5)
	Fried Noodle Dishes	9 (3)
	Hot Chips/Potato Products	23 (5)
	Pizza	20 (5)
	Restaurant Style Takeaway Dishes	17 (3)
	Spring Rolls	9 (0)
Snack Foods	Extruded Snacks	13 (3)
	Popcorn	11 (5)
	Potato Crisps & Corn Chips	16 (3)
Fats & Oils	Edible Oil Spreads	18 (5)
	Oil Based Dressings	8 (0)
	Vegetable Oil	12 (2)
Meat & Products	Meat Pies	12 (3)
	Sausage Rolls	14 (3)
Bread & Bakery Products	Choc Chip Biscuits	20 (6)
	Chocolate Coated and Chocolate Filled Biscuits	12 (2)
	Cream Biscuits	13 (2)
	Croissant	10 (2)
	Custard Baked Goods	10 (1)
	Desserts	16 (6)
	Donut	14 (1)
	Falafel	9 (0)
	Pikelets/Pancakes	8 (0)
	Prepared Pastry	13 (5)
	Savoury Biscuits - Rice Crackers and Crispbreads	10 (0)
	Savoury Biscuits- Standard	13 (5)
	Scones	8 (0)
	Shelf Stable Cakes - No Cream	12 (2)
	Sweet Biscuits	12 (2)
	Sweet Muffins & Banana Bread	12 (2)
	Shelf Stable Cakes - Cream Filled	8 (0)
Others	Confectionery	13 (3)
	Dips	8 (0)
	Dry Mix Pasta	8 (0)
	Nut Based Spreads	13 (3)
	Sauces	8 (0)
	Snack Bars	15 (5)
	Toasted Style Muesli Cereal	11 (3)
Total		500

() values in parentheses are the number of samples obtained from New Zealand

- 6.2 Method of analysis

Analytical measurements were conducted by the National Measurement Institute (NMI), NSW Forensic Analytical and Science Services and Chem Centre. Analysis of fatty acids from food samples generally involved three steps: extraction of lipids, conversion of the extracted lipids to fatty acid methyl esters (FAME) and analysis of the FAME using gas-liquid chromatography (GC) coupled with flame ionisation detection (FID). Quantification and identification of the individual FAME was achieved by the use of external standards.

The Limits of Reporting (LOR) for each method were:

- 0.1 g/100 g total fat and 0.1% FAME (NMI)
- 0.1 g/100 g total fat and 0.1% FAME (Chem Centre)
- 0.1 g/100 g total fat and 0.05% FAME (NSW Forensic Analytical and Science Services).

To demonstrate the reproducibility of the methods, inter-laboratory analyses were performed on ten different samples (refer to Appendix 2, Table A2.1). Relative percent difference (RPD) values for total fat, MUFAs, PUFAs, SFAs and TFAs were considered acceptable to achieve the objectives of the study.

RPDs were generally higher for TFAs than total fat, MUFAs, PUFAs and SFAs, which reflects the lower absolute levels of TFAs in food samples, and results in exaggerated differences when expressed as a percentage. In absolute terms, the concentrations of TFAs measured by the three laboratories were generally comparable (refer to Appendix 2, Figure A2.1).

The main advantage of GC-FID compared to other techniques, is that it has been well validated and allows the simultaneous analysis of the overall fatty acid composition, i.e. TFAs, SFAs, MUFAs and PUFAs. A limitation of this analytical technique is that due to the large number of different fatty acids in the analysed materials, some isomers will be expected to co-elute. A complete determination and identification of TFAs can only be achieved by a combination of different chromatographic methods such as silver ion chromatography, or mass spectrometry coupled to GC.

It should also be recognised that current techniques cannot reliably distinguish between naturally occurring TFAs in ruminant products from those originating from partial hydrogenation of fats and oils (EFSA 2004). That is, the analytical techniques do not provide information on the source of the TFAs in the food, or whether it has ruminant or manufactured origins. Naturally occurring TFAs are referred to as 'ruminant TFAs' in this assessment although small amounts of TFAs may be present in other unprocessed foods, such as poultry meat. Manufactured TFAs can occur in foods from the addition of oils to mixed foods, for example the addition of baking shortenings to pastries, cakes and biscuits, or from frying media for fried foods such as potato chips.

- 6.3 Statistical analyses

Median and mean concentrations of TFAs in different product categories for the 2008–09 and 2013 surveys were compared using the Student's T-test, following tests for normality and equality of variances. In cases where data from one of the distributions were not normally distributed, the Mann-Whitney test was used. Statistical data were supplemented by using graphical displays (side by side Box-and-Whisker plots) to facilitate comparison between the 2008/09 survey and 2013 results.

7 Analytical results

Median concentrations of total fat, SFAs, MUFAs, PUFAs and TFAs for the 39 product categories (n = 8 - 21) analysed are shown in Table 2.

Key findings included:

- TFAs were detected in 36 of the 39 product categories analysed:
 - The highest median concentrations of TFAs were found in edible oil spreads (0.65 g/100 g food), vegetable oils (0.71 g/100 g food), croissants (1.02 g/100 g food), custard baked goods (0.58 g/100 g food) and prepared pastry (0.96 g/100 g food).
 - Median concentrations of TFAs in other product categories were less than 0.6 g/100 g food.
 - TFAs were not detected in pikelets/pancakes, snack bars or toasted style muesli.

It should be noted that these results do not distinguish between ruminant and manufactured TFAs.

- SFAs were detected in all foods analysed at markedly higher concentrations than TFAs:
 - The highest median concentrations of SFAs were found in popcorn (11.1 g/100 g food), edible oil spreads (15.7 g/100 g food), vegetable oils (14.5 g/100 g food), chocolate chip biscuits (13.0 g/100 g food), chocolate coated and chocolate filled biscuits (13.8 g/100 g food), cream biscuits (13.2 g/100 g food), croissant (15.6 g/100 g food), prepared pastry (10.8 g/100 g food), potato crisps and corn chips (10 g/100 g food) and confectionery (19.0 g/100 g food).
 - In all other product categories analysed, median SFA concentrations were less than 10 g/100 g of food.
- Median concentrations for MUFAs and PUFAs were highest in fats and oils, which comprised edible oil spreads, oil based dressings and vegetable oils.
 - MUFA concentrations were also above 10 g/100 g in nut-based spreads and potato crisps and corn chips.
 - All other product categories had median MUFA and PUFA concentrations of less than 10 g/100 g.

Individual results for each product are shown in Appendix 3.

Table 2 Median concentrations of total fat, SFA, MUFA, PUFA, and TFA for analysed product categories expressed in g/100 g food

Product type	Product Category	No. of samples	Total Fat	SFA	MUFA	PUFA	TFA
Takeaway Foods	Chicken Nuggets/Products	21	17.3	3.8	7.0	3.5	0.23
	Crumbed/Battered Fish Fillets	21	10.7	2.0	5.3	2.5	0.21
	Falafel	9	13.1	1.8	4.6	4.9	0.12
	Fried Noodle Dishes	9	5.6	1.0	2.2	1.5	0.02
	Hot Chips/Potato Products	23	8.5	1.0	5.3	1.8	0.10
	Pizza	20	8.3	3.5	2.9	1.3	0.14
	Restaurant Style Takeaway Dishes	17	7.9	3.2	2.8	1.6	0.14
	Spring Rolls	9	10.4	2.3	4.9	2.3	0.21
Snack Foods	Extruded Snacks	13	25.5	9.3	8.7	2.1	0.19
	Popcorn	11	26.1	11.1	7.7	3.0	0.20
	Potato Crisps & Corn Chips	16	25.6	10.0	14.2	3.0	0.20
Fats & Oils	Edible Oil Spreads	18	64.3	15.7	26.3	13.9	0.65
	Oil Based Dressings	8	26.6	2.7	8.7	12.1	0.30
	Vegetable Oils	12	100.0	14.5	59.3	27.7	0.71
Meat Products	Meat Pies	12	11.8	6.0	4.1	0.6	0.42
	Sausage Rolls	14	14.1	7.1	4.3	1.0	0.62
Bakery Products	Choc Chip Biscuits	19	22.3	13.0	6.5	1.3	0.30
	Chocolate Coated and Chocolate Filled Biscuits	12	24.8	13.8	8.3	1.9	0.21
	Cream Biscuits	13	22.6	13.2	7.5	2.1	0.25
	Croissant	10	23.1	15.6	4.6	0.9	1.02
	Custard Baked Goods	10	12.6	7.4	3.8	0.8	0.58
	Desserts	16	13.2	7.3	5.6	1.2	0.38
	Donut	14	19.8	8.2	7.6	2.1	0.39
	Pikelets/Pancakes	8	2.7	0.6	1.0	0.9	<LOR
	Prepared Pastry	13	18.1	10.8	5.6	0.8	0.96
	Savoury Biscuits - Rice Crackers and Crispbreads	10	10.0	1.7	5.1	1.7	0.04
	Savoury Biscuits- Standard	13	17.7	5.0	8.1	2.5	0.20
	Scones	8	8.8	3.7	3.0	1.3	0.10
	Shelf Stable Cakes - Cream Filled	8	18.9	6.8	6.6	2.0	0.09
	Shelf Stable Cakes - No Cream	12	11.0	4.1	4.0	1.8	0.17
	Sweet Biscuits	12	15.1	8.1	5.7	1.7	0.10
	Sweet Muffins & Banana Bread	13	16.0	1.7	8.4	3.3	0.20
Others	Confectionery	13	29.9	19.0	9.3	0.9	0.12
	Dips	8	19.9	2.3	9.7	5.1	0.21
	Dry Mix Pasta	8	4.5	2.6	0.7	0.9	0.06
	Nut Based Spreads	13	45.1	8.0	19.0	5.8	0.13
	Sauces	8	5.5	1.7	1.7	0.6	0.02
	Snack Bars	15	14.6	7.5	4.6	2.3	<LOR
	Toasted Style Muesli Cereal	11	15.7	2.8	7.1	4.1	<LOR

8 Comparison of TFA concentrations with previous surveys

- 8.1 Change in TFA concentrations in selected product categories from 2008–09 to 2013

To establish whether there has been a measurable change in TFA concentrations in comparable product categories from 2008–09 (refer to Section 5.2) to 2013 in Australia and New Zealand, TFA concentrations from the two analytical surveys were compared in side-by-side Box-and-Whisker plots (refer to Figures 1–3). Inspection of the plots shows that median values were broadly similar for the two surveys across the analysed product categories. This conclusion was supported by statistical analyses of the data which showed that there were no significant (i.e. $p < 0.01$) differences between the product categories with the exception of chicken nuggets.

The key results are summarised below:

- Slight, but non-significant ($p > 0.01$) decreases in median TFA values were observed for 10 product categories including: pizza, vegetable oils, meat pies, sausage rolls, cream biscuits, custard baked goods, donut, prepared pastry, shelf stable cakes and dry mix pasta.
- Slight increases in TFA median concentrations were observed for 15 product categories including: chicken nuggets/products, crumbed/battered fish fillets, falafel, restaurant style takeaway dishes, spring rolls, extruded snacks, popcorn, potato crisps and corn chips, edible oil spreads, oil based dressings, chocolate biscuits, croissant, savoury biscuits, sweet muffins and banana bread and nut based spreads. The increases were statistically significant ($p < 0.01$) for only one product category - chicken nuggets/products. However this increase was small in absolute terms, from 0.1 g/100 g food in 2008–09 to 0.2 g/100 g food in 2013. This product category was widened slightly to include other chicken products in the current survey which may have contributed to this result.
- For the remaining six products there was no difference in median values across the surveys with no statistically significant change observed ($p > 0.01$).

Median concentrations of TFAs in selected product categories for 2008–09 and 2013 are also tabulated in Appendix 4.

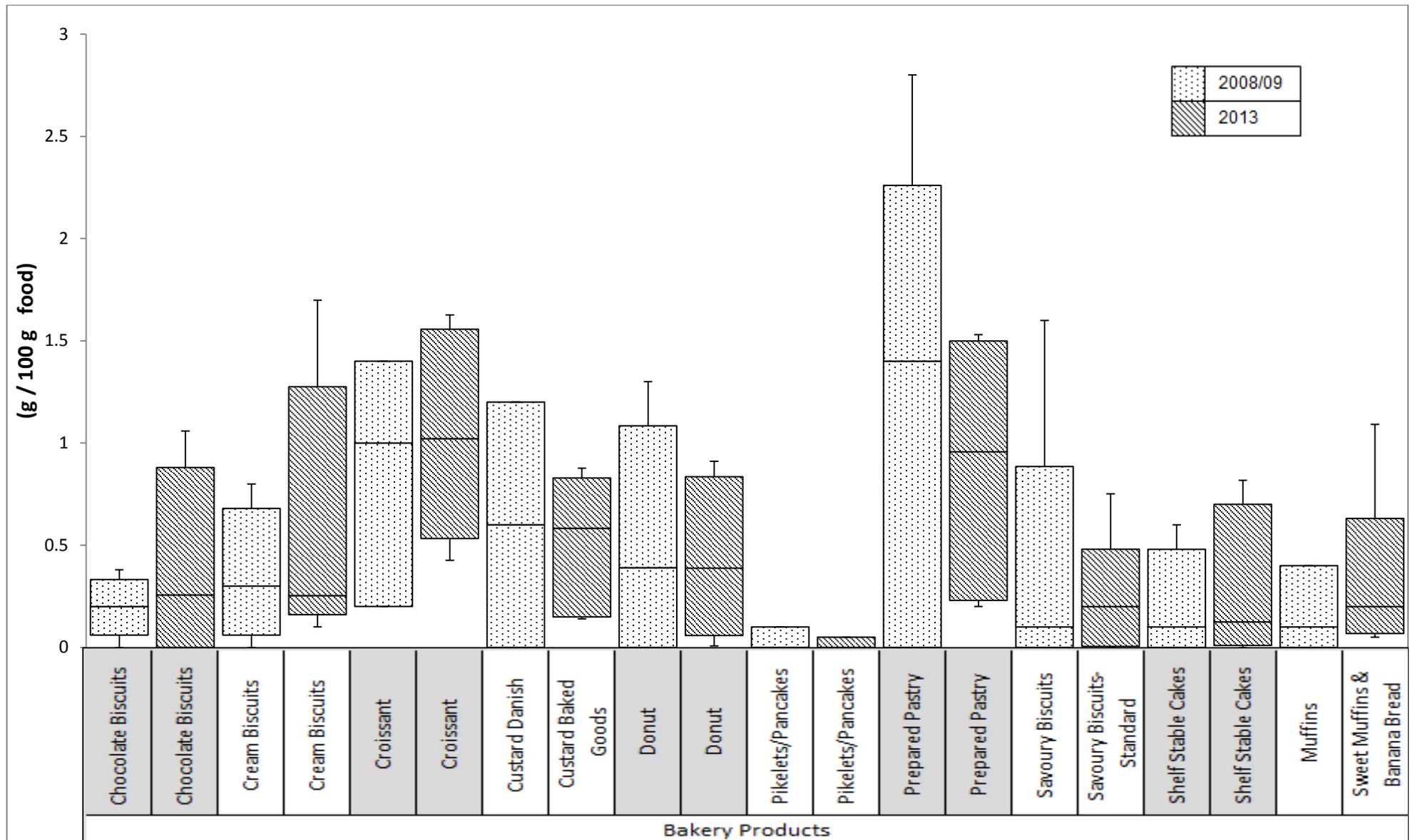


Figure 1 Box-and-Whisker plots showing medians, and 5th and 95th percentiles for TFA concentrations in analysed product categories from the 2008–09 and 2013 surveys. The lines in the middle of the boxes denote the median values, and the upper and lower boundaries of the boxes show the 5th and 95th percentiles, respectively. The whiskers extend to both the maximum and minimum values.

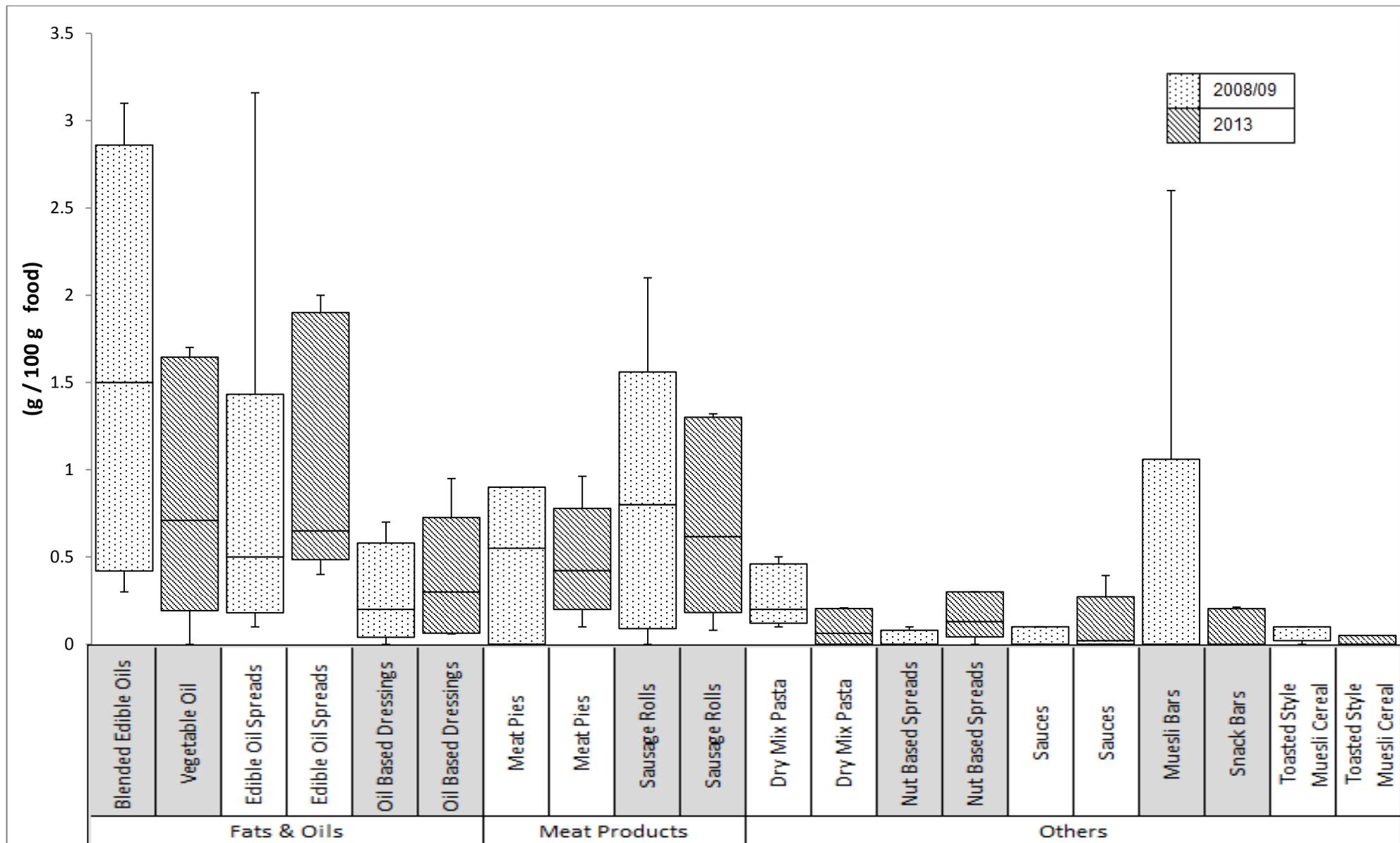


Figure 2 Box-and-Whisker plots showing medians and 5th and 95th percentiles for TFA concentrations in analysed product categories from the 2008–09 and 2013 surveys. The lines in the middle of the boxes denote the median values, and the upper and lower boundaries of the boxes show the 5th and 95th percentiles, respectively. The whiskers extend to both the maximum and minimum values.

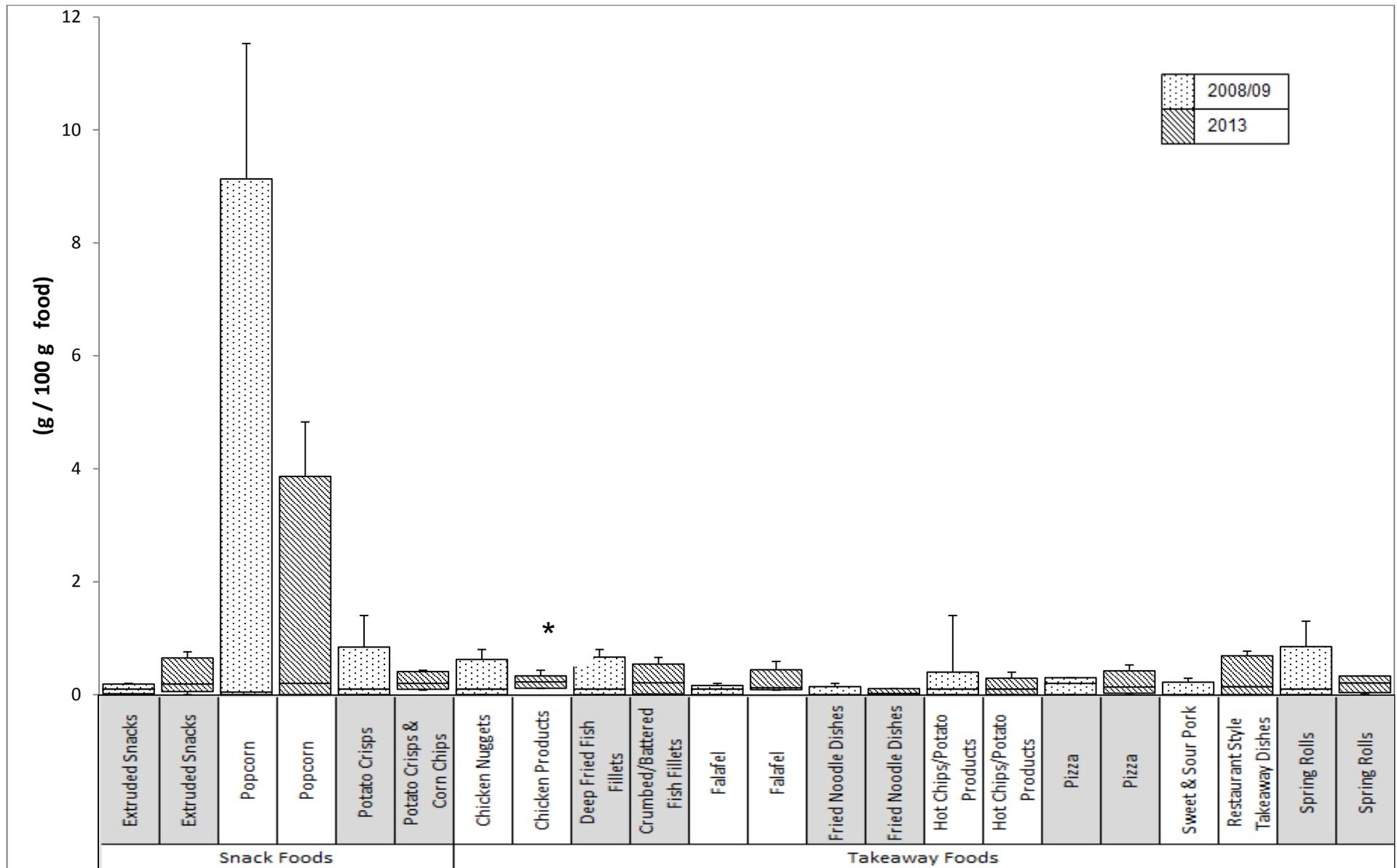


Figure 3 Box-and-Whisker plots showing medians and 5th and 95th percentiles for TFA concentrations in analysed product categories from the 2008–09 and 2013 surveys. The lines in the middle of the boxes denote the median values, and the upper and lower boundaries of the boxes show the 5th and 95th percentiles, respectively. The whiskers extend to both the maximum and minimum values.* Denotes significantly different from 2008–09 value.

- 8.2 Change in total TFA concentrations for selected food products from 2008–09 to 2013

A total of 51 products of the same brand were tested in the 2008–09 analytical survey and the current survey. The concentrations of TFAs in these products and the change in TFA concentration expressed in g/100 g foods, and as a percentage of 2008/09 levels, are shown in Table 3. These were generally individual samples, except where indicated.

The key findings can be summarised as:

- TFA concentrations were at least 0.1 g/100 g lower than 2008–09 concentrations in 18 of the 51 products in the current survey.
- No change was observed for a further 14 products (defined as a change of less than or equal to 0.1 g/100 g food).
- The remaining 19 products showed an increase in TFA concentrations of greater than 0.1 g/100 g from the 2008–09 survey. The magnitude of the increases for all products was small however, amounting to a maximum of 0.4 g /100 g food for an edible oil spread product.

The pattern of changes, which shows slight decreases in TFA concentrations in some products and an increase in TFA concentrations in others, is consistent with the previous results for analysed product categories (e.g. meat pies, chicken nuggets/products).

It should be noted that a number of the products in Table 3 (e.g. meat pies, sausage rolls, pizza, prepared pastry) may contain significant proportions of ruminant TFAs, which cannot be reduced by improved manufacturing processes. Equally TFAs from manufacturing processes, such as hardened fats in pastry making may contribute to the total TFA content of these products. The source of the TFAs has not been assessed as a part of this study.

Overall, the results show no clear trend to suggest that TFA concentrations have changed markedly from 2008–09 to 2013 across individual products of the same brand.

Table 3 Change in TFA concentrations for 51 products tested in both the 2008–09 and 2013 surveys

Food ID	TFA 2008–09 (g/100 g food)	TFA 2013 (g/100 g food)	Change in TFA concentration (g/100 g food)	Total fat difference ^a (g/100 g food)
Chicken Nuggets/Potato Products a)	0.05*	0.19	0.14	0.50
Chicken Nuggets/Potato Products b)	0.07*	0.27*	0.19	4.84
Hot Chips/Potato Products a)	0.10*	0.21	0.11	-0.25
Hot Chips/Potato Products b)	0.06*	0.2	0.14	-2.44
Hot Chips/Potato Products c)	<LOR	0.2	0.20	-3.10
Pizza a)	0.23	0.23	-0.05	0.08
Pizza b)	0.2*	0.02	-0.18	-1.56
Spring Rolls	<LOR	0.07	0.07	2.99
Popcorn a)	0.09	0.20	0.11	-1.64
Popcorn b)	<LOR	<LOR	0	-1.86
Potato Crisps & Corn Chips	0.10	0.08	-0.02	-5.57

Food ID	TFA 2008–09 (g/100 g food)	TFA 2013 (g/100 g food)	Change in TFA concentration (g/100 g food)	Total fat difference ^{&} (g/100 g food)
Edible Oil Spreads a)	1.00	0.57	-0.43	1.50
Edible Oil Spreads b)	0.30	0.50	0.20	-5.00
Edible Oil Spreads c)	0.45*	0.80	0.35	-9.75
Edible Oil Spreads d)	3.16	1.88	-1.28	-9.35
Edible Oil Spreads e)	0.67*	0.70*	0.03	1.29
Edible Oil Spreads f)	0.20	0.60	0.40	-1.10
Edible Oil Spreads g)	0.30*	0.40	0.10	-4.10
Edible Oil Spreads h)	0.31*	0.60	0.29	-0.58
Vegetable Oil a)	1.90	1.40	-0.50	0.00
Vegetable Oil b)	0.30	0.48	0.18	0.00
Meat Pie a)	0.20	0.42	0.22	1.30
Meat Pie b)	0.81	0.42	-0.39	-1.59
Sausage Rolls a)	0.70	0.59	-0.11	-0.80
Sausage Rolls b)	1.50	0.72	-0.78	2.20
Choc Chip Cookie	0.15	0.20	0.05	-0.50
Chocolate Coated & Chocolate Filled Biscuits a)	0.30	0.34	0.04	2.51
Chocolate Coated & Chocolate Filled Biscuits b)	0.25*	0.33	0.08	-1.16
Chocolate Coated & Chocolate Filled Biscuits c)	<LOR	0.14	0.14	1.84
Custard Baked Goods	0.30*	0.17	-0.13	-0.55
Cream Biscuits	0.20	0.25	0.05	4.54
Donut a)	0.70	0.11	-0.59	7.87
Donut b)	0.67*	0.33	-0.34	-3.70
Pikelet/Pancakes	<LOR	0.05	0.05	0.34
Prepared Pastry a)	1.04	0.96	-0.08	0.37
Prepared Pastry b)	0.90	0.53	-0.37	0.17
Prepared Pastry c)	0.02	0.2	0.18	3.30
Prepared Pastry d)	2.80	1.32	-1.48	-10.06
Prepared Pastry e)	1.40	0.72	-0.68	1.30
Prepared Pastry f)	2.20	1.18*	-1.02	-3.32
Prepared Pastry g)	1.60	1.48	-0.12	0.14
Prepared Pastry h)	1.31	0.43	-0.88	-2.30
Savoury Biscuits- Standard	0.05*	0.10	0.05	-3.70
Sweet Muffins & Banana Breads a)	0.20	0.20	0.00	0.60
Sweet Muffins & Banana Breads b)	0.05*	0.32	0.27	1.45
Dry Mix Pasta a)	0.30	0.11	-0.19	-1.55
Dry Mix Pasta b)	0.50	0.21	-0.29	-6.10
Nut Based Spreads a)	<LOR	0.1	0.10	0.90
Nut Based Spreads b)	0.10	0.13	0.03	-5.67
Nut Based Spreads c)	<LOR	0.2	0.20	-6.00
Nut Based Spreads d)	<LOR	0.3	0.30	-4.30

* More than one product of the same brand sampled and analysed. The mean value is shown.

& Total difference in fat is shown because this change will impact on the TFA concentration in the food. LOR has been assumed to be 0 for the purpose of this comparison.

a)-h) represents where more than one product in each product category were sampled in the 2008-09 and 2013 surveys.

- 8.3 Comparison of TFA concentrations in selected product categories with pre-2008–09 levels

FSANZ also reviewed the concentrations of TFAs in the New Zealand and Australian food supply in 2007. Analytical data were derived from laboratory analyses carried out by the NSW Food Authority in 2005, SA Health in 2006 and by FSANZ between 2001 and 2006. For New Zealand, data were used from laboratory analyses conducted by ESR in 2006 and Crop and Food Research from 2002. Key findings of the 2007 report were described in Section 5.1.

To help compare the 2013 survey with pre-2008–09 levels, the median concentrations from the current survey, the 2008–09 survey, and the 2005–2007 survey are plotted together for the nineteen comparable product categories in Figure 4. A qualitative comparison of the median TFA concentrations from 2013 survey data to the 2005–2007 data indicates that:

- Median TFA concentrations are lower in eight of the 19 food products (chicken nuggets/products, hot chips/potato products, pizza, potato crisps and corn chips, sausage rolls, cream biscuits, prepared pastry, and shelf stable cakes).
- Median TFA concentrations are greater in seven of the 19 food products (extruded snacks, edible oil spreads, oil based dressings, chocolate biscuits, croissant, custard baked goods, and donut).
- Median TFA concentrations were comparable in the remaining four products (crumbed/battered fish fillets, meat pies, savoury biscuits, and snack bars).

These findings are generally consistent with conclusions made in the 2008–09 survey report which did not identify a clear trend in changes of TFA concentrations from 2008–09 to 2005–2007. The key conclusions in the 2008–09 analytical survey report when compared with the 2005–2007 survey were:

- Eight of the 19 food products (chicken nuggets, deep fried fish fillets, hot chips, potato crisps, sausage rolls, cream filled biscuits, savoury biscuits and shelf stable cakes) showed a reduction in the median TFA content.
- Three products (pizza, oil based dressings and muesli bars) remained similar.
- Eight food products (extruded snacks, edible oil spreads, meat pies, chocolate biscuits, croissants, custard Danish, donut and prepared pastries) showed an increase in the median TFA value.

A comparison of TFA concentrations in Australian and New Zealand foods with other published domestic and international surveys is also shown in Appendix 5.

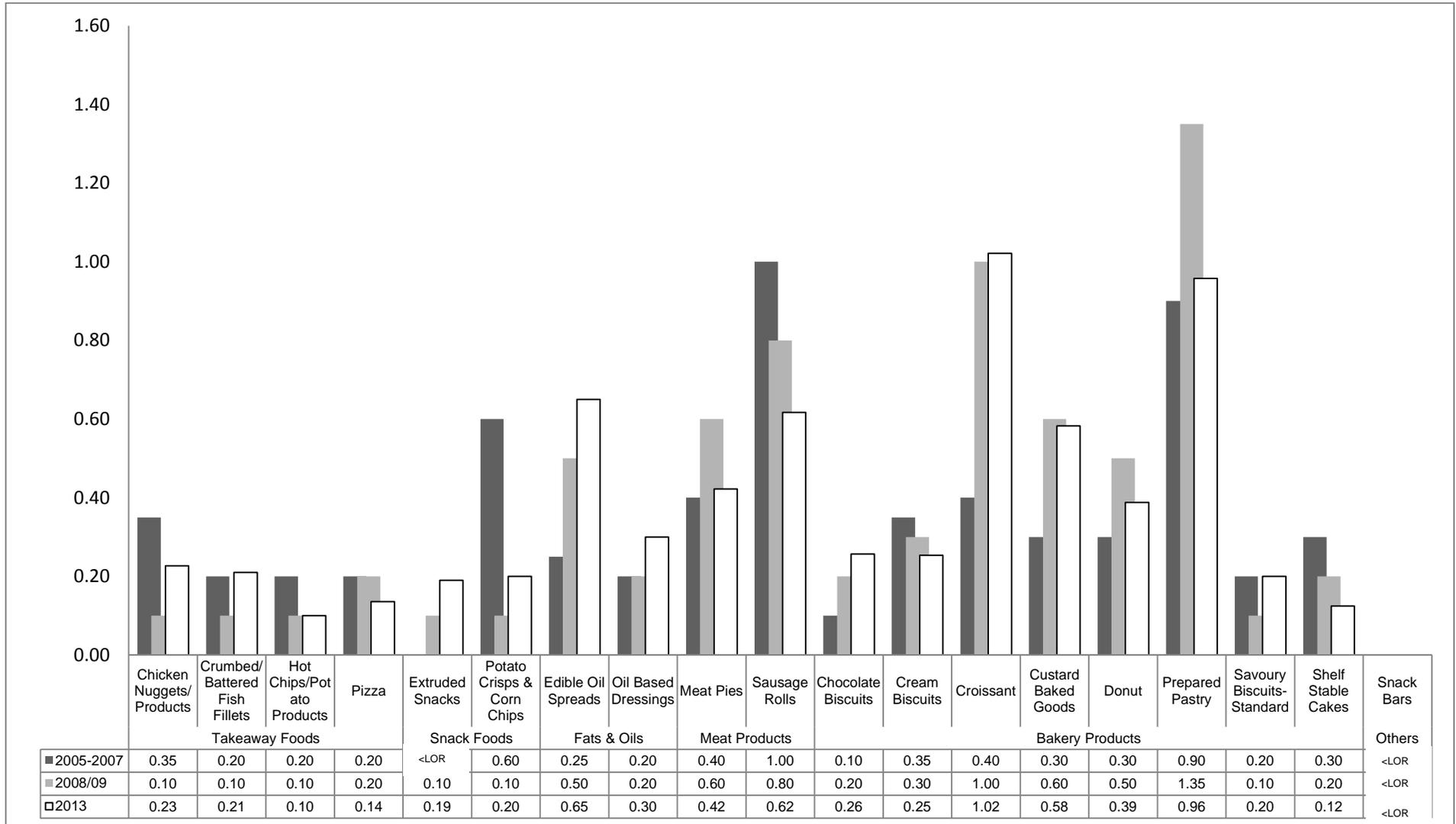


Figure 4 Median concentrations of TFA measured in 19 product categories in the 2005-2007, 2008/09 and 2013 surveys.

9 Comparison to the Danish maximum level of TFAs

In June 2003, Denmark implemented a maximum level on the content of industrially produced TFAs in processed foods. Under this legislation the content of TFAs in oils, fats and food products can't exceed 2 grams per 100 grams of oil or fat. The maximum level applies only to industrially produced TFA and not to the naturally occurring TFA's found in meat and milk from certain animals (Danish Veterinary and Food Administration 2014).

A comparison of the results for the 500 products sampled as a part of this survey with the Danish maximum level showed that TFA concentrations were below 2 g/100 g fat in approximately 74% of products (refer to Figure 5). A total of 127 products contained TFAs at concentrations of greater than 2 g/100 g fat. However, this group included products that are expected to contain both manufactured and naturally occurring TFAs (refer to Table 4).

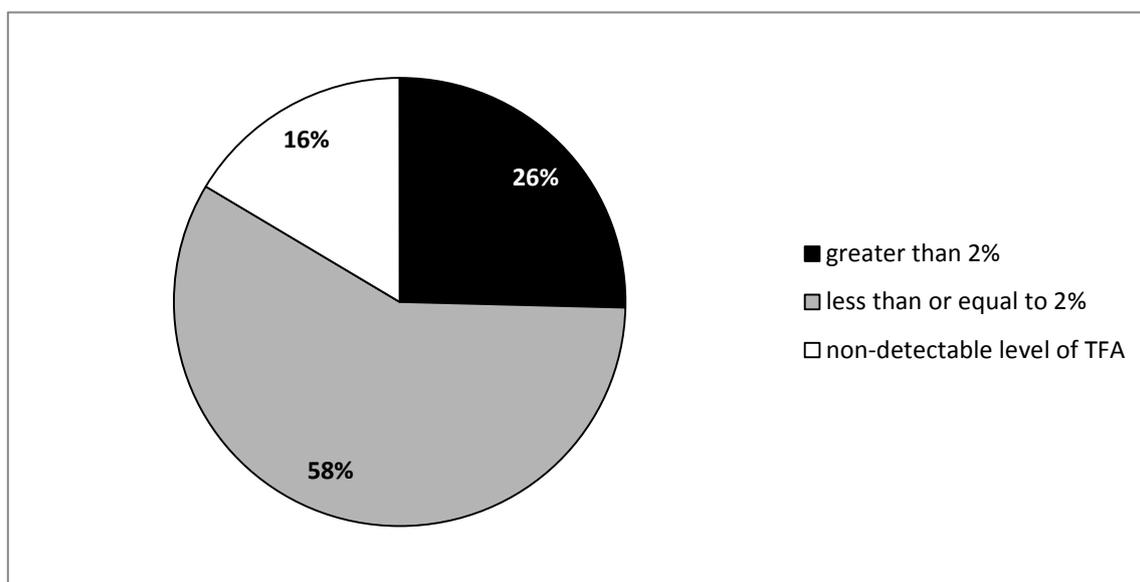


Figure 5 Proportion of samples containing greater than 2% (2 g/100 g fat) TFAs; less than or equal to 2% TFAs of total fat; or non-detectable concentrations of TFA

To help compare the results with the previous 2008–09 survey, food products that may contain considerable proportions of ruminant TFA, including pizza, meat pies, sausage rolls, croissants, desserts and custard baked goods were excluded from the analysis. When these products were omitted, the percentage of products with TFA concentrations less than or equal to 2 g/100 g fat is approximately 86%. This is comparable to the 2008–09 NSW analytical survey which found that more than 82% of the samples surveyed had TFA levels less than or equal to 2% fat (NSW FA 2009).

It is noted that this estimation is made on the assumption that these product categories may contain a significant proportion of ruminant TFA, and that the analytical method cannot distinguish between naturally occurring and manufactured TFAs. The approach is consistent with the 2008-09 methodology which excluded these product categories on the basis that they are likely to contain ruminant TFAs in ingredients including meat, cheese and milk. An analysis of the ingredient labels was not carried out, because this information was not available for all samples within the omitted product categories.

Table 4 Number of individual samples containing TFAs at concentrations exceeding 2 g/100 g of oil or fat

Food ID	No. of samples above 2 g/100 g of fat
Falafel	1 (9)
Chicken Products	1 (21)
Sweet Muffins & Banana Bread	1 (13)
Sauces	1 (8)
Extruded Snacks	1 (13)
Savoury Biscuits- Standard	1 (13)
Hot Chips/Potato Products	2 (23)
Spring Rolls	2 (9)
Popcorn	3 (11)
Dips	3 (8)
Cream Biscuits	3 (13)
Scones	3 (8)
Edible Oil Spreads	3 (18)
Dry Mix Pasta	4 (8)
Shelf Stable Cakes - No Cream	4 (12)
Crumbed/Battered Fish Fillets	5 (21)
Restaurant Style Takeaway Dishes	5 (17)
Donut	6 (14)
Custard Baked Goods	7 (10)
Chocolate Chip Biscuits	8 (19)
Pizza	9 (20)
Desserts	10 (16)
Croissant	10 (10)
Prepared Pastry	11 (13)
Meat Pies	11 (12)
Sausage Rolls	12 (14)
Total	127

() values in parentheses represent total number of products tested in that product category

10 Saturated fatty acids

One strategy to reduce manufactured TFA concentrations in foods that could be used by food manufacturers would be to replace fats and oils high in TFAs with vegetable fats that are high in SFAs. As SFA intakes in Australia and New Zealand are already higher than recommended, this would not be desirable.

In the current survey, SFAs were detected in all product categories analysed. The highest median concentrations of SFAs were found in popcorn (11.1 g/100 g food), edible oil spreads (15.7 g/100 g food), vegetable oils (14.5 g/100 g food), choc chip biscuits (13.0 g/100 g food), chocolate coated and chocolate filled biscuits (13.8 g/100 g food), cream biscuits (13.2 g/100 g food), croissant (15.6 g/100 g food), prepared pastry (10.8 g/100 g food), potato crisps and corn chips (10 g/100 g food) and confectionery (19.0 g/100 g food).

The 2013 median SFA concentrations are compared to the median SFA concentrations from 2008–09 in Box-and-Whisker plots (Figures 6, 7, 8). Overall, the data indicate that the median SFA concentrations are similar between the two surveys and do not suggest that there has been an increase in SFA concentrations in the analysed product categories between 2008–09 and 2013.

This result is generally consistent with the FSANZ 2009 review that assessed whether any changes to industry practices aimed at reducing manufactured TFA intake, have led to an

increased SFA intake. The review which analysed SFA dietary intakes for Australians pre and post-2007, found that SFA intake had remained largely constant at 30–32 g/day for 2–16 year olds and 29 g/day for those aged 17 years and above. This indicated that any reformulation that may have occurred to reduce TFA levels had not led to significant changes in SFA intake.

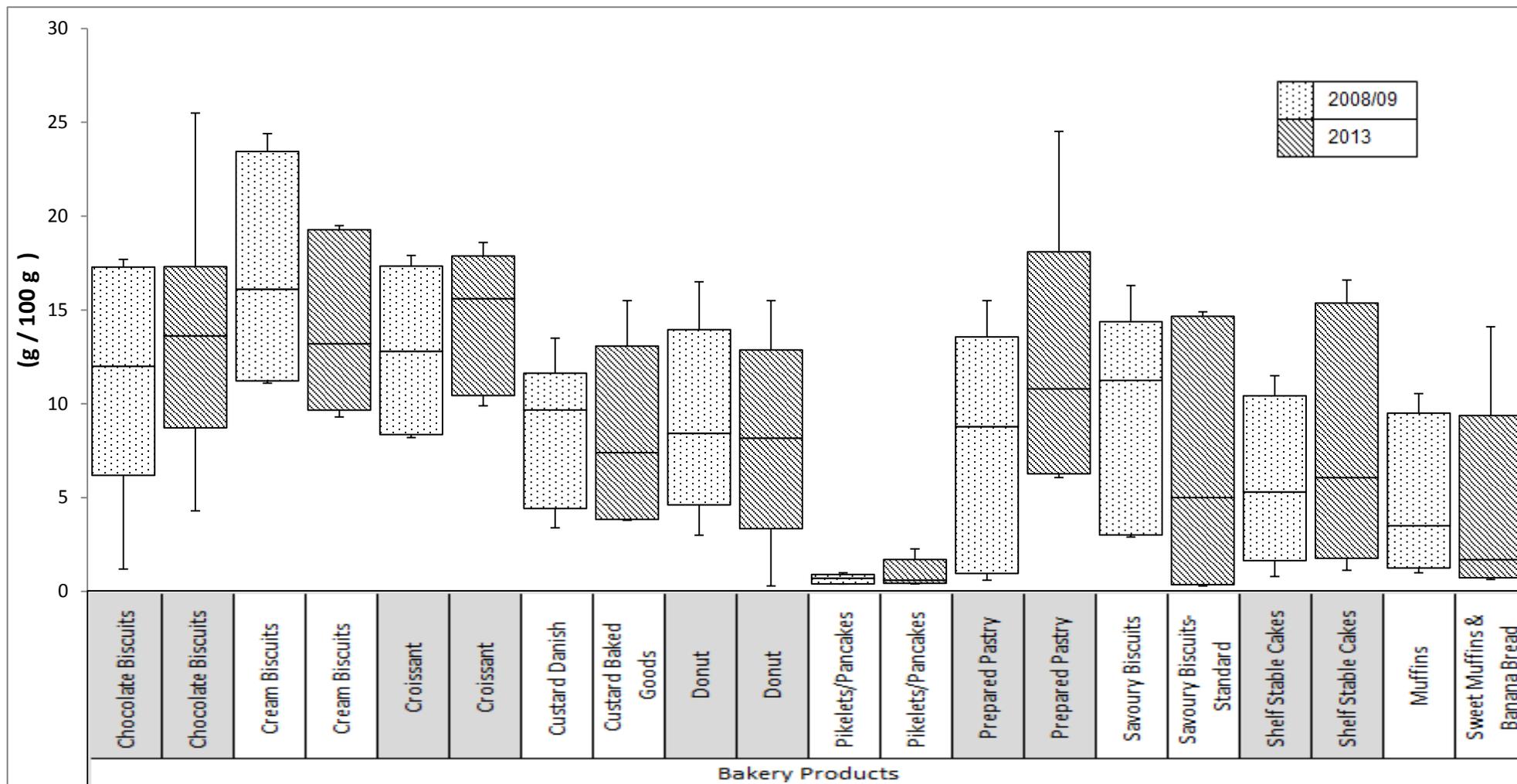


Figure 6 Box-and-Whisker plots showing medians, and 5th and 95th percentiles for SFA concentrations in analysed product categories from the 2008–09 and 2013 survey. The lines in the middle of the boxes denote the median values, and the upper and lower boundaries of the boxes show the 5th and 95th percentiles, respectively. The whiskers extend to both the maximum and minimum values.

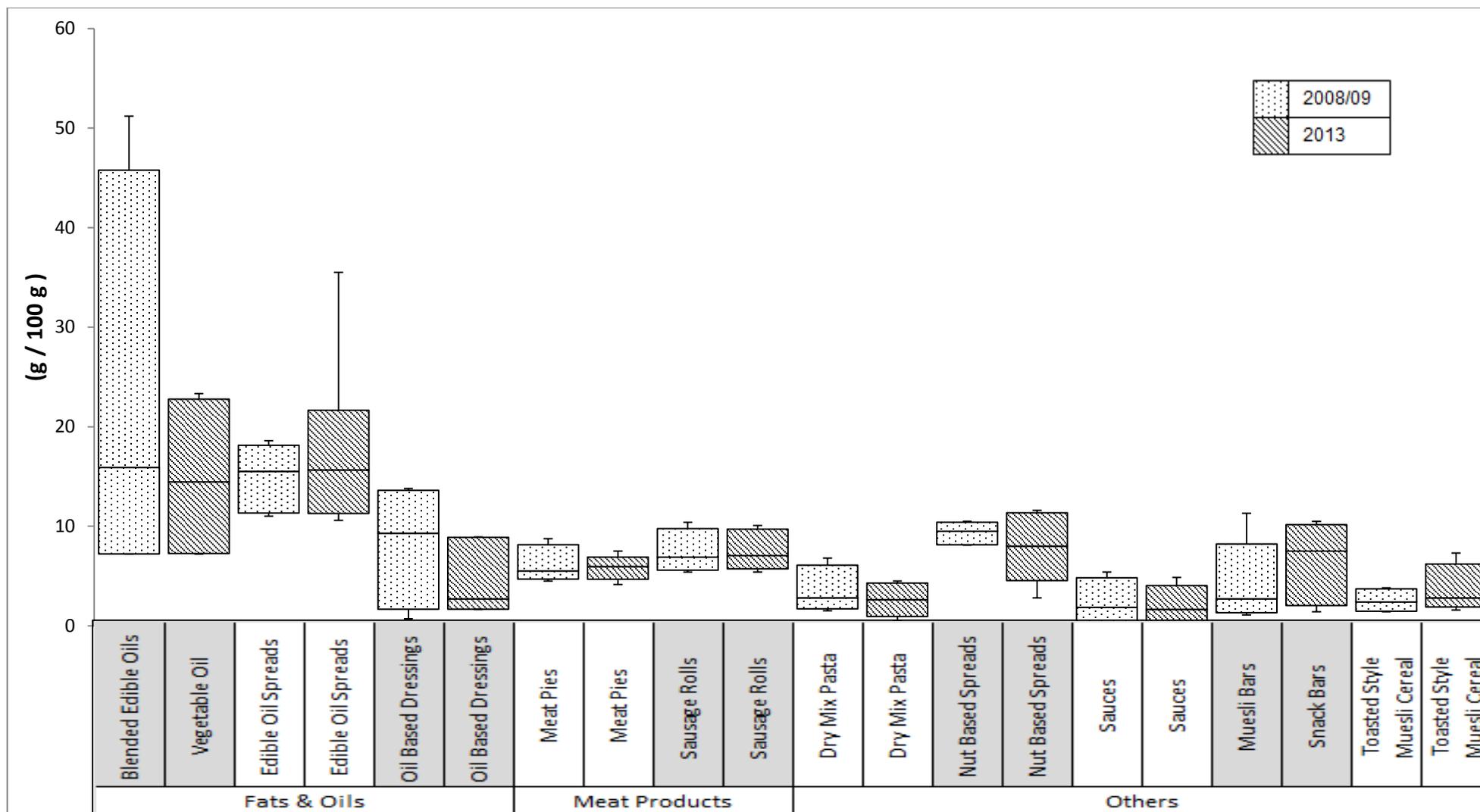


Figure 7 Box-and-Whisker plots showing median, and 5th and 95th percentiles for SFA concentrations in analysed product categories from the 2008–09 and 2013 survey. The lines in the middle of the boxes denote the median values, and the upper and lower boundaries of the boxes show the 5th and 95th percentiles, respectively. The whiskers extend to both the maximum and minimum values.

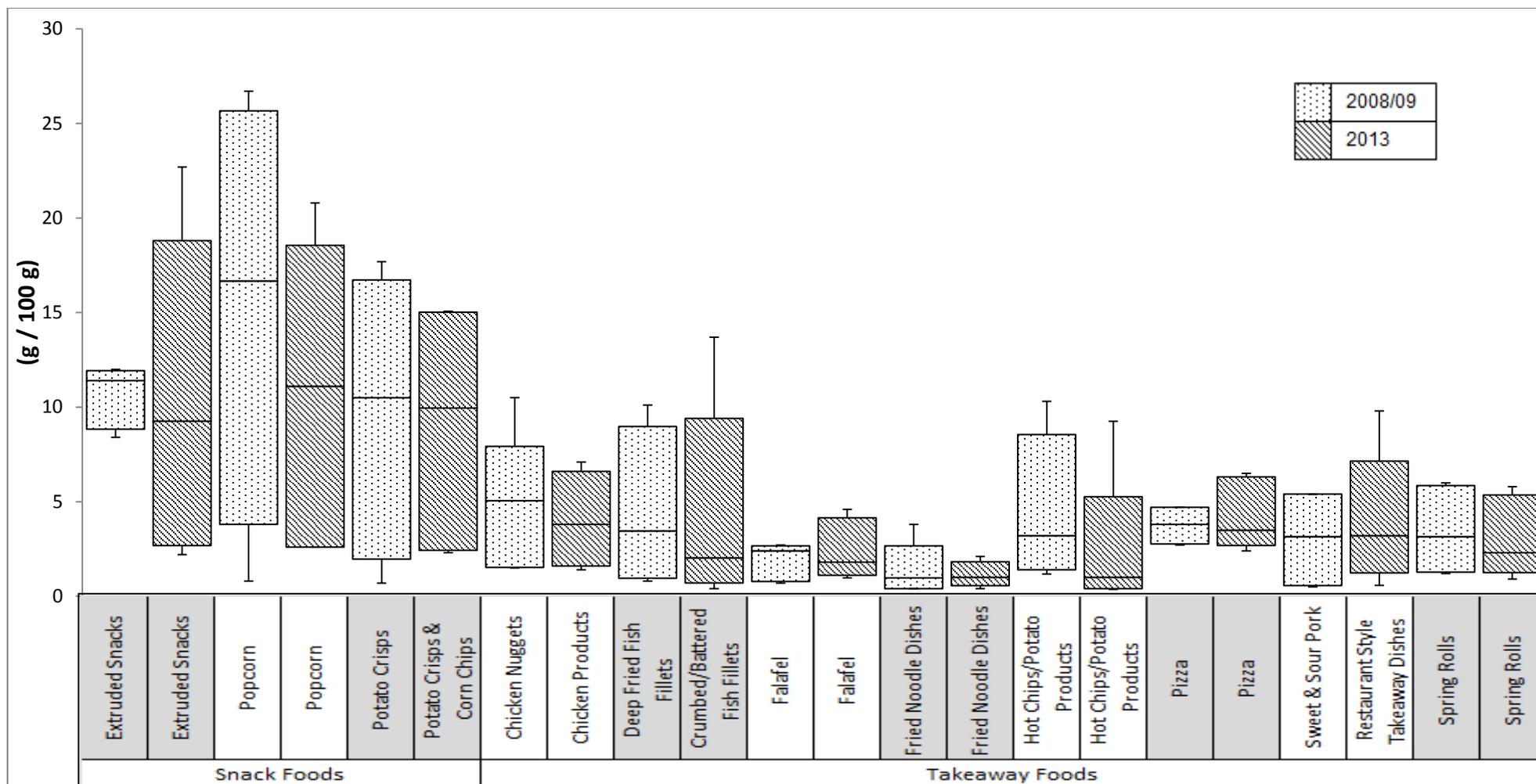


Figure 8 Box-and-Whisker plots showing median, 5th and 95th percentiles for SFA concentrations in analysed product categories from the 2008–09 and 2013 survey. The lines in the middle of the boxes denote the median values, and the upper and lower boundaries of the boxes show the 5th and 95th percentiles, respectively. The whiskers extend to both the maximum and minimum values.

11 Considerations relevant to the need for an updated estimated dietary intake assessment

Mean TFA intake from both ruminant and manufactured sources in the FSANZ 2009 review was estimated to be 0.5-0.6% of dietary energy, with more than 90% of Australians and more than 85% of New Zealanders having TFA intakes below 1% of dietary energy. These figures indicated that Australia and New Zealand continue to meet the WHO population goal for TFA intake.

The 2013 survey results indicate that median TFA concentrations were generally similar across the analysed product categories, with some products showing slight decreases in median values and others showing slight increases. Statistically significant increases in median TFA concentrations were observed only for one product category, chicken nuggets/products. This product category was not identified in the FSANZ 2009 review as a major contributor to dietary TFA intake. Similarly, chicken nuggets/products were not identified as contributing disproportionately to TFA dietary intake in high consumers in Australia or New Zealand in 2009.

As the analytical results did not show a change in TFA concentrations in Australia or New Zealand, revised dietary exposure modelling using the available nutrition surveys⁴ was not conducted.

On 9 May 2014, the summary results of the 2011–12 National Nutrition and Physical Activity Survey (NNPAS) component of the Australian Health Survey were released. These included new estimates of TFA and energy intake and were based on up to date food consumption data and the TFA concentration data available to FSANZ in 2009. The NNPAS results show that TFA intake remains low and below the WHO recommendation, with the mean intake of all Australians 2 years and above estimated to be 1.4 g/day, representing 0.6% of dietary energy.

In the 2011–12 NNPAS, the dairy and meat food groups, together with butters and dairy blends, contributed more than half the total TFA intake, showing that ruminant TFAs continue to be the major source of TFA in the Australian diet. This estimate is based on an analysis of food groups that differs from the analysis undertaken in the FSANZ 2009 survey (60-75% of TFAs came from ruminant TFAs) and therefore the two estimates are not directly comparable.

The most recent national nutrition survey for New Zealand adults, the 2008–09 Adult Nutrition Survey, also found continuing high intakes of SFAs. The mean contribution of SFAs to daily energy intake was 13.1% for both males and females aged 15 years and above (University of Otago & Ministry of Health 2011). TFA intakes were not determined.

12 Uncertainty

There are a number of sources of uncertainty in the analytical data used in this assessment:

- The analytical techniques used in this survey did not distinguish between the sources of the TFAs in a food; and therefore total TFA concentrations for all samples takes into

⁴ In 2009, the dietary intake of TFAs was estimated using the Australian 1995 (for 2-16 years and 17 years & above groups) and 2007 (for 2-16 years) National Nutrition Surveys, and the New Zealand 1997 (for 15 years & above) and 2002 (for 5-14 years) National Nutrition Surveys. Updated consumption data for New Zealand are not yet available for dietary exposure modelling purposes.

account both the naturally occurring and manufactured sources of TFAs that may occur in foods analysed.

- Foods are likely to vary in TFA levels and the samples selected may not have been fully representative of this variation. A limited range of foods has been analysed and therefore it is possible that foods high in TFAs may be over- or under-represented. In addition, samples collected were not necessarily the same brands as those sampled in 2008–09, so apparent variation over time may simply reflect brand differences.
- Laboratories may not have identified and measured all TFAs that were present in foods. In addition, as testing methodology has improved over time, more TFAs were quantified in the more recent surveys such that some differences may result from improved analytical methodology. This is particularly relevant for TFAs because concentrations in food were generally low.
- The studies specifically designed to examine manufactured TFA concentrations did not cook samples before analysis so any effect of cooking on TFA levels has not been taken into account. However this will not be a significant factor for those foods highest in TFAs (e.g. biscuits, pastries) which were mostly purchased ready to eat.
- Although the same areas of uncertainty apply to the estimated SFA levels, this uncertainty as a proportion of the total estimated SFA intake is likely to be much lower than it is for TFAs. This is because SFAs are present in much higher concentrations in foods and levels are easier to measure.
- The three surveys were snapshots of the TFA levels in food at the time of sampling and do not necessarily represent a relationship between time and concentration.

13 Conclusions

The current analytical survey investigated TFA concentrations in a total of 500 samples from 39 different product categories that were collected from NSW, WA, New Zealand, SA, Tasmania, Queensland and Victoria, over a two week period in October 2013. The range of product categories tested in the survey included takeaway foods, fats and oils, snack foods, meat products, and bakery products.

TFAs were detected in 36 of the 39 product categories analysed. The highest median concentrations of TFAs were found in edible oil spreads, vegetable oils, croissants, custard baked goods, and prepared pastry. TFAs were not detected in pikelets/pancakes, snack bars and toasted style muesli. While TFAs were detected in most product categories, the median concentrations in Australian and New Zealand foods were generally low. Excluding samples likely to contain ruminant TFA, approximately 86% of the samples had TFA concentrations below 2 g/100 g fat, the limit adopted for manufactured TFAs in Danish legislation in 2003.

Median TFA concentrations were generally consistent with those observed in the 2008-09 survey, with no clear trend toward an increase or a decrease in median TFA concentrations found in Australian or New Zealand foods. Statistically significant ($p < 0.01$) increases in TFA concentration were observed in only one product category—chicken nuggets/products (median concentrations of TFAs in chicken nuggets/products were 0.1 and 0.2 g/100 g food in the 2008–09 and 2013 surveys, respectively). This product category was widened slightly to include other chicken products in the current survey, which may have contributed to this result. No significant changes in TFA concentrations were observed in other product categories.

On the basis that the analytical results did not show an increase in TFA concentrations in Australian or New Zealand foods, it is anticipated that the dietary intake of TFAs remains low, and below the WHO recommended level of 1% dietary energy in both Australia and New Zealand.

On 9 May 2014, the summary results of the 2011–12 National Nutrition and Physical Activity Survey (NNPAS) component of the Australian Health Survey were released. These included new estimates of TFA and energy intake and were based on up-to-date food consumption data and the TFA concentration data available to FSANZ in 2009. The NNPAS results show that TFA intake remains low, with the mean intake of all Australians 2 years and above (1.4 g/day) representing 0.6% of dietary energy. The dairy and meat food groups, together with butters and dairy blends, contributed more than half of the intake, which shows ruminant TFAs continue to be the major source of TFAs in the Australian diet. The updated food consumption data indicate that the mean TFA intake of Australian consumers remains below the WHO recommendation of less than 1% of dietary energy. Updated consumption data for New Zealand are not yet available for dietary exposure modelling purposes.

The NNPAS results support the conclusion that TFA intakes are likely to be low based on the concentrations of TFAs found in food.

The survey results should be considered with the 2013 FSANZ industry survey on the use of TFAs in the New Zealand and Australian food supply, and the 2014 FSANZ systematic and narrative reviews of the health effects of TFAs.

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Appendix 1 Chemistry and occurrence of fatty acids in foods

Edible oils (including oils and fats) are esters (a chemical linkage that holds an alcohol and acid group together) of *fatty acids* and glycerol. In food most edible oils occur as *triglycerides*, i.e. three fatty acids are attached to a glycerol backbone (*triacylglycerols*). Fatty acids contain a *carboxyl group* (COOH) and an aliphatic chain of carbon molecules and it is the characteristics of this *carbon chain* that play a major role in determining the properties of a fat.

Fatty acids can be classified according to the number of double bonds. *Saturated fatty acids* (SFAs) have no double bonds, *monounsaturated fatty acids* (MUFAs) have one double bond, and *polyunsaturated fatty acids* (PUFAs) have two or more double bonds (refer to Figure A1.1). Commonly, the unsaturated fatty acids that occur naturally in food have double bonds in a *cis* configuration: the carbon chains on the two sides of the double bond bend towards each other and the hydrogen atoms on the double bond are located on the same side.

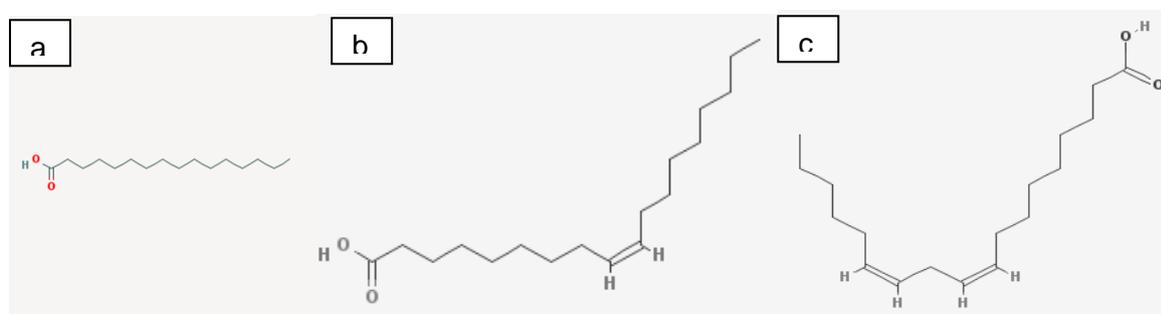


Figure A1.1: Structure of: (a) saturated fatty acid, (b) monounsaturated fatty acid, and (c) polyunsaturated fatty acid Images: from Pubchem

In the rarer *trans* configuration, the hydrogen atoms on the double bond are opposite each other, rather than oriented in the same direction. The insertion of a *cis* double bond has a dramatic effect on the shape of the molecule, introducing a kink into an otherwise straight chain. However, inserting a *trans* double bond has very little effect on the configuration. This difference in configuration accounts for the different chemical and physical properties of *trans* and *cis* fatty acids, and may also result in a difference in the biological activity.

Saturated fats such as lauric acid, myristic acid, palmitic acid and stearic acids consist of straight chains of carbon and hydrogen, and their tight packing results in high melting points. In contrast, because of the kink in fatty acids in the *cis*-configuration, unsaturated fatty acids are generally less tightly packed and tend to be liquids at room temperature. The melting point of *trans* fatty acids tend to be intermediate between that of saturated and *cis* fatty acids because the double bonds in *trans*-fatty acids are in a more linear formation that requires less space than the *cis*-double bond.

FSANZ (2009) reviewed the use of edible oils which are solid and or semi-solid at room temperature. There is a great demand for such edible oils and to meet this need a process based on hydrogenation of unsaturated (liquid) edible oils was developed. This process allows the conversion of liquid oils into semi-solid or plastic edible oils more suitable for specific applications, such as in shortenings and margarine, and improves the oxidative stability of the oils. For further detail see the FSANZ (2009) review.

Nomenclature of fatty acids

Fatty acids are often referred to by their common name e.g., 'oleic acid'. Following the Geneva (IUPAC) system of chemical nomenclature, carbon atoms of fatty acid chains are numbered consecutively starting with the carbon of the carboxyl group and continuing to the carbon in the terminal methoxy group. Their systematic name is based on the prefix describing the length of the carbon chain and if appropriate the position of any double bonds, such as '9-octadecenoic acid' for oleic acid.

For convenience, fatty acids are commonly referred to as based on the number of carbons and the number of double bonds in the molecule. For example, the saturated fatty acid palmitic acid is referred to as 'C16:0', the MUFA oleic acid as '18:1', and the triple double bond PUFA linolenic acid as 'C18:3'. In addition, the position of the double bonds can be shown after the symbol ' Δ ' or within brackets, for example α -linolenic acid (9, 12, 15-octadecatrienoic acid) can be written as '18:3 Δ 9, 12, 15' or '18:3 (9, 12, 15)'

The status of the double bond can be specified as *cis* or *trans* as an additional prefix to the name, as in '*cis*-9-octadecenoic acid', or given as part of the shorthand: 18:2 (tr9, tr 12) for linoleic acid.

The origins and occurrence of SFAs, MUFAs, PUFAs and TFAs in foods is described in further detail below. The principal reference for this information is the Food and Agricultural Organisation (FAO) (2010) report on fats and fatty acids in human nutrition. The report is available at: http://www.who.int/nutrition/topics/FFA_human_nutrition/en/.

Saturated fatty acids

SFAs are typically divided into four sub-classes according to chain length; short-chain fatty acids (three to seven carbon atoms), medium-chain fatty acids (eight to thirteen carbon atoms), long-chain fatty acids (fourteen to twenty carbon atoms) and very-long chain fatty acids (21 or more carbon atoms).

The common and systemic names, abbreviation and dietary sources of some important dietary SFAs are briefly summarised below:

- Butyric acid and caproic acid are the most important short chain fatty acids and occur in milk fats.
- Caprylic acid and capric acid are medium chain fatty acids that are found in milk fats. Lauric acid is found in coconut and palm kernels.
- Palmitic acid is the most widely occurring long-chain fatty acid and is present in most fat examined. Stearic acid is less common than palmitic acid but is also present in most vegetable and animal fats.
- Behenic acid and lignoceric acid are the most common very-long chain fatty acids in the diet, but are usually present at very low concentrations.

Monounsaturated fatty acids

MUFAs in food are predominately found in the *cis*-configuration which introduces a characteristic U-shaped bend or kink in the molecule. This means that these fatty acids are less tightly packed than saturated fatty acids, generally have melting points lower than those of SFAs and exist as liquids at room temperature. As a result of the double bond, MUFAs are also more chemically reactive than SFAs.

The most common dietary MUFAs are of chain length C14 – C24; the double bond is most likely to be located at the n-9 position. Some MUFA found in the diet include:

- Oleic acid, the most common of the MUFA is commonly associated with small amounts of *cis*-vaccenic acid, the 11 *cis* isomer of oleic acid. Other *cis* MUFAs are often widely distributed in plants and animal tissues but represent only a minor component in the diet.
- Erucic acid occurs at significant levels in some culinary oils derived from Brassica, but these oils are generally consumed only in some parts of Asia and Europe. Nervonic acid has been reported to present as a minor constituent in many marine oils.

Polyunsaturated fatty acids

PUFAs contain more than one double bond. In almost all naturally occurring PUFAs, the double bonds are in the *cis* configuration, separated by a methylene group, and typically positioned at the 3rd, 6th or 9th carbon atom from the terminal methyl group.

The most important PUFA families in human health and nutrition are the n-6 and n-3 families since humans lack the necessary enzymes to introduce double bonds in these positions, respectively. As a result, alpha-linolenic acid, 18:3, n-3 and linoleic acid, 18:2, n-6 are essential to the diet. These compounds are necessary for humans to produce highly unsaturated fatty acids which are critical to a diverse range of functions.

Some common or nutritionally important PUFAs that occur in the diet include:

- Linoleic acid (18:2 n-6) is reported to occur in virtually all fats and is found at high levels in vegetable oils.
- Arachidonic acid (20:4 n-6) is a major component of membrane phospholipids in animals – fish and lean meat have been reported to be good sources of arachidonic acid.
- Of the omega-3 fatty acids, alpha-linolenic acid (18:3 n-3) is found at high levels in flaxseed oil and perilla oil. It is also found in canola and soybean oils.

Trans-fatty acids

A number of TFA isomers of MUFAs and PUFAs originating from both natural and manufacturing processes can be found in a range of foods. These processes include:

- Biohydrogenation of MUFAs and PUFAs in the rumen of ruminant animals.
- Partial hydrogenation of edible oils containing edible oils containing unsaturated fatty acids.
- Deodorisation of vegetable oils high in PUFAs which removes volatile compounds from fat that contribute to unwanted odours and tastes.
- Heating and frying of oils at excessive temperatures has also been reported to result in time dependent formation of TFAs.

Dairy products and beef fat have been reported to contain approximately 3 to 6% TFAs, expressed as a weight percentage of total fatty acids. The main TFA isomers in the fat of dairy and meat products are isomers of the MUFA oleic acid with 11t-18:1 (vaccenic acid) the dominant isomer representing approximately 30-50% of 18:1 *trans* isomers in milk fat from cows and goats. TFAs in plants are reportedly relatively rare but have been found in six species of plants, including pomegranates with 70% of their fatty acids being puniolic acid (9c, 11t, 13c-18:3).

In addition to TFAs of ruminant origin, manufactured TFAs were introduced to the diet in the

early 1900's to produce fat blends for margarine, shortening and deep frying. This process hydrogenates—or saturates—double bonds in vegetable oils. If hydrogenation is complete, the result is a saturated fatty acid. If the oil is partially hydrogenated, the *cis* double bond of the unsaturated fatty acid in the original oil can migrate to a new position in the fatty acid chain (ie positional isomerization) and at the same time, some of the *cis* double bonds (both old and new double bonds) can be converted to the *trans* configuration (geometrical isomerisation). Thus, partial hydrogenation can result in the formation of a complex mixture of new *cis* and *trans* isomers of MUFAs and PUFAs dependent on the nature and amounts of catalyst, the extent of hydrogenation, and other factors.

While the same isomers occur in industrially produced TFAs and ruminant TFAs, the pattern of individual isomers varies widely dependent on the source. For instance, whereas vaccenic acid accounts for 60% of the TFAs in animal fat, it typically represents less than 20% of industrially produced TFAs. During partial hydrogenation of vegetable oils various octadecanoic acid isomers such as elaidic (*trans*-9 18:1) or *trans* 10 18:1 acids are formed, but these isomers are present at much lower concentrations in ruminant fat.

Conjugated linoleic acids (CLA) consist of a mixture of several positional and geometric isomers whose double bonds can be either *trans* or *cis* configuration. The *cis*-9,*trans*-11 isomer (sometimes referred to as rumenic acid) is the most abundant form found in food, the *trans*-10,*cis*-12 isomer being the second most abundant form. Dairy products may account for up to about 75% of total food intake of CLA and ruminant meats account for the other 25%.

Appendix 2 Inter-laboratory results

Table A2.1 Relative percent difference (RPD) values between contracted analytical laboratories

Food ID	Relative Percent Difference				
	Total Fat	Total Saturated Fatty Acids	Total Monounsaturated Fatty Acids	Total Polyunsaturated Fatty Acids	Total Trans Fatty Acids
	(%)	(%)	(%)	(%)	(%)
Laboratory A & B					
Sweet Biscuits	1	0	6	15	16
Donut	1	3	3	25	40
Confectionery	3	4	5	0	8
Sausage Rolls	3	3	2	10	60
Chicken Products	3	5	1	11	39
Hot Chips/Potato Products	3	1	0	5	50
Vegetable Oil	0	7	4	5	24
Nut Based Spreads	4	5	1	0	124
Potato Crisps & Corn Chips	2	10	3	18	NA
Pizza	1	5	5	15	22
Laboratory A & C					
Sweet Biscuits	15	14	23	21	22
Donut	15	7	19	25	33
Confectionery	14	14	25	33	156
Sausage Rolls	10	7	21	11	20
Chicken Products	12	17	14	15	62
Hot Chips/Potato Products	20	38	21	21	120
Vegetable Oil	0	7	5	5	95

Nut Based Spreads	12	24	15	13	NA
Potato Crisps & Corn Chips	25	33	29	35	NA
Pizza	24	25	24	4	11

A = NMI; B=NSW Forensic Analytical and Science Services, C=Chem Centre.

NA = not applicable. One value was below the LOR.

Relative percent difference = $(|[A] - [B]| / ([A] + [B]) / 2) \times 100$ where A = concentration in the first sample, B = concentration in the second sample.

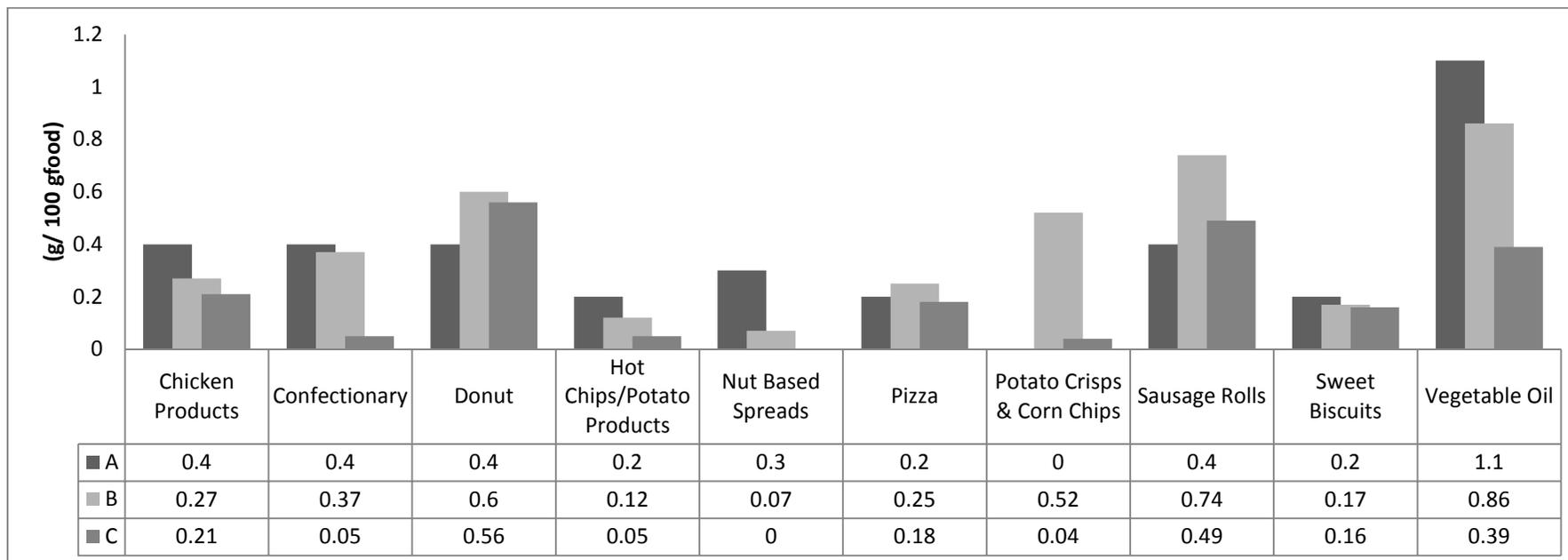


Figure A2.1 Inter- laboratory results for TFA in g/100 g food

A = NMI; B=NSW Forensic Analytical and Science Services, C=Chem Centre.

Appendix 3 Individual analytical results

Table A3.1 Individual results for total fat, SFA, MUFA, PUFA and total TFA expressed in g/100 g food

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Chicken Products*	21.0	3.5	13.4	2.9	0.33	1.6
Chicken Products*	15.7	1.6	11.0	2.2	0.20	1.3
Chicken Products*	14.0	3.3	7.0	2.9	0.23	1.6
Chicken Products*	14.8	2.9	5.1	5.9	0.22	1.5
Chicken Products	17.5	3.1	10.2	3.7	0.28	1.6
Chicken Products	18.5	5.0	9.4	3.5	0.19	1.0
Chicken Products*	8.2	1.4	2.7	3.6	0.11	1.4
Chicken Products	19.0	4.8	5.3	7.9	0.23	1.2
Chicken Products	18.4	6.6	7.1	3.5	0.43	2.4
Chicken Products	18.1	4.3	9.6	3.3	0.20	1.1
Chicken Products	20.1	7.1	9.3	2.5	0.33	1.7
Chicken Products	14.9	5.5	6.7	1.9	0.23	1.6
Chicken Products	10.1	3.9	3.9	1.6	0.11	1.1
Chicken Products	19.9	3.4	12.6	3.5	0.20	1.0
Chicken Products	14.7	3.8	5.1	4.9	0.24	1.7
Chicken Products	12.4	3.0	2.7	6.0	0.12	1.0
Chicken Products	23.6	2.0	15.7	5.5	0.25	1.1
Chicken Products	17.3	2.8	10.9	3.1	0.22	1.3
Chicken Products	17.4	4.6	6.1	5.8	0.25	1.5
Chicken Products	14.2	3.8	4.0	5.7	0.13	0.9
Chicken Products	17.0	4.2	5.6	6.3	0.25	1.4
Choc Chip Biscuits*	21.6	10.7	7.8	1.9	0.20	0.9
Choc Chip Biscuits*	23.0	13.2	7.1	0.8	1.06	4.6
Choc Chip Biscuits*	18.5	11.7	4.6	1.3	0.00	0.0
Choc Chip Biscuits*	22.5	17.4	3.1	0.6	0.66	2.9
Choc Chip Biscuits*	13.1	7.4	4.0	1.0	0.00	0.0
Choc Chip Biscuits*	25.8	15.5	7.2	1.2	0.94	3.6
Choc Chip Biscuits	24.1	15.7	6.0	0.8	0.64	2.7
Choc Chip Biscuits	22.3	13.0	6.8	1.3	0.36	1.6
Choc Chip Biscuits	22.0	12.9	6.3	1.7	0.10	0.5
Choc Chip Biscuits	22.3	14.5	5.4	0.9	0.82	3.7
Choc Chip Biscuits	30.6	16.1	9.7	2.8	0.64	2.1
Choc Chip Biscuits	22.6	15.8	4.5	0.8	0.53	2.3
Choc Chip Biscuits	23.3	11.3	9.3	1.6	0.20	0.9
Choc Chip Biscuits	22.1	11.8	7.6	1.6	0.10	0.5
Choc Chip Biscuits	24.2	15.7	5.9	0.9	0.78	3.2
Choc Chip Biscuits	21.0	11.7	6.5	1.7	0.20	1.0

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Choc Chip Biscuits	20.0	10.3	7.0	1.6	0.30	1.5
Choc Chip Biscuits	21.7	12.5	6.7	1.3	0.24	1.1
Choc Chip Biscuits	21.8	13.7	5.8	1.2	0.26	1.2
Chocolate Coated and Chocolate Filled Biscuits	24.9	13.2	9.1	2.5	0.12	0.5
Chocolate Coated and Chocolate Filled Biscuits	24.7	13.8	8.8	1.8	0.33	1.3
Chocolate Coated and Chocolate Filled Biscuits	18.0	13.7	3.1	1.1	0.14	0.8
Chocolate Coated and Chocolate Filled Biscuits	31.4	17.2	11.5	2.4	0.34	1.1
Chocolate Coated and Chocolate Filled Biscuits	24.4	13.6	8.7	2.0	0.12	0.5
Chocolate Coated and Chocolate Filled Biscuits*	24.4	16.8	5.5	0.9	0.00	0.0
Chocolate Coated and Chocolate Filled Biscuits*	27.3	25.5	0.4	0.2	0.00	0.0
Chocolate Coated and Chocolate Filled Biscuits	20.2	11.6	5.9	1.7	0.22	1.1
Chocolate Coated and Chocolate Filled Biscuits	26.0	13.8	8.5	2.3	0.34	1.3
Chocolate Coated and Chocolate Filled Biscuits	19.3	9.8	6.8	1.7	0.20	1.0
Chocolate Coated and Chocolate Filled Biscuits	27.9	14.6	9.4	2.3	0.33	1.2
Chocolate Coated and Chocolate Filled Biscuits	27.6	16.3	8.0	1.9	0.35	1.3
Confectionery	29.3	18.6	9.3	1.1	0.44	1.5
Confectionery	32.0	20.3	10.5	1.1	0.12	0.4
Confectionery	27.7	19.0	7.3	0.9	0.49	1.8
Confectionery	35.8	23.4	10.9	1.2	0.41	1.1
Confectionery	19.9	12.8	6.3	0.7	0.12	0.6
Confectionery*	35.9	20.1	12.0	2.0	0.20	0.6
Confectionery*	34.4	21.3	10.2	1.0	0.30	0.9
Confectionery*	34.7	31.6	1.1	0.5	0.00	0.0
Confectionery	29.9	18.3	9.3	0.9	0.00	0.0
Confectionery	34.0	21.1	10.1	1.1	0.20	0.6
Confectionery	8.5	5.2	2.6	0.3	0.00	0.0
Confectionery	7.7	4.5	2.5	0.4	0.00	0.0
Confectionery	22.5	16.1	4.8	0.5	0.00	0.0
Cream Biscuits	20.2	10.0	7.5	2.4	0.31	1.5
Cream Biscuits	20.4	9.9	7.8	2.3	0.34	1.7
Cream Biscuits	27.0	19.1	6.0	1.7	0.25	0.9
Cream Biscuits	19.8	10.5	6.8	2.3	0.21	1.1
Cream Biscuits	29.8	19.5	7.7	2.1	0.61	2.1
Cream Biscuits*	20.0	9.9	7.1	2.0	0.20	1.0
Cream Biscuits*	22.6	13.2	6.5	1.2	0.99	4.4
Cream Biscuits	25.7	13.0	9.5	1.7	0.51	2.0
Cream Biscuits	26.6	18.0	5.4	0.7	1.70	6.4

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Cream Biscuits	28.4	13.4	10.9	2.8	0.20	0.7
Cream Biscuits	22.3	14.1	5.7	1.5	0.20	0.9
Cream Biscuits	28.2	13.7	10.1	2.9	0.20	0.7
Cream Biscuits	20.6	9.3	7.8	2.5	0.10	0.5
Croissant	24.4	17.0	4.9	1.2	1.47	6.0
Croissant	24.2	16.2	5.4	1.3	1.63	6.7
Croissant	20.3	13.6	4.4	1.2	1.26	6.2
Croissant*	27.5	18.6	5.8	0.9	1.39	5.0
Croissant*	14.9	9.9	3.2	0.7	0.66	4.5
Croissant	22.9	14.3	5.7	1.0	0.96	4.2
Croissant	17.3	11.1	4.2	0.8	0.43	2.5
Croissant	22.6	15.5	4.4	0.8	0.96	4.2
Croissant	23.5	16.3	4.4	0.9	0.97	4.1
Croissant	23.3	15.7	4.7	0.9	1.07	4.6
Crumbed/Battered Fish Fillets	16.8	3.3	4.5	8.8	0.28	1.7
Crumbed/Battered Fish Fillets	19.4	2.0	12.3	4.8	0.23	1.2
Crumbed/Battered Fish Fillets	9.2	2.4	2.1	4.5	0.08	0.9
Crumbed/Battered Fish Fillets*	19.9	6.6	6.3	6.0	0.23	1.1
Crumbed/Battered Fish Fillets*	25.4	13.7	8.7	1.8	0.20	0.8
Crumbed/Battered Fish Fillets*	1.5	0.4	0.5	0.5	0.01	0.0
Crumbed/Battered Fish Fillets*	6.7	0.7	3.7	1.9	0.01	0.0
Crumbed/Battered Fish Fillets*	8.9	0.8	5.3	2.3	0.00	0.0
Crumbed/Battered Fish Fillets	9.2	2.4	1.9	4.4	0.13	1.4
Crumbed/Battered Fish Fillets	18.5	7.5	8.2	1.4	0.54	2.9
Crumbed/Battered Fish Fillets	15.9	1.4	9.7	3.8	0.23	1.4
Crumbed/Battered Fish Fillets	11.6	1.1	6.8	3.0	0.21	1.8
Crumbed/Battered Fish Fillets	10.7	4.7	4.4	0.9	0.35	3.3
Crumbed/Battered Fish Fillets	8.4	2.0	2.7	3.2	0.10	1.2
Crumbed/Battered Fish Fillets	23.5	9.4	10.3	2.1	0.66	2.8
Crumbed/Battered Fish Fillets	12.9	2.7	4.4	5.0	0.22	1.7
Crumbed/Battered Fish Fillets	10.0	1.2	6.0	2.3	0.23	2.3
Crumbed/Battered Fish Fillets	12.5	1.5	5.6	4.8	0.10	0.8
Crumbed/Battered Fish Fillets	7.0	0.8	4.0	1.8	0.21	3.0
Crumbed/Battered Fish Fillets	9.7	0.9	5.8	2.5	0.12	1.3
Crumbed/Battered Fish Fillets	8.7	2.5	4.2	1.5	0.12	1.3
Custard Baked Goods	11.8	7.5	3.1	0.7	0.65	5.5
Custard Baked Goods	11.1	7.3	2.6	0.6	0.66	5.9
Custard Baked Goods	13.9	6.8	5.5	1.0	0.71	5.1
Custard Baked Goods	16.8	10.1	5.6	0.3	0.17	1.0
Custard Baked Goods	10.5	5.6	3.8	0.3	0.77	7.3
Custard Baked Goods	9.0	3.8	3.8	1.1	0.16	1.8

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Custard Baked Goods*	13.4	7.5	3.7	1.5	0.14	1.0
Custard Baked Goods	30.5	15.5	9.6	3.4	0.88	2.9
Custard Baked Goods	7.0	3.9	1.8	0.5	0.52	7.4
Custard Baked Goods	15.7	10.0	3.8	0.9	0.43	2.7
Desserts	12.6	5.9	4.7	1.3	0.53	4.2
Desserts	20.7	7.0	9.7	3.3	0.39	1.9
Desserts	13.4	8.6	4.0	0.6	0.37	2.8
Desserts	11.7	5.8	4.3	0.4	0.75	6.4
Desserts	13.0	4.4	6.7	1.6	0.13	1.0
Desserts*	25.5	14.9	7.6	1.5	0.52	2.0
Desserts*	9.9	5.0	3.6	0.7	0.22	2.2
Desserts*	12.6	4.5	6.1	1.3	0.23	1.8
Desserts*	12.4	8.8	2.4	0.4	0.31	2.5
Desserts*	8.3	4.8	2.4	0.7	0.00	0.0
Desserts*	12.9	7.7	3.7	0.6	0.32	2.4
Desserts	14.5	6.8	5.6	1.1	0.45	3.1
Desserts	19.6	11.5	5.5	1.2	0.54	2.8
Desserts	27.4	15.5	8.0	2.6	0.20	0.7
Desserts	31.6	8.2	15.2	6.4	0.40	1.3
Desserts	24.1	15.9	5.7	0.9	0.65	2.7
Dips	25.7	9.5	10.0	5.2	0.26	1.0
Dips	9.2	1.6	4.6	2.9	0.08	0.9
Dips	33.5	4.8	14.9	13.3	0.26	0.8
Dips	21.2	2.2	11.4	6.4	0.20	0.9
Dips	5.9	1.9	2.7	0.9	0.14	2.3
Dips	8.4	2.3	4.1	1.6	0.22	2.7
Dips	34.5	11.9	15.4	5.1	0.81	2.3
Dips	18.5	2.1	9.3	6.2	0.20	1.1
Donut	11.4	5.0	4.7	1.7	0.09	0.7
Donut	24.0	8.3	11.4	3.8	0.45	1.9
Donut	20.5	8.9	8.5	2.6	0.55	2.7
Donut	23.6	11.5	8.8	3.2	0.11	0.5
Donut	19.4	8.0	8.5	2.1	0.91	4.7
Donut*	23.3	15.5	5.6	0.7	0.67	2.9
Donut	17.4	7.7	7.2	1.3	0.46	2.6
Donut	23.1	10.1	9.3	2.5	0.20	0.9
Donut	20.9	9.7	7.8	1.8	0.79	3.8
Donut	13.2	6.5	5.0	0.9	0.23	1.7
Donut	20.2	9.3	7.3	2.1	0.69	3.4
Donut	18.0	5.7	8.6	2.6	0.33	1.8
Donut	17.7	8.0	6.8	2.0	0.22	1.2

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Donut	3.1	0.3	1.7	0.9	0.01	0.0
Dry Mix Pasta	3.5	1.7	0.7	1.0	0.11	3.3
Dry Mix Pasta	2.0	0.5	0.5	1.0	0.01	0.5
Dry Mix Pasta	4.5	2.1	1.1	1.1	0.13	2.8
Dry Mix Pasta	5.2	2.8	1.2	1.0	0.20	3.8
Dry Mix Pasta	4.4	2.5	0.9	0.9	0.21	4.7
Dry Mix Pasta	4.6	3.2	0.6	0.5	0.00	0.0
Dry Mix Pasta	4.9	3.9	0.3	0.5	0.00	0.0
Dry Mix Pasta	6.2	4.5	0.6	0.8	0.00	0.0
Edible Oil Spreads*	80.2	35.5	30.5	9.3	1.81	2.3
Edible Oil Spreads*	55.3	17.6	19.5	14.0	1.88	3.4
Edible Oil Spreads*	64.6	13.8	33.8	13.5	0.60	0.9
Edible Oil Spreads*	65.1	14.6	32.7	14.4	0.60	0.9
Edible Oil Spreads*	48.7	11.6	25.6	8.6	0.85	1.7
Edible Oil Spreads	66.4	15.5	33.5	13.8	0.80	1.2
Edible Oil Spreads	66.3	15.7	32.8	14.0	0.80	1.2
Edible Oil Spreads	60.3	10.6	33.1	11.9	2.00	3.3
Edible Oil Spreads	63.9	17.4	20.3	22.7	0.60	0.9
Edible Oil Spreads	50.2	11.4	26.3	9.5	0.80	1.6
Edible Oil Spreads	70.5	18.7	16.3	31.7	0.70	1.0
Edible Oil Spreads	69.5	18.4	17.6	29.8	0.70	1.0
Edible Oil Spreads	51.0	12.0	26.3	9.9	0.50	1.0
Edible Oil Spreads	63.7	15.6	19.7	25.3	0.40	0.6
Edible Oil Spreads	44.9	11.6	22.0	8.6	0.60	1.3
Edible Oil Spreads	64.9	16.8	30.6	14.2	0.50	0.8
Edible Oil Spreads	62.9	15.8	30.4	13.5	0.57	0.9
Edible Oil Spreads	70.2	19.2	16.4	31.0	0.50	0.7
Extruded Snacks	18.8	8.6	7.8	1.9	0.16	0.9
Extruded Snacks	20.8	9.5	8.7	2.1	0.09	0.4
Extruded Snacks	20.4	9.3	8.5	2.1	0.19	0.9
Extruded Snacks	26.0	8.4	11.5	5.6	0.16	0.6
Extruded Snacks	19.4	8.6	8.2	2.1	0.16	0.8
Extruded Snacks*	20.3	3.0	14.3	2.0	0.10	0.5
Extruded Snacks*	29.3	2.2	18.5	7.0	0.33	1.1
Extruded Snacks*	32.5	14.5	13.3	2.9	0.40	1.2
Extruded Snacks	30.5	16.2	10.5	2.0	0.58	1.9
Extruded Snacks	23.4	13.0	7.0	2.2	0.23	1.0
Extruded Snacks	28.6	5.5	8.1	13.0	0.76	2.6
Extruded Snacks	25.5	22.7	1.4	0.2	0.00	0.0
Extruded Snacks	26.1	11.9	10.5	2.2	0.34	1.3
Falafel	13.9	3.5	3.3	7.1	0.12	0.9

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Falafel	8.5	1.0	4.6	2.8	0.08	0.9
Falafel	13.1	2.1	4.0	6.9	0.17	1.3
Falafel	16.2	2.0	10.1	3.3	0.10	0.6
Falafel	12.8	1.4	8.9	1.8	0.11	0.9
Falafel	22.5	4.6	7.6	8.9	0.59	2.6
Falafel	10.7	1.8	2.7	5.5	0.21	2.0
Falafel	9.5	1.5	2.5	4.9	0.10	1.1
Falafel	13.7	1.3	8.2	3.4	0.20	1.5
Fried Noodle Dishes	3.2	0.9	1.8	0.2	0.02	0.6
Fried Noodle Dishes	3.1	0.4	1.8	0.7	0.05	1.6
Fried Noodle Dishes	4.0	1.0	1.9	0.8	0.05	1.2
Fried Noodle Dishes*	7.5	2.1	3.2	1.8	0.01	0.0
Fried Noodle Dishes*	5.6	1.0	2.7	1.5	0.00	0.0
Fried Noodle Dishes*	4.6	0.8	2.2	1.3	0.01	0.0
Fried Noodle Dishes	6.7	1.2	2.1	3.0	0.10	1.5
Fried Noodle Dishes	8.6	1.3	3.2	3.6	0.01	0.0
Fried Noodle Dishes	8.2	1.4	2.7	3.6	0.11	1.3
Hot Chips/Potato Products	4.1	0.4	2.6	1.1	0.06	1.5
Hot Chips/Potato Products	2.0	0.5	1.0	0.5	0.01	0.5
Hot Chips/Potato Products	4.4	1.1	1.5	1.8	0.03	0.7
Hot Chips/Potato Products	16.4	1.5	10.3	3.8	0.20	1.2
Hot Chips/Potato Products	13.2	1.2	8.2	3.3	0.20	1.5
Hot Chips/Potato Products	17.5	3.3	8.4	5.1	0.13	0.7
Hot Chips/Potato Products	18.7	9.3	7.2	1.7	0.08	0.4
Hot Chips/Potato Products	8.0	0.7	5.3	1.8	0.12	1.5
Hot Chips/Potato Products*	15.4	1.3	10.7	2.5	0.30	1.9
Hot Chips/Potato Products*	8.8	0.7	5.3	2.3	0.10	1.1
Hot Chips/Potato Products*	13.5	5.4	5.8	1.6	0.10	0.7
Hot Chips/Potato Products*	7.0	0.5	4.4	1.7	0.01	0.0
Hot Chips/Potato Products*	8.3	4.0	3.2	0.7	0.00	0.0
Hot Chips/Potato Products	7.9	0.5	5.2	1.7	0.20	2.5
Hot Chips/Potato Products	9.7	0.7	6.0	2.4	0.21	2.2
Hot Chips/Potato Products	25.2	2.9	16.6	4.2	0.40	1.6
Hot Chips/Potato Products	13.2	1.3	8.7	2.5	0.20	1.5
Hot Chips/Potato Products	12.9	1.7	8.2	2.3	0.20	1.6
Hot Chips/Potato Products	6.2	0.6	4.0	1.3	0.01	0.0
Hot Chips/Potato Products	4.4	0.4	2.8	1.0	0.01	0.0
Hot Chips/Potato Products	8.1	1.0	2.4	4.2	0.12	1.4
Hot Chips/Potato Products	4.6	0.4	2.8	1.1	0.01	0.0
Hot Chips/Potato Products	8.5	0.7	6.7	0.6	0.00	0.0
Meat Pies	11.9	5.8	4.5	0.7	0.96	8.1

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Meat Pies	11.8	6.2	4.0	1.0	0.57	4.9
Meat Pies	8.6	4.2	3.2	0.6	0.59	6.8
Meat Pies*	13.9	7.5	4.8	0.6	0.42	3.0
Meat Pies*	11.8	6.3	3.9	0.8	0.30	2.5
Meat Pies*	11.8	6.1	4.0	0.9	0.30	2.5
Meat Pies	12.3	6.4	4.5	0.5	0.42	3.4
Meat Pies	12.9	6.4	4.8	0.6	0.63	4.9
Meat Pies	10.2	5.2	3.8	0.4	0.32	3.1
Meat Pies	10.8	5.5	4.1	0.5	0.28	2.6
Meat Pies	10.6	5.7	3.3	0.6	0.57	5.3
Meat Pies	11.5	5.1	4.7	1.1	0.10	0.9
Nut Based Spreads	30.3	10.7	15.6	3.9	0.13	0.4
Nut Based Spreads	48.3	7.8	32.8	7.6	0.08	0.2
Nut Based Spreads	54.3	9.8	31.6	12.8	0.07	0.1
Nut Based Spreads	45.1	11.2	17.5	16.4	0.09	0.2
Nut Based Spreads	37.3	7.3	22.6	7.4	0.09	0.2
Nut Based Spreads*	31.5	7.1	17.0	5.7	0.30	1.0
Nut Based Spreads*	19.1	2.8	11.5	3.7	0.30	1.6
Nut Based Spreads*	48.7	11.6	19.0	15.8	0.20	0.4
Nut Based Spreads	48.6	8.0	29.7	8.6	0.10	0.2
Nut Based Spreads	23.4	5.7	10.6	5.8	0.30	1.3
Nut Based Spreads	52.4	8.4	36.8	4.9	0.00	0.0
Nut Based Spreads	47.3	9.1	33.1	2.7	0.30	0.6
Nut Based Spreads	24.8	7.5	13.4	2.6	0.20	0.8
Oil Based Dressings	15.1	1.7	4.4	9.0	0.07	0.5
Oil Based Dressings	79.8	8.8	23.8	47.0	0.30	0.4
Oil Based Dressings	15.4	1.7	4.5	9.2	0.06	0.4
Oil Based Dressings	56.0	8.9	15.3	30.8	0.95	1.7
Oil Based Dressings	24.6	2.0	15.9	6.4	0.31	1.3
Oil Based Dressings	13.5	1.7	4.2	6.9	0.10	0.7
Oil Based Dressings	28.5	3.4	8.5	15.1	0.30	1.1
Oil Based Dressings	30.0	3.9	8.9	15.5	0.30	1.0
Pikelets/Pancakes	4.9	2.3	1.7	0.9	0.04	0.8
Pikelets/Pancakes	4.1	0.7	2.3	1.1	0.05	1.2
Pikelets/Pancakes	4.0	0.6	2.3	1.1	0.05	1.2
Pikelets/Pancakes	1.8	0.6	0.4	0.7	0.00	0.0
Pikelets/Pancakes	3.1	0.6	1.2	1.2	0.00	0.0
Pikelets/Pancakes	1.5	0.4	0.3	0.7	0.00	0.0
Pikelets/Pancakes	2.2	0.6	0.7	0.8	0.00	0.0
Pikelets/Pancakes	1.9	0.5	0.5	0.8	0.00	0.0
Pizza	7.7	3.6	2.7	0.7	0.16	2.1

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Pizza	14.8	6.1	5.8	2.3	0.05	0.3
Pizza	9.1	3.3	3.7	1.3	0.08	0.9
Pizza	9.6	3.0	4.5	1.5	0.08	0.8
Pizza	7.0	2.9	3.0	0.7	0.05	0.7
Pizza*	7.2	3.2	1.6	1.9	0.23	3.1
Pizza*	6.0	2.9	1.7	1.1	0.00	0.0
Pizza*	7.5	3.8	2.5	0.7	0.22	2.9
Pizza*	7.9	3.4	2.8	1.2	0.11	1.4
Pizza*	7.3	2.7	2.8	1.3	0.11	1.5
Pizza	7.3	2.8	2.9	1.1	0.10	1.4
Pizza	13.6	6.5	4.7	1.6	0.20	1.5
Pizza	14.2	5.9	5.8	1.6	0.34	2.4
Pizza	9.4	5.5	2.4	0.7	0.32	3.4
Pizza	8.6	4.9	2.5	0.6	0.32	3.7
Pizza	4.9	2.4	1.6	0.6	0.02	0.0
Pizza	13.8	6.3	4.7	1.9	0.53	3.8
Pizza	6.3	3.0	1.7	1.3	0.04	0.0
Pizza	11.8	5.8	3.7	1.5	0.42	3.5
Pizza	12.1	5.1	4.5	1.9	0.28	2.4
Popcorn*	11.7	4.3	4.8	2.1	0.10	0.9
Popcorn*	20.8	2.7	5.5	11.4	0.33	1.6
Popcorn*	22.8	16.3	2.4	3.0	0.00	0.0
Popcorn	24.2	9.9	7.7	3.1	2.50	10.3
Popcorn*	24.6	12.3	8.2	2.9	0.20	0.8
Popcorn	26.1	11.1	8.5	2.4	2.90	11.1
Popcorn	26.3	20.8	2.2	2.0	0.00	0.0
Popcorn	26.7	11.7	6.6	2.5	4.83	18.1
Popcorn*	26.8	12.7	8.8	4.0	0.20	0.7
Popcorn	29.1	2.6	21.2	3.8	0.10	0.3
Popcorn	29.6	2.6	21.9	3.6	0.20	0.7
Potato Crisps & Corn Chips	25.4	2.5	21.0	1.9	0.11	0.4
Potato Crisps & Corn Chips	28.4	2.5	23.8	2.1	0.08	0.3
Potato Crisps & Corn Chips	34.1	15.1	15.2	3.5	0.27	0.8
Potato crisps & Corn Chips*	19.3	8.0	7.6	2.7	0.10	0.5
Potato crisps & Corn Chips*	31.6	13.9	13.1	3.0	0.20	0.6
Potato crisps & Corn Chips*	33.9	15.0	13.8	3.4	0.30	0.9
Potato crisps & Corn Chips	25.3	10.3	10.5	3.3	0.20	0.8
Potato crisps & Corn Chips	24.0	9.8	9.6	3.5	0.20	0.8
Potato crisps & Corn Chips	25.6	6.8	14.6	2.8	0.20	0.8
Potato crisps & Corn Chips	25.0	10.1	10.3	3.3	0.20	0.8
Potato crisps & Corn Chips	25.3	10.2	10.5	3.3	0.20	0.8

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Potato crisps & Corn Chips	32.5	14.2	13.5	2.9	0.43	1.3
Potato crisps & Corn Chips	25.6	2.5	20.0	1.7	0.33	1.3
Potato crisps & Corn Chips	27.3	2.3	21.9	1.7	0.20	0.7
Potato crisps & Corn Chips	25.1	3.4	18.5	1.9	0.20	0.8
Potato crisps & Corn Chips	36.4	14.2	16.9	3.3	0.40	1.1
Prepared Pastry	12.2	6.1	4.1	0.7	1.32	10.8
Prepared Pastry*	12.8	6.4	4.5	0.7	0.72	5.6
Prepared Pastry	14.7	6.9	5.6	0.7	0.84	5.7
Prepared Pastry	15.1	7.5	5.3	0.8	1.53	10.2
Prepared Pastry*	18.0	10.8	5.4	0.6	0.43	2.4
Prepared Pastry*	18.1	11.3	4.6	1.3	0.20	1.1
Prepared Pastry	18.1	8.9	6.4	1.1	1.02	5.7
Prepared Pastry*	20.5	10.8	7.1	0.7	0.96	4.7
Prepared Pastry	21.0	13.1	5.2	0.9	1.07	5.1
Prepared Pastry*	21.5	11.4	8.0	0.6	0.53	2.5
Prepared Pastry	22.0	13.8	5.6	1.4	1.16	5.3
Prepared Pastry	22.4	10.3	8.6	2.1	1.48	6.6
Prepared Pastry	34.6	24.5	7.1	2.8	0.25	0.7
Restaurant Style Takeaway Dishes	4.8	1.4	1.7	1.5	0.14	2.9
Restaurant Style Takeaway Dishes	4.9	1.9	2.3	0.6	0.04	0.7
Restaurant Style Takeaway Dishes	7.9	3.8	3.1	0.8	0.30	3.8
Restaurant Style Takeaway Dishes	12.8	6.5	4.9	0.9	0.67	5.2
Restaurant Style Takeaway Dishes	1.9	0.6	0.7	0.6	0.03	1.8
Restaurant Style Takeaway Dishes	7.9	3.7	3.2	0.9	0.11	1.5
Restaurant style takeaway dishes*	7.8	3.4	2.8	1.0	0.32	4.1
Restaurant style takeaway dishes*	22.4	3.2	12.9	5.0	0.33	1.5
Restaurant style takeaway dishes*	4.7	3.5	0.7	0.3	0.00	0.0
Restaurant style takeaway dishes	5.0	2.1	1.1	1.6	0.00	0.0
Restaurant style takeaway dishes	19.1	9.8	5.9	1.9	0.77	4.0
Restaurant style takeaway dishes	23.4	4.5	6.3	11.3	0.43	1.8
Restaurant style takeaway dishes	8.3	1.4	2.6	3.8	0.12	1.5
Restaurant style takeaway dishes	14.6	2.3	4.5	7.0	0.24	1.7
Restaurant style takeaway dishes	7.9	1.7	2.6	3.2	0.13	1.7
Restaurant style takeaway dishes	15.9	4.0	8.3	2.7	0.27	1.7
Restaurant style takeaway dishes	8.4	2.7	2.6	2.7	0.03	0.0
Sauces	4.0	2.3	1.2	0.5	0.03	0.8
Sauces	7.7	1.0	2.4	4.3	0.05	0.6
Sauces	8.0	4.9	2.1	0.7	0.39	5.0
Sauces	0.2	0.1	0.0	0.1	0.00	0.0
Sauces	0.9	0.2	0.2	0.5	0.00	0.0
Sauces	6.5	2.5	2.6	1.0	0.03	0.0

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Sauces	6.6	0.6	4.1	1.6	0.01	0.0
Sauces	4.5	2.4	1.4	0.5	0.00	0.0
Sausage Rolls	14.1	5.4	6.0	1.0	1.32	9.4
Sausage Rolls	18.4	10.1	6.5	1.2	0.08	0.4
Sausage Rolls	12.9	5.9	4.4	0.9	1.29	10.0
Sausage Rolls*	18.2	9.5	6.0	1.1	0.83	4.6
Sausage Rolls*	12.6	6.9	4.0	0.8	0.42	3.3
Sausage Rolls*	14.0	7.8	4.3	0.8	0.52	3.7
Sausage Rolls	15.8	9.5	4.2	1.1	0.36	2.3
Sausage Rolls	14.7	9.3	3.9	0.5	0.59	4.0
Sausage Rolls	14.1	7.7	4.7	0.9	0.24	1.7
Sausage Rolls	11.8	6.2	3.5	0.9	0.72	6.1
Sausage Rolls	12.8	6.2	4.4	1.2	0.40	3.1
Sausage Rolls	14.7	7.0	5.4	1.1	0.65	4.4
Sausage Rolls	13.6	7.1	4.3	0.9	0.72	5.3
Sausage Rolls	11.1	6.0	2.8	1.0	0.70	6.3
Savoury Biscuits - Rice Crackers and Crispbreads	7.6	1.3	5.2	1.0	0.10	1.4
Savoury Biscuits - Rice Crackers and Crispbreads	23.2	2.2	19.4	1.6	0.05	0.2
Savoury Biscuits - Rice Crackers and Crispbreads	1.2	0.5	0.4	0.4	0.02	1.6
Savoury Biscuits - Rice Crackers and Crispbreads	12.3	5.7	4.7	1.7	0.12	1.0
Savoury Biscuits - Rice Crackers and Crispbreads	11.1	2.1	7.2	1.7	0.07	0.6
Savoury Biscuits - Rice Crackers and Crispbreads	12.8	1.2	10.0	1.0	0.00	0.0
Savoury Biscuits - Rice Crackers and Crispbreads	6.2	1.7	2.4	1.8	0.00	0.0
Savoury Biscuits - Rice Crackers and Crispbreads	3.7	1.7	1.4	0.4	0.00	0.0
Savoury Biscuits - Rice Crackers and Crispbreads	13.0	1.8	7.7	2.8	0.11	0.9
Savoury Biscuits - Rice Crackers and Crispbreads	8.9	1.5	5.0	2.0	0.01	0.0
Savoury Biscuits- Standard	2.0	0.4	0.3	1.2	0.00	0.0
Savoury Biscuits- Standard	2.9	0.3	1.7	0.7	0.01	0.0
Savoury Biscuits- Standard	8.1	1.1	4.2	2.4	0.11	1.4
Savoury Biscuits- Standard	9.6	1.3	4.2	3.6	0.10	1.0
Savoury Biscuits- Standard*	15.4	4.6	8.1	1.8	0.20	1.3
Savoury Biscuits- Standard	17.6	3.7	10.0	3.0	0.20	1.1
Savoury Biscuits- Standard	17.7	8.1	6.5	2.1	0.20	1.1
Savoury Biscuits- Standard	20.6	5.0	12.0	2.5	0.20	1.0
Savoury Biscuits- Standard*	23.0	9.2	8.4	4.2	0.20	0.9
Savoury Biscuits- Standard*	24.1	12.1	8.3	2.5	0.10	0.4
Savoury Biscuits- Standard*	24.3	14.5	6.5	1.6	0.75	3.1
Savoury Biscuits- Standard	26.2	11.8	10.2	2.8	0.20	0.8

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Savoury Biscuits- Standard*	28.8	14.9	9.6	2.7	0.30	1.0
Scones	10.1	5.8	2.7	1.4	0.05	0.5
Scones	13.2	4.9	5.6	2.3	0.12	0.9
Scones	7.4	2.1	3.5	1.2	0.07	1.0
Scones	6.2	3.8	2.8	0.7	0.36	5.8
Scones	8.2	3.5	3.1	0.7	0.41	5.0
Scones	9.4	3.3	3.9	1.7	0.00	0.0
Scones	5.5	0.7	2.9	1.5	0.01	0.0
Scones	11.2	7.1	2.6	0.5	0.66	5.9
Shelf Stable Cakes - Cream Filled	14.6	6.9	5.5	1.5	0.12	0.8
Shelf Stable Cakes - Cream Filled	23.8	5.8	9.6	7.8	0.18	0.8
Shelf Stable Cakes - Cream Filled	17.2	8.8	6.2	1.8	0.12	0.7
Shelf Stable Cakes - Cream Filled	27.7	16.6	7.1	3.0	0.36	1.3
Shelf Stable Cakes - Cream Filled	21.7	6.6	10.6	3.9	0.05	0.2
Shelf Stable Cakes - Cream Filled	11.4	5.6	4.0	1.2	0.02	0.0
Shelf Stable Cakes - Cream Filled	8.1	6.4	0.9	0.3	0.02	0.0
Shelf Stable Cakes - Cream Filled	20.5	9.9	7.4	2.2	0.04	0.0
Shelf Stable Cakes - No Cream	9.9	1.1	6.0	2.7	0.13	1.3
Shelf Stable Cakes - No Cream	8.2	5.6	1.8	0.8	0.02	0.2
Shelf Stable Cakes - No Cream	14.2	2.9	7.8	3.3	0.21	1.5
Shelf Stable Cakes - No Cream	16.1	2.8	9.4	3.7	0.20	1.2
Shelf Stable Cakes - No Cream	5.9	2.1	2.8	1.0	0.05	0.9
Shelf Stable Cakes - No Cream*	17.6	11.4	4.4	0.6	0.69	3.9
Shelf Stable Cakes - No Cream*	21.8	15.3	4.3	0.6	0.82	3.8
Shelf Stable Cakes - No Cream	10.9	2.9	3.6	3.8	0.13	1.2
Shelf Stable Cakes - No Cream	9.2	1.8	2.5	4.3	0.22	2.4
Shelf Stable Cakes - No Cream	11.1	9.1	1.2	0.4	0.00	0.0
Shelf Stable Cakes - No Cream	9.9	5.2	3.2	1.0	0.01	0.0
Shelf Stable Cakes - No Cream	18.9	6.3	6.7	4.7	0.47	2.5
Snack Bars*	8.8	2.6	4.5	1.3	0.00	0.0
Snack Bars	9.0	1.4	4.3	2.9	0.00	0.0
Snack Bars	10.7	9.0	0.7	0.4	0.21	2.0
Snack Bars*	13.7	5.1	4.6	3.2	0.10	0.7
Snack Bars	14.4	8.2	4.2	1.3	0.00	0.0
Snack Bars*	14.5	9.3	3.2	1.3	0.00	0.0
Snack Bars	14.6	8.8	4.0	1.1	0.00	0.0
Snack Bars	14.6	5.1	4.9	3.9	0.00	0.0
Snack Bars*	15.4	10.5	3.0	1.1	0.00	0.0
Snack Bars	17.4	2.3	11.2	3.1	0.00	0.0
Snack Bars	19.6	7.5	9.3	1.7	0.20	1.0
Snack Bars	20.7	2.3	11.9	5.4	0.00	0.0

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Snack Bars	21.3	10.0	7.9	2.3	0.20	0.9
Snack Bars	29.4	6.4	12.0	9.6	0.00	0.0
Snack Bars*	35.2	9.6	20.7	3.2	0.20	0.6
Spring Rolls	10.4	4.7	4.3	1.3	0.07	0.7
Spring Rolls	10.9	1.8	6.8	2.3	0.21	1.9
Spring Rolls	9.0	0.9	5.3	2.7	0.08	0.9
Spring Rolls	6.8	2.3	2.2	1.9	0.21	3.2
Spring Rolls	9.8	4.2	3.6	1.3	0.32	3.3
Spring Rolls	19.8	4.1	7.3	7.3	0.33	1.7
Spring Rolls	12.8	2.0	7.2	2.8	0.20	1.6
Spring Rolls	21.7	5.8	4.9	9.8	0.25	1.1
Spring Rolls	4.7	2.2	1.8	0.4	0.01	0.0
Sweet Biscuits	12.6	6.3	4.5	1.7	0.09	0.7
Sweet Biscuits	6.5	2.8	2.5	1.1	0.04	0.6
Sweet Biscuits	12.0	6.7	3.8	1.4	0.08	0.7
Sweet Biscuits	28.4	14.5	10.8	2.9	0.18	0.6
Sweet Biscuits	21.0	12.4	6.2	2.0	0.41	1.9
Sweet Biscuits*	26.5	15.9	7.2	2.1	0.10	0.4
Sweet Biscuits*	17.6	9.4	5.6	1.8	0.00	0.0
Sweet Biscuits	19.9	10.8	6.2	1.9	0.10	0.5
Sweet Biscuits	12.2	5.8	4.4	1.4	0.10	0.8
Sweet Biscuits	11.7	1.3	6.8	2.9	0.23	2.0
Sweet Biscuits	18.3	10.1	5.7	1.6	0.00	0.0
Sweet Biscuits	10.2	5.0	3.6	1.1	0.10	1.0
Sweet Muffins & Banana Bread	8.5	2.7	3.8	1.7	0.05	0.6
Sweet Muffins & Banana Bread	6.7	0.6	4.0	1.7	0.08	1.2
Sweet Muffins & Banana Bread	7.4	0.8	4.2	2.2	0.12	1.6
Sweet Muffins & Banana Bread*	17.2	4.2	8.6	3.6	0.20	1.2
Sweet Muffins & Banana Bread*	20.1	4.3	10.3	4.4	0.30	1.5
Sweet Muffins & Banana Bread	16.0	1.4	10.0	3.7	0.20	1.3
Sweet Muffins & Banana Bread	22.4	14.1	5.6	0.9	1.09	4.9
Sweet Muffins & Banana Bread	6.8	1.7	3.3	1.4	0.11	1.6
Sweet Muffins & Banana Bread	13.7	1.2	8.4	3.3	0.10	0.7
Sweet Muffins & Banana Bread	18.8	5.5	8.6	3.7	0.22	1.2
Sweet Muffins & Banana Bread	18.5	4.3	9.4	3.7	0.32	1.8
Sweet Muffins & Banana Bread	12.5	1.2	7.6	2.9	0.20	1.6
Sweet Muffins & Banana Bread	18.6	1.7	11.5	4.2	0.30	1.6
Toasted Style Muesli Cereal	16.3	3.4	7.1	5.8	0.05	0.3
Toasted Style Muesli Cereal	10.8	1.6	5.9	3.4	0.02	0.2
Toasted Style Muesli Cereal	17.0	3.2	7.8	5.9	0.05	0.3
Toasted Style Muesli Cereal*	12.6	4.0	4.4	3.6	0.00	0.0

Food ID	(g/100 g food)					Total TFA (g/100g of fat)
	Total fat	Total saturated fatty acids	Total mono-unsaturated fatty acids	Total poly-unsaturated fatty acids	Total Trans Fatty Acids	
Toasted Style Muesli Cereal*	16.8	5.1	5.8	5.0	0.00	0.0
Toasted Style Muesli Cereal*	12.1	2.6	4.8	4.1	0.00	0.0
Toasted Style Muesli Cereal	15.2	7.3	5.1	2.1	0.00	0.0
Toasted Style Muesli Cereal	15.7	2.3	7.8	4.8	0.00	0.0
Toasted Style Muesli Cereal	16.7	2.2	10.4	3.3	0.00	0.0
Toasted Style Muesli Cereal	21.5	2.5	11.7	6.3	0.00	0.0
Toasted Style Muesli Cereal	14.1	2.8	7.2	3.4	0.00	0.0
Vegetable oil (olive)	100.0	16.1	75.0	8.9	0.00	0.0
Vegetable oil (sunflower)	100.0	10.6	29.9	59.2	0.35	0.4
Vegetable oil (peanut)	100.0	17.5	59.9	22.2	0.53	0.5
Vegetable oil (canola)	100.0	7.6	64.1	27.7	0.62	0.6
Vegetable oil (rice)	100.0	23.3	41.9	34.3	0.48	0.5
Vegetable oil (canola)*	99.9	7.3	59.5	27.2	1.50	1.5
Vegetable oil (soya bean)*	100.0	14.0	26.0	54.1	1.60	1.6
Vegetable oil (rice bran)	99.8	22.3	39.9	32.4	0.90	0.9
Vegetable oil (blended)	100.0	13.2	33.4	47.7	1.40	1.4
Vegetable oil (canola)	99.9	7.2	59.0	27.6	1.70	1.7
Vegetable oil (olive)	99.8	14.9	71.3	8.6	0.80	0.8
Vegetable oil (olive)	99.8	17.8	64.4	12.8	0.50	0.5

- * = New Zealand samples

Appendix 4 Summary of total TFA concentrations in 2005-07, 2008/09 and 2013 surveys

Table A4.1 Summary of total TFA concentrations (g/100 g) for product categories tested in 2005-07, 2008/09 and 2013 survey

Product category	2005-2007					2008-2009					2013				
	Food ID	No of samples	Min	Median	Max	Food ID	No of samples	Min	Median	Max	Food ID	No of samples	Min	Median	Max
			(g/100 g)					(g/100 g)					(g/100 g)		
Takeaway Foods	Chicken Nuggets	10	<0.1	0.35	0.7	Chicken Nuggets	26	<0.1	0.1	0.8	Chicken Products ›	21.00	0.10	0.23	0.43
	Deep Fried Fish Fillets	5	0.1	0.2	0.7	Deep Fried Fish Fillets	16	<0.1	0.1	0.8	Crumbed/Battered Fish Fillets ›	21.00	<0.1	0.21	0.66
	N/A	-	-	-	-	Dumpling^	13	<0.1	0.1	0.5	N/A	-	-	-	-
	N/A	-	-	-	-	Falafel	9	<0.1	0.1	0.2	Falafel	9.00	0.08	0.12	0.59
	N/A	-	-	-	-	Fried Noodle Dishes	13	<0.1	<0.1	0.2	Fried Noodle Dishes	9.00	<0.1	0.02	0.11
	Hot Chips	20	0.1	0.2	1.6	Hot Chips	31	<0.1	0.1	1.4	Hot Chips/Potato Products ›	23.00	<0.1	0.10	0.40
	Pizza	5	0.2	0.2	0.3	Pizza	14	0.1	0.2	0.3	Pizza ›	20.00	<0.1	0.14	0.53
	N/A	-	-	-	-	Spring Rolls	16	<0.1	0.1	1.3	Spring Rolls ›	9.00	<0.1	0.21	0.33
	N/A	-	-	-	-	Sweet & Sour Pork	14	<0.1	<0.1	0.29	Restaurant Style Takeaway Dishes ›	17.00	<0.1	0.14	0.77
Snack Foods	N/A	-	-	-	-	Corn Cakes^	3	<0.1	<0.1	<0.1	N/A	-	-	-	-
	Extruded Snacks	2	<0.1	<0.1	<0.1	Extruded Snacks	4	<0.1	0.1	0.2	Extruded Snacks	13.00	<0.1	0.19	0.76
	N/A	-	-	-	-	Popcorn	10	<0.1	0.1	11.53	Popcorn	11.00	<0.1	0.20	4.83
	Potato Crisps	13	<0.1	0.6	1.8	Potato Crisps	15	<0.1	0.1	1.4	Potato Crisps & Corn Chips ›	16.00	0.08	0.20	0.43

Product category	2005-2007					2008-2009					2013				
	Food ID	No of samples	Min	Median	Max	Food ID	No of samples	Min	Median	Max	Food ID	No of samples	Min	Median	Max
			(g/100 g)					(g/100 g)					(g/100 g)		
Fats & Oils	Edible Oil Spreads	10	<0.1	0.25	2.9	Edible Oil Spreads	17	0.1	0.5	3.16	Edible Oil Spreads	18.00	0.40	0.65	2.00
	Oil Based Dressings	3	0.1	0.2	0.2	Oil Based Dressings	9	<0.1	0.2	0.7	Oil Based Dressings	8.00	0.06	0.30	0.95
	N/A	-	-	-	-	Blended Edible Oils	5	0.3	1.5	3.1	Vegetable Oil ›	12.00	<0.1	0.71	1.70
Meat Products	Meat Pies	5	0.2	0.4	0.5	Meat Pies	20	0.15	0.6	0.9	Meat Pies ›	12.00	0.10	0.42	0.96
	Sausage Rolls	5	0.6	1	1	Sausage Rolls	19	0.09	0.8	2.1	Sausage Rolls ›	14.00	0.08	0.62	1.32
Bakery Products	Chocolate Biscuits	5	0.1	0.1	0.1	Chocolate Biscuits	12	<0.1	0.2	0.38	Chocolate Biscuits	31.00	<0.1	0.26	1.06
	N/A	-	-	-	-	N/A	-	-	-	-	Sweet Biscuits *	12.00	<0.1	0.10	0.41
	Cream Filled Biscuits	6	0.1	0.35	1.4	Cream Filled Biscuits	14	<0.1	0.3	0.8	Cream Biscuits +	13.00	0.10	0.25	1.7
	Croissant	5	0.3	0.4	0.5	Croissant	17	0.2	1	1.4	Croissant	10.00	0.40	1.02	1.36
	Custard Danish	5	0.2	0.3	0.4	Custard Danish	18	<0.1	0.6	1.2	Custard Baked Goods ›	10.00	0.14	0.58	0.88
	N/A	-	-	-	-	N/A	-	-	-	-	Desserts *	16.00	<0.1	0.38	0.75
	Donut	22	<0.1	0.3	8.7	Donut	23	<0.1	0.5	1.27	Donut	14.00	<0.1	0.39	0.91
	N/A	-	-	-	-	Pikelets /Pancakes	11	<0.1	<0.1	0.1	Pikelets /Pancakes	8.00	<0.1	<0.1	0.05
	Prepared Pastry	5	0.1	0.9	1.4	Prepared Pastry	19	0.02	1.35	2.8	Prepared Pastry	13.00	0.20	0.96	1.53
N/A	-	-	-	-	N/A	-	-	-	-	Savoury Biscuits - Rice Crackers and Crispbreads *	10.00	<0.1	0.04	0.12	

Product category	2005-2007					2008-2009					2013				
	Food ID	No of samples	Min	Median	Max	Food ID	No of samples	Min	Median	Max	Food ID	No of samples	Min	Median	Max
			(g/100 g)					(g/100 g)					(g/100 g)		
Bakery Products cont.	Savoury Biscuits	5	0.1	0.2	0.2	Savoury Biscuits	12	<0.1	0.1	1.6	Savoury Biscuits-Standard	13.00	<0.1	0.20	0.75
	N/A	-	-	-	-	N/A	-	-	-	-	Scones *	8.00	<0.1	0.10	0.66
	Shelf Stable Cakes	15	0.1	0.3	2.3	Shelf Stable Cakes	7	<0.1	0.2	0.6	Shelf Stable Cakes °	8.00	<0.1	0.12	0.58
	N/A	-	-	-	-	Muffins	21	<0.1	0.1	0.4	Sweet Muffins & Banana Bread ›	13.00	0.05	0.20	1.09
Others	Muesli Bars	5	<0.1	<0.1	<0.1	Muesli Bars	9	<0.1	<0.1	0.2	Snack Bars ›	15.00	<0.1	<0.1	0.21
	N/A	-	-	-	-	Dry Instant Soup Mix^	5	<0.1	0.1	1	N/A	-	-	-	-
	N/A	-	-	-	-	Dry Mix Pasta	5	0.1	0.2	0.5	Dry Mix Pasta	8.00	<0.1	0.06	0.21
	N/A	-	-	-	-	Gravy Mix^	7	<0.1	<0.1	1	N/A	-	-	-	-
	N/A	-	-	-	-	Nut Based Spreads	5	<0.1	<0.1	0.1	Nut Based Spreads	13.00	<0.1	0.13	0.30
	N/A	-	-	-	-	Sauces	6	<0.1	<0.1	0.1	Sauces	8.00	<0.1	0.02	0.39
	N/A	-	-	-	-	Toasted Style Muesli Cereal	5	<0.1	<0.1	0.1	Toasted Style Muesli Cereal	11.00	<0.1	<0.1	0.05
	N/A	-	-	-	-	N/A	-	-	-	-	Confectionery*	13.00	<0.1	0.12	0.49
	N/A	-	-	-	-	N/A	-	-	-	-	Dips *	8.00	0.08	0.21	0.81

N/A= not applicable. This product category was not analysed in this survey.

* New food product.

^ Product removed from 2013 survey sampling.

+ Chocolate Chip and Chocolate Coated & Chocolate Filled Biscuit product categories combined to compare against 2005-07 and 2008/09 data.

° Shelf Stable Cakes with and without cream fillings combined to compare against 2005-07 and 2008/09 data.

› Product category modified slightly to include a greater proportion of the products available on the market today.

Appendix 5 Comparison of TFA concentrations in Australian and New Zealand foods with other published food surveys

A comparison of the TFA concentrations in the 2013 survey with other surveys conducted in the United Kingdom (UK), Ireland, Canada and Australia in 2008 or 2009 is shown in Table 4. In general, the range of TFA concentrations observed in the studies is generally comparable to the current survey. In interpreting the data, it should be noted that there are significant differences in survey designs and analytical methodologies. A brief summary of each of the surveys is included below.

In the UK, the Department of Health undertook an analysis of a number of composite samples, comprised of a number of different brands, as part of its rolling programme of nutrient analysis surveys (UK Department of Health 2013). Samples were collected and prepared for analysis between 2010 and 2012. Sixty-five composite samples were prepared for analysis with each composite sample made up of between five and 16 sub-samples. Lipid fractions were solvent extracted, and the isolated fat was trans-esterified to form FAMES. The FAME profile was determined using GC with reference to calibration standards.

In 2008, the Food Safety Authority of Ireland undertook a study to analyse the fat profiles of fast-foods sold in Ireland. A total of 150 samples were collected from restaurants and analysed. It analysed 150 samples of fast food. Of the 150 products analysed, the survey found 77% (115) samples to have TFA levels less than or equal to 2% in the food. Each of the analyses for fatty acid profiles was conducted using gas chromatographic separation of methyl esters (FSAI 2008).

Health Canada, as part of their *Trans* Fat Monitoring Program, have analysed a wide variety of foods for total fat, TFAs, and SFAs (available at: http://www.hc-sc.gc.ca/fn-an/nutrition/gras-trans-fats/tfa-age_four_data_quatr-donn-eng.php). Results from the fourth set of data, carried out in 2009, indicated that many food manufacturers had reduced the TFA content of their products to meet the 5% TFA of total fat content voluntary limit applicable in Canada. TFA analyses were conducted using the AOAC Official Method 996.06 which is used to determine the total fat and fatty acids in a wide variety of foods that require nutrition labelling in Canada and the United States.

McCarthy et al. (2008) conducted a small scale survey to analyse the TFA concentrations in selected processed foods in Australia using Fourier *Transform* infrared spectroscopy with attenuated total reflection (ATR-FTIR). Foods included bakery products, fast food, frozen food, packaged snacks and fats and oils, where vegetable oil was a listed ingredient and the fat content of the food exceeded 5%. The mean concentration (g/100 g food) of TFAs in foods ranged from 0.1 g/100 g food for fish fingers to 7.5 g/100 g food for a sample of margarine. The different analytical methodology and slight differences in product categories sampled may have contributed to differences in TFA concentrations between this study and the current results.

Stender et al. (2012) compared the concentrations of manufactured TFAs in six European Union countries using a standardised purchase methodology in 2005, and again in 2009. Seventy servings of French fries and chicken nuggets, 90 packages of microwave popcorn, and 442 samples of biscuits/cakes/wafers with 'partially hydrogenated vegetable fat' on the list of ingredients were analysed. Serving sizes were 171 g of French fries and 160 g of chicken nuggets. In general, the results appeared to indicate that the highest manufactured

TFA concentrations (10–15 g) in biscuits, cakes and wafers in 2005 were found in Hungary, Poland and the Czech Republic. In France, Germany and the UK, the TFA contents were lower but were above 2 g in 100 g product in many cases. In 2009, biscuits, cakes and wafers in the three Eastern EU countries contained a smaller, but still substantial, amount of manufactured TFA. In contrast, the manufactured TFA content in products in the three Western EU countries was minimal (<1 g). Substantial decreases in maximum TFA content were also observed in France, Germany and the UK for fast food. Unfortunately, information on mean, median and the range of analytical results were generally not presented, limiting the utility of this study for comparative purposes. On that basis, the data have not been included in Table 4.

Table A5.1 Comparison of the range of reported TFA concentrations in Australian and New Zealand foods in the current survey with TFA levels found in other recent published domestic and international surveys

Food	2013 Coordinated Survey			Deakin University Australia			UK			Ireland			Canada		
	Total fat	SFA	TFA	Total fat	SFA	TFA	Total fat	SFA	TFA	Total fat	SFA	TFA	Total fat	SFA	TFA
	(g / 100 g food)			(g / 100 g food)			(g / 100 g food)			(g / 100 g food)			(g / 100 g food)		
Toasted Style Muesli Cereal	10.8-21.5	1.6-7.3	0.02-0.1	-	-	-	20.5	4.6	0.01	-	-	-	-	-	-
Chicken Nuggets/Products	8.2-23.6	1.4-7.1	0.1-0.4	15-24.7	-	0.3-0.5	11.6-15.5	1.8-3.1	0.02-0.1	13.5-17.5	2.2-8.1	<0.1-0.6	7.6-29	0.8-5.6	0.1-3.5
Meat Pie	8.6-13.9	4.2-7.5	0.1-0.9	11.4-15.9	-	0.9-1.8	13-26	5.5-10.1	0.06-0.1	-	-	-	-	-	-
Sausage Roll	11.1-18.4	5.4-10.1	0.2-1.4	11-13.7	-	0.8-2.2	24.1	10.4	0.03	-	-	-	-	-	-
Crumbed/Battered Fish Fillets	1.5-25.4	0.4-13.7	0.1-0.6	6-10.8	-	0.1	8.3-14.7	1.2-7.6	0.01-0.3	-	-	-	-	-	-
Hot Chips/Potato Products	2.0-25.2	0.4-9.3	0.03-0.4	11.7-21.4	-	0.3-0.4	4.9-8.4	0.8-4.3	<0.01-0.2	13.4-25.3	1.4-7.7	<0.1-0.1	2.7-25	0.3-4.3	0.7-3.8
Potato Crisps & Corn Chips	19.3-36.4	2.3-15.1	0.1-0.4	18.6-44.1	-	0.3-0.6	22.4-31.8	1.9-8.4	0.02-0.1	-	-	-	-	-	-
Confectionery	7.7-35.9	4.5-31.6	0.1-0.5	24.5-35.1	-	0.4-1.7	15.3-31.1	7.3-18.7	0.03-0.2	-	-	-	-	-	-
Chocolate Coated & Chocolate Filled Biscuits	18.0-31.4	9.8-25.5	0.1-0.3	19.4-27.1	-	0.3-5.7	23.6	13.5	0.05	-	-	-	-	-	-
Snack Bars	8.8-35.2	1.4-10.5	0.1-0.2	6.7-7.9	-	0-0.2	25.8	16.3	0.1	-	-	-	-	-	-
Nut Based Spreads	19.1-54.3	2.8-11.6	0.1-0.3	26.4-50.3	-	0.1-1.6	37.7	8.1	0.03	-	-	-	-	-	-
Oil Based Dressings	13.5-79.8	1.7-8.9	0.06-1.0	-	-	-	74.8	5.7	0.04	-	-	-	-	-	-
Pizza	4.9-14.8	2.4-6.5	0.05-0.4	5.6-17.9	-	0.2-2.2	-	-	-	7.2-13.9	3.4-6.8	0.1-0.3	-	-	-
Desserts	8.3-31.6	4.4-15.9	0.1-0.8	-	-	-	-	-	-	5.5-21.8	3-12.9	0.1-0.3	6.7-27.7	1.7-13.4	0.02-4.9
Choc Chip Biscuit	13.1-30.6	4.3-17.4	0.1-0.9	-	-	-	-	-	-	-	-	-	21-25	6.4-14.9	0.2-6
Croissant	14.9-27.5	9.9-18.6	0.4-1.4	19.1-20.7	-	0.3-0.4	-	-	-	-	-	-	15.7-15.9	3.4-9.9	0.4-7
Donut	3.1-24.0	0.3-15.5	0.08-0.9	13.5-23.2	-	0.2-6.6	-	-	-	-	-	-	14-26.1	5.5-6.5	0.6-9.6

Food	2013 Coordinated Survey			Deakin University Australia			UK			Ireland			Canada		
	Total fat	SFA	TFA	Total fat	SFA	TFA	Total fat	SFA	TFA	Total fat	SFA	TFA	Total fat	SFA	TFA
	(g / 100 g food)			(g / 100 g food)			(g / 100 g food)			(g / 100 g food)			(g / 100 g food)		
Sweet Muffins & Banana Bread	6.7-22.4	0.6-14.1	0.08-0.8	11.5-19.8	-	0.2-0.6	-	-	-	-	-	-	8-14	0.9-1.8	0.1-0.2
Spring Roll	4.7-21.7	0.9-5.8	0.07-0.3	-	-	-	-	-	-	-	-	-	18.6	0.2	4.3
Savoury Biscuits-Standard	2.0-28.8	0.3-14.9	0-0.8	16.6-21.5	-	0.1-3.9	-	-	-	-	-	-	-	-	-
Popcorn	11.7-29.6	2.6-20.8	0-4.8	4.1-26.8	-	0-8.1	-	-	-	-	-	-	-	-	-
Prepared Pastry	12.2-34.6	6.1-24.5	0.2-1.5	10.1-37.2	-	0.6-7.6	-	-	-	-	-	-	-	-	-

- Product category not analysed.

Values shown represent the range of values reported for the selected product category.