

Report on 2009 *trans* fatty acid survey – analytical results

A survey conducted under the Coordinated Food Survey Plan with participation from food regulatory jurisdictions in NSW, SA, WA and NZ.

Report prepared by the NSW Food Authority

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This report should be read in conjunction with the Food Standards Australia New Zealand review report entitled 'Review Report: Intakes of *trans* fatty acids in New Zealand and Australia (2009)'

Executive Summary

Trans fats 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.

In 2007, Food Standards Australia New Zealand (FSANZ) conducted a formal scientific review of TFA in the food supply. The review found that the contributions of TFA to energy intakes of Australians and New Zealanders was below the goal of 1% proposed by the World Health Organization, and was comparable to or lower than intake estimates from some countries overseas.

Ministers endorsed the findings of the Review and agreed that immediate regulatory intervention was not required and that non-regulatory measures (in the form of the voluntary action of industry such as reformulation) to further reduce the levels of TFA in the Australian and New Zealand food supply would be the most appropriate action.

The aim of this survey was to determine the amount of TFA in a range of Australian and New Zealand processed and takeaway foods after non regulatory measures were introduced. The ratios of TFA to other fatty acids, particularly saturated fatty acids, and changes to these ratios were also assessed.

A total of 456 samples from six different food categories were collected from NSW, SA, WA and NZ and analysed for total fat, saturated fat, monounsaturated fat, polyunsaturated fat and *trans* fat. The range of food categories tested in the survey included takeaway foods, fats and oils, snack foods, meat products, and bakery products.

The results showed overall that the ratio of TFA in a range of processed and takeaway foods were relatively low. Omitting the samples likely to contain ruminant TFA, 82.3% of the samples surveyed had TFA levels equal to or less than the Danish limit of 2 grams of TFA per 100 grams of fat.

Of the 456 samples tested, one brand of popcorn had the highest ratio of TFA (compared to total fat) at 35.2%. A breakfast bar, another popcorn sample and one sample of potato crisps also had a very high TFA ratio at 30.6, 27.8, and 22.2% respectively.

Of the forty two samples that were tested in both the previous and current survey, twenty six (61.9%) showed a decrease in the TFA content over time.

The survey results were provided to FSANZ for their review of TFA intake in the Australian and New Zealand populations. Thus, this report should be read in conjunction with the Food Standards Australia New Zealand review report entitled 'Review Report: Intakes of *trans* fatty acids in New Zealand and Australia (2009)'.

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1. Introduction

There is consistent and robust evidence linking *trans* fatty acids (TFA) intake with risk factors for coronary heart disease, including raised total cholesterol concentrations. TFA originate from several sources. TFA are formed naturally by bacteria in the first stomach of ruminant animals such as cows and sheep and are present in the milk and meat of these animals (Sommerfeld, 1983). They are also formed when vegetable oils high in polyunsaturated fatty acids are converted into solid fats; a process known as partial hydrogenation. TFA which are derived from foods containing hydrogenated or 'hardened' fats can be found in cakes and biscuits and other processed foods, and in takeaway meals. TFA can also be formed during heating and frying of oils at extreme temperatures (EFSA, 2004; IFST, 2007; Stender & Dyerberg, 2003).

Reductions in TFA can be achieved by modifying the conditions of hydrogenation or by using interesterification. There is clear evidence that in the United Kingdom and elsewhere in Europe, industry has responded positively to requests to reduce levels of manufactured TFA in foods. Reductions have been demonstrated in major brands of margarine in the United Kingdom. For example, in 1994, some margarine had between 8 and 12% TFA. When measured again in 2007, TFA levels had decreased to less than 1% (IFST, 2007).

In Canada, the level of TFA in foods was assessed during the period of 2005 to 2007. Of the 221 food products tested, 92 (42%) contained TFA of greater than 5% of the total fat on initial assessment. However, 72% were reformulated during the period of sampling. TFA levels decreased from $26 \pm 13\%$ to $2 \pm 4\%$, without an increase in the SFA content or total fat content (Ratnayake, L'Abbe & Mozaffarian, 2009).

In January 2004, Danish food authorities adopted legislation which introduced a limit of no more than 2g of TFA per 100g of fats or oil in the food product as sold to the consumer, with some exemptions for animal fats (Danish Ministry of Food Agriculture and Fisheries, 2008). In July 2003, the US Food and Drug Administration issued a regulation requiring manufacturers to list TFA on the nutrition label of foods and some dietary supplements. This regulation took effect on 1 January 2006 (US FDA, 2003).

After a 2007 study from ETH Zurich found almost a third of the 120 Swiss foods contained an excessive amount of *trans* fatty acids (greater than the Danish limit value of two percent TFA per total fat content), Switzerland became the second country in the world to introduce a legal limit for *trans* fat. From April 2008, 100 grams of vegetable cooking oil and vegetable cooking fat can contain no more than two grams of TFA (ETH, 2008).

In Australia, under the current Australia New Zealand Food Standards Code, manufacturers are not required to label TFA unless a nutrient content claim is made relating to cholesterol, saturated fats (SFA), monounsaturated fats (MUFA), polyunsaturated fats (PUFA), TFA, or omega-3, omega-6 or omega-9 fatty acids. Voluntary labelling of TFA is permitted and many edible oil spreads and oil manufacturers declare TFA content on labels.

In 2007, Food Standards Australia New Zealand (FSANZ) conducted a formal scientific review of TFA in the food supply (FSANZ, 2007). The review found that the contributions of TFA to energy intakes of Australians and New Zealanders was below the goal of 1% proposed by the World Health Organization (WHO/FAO, 2003), and was comparable to or lower than intake estimates from some countries overseas.

Ministers endorsed the findings of the Review and agreed that immediate regulatory intervention was not required and that non-regulatory measures (in the form of the voluntary action of industry such as reformulation) to further reduce the levels of TFA in the Australian and New Zealand food supply would be the most appropriate action.

In early 2007, the Australia New Zealand Collaboration on Trans Fats was established to assist in reducing levels of TFA in foods. Representatives include the National Heart Foundation of Australia, the National Heart Foundation of New Zealand, the Dietitians Association of Australia, the Australian Food and Grocery Council, the New Zealand Food and Grocery Council, the New Zealand Food Safety Authority (NZFSA) and FSANZ.

The primary aim of this group is to work cooperatively with industry in reducing the amount of TFA in the New Zealand and Australian food supply, without increasing the amount of SFA present in the food. In September 2007 FSANZ reported that information provided by the food industry

representatives showed a reduction in TFA levels in foods without dramatic increases in the SFA content of foods.

The review by FSANZ also recommended that a re-assessment of TFA in foods and dietary intake would commence in early 2009. This review would measure the effectiveness of the outcome of non-regulatory measures aimed to reduce manufactured TFA content in the food supply.

2. Survey Objective

The aim of this survey was to determine the amount of TFA in a range of Australian and New Zealand processed and takeaway foods after non-regulatory measures were introduced. The ratios of TFA to other fatty acids, particularly SFA, and changes to these ratios were also assessed.

The survey results were provided to FSANZ for their review of TFA in the Australian and New Zealand food supply. The purpose of the FSANZ review was to estimate dietary intakes of TFA for the Australian and New Zealand populations and to determine whether the risk management strategy adopted assisted in reducing consumers' intake of TFA.

3. ISC Coordinated Food Survey

On 30 October 2003 the Food Regulation Standing Committee's Implementation Sub-Committee (ISC) agreed to the development of a 'Coordinated Food Survey Plan' (the Plan) for the Australian jurisdictions, food regulatory partners and New Zealand. This was in recognition that there were significant advantages in implementing agreed national survey priorities in a prospective and coordinated manner. A national coordinated survey of the TFA in Australian and New Zealand foods was proposed by the NSW Food Authority and endorsed by ISC for inclusion in the Plan for 2008 and 2009.

4. Sample collection

In September 2008 to April 2009, a total of 456 samples of takeaway and processed foods were collected from a range of supermarkets and takeaway shops in New South Wales, South Australia, Western Australia, and New Zealand.

The specific target of the sampling was processed and takeaway foods potentially containing hydrogenated vegetable oils. Samples were collected at random to pick up a diverse range of products. For takeaway food, samples were collected from various chain and independent retailers present in each jurisdiction and not selected based on market share. As a result, samples are not fully representative of bi-national purchasing trends or intake.

Products from a range of different food categories were tested in the survey, including:

- Takeaway foods e.g. hot chips, deep fried fish fillets, chicken nuggets and pizzas
- Snack foods e.g. potato crisps and extruded snacks
- Fats and oils e.g. edible oil spreads and blended edible oil
- Meat and meat products e.g. meat pies and sausage rolls
- Bread and bakery products e.g. croissants, donuts, biscuits and shelf stable cakes
- Others such as dry mix pasta, dry instant soup mix and gravy mix

Samples were transported in their original packaging to the laboratories for testing. All samples were tested without further preparation or cooking, except for the following:

- Popcorn – prepared as instructed by the on pack product instructions
- Gravy mix (NZ only) – prepared as instructed by the on pack product instructions

5. Method of analysis

Tests were conducted by four laboratories using their in-house methods to determine the levels of fatty acids in the selected foods. Prior to commencing the survey, a small sub-set of samples were tested by each laboratory to assess reproducibility across the laboratories (see Appendix 1). No issues were identified as similar results were obtained across the laboratories.

NSW samples were tested by the General Chemistry Laboratory at the Division of Analytical Laboratories (DAL) in Sydney. TFA was quantified using an in-house method, based on AOCS method Ce 1f-96 (personal communication, DAL). Triglycerides were saponified by methanolic potassium hydroxide to liberate fatty acids which were then esterified in the presence of boron trifluoride to produce fatty acid methyl esters. Methyl esters of fatty acids with 4 – 24 carbon atoms were separated, identified (using reference standards) and determined using gas chromatography (personal communication, DAL). The limit of detection of this method is 0.1% of total fatty acids for each fatty acid.

SA samples were tested by the National Measurement Institute in Melbourne. Fat was extracted from the homogenised sample using either Chloroform/Methanol or Petroleum ether/iso-propyl alcohol under nitrogen depending on the food matrix. The extracted fat was then esterified using a methanolic sodium methoxide solution and treatment with sulphuric acid in methanol. The relative proportion of each fatty acid methyl ester in the prepared samples was then determined using gas chromatography with flame ionisation detection¹ (personal communication, NMI). The limit of reporting of this laboratory is 0.1%.

WA samples were tested by the Chem Centre in Perth. Total lipids including phospholipids were extracted using a Chloroform/Methanol according to the Folch method². The extract was then saponified, methylated and esterified using boron trifluoride. Esterified samples were then run on a gas chromatography with flame ionisation detection and compared to certified reference standards to determine the individual fatty acids value (personal communication, Chem Centre). The limit of detection of this method is 0.1%.

NZ samples were tested by the Institute of Environmental Science and Research (ESR) in Christchurch. Fat was extracted using diluted hydrochloric acid, ethanol, petroleum ether and diethyl ether as reagents³. Samples were then methylated using methanolic potassium hydroxide⁴. The TFA profile was determined using gas chromatography - mass spectrometry against reference standards (personal communication, ESR). The limit of detection of this method is 0.1%.

6. Results and Discussion

A total of 456 samples representing thirty six product types were tested in this survey (Table 1). The results for each individual product are listed in Appendix 2.

Table 1: Number of samples in each food category tested in the 2008/09 survey

Food category	Product	No of samples
Takeaway foods	Chicken nuggets	26
	Deep fried fish fillets	16
	Dumpling	13
	Falafel	9
	Fried noodles	13
	Hot chips	31

¹ Bligh & Dwyer. A rapid method of total lipid extraction and purification. *Can. J. Biochem. Physiol.*, 37, 911 – 917. Badings & Dejong (1983) *J. Chrom.*, 279, 493 – 506. McCance & Widdowson (1991). *The composition of foods*. 5th Ed, p9.

² Folch, J., Lees, M. and Stanley, G.H.S. (1957). Preparation of lipid extracts from brain tissue. *J. Biol. Chem.*, 226, 497 – 507.

³ AOAC Official Methods of Analysis 32.2.02A

⁴ Bannon, C. *et al.* (1982). *J. Chrom* 247, 71 – 89. British standard methods of analysis of fats and oils, BS 684: Section 2.35:1980.

Food category	Product	No of samples
	Pizza	14
	Spring rolls	16
	Sweet & sour pork	14
Snack foods	Extruded snacks	4
	Potato crisps	15
	Popcorn	10
	Corn cakes	3
Fats & oils	Blended edible oil	5
	Edible oil spreads	17
	Oil based dressings	9
Meat & products	Meat pies	20
	Sausage rolls	19
Bread & bakery products	Croissant	17
	Custard Danish	18
	Donuts	23
	Chocolate biscuits	13
	Cream biscuits	13
	Savoury biscuits	12
	Shelf stable cakes	7
	Muffins	21
	Pikelets	11
Prepared pastry	19	
Others	Toasted style muesli cereal	5
	Muesli bars	9
	Breakfast bars	6
	Dry mix pasta	5
	Dry instant soup mix	5
	Gravy mix	7
	Sauces	6
	Nut based spread	5

Comparison to Danish Legislation

The Danish legislation introduced a limit of no more than two grams of TFA per 100 grams of fats or oil in the food product as sold to the consumer, with some exemptions for animal fats. In order to analyse the results against the Danish regulatory limit, the ratio of TFA to total fat (weight per weight) was calculated and expressed as a percentage.

The total fat, saturated fatty acids (SFA), polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA) and TFA values were reported as gram per 100 gram of food. A total of 107 samples tested in this survey contained TFA that may be derived from ruminant sources or a mixture of both ruminant origin and manufactured TFA (Table 2). Thus, these products were excluded from the comparison to the Danish legislation.

Table 2: Food product that may contain TFA from ruminant sources

Food product	Ruminant source
Pizza	Cheese
Meat pies	Beef
Sausage rolls	Beef
Croissants	Butter
Custard Danish	Butter
Prepared pastry	Butter

Omitting the samples likely to contain considerable proportions of ruminant TFA, over 82% of the samples surveyed had TFA levels equal to or less than the Danish limit of two grams of TFA per 100 grams of fat (Figure 1). These results are similar to previous surveys conducted between 2005 and 2007 which found over 87% of products tested had TFA levels which were less than the limit defined in the Danish legislation (FSANZ, 2007).

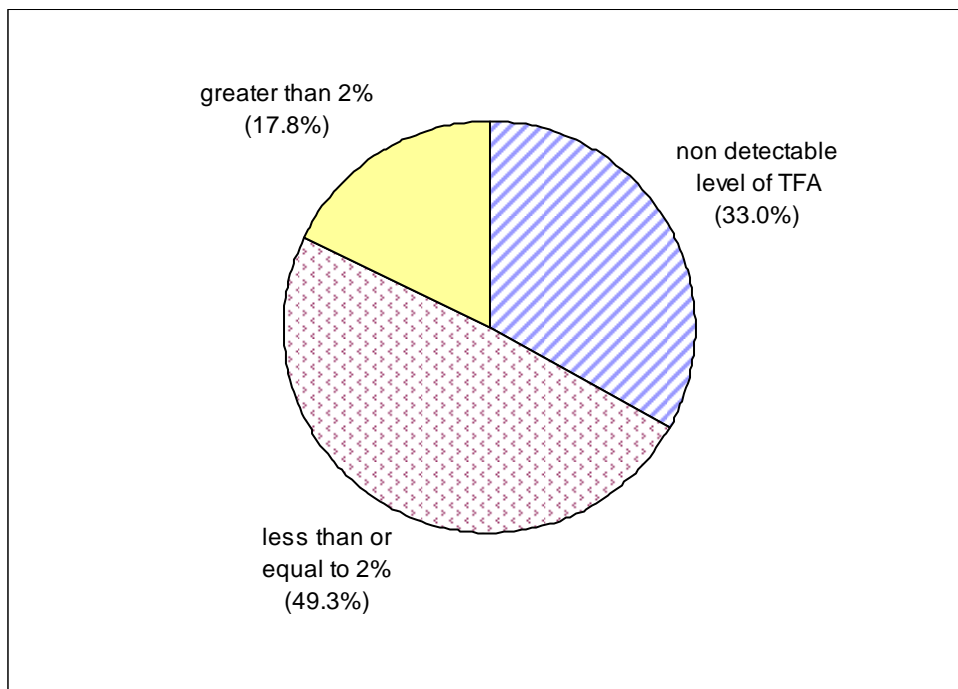


Figure 1: Proportion of samples containing different ranges of manufactured TFA

A breakdown of the 349 food products without ruminant TFA (Table 3) shows:

- 115 (33.0%) contained non detectable levels of TFA (less than 0.1%);
- 172 (49.3%) contained TFA at less than or equal to 2%; and
- 62 (17.8%) contained TFA greater than 2%.

Table 3: Breakdown of products when compared to the Danish legislation

No detected level of TFA	Less than 2% TFA ⁵	Greater than 2% TFA ⁵
Breakfast bars	Blended edible oil	Breakfast bar
Chicken nuggets	Breakfast bars	Blended edible oil
Corn cakes	Chicken nuggets	Cream biscuits
Donuts	Cream biscuits	Chicken nuggets
Dumplings	Donuts	Donuts
Extruded snacks	Dry instant soup mix	Dry instant soup mix
Falafel	Dumplings	Dry mix pasta
Fried noodles	Extruded snacks	Dumplings
Gravy mix	Falafel	Falafel
Hot chips	Fried noodles	Fried noodles
Muesli bars	Gravy mix	Gravy mix
Muffins	Hot chips	Hot chips
Nut-based spreads	Edible oil spreads	Muffins
Oil-based dressings	Muesli bars	Edible oil spreads
Pikelets	Muffins	Popcorn
Prepared pastry	Nut based spreads	Potato crisps
Popcorn	Oil based dressings	Prepared pastry
Potato crisps	Pikelets	Savoury biscuits
Sauces	Popcorn	Shelf stable cakes
Savoury biscuits	Potato crisps	Spring rolls
Shelf-stable cakes	Prepared pastry	Sweet and sour pork
Spring rolls	Sweet and sour pork	
Sweet and sour pork	Shelf-stable cakes	
Toasted muesli cereals	Sauces	
	Savoury biscuits	
	Spring rolls	
	Toasted muesli cereal	

From the above table it can be seen that there is a wide variation in the TFA values within a food product. Many of the products within a food category fell within the three TFA ranges (Table 4). For example, the TFA value for chicken nuggets ranged from under the limit of detection of 0.1% to 8.5%. As expected the type and amount of fat present in a food product is dependent on the product formulation and differs from product to product as well as between manufacturers.

⁵ The 2% figure refers to 2 grams of TFA per 100 grams of fat in the food.

Table 4: Food products that fell within the three TFA ranges as set by the Danish Legislation

Food product	TFA ranges (% per total fat in the food)
Breakfast bars	<0.1 to 30.6
Chicken nuggets	<0.1 to 8.5
Cream biscuits	<0.1 to 3.3
Deep fried fish fillets	<0.1 to 5.0
Donuts	<0.1 to 4.8
Dumpling	<0.1 to 3.2
Falafel	<0.1 to 2.6
Fried noodles	<0.1 to 5.9
Hot chips	<0.1 to 5.8
Muffins	<0.1 to 3.1
Popcorn	<0.1 to 35.2
Potato crisps	<0.1 to 22.2
Savoury biscuits	<0.1 to 12.7
Shelf stable cakes	<0.1 to 4.1
Spring rolls	<0.1 to 10.8
Sweet & sour pork	<0.1 to 2.4

Comparison to previous surveys

Change in fatty acid profile in selected food categories from 2005-2007 to 2008/09

In 2005 and 2007, surveys were undertaken to assess the TFA levels in the Australian food supply (NSW Food Authority, 2008). A total of nineteen food products from five food categories were tested in those surveys and was repeated for the 2008/09 survey. The food categories and food products are:

- Takeaway foods: chicken nuggets, deep fried fish fillets, hot chips, and pizza
- Snack foods: potato crisps and extruded snacks
- Fats & oils: oil based dressings and edible oil spreads
- Meat products: meat pies and sausage rolls
- Bakery products: chocolate biscuits, cream filled biscuits, croissants, custard Danish, donuts, prepared pastry, and shelf stable cakes
- Others: muesli bars

Table 5 provides a summary of the comparison between the surveys. Key results were:

- Eight of the nineteen 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; and
- 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 content

Of the eight food products showing an increase in the median TFA content, four (meat pies, croissants, custard Danish, and prepared pastries) are likely to contain ruminant TFA or a mixture of ruminant and manufactured TFA. In situations of mixed TFA, the amount of manufactured TFA present cannot be separately determined. Ruminant TFA is naturally present in meat and dairy products and can therefore increase TFA levels in products containing these ingredients even though the levels of manufactured TFA are reduced.

Table 5: Summary of TFA results (g/100g of food) for food categories tested in previous and current survey

Food category	Food product	2005 - 2007				2009			
		No of samples	Min	Median	Max	No of samples	Min	Median	Max
Takeaway foods	Chicken nuggets	10	<0.1	0.35	0.70	26	<0.1	0.10	0.80
	Deep fried fish fillets	5	0.10	0.20	0.70	16	<0.1	0.10	0.80
	Hot chips	20	0.10	0.20	1.60	31	<0.1	0.10	1.40
	Pizza	5	0.20	0.20	0.30	14	0.10	0.20	0.30
Snack foods	Potato crisps	13	<0.1	0.60	1.80	15	<0.1	0.10	1.40
	Extruded snacks	2	<0.1	<0.1	<0.1	4	<0.1	0.10	0.20
Fats & oils	Oil based dressings	3	0.10	0.20	0.20	9	<0.1	0.20	0.70
	Edible oil spreads	10	<0.1	0.25	2.90	17	0.10	0.50	3.16
Meat products	Meat pies	5	0.20	0.40	0.50	20	0.15	0.60	0.90
	Sausage rolls	5	0.60	1.00	1.00	19	0.09	0.80	2.10
Bakery products	Chocolate biscuits	5	0.10	0.10	0.10	12	<0.1	0.20	0.38
	Cream filled biscuits	6	0.10	0.35	1.40	14	<0.1	0.30	0.80
	Croissants	5	0.30	0.40	0.50	17	0.20	1.00	1.40
	Custard Danish	5	0.20	0.30	0.40	18	<0.1	0.60	1.20
	Donuts	22	<0.1	0.30	8.70	23	<0.1	0.50	1.27
	Prepared pastry	5	0.10	0.90	1.40	19	0.02	1.35	2.80
	Savoury biscuits	5	0.10	0.20	0.20	12	<0.1	0.10	1.60
	Shelf stable cakes	15	0.10	0.30	2.30	7	<0.1	0.20	0.60
Others	Muesli bars	5	<0.1	<0.1	<0.1	9	<0.1	<0.1	0.20

Using the median values for each of the fatty acid types (TFA, SFA, MUFA and PUFA) from the different surveys (2005, 2007 and 2009), the change in the fatty acid profiles of selected food products has been graphed (Figure 2 to Figure 8).

Takeaway foods

A reduction in the total fat content and TFA level can be seen in three of the four takeaway foods products (chicken nuggets, hot chips and pizza), without a considerable increase in SFA (Figure 2). There is a slight increase (1.1%) in the total fat content for deep fried fish fillets, but this increase can be attributed to an increase in the MUFA content since TFA and SFA levels remain similar.

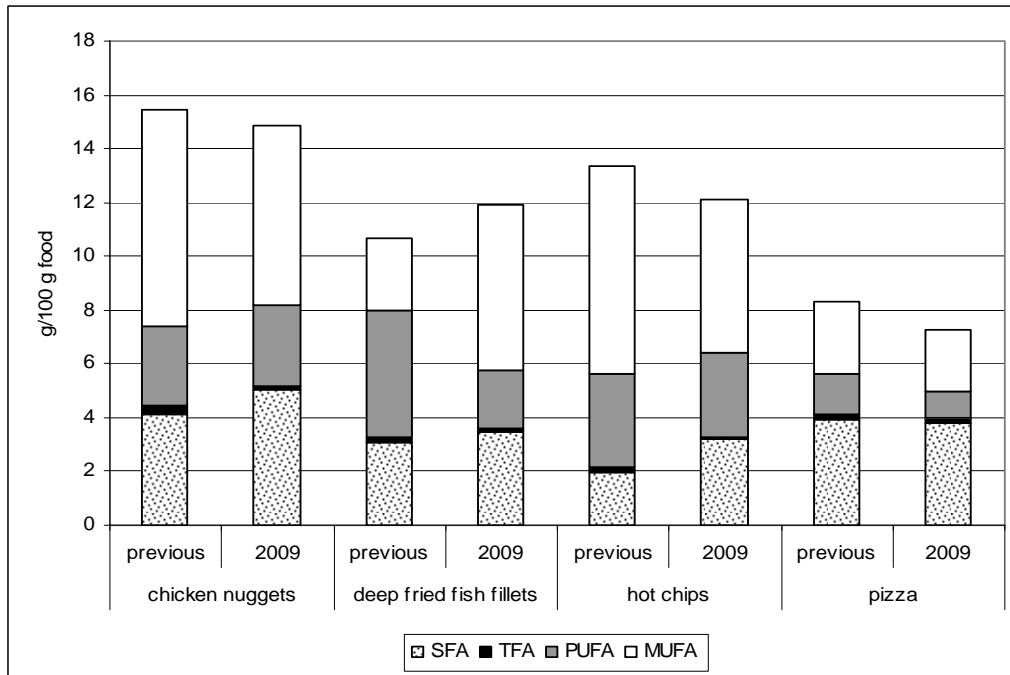


Figure 2: Change in fat content and composition for takeaway foods

Snack foods

Both potato crisps and extruded snacks show a reduction in total fat and SFA content (Figure 3). The median TFA content for potato crisps was reduced from 0.6g/100g food to 0.1g/100g food, and TFA content for extruded snacks remained low at less than 0.1g/100g food.

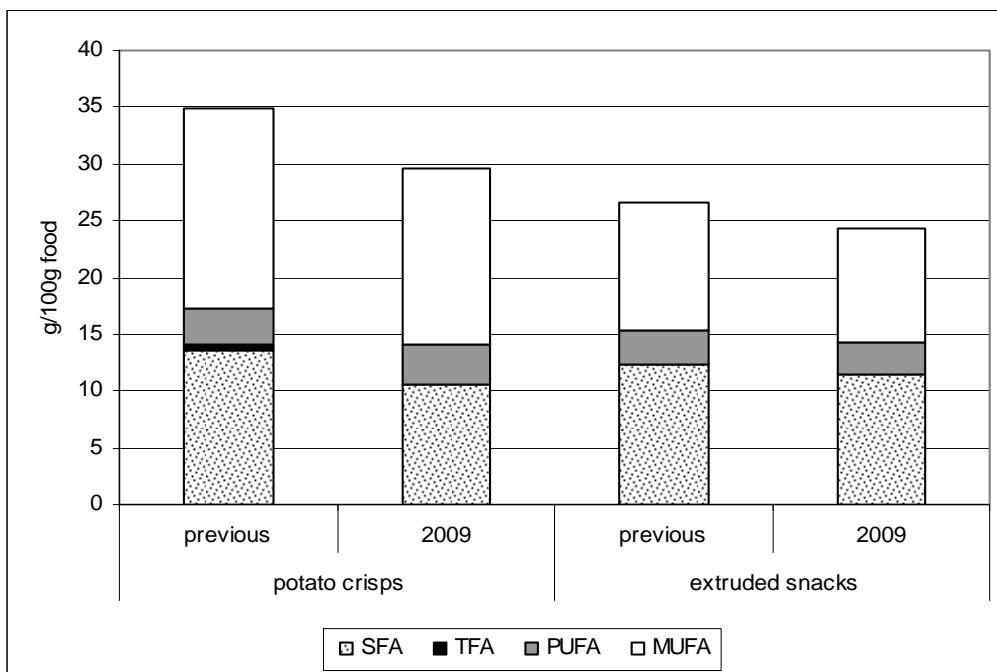


Figure 3: Change in fat content and composition for snack foods

Edible oil spreads

The fat profile for edible oil spreads remained similar over time, with total fat of approximately 60g/100g of food (Figure 4).

The median TFA level has increased between the surveys, although this can be attributed to a brand of edible oil spread tested in 2009 which was not included in the previous survey. Since conducting the 2009 survey, there is anecdotal evidence that some brands of edible oil spread have been reformulated resulting in a decrease in the TFA level. The TFA ratio (compared to total fat) remained low at less than 1%.

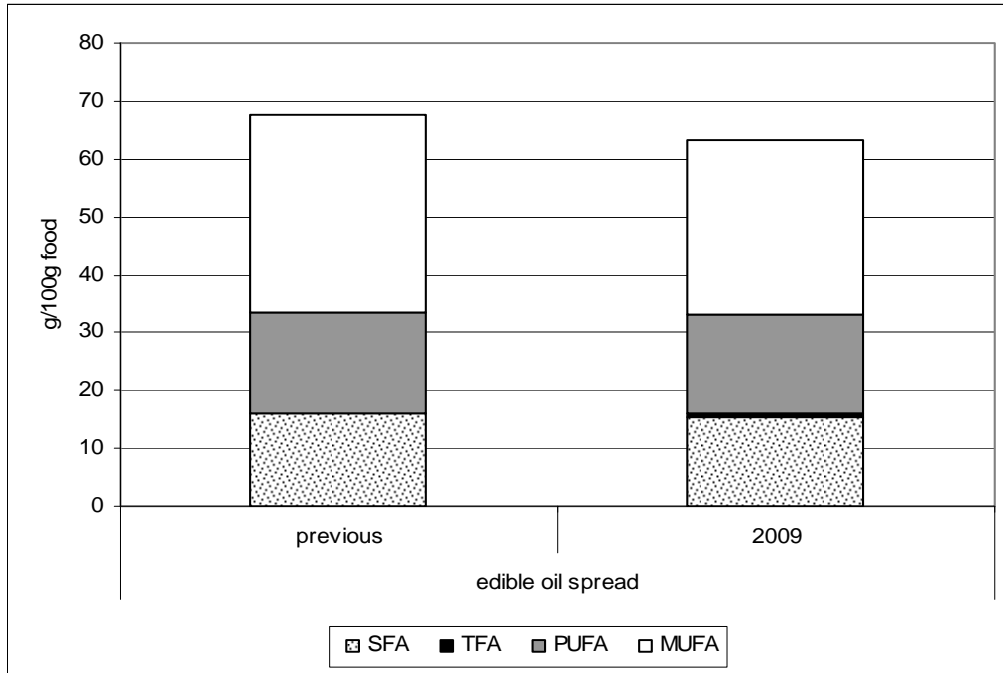


Figure 4: Change in fat content and composition for edible oil spreads

Meat products

The total fat content and SFA levels for meat pies were both lower than the previous surveys, with only a slight increase in TFA levels from 0.4g/100g of food to 0.6g/100g of food (Figure 5). However, TFA in these products may originate from ruminant sources as well as manufactured sources. TFA levels in ruminant products are likely to vary due to the rearing methods employed. For sausage rolls, the total fat content and its profile remained similar to previous surveys, with TFA levels at 1g TFA/100g food.

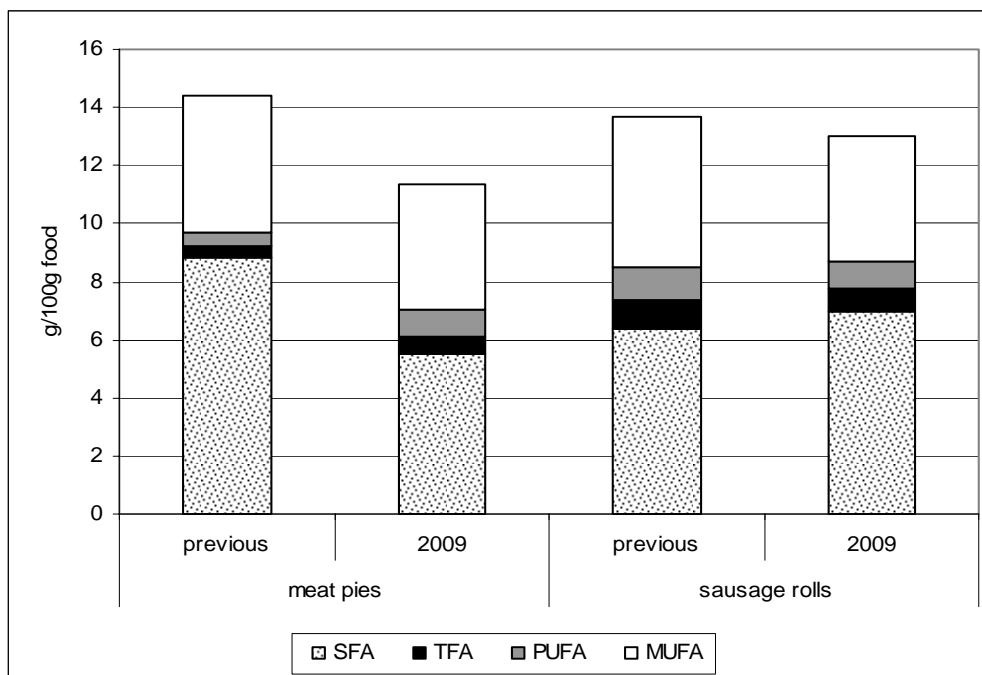


Figure 5: Change in fat content and composition for meat products

Bakery products

Of the eight bakery products tested, three showed reductions in total fat content (chocolate biscuits, prepared pastry and shelf stable cakes), one (donuts) showed a slight increase in the total fat content and the remainder were similar to the previous survey (Figure 6 and Figure 7).

For chocolate biscuits this decrease in total fat can be attributed to a decrease in levels of SFA from 17.1g/100g food to 12.3g/100g food as there were not considerable changes to the profile of other fatty acids.

Prepared pastry contained similar amount of SFA and TFA over time, but total fat decreased because the levels of MUFA and PUFA reduced quite considerably (from 2.7g/100g food to 1.1g/100g food and 9.1g/100g food to 6.4g/100g food, respectively).

There was an overall reduction in the total fat content of shelf stable cakes. This was predominately due to a decrease in the amount of MUFA and PUFA with an increase in the SFA content (from 3.8g/100g food to 5.3g/100g food). The TFA levels remained similar over time (under 0.4g/100g food in both surveys).

Donuts showed an increase in saturated fats and total fat content. However, the TFA level was reduced from 1.1g/100g food to 0.5g/100g food.

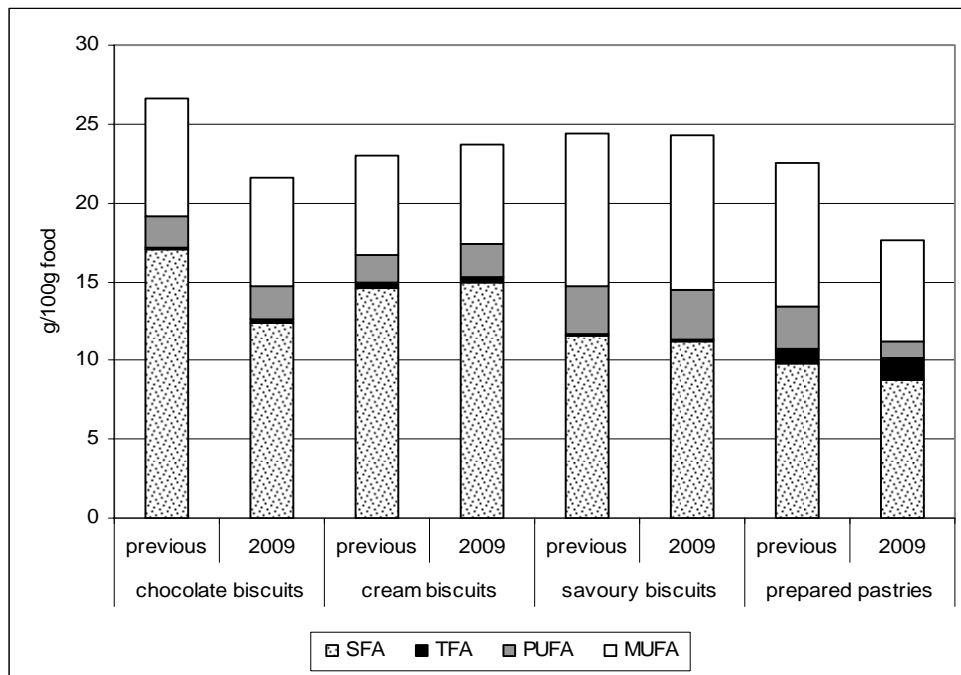


Figure 6: Change in fat content and composition for bakery products – part 1

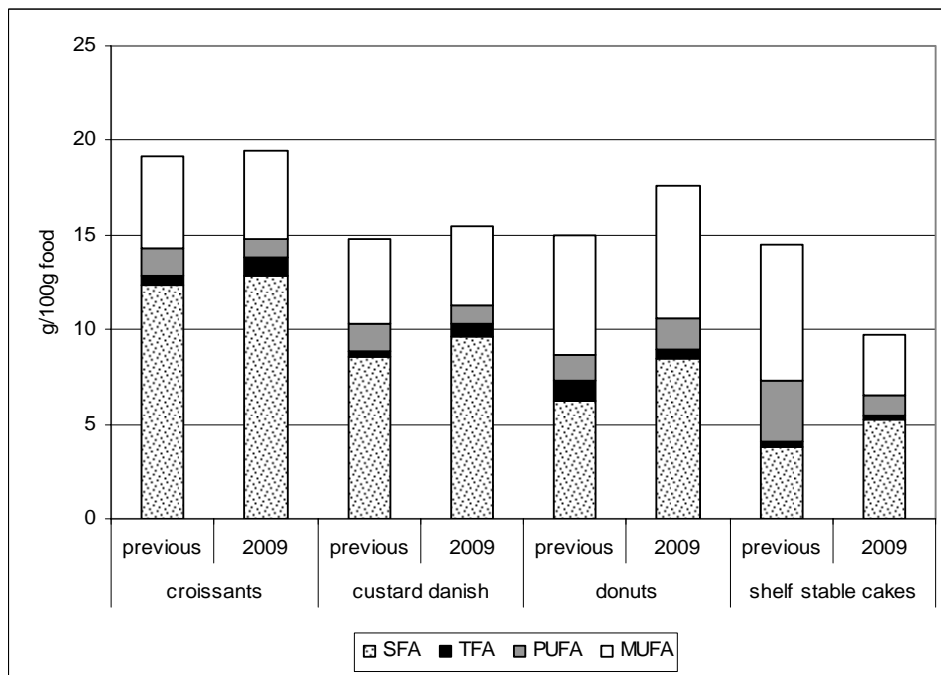


Figure 7: Change in fat content and composition for bakery products – part 2

Muesli bars

Muesli bars show considerable reduction in total fat content, especially due to considerable decrease in SFA content. TFA was not detected in these products (Figure 8).

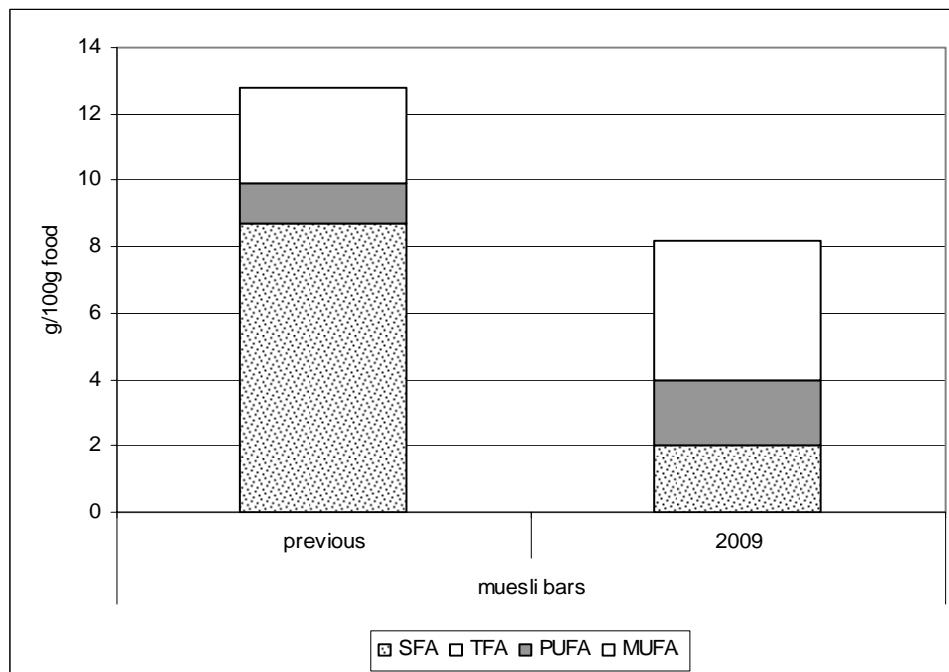


Figure 8: Change in fat content and composition for muesli bars

Change in fatty acid profile for selected food products from 2005-2007 to 2008/09 survey

A total of forty two randomly selected food products (same brand) were tested in both the previous and current surveys. The variation for total fat, SFA, MUFA, PUFA and TFA content was calculated as grams per 100 grams of food (Appendix 3).

A total of twenty six products (61.9%) showed a reduction in TFA content over time, with four products showing no changes in TFA content. The rest of the products show an increase in TFA content, ranging from 0.05 to 0.9g/100g food. However, eight of these products are likely to contain ruminant TFA, which cannot be controlled through changes in the manufacturing processes. The key findings were:

- There was a considerable reduction (55.5% and 80%) in TFA content of two chicken nuggets products. One brand also showed a reduction across all other fatty acids.
- The TFA content of hot chips also decreased, with one brand also showing a decrease in other fatty acids.
- A reduction was observed in TFA level in potato crisps (ranging from a 66.7% to 94.4% decrease). There was a slight increase in the total fat content and MUFA, with slight reductions in SFA content.
- Of the four edible oil spreads tested in both surveys, two showed an increase in TFA levels, without considerable change in other fatty acids. However, the actual content of TFA in these products was quite low (range from 0.2 to 0.6g/100g food).
- Three cream filled biscuits were tested in both surveys with two brands reducing TFA content (42.9% and 25%) over time. An increase in the total fat and saturated fat (21.2 and 38% respectively) was observed for one cream filled biscuit sample, while all fatty acids decreased in the other samples.
- Two brands of donuts were tested in both surveys. Despite the increase in total fat, SFA and PUFA content, considerable reductions were observed with the TFA content (59.6% and 88.6% reduction).

- There is an overall increase in the total fat, SFA, PUFA and MUFA content in four savoury biscuit products tested in both surveys. However, the TFA content in these products was generally low (less than 0.2g/100g food).
- An overall reduction in the TFA content for four shelf stable cakes was observed (range from 66.7 to 100% reduction). However, there was an increase in the SFA content (range from 0.2 to 3.1g/100g food), with two products also showing an increase in the total fat content.

Constraints when comparing data from the two surveys

When comparing the fat content, especially TFA, of food products tested in the previous and current survey, it is important to note that:

- Both surveys were snapshots of the situation at the time. The foods sampled in the surveys were not matched brand to brand and sample numbers within each category differed between the two surveys.
- Testing methodology has improved. Only four different TFAs were quantified in previous surveys compared with up to ten in the current survey (varies according to the laboratories). Some of the apparent increases in TFA levels may simply result from improved testing. This factor seems to be more relevant for foods containing ruminant sources of TFA.
- The proportion of food that had more than 2% TFA (as a percentage of the total fat) cannot be directly compared to previous surveys as the current survey focussed on manufactured foods whereas the previous surveys included a greater mixture of foods containing manufactured and/or ruminant TFA (e.g. ice cream, pasta, eggs).

Due to these factors, a direct comparison of results should be viewed in conjunction with the dietary exposure assessment conducted as part of a review of TFA in the food supply.

7. Follow-up Action

This survey is one part of a review of TFA intake in the Australian and New Zealand population. As part of the review, the results obtained from this survey has been used to determine the dietary intakes in both the Australian and New Zealand populations. Any recommendations or follow-up action should consider the conclusions and outcomes from both the food survey and the dietary intake sub-projects.

8. Conclusion

The results of the survey showed that TFA concentrations in Australian and New Zealand processed and takeaway foods were generally low. Overall, 82.3% of products had an undetectable level of TFA or TFA levels below the 2% limit introduced in Denmark in 2004.

Of the products with TFA concentrations greater than 2%, 60% were products which contain ruminant fats or a combination of ruminant and natural TFA.

One brand of popcorn had a high ratio of TFA (compared to total fat) at 35.2%. Other products with high ratios of TFA include a breakfast bar, another popcorn sample and one sample of potato crisps.

Eight of the nineteen (42.14%) food products showed a decrease in the median for TFA content, with three (15.8%) products remaining similar. Of the eight food products that show an increase in the median TFA content, five are likely to contain ruminant TFA.

Of the forty two products that were tested in both previous and current survey, twenty six (61.9%) showed a decrease in the TFA content over time, while four products showed no changes in the TFA content. Only a slight increase was observed in the remaining products, with increases ranging from 0.05g/100g food to 0.9g/100g food. Of the products where an increase was noted, eight out of twelve products (66.7%) are likely to contain ruminant TFA.

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Appendix 1: Verification trial

Analysis of samples in this survey was conducted by four laboratories across Australia and New Zealand. To ensure that results are comparable, a small comparison of laboratories' results was undertaken prior to the commencement of the survey.

Six samples, representing various food matrices, were purchased from retail premises (Table 6). Separate samples from the same batch were sent to each laboratory and tested using their in-house method for fatty acid profile analysis.

Table 6: Samples tested in laboratory comparison

Sample No	Product
1	Potato crisps
2	Sweet biscuit with cream filling
3	Shelf stable cake
4	Gravy mix
5	Nut spread
6	Oil based dressing

Retail products can be non-homogenous and differences in composition might contribute to some analytical variability. In addition, comparison of the results was by simple observation and not the statistical techniques used for the evaluation of inter-laboratory comparison studies.

All laboratories reported the value of different type of fats as g/100g of food. The TFA content was determined by adding the value of C16:1 trans, C18:1 trans, C18:2 trans, and C18:3 trans. It was measured as g per 100g of fat (%).

The comparison trial showed that despite differences in method of analysis, similar results were obtained for both total fat (Figure 9) and trans fatty acid content (Figure 10).

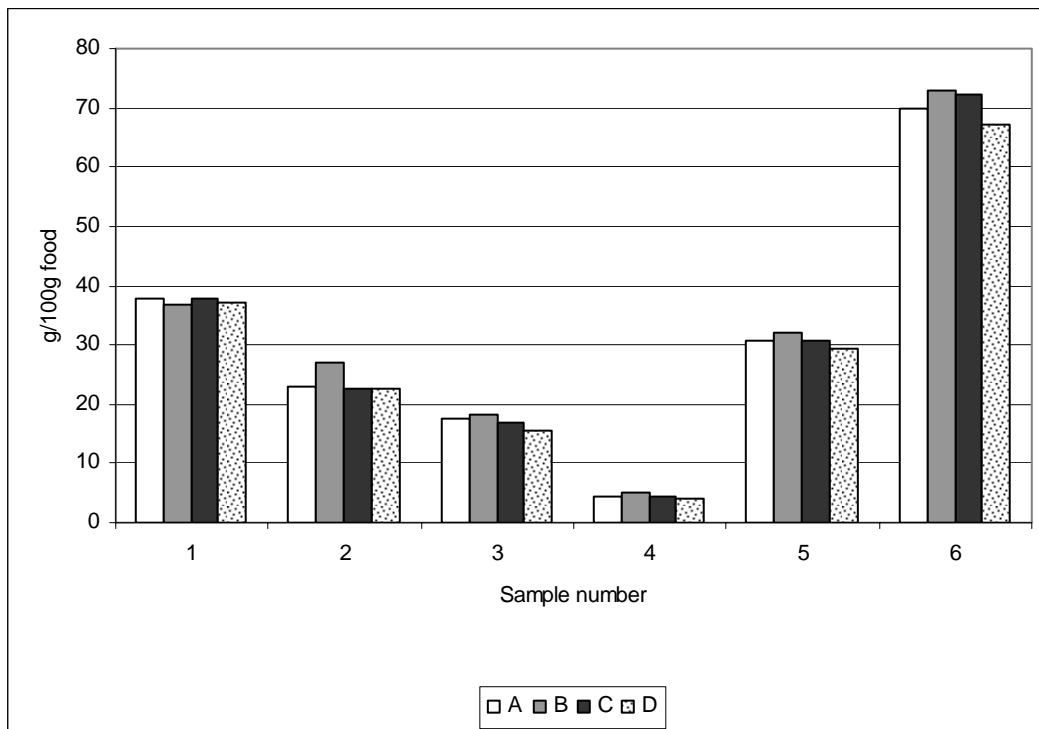


Figure 9: Comparative results for total fat for six verification samples (1-6) tested by the four laboratories (A-D) participating in the survey

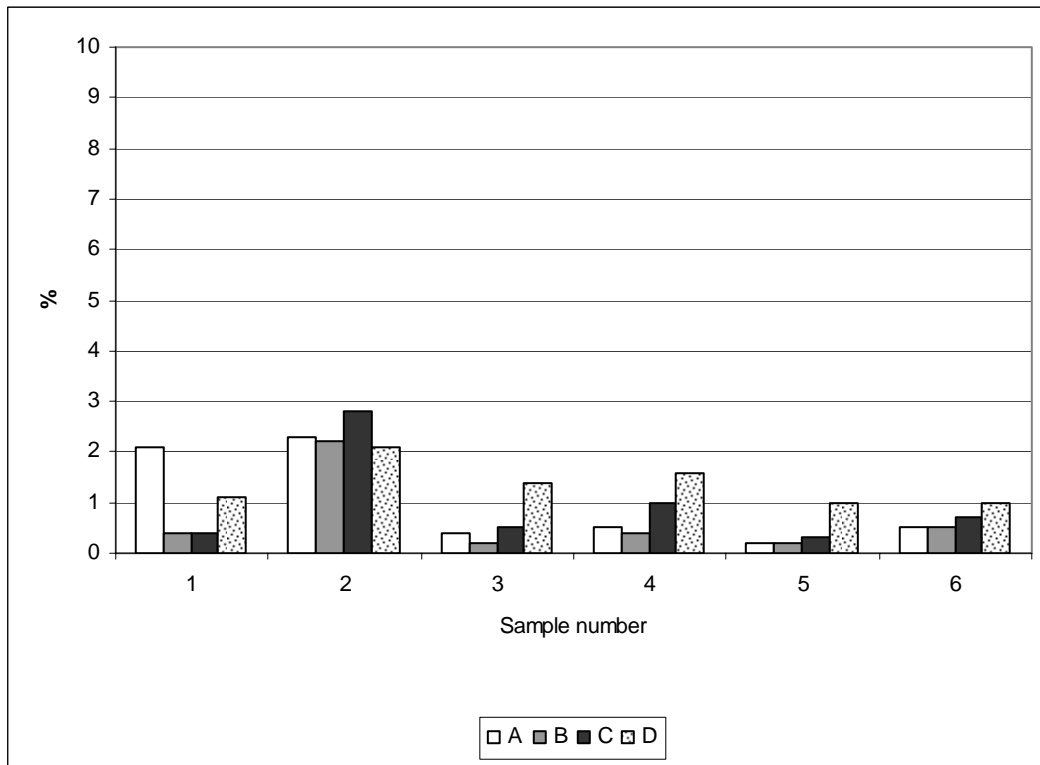


Figure 10: Comparative results for trans fatty acid ratio for six verification samples (1-6) tested by the four laboratories (A-D) participating in the survey

Appendix 2: Individual product results

Takeaway foods (gram per 100 grams of food)

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Chicken nuggets	13.0	3.9	3.0	6.0	0.10
Chicken nuggets	14.6	4.4	5.3	4.8	0.20
Chicken nuggets	11.9	5.7	1.3	4.9	0.10
Chicken nuggets	6.5	1.5	1.7	3.2	0.10
Chicken nuggets	15.5	7.4	1.7	6.2	0.10
Chicken nuggets	15.6	2.8	2.6	10.1	<0.1
Chicken nuggets	7.4	1.5	2.2	3.7	<0.1
Chicken nuggets	17.9	7.5	3.7	6.6	0.10
Chicken nuggets	17.4	7.1	3.0	7.2	0.10
Chicken nuggets	23.7	7.7	4.9	11.0	0.20
Chicken nuggets	5.8	1.6	1.1	3.0	<0.1
Chicken nuggets	13.0	2.2	2.0	8.3	0.10
Chicken nuggets	11.2	1.9	3.8	4.8	0.70
Chicken nuggets	9.4	2.0	3.3	3.3	0.80
Chicken nuggets	14.6	2.4	3.1	9.0	0.10
Chicken nuggets	16.18	2.20	2.69	11.29	0.07
Chicken nuggets	16.24	6.53	2.72	6.99	0.10
Chicken nuggets	25.86	10.50	2.44	12.92	0.39
Chicken nuggets	17.6	7.4	3.1	7.0	<0.1
Chicken nuggets	18.3	2.7	3.8	11.7	0.20
Chicken nuggets	15.3	7	1.8	6.4	<0.1
Chicken nuggets	15.2	5.9	3.2	6.2	<0.1
Chicken nuggets	17.2	8.0	1.7	7.5	<0.1
Chicken nuggets	19.3	7.8	4.9	6.7	<0.1
Chicken nuggets	18.1	7.3	4.1	6.7	<0.1
Chicken nuggets	16.0	2.4	3.3	10.3	<0.1
Deep fried fish fillet	8.9	1.1	1.0	6.7	<0.1
Deep fried fish fillet	16.6	1.5	4.9	10.1	0.10
Deep fried fish fillet	12.1	3.1	5.3	3.5	0.10
Deep fried fish fillet	10.7	5.1	1.3	4.2	0.10
Deep fried fish fillet	12.6	2.0	2.2	8.3	0.10
Deep fried fish fillet	15.5	4.1	8.0	3.3	0.10
Deep fried fish fillet	15.32	7.87	0.68	6.77	0.62
Deep fried fish fillet	10.08	5.45	0.48	4.15	0.37
Deep fried fish fillet	16.03	8.60	0.42	7.02	0.80
Deep fried fish fillet	10.5	1.0	3.3	6.2	0.30
Deep fried fish fillet	11.6	1.5	5.2	4.8	0.40
Deep fried fish fillet	10.8	1.1	2.1	7.6	<0.1
Deep fried fish fillet	8.5	3.9	1.6	3.0	<0.1

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Deep fried fish fillet	22.0	10.2	2.3	9.5	<0.1
Deep fried fish fillet	9.4	0.8	2.6	6.1	<0.1
Deep fried fish fillet	12.1	6.1	1.1	4.9	<0.1
Dumpling	4.2	2.1	0.5	1.5	<0.1
Dumpling	17.2	7.4	1.3	8.0	0.50
Dumpling	11.0	4.1	1.5	5.2	0.10
Dumpling	6.0	2.5	0.7	2.7	0.10
Dumpling	12.5	3.2	2.9	6.3	0.10
Dumpling	5.9	1.7	1.2	2.9	0.10
Dumpling	9.4	1.8	3.7	3.6	0.30
Dumpling	9.5	2.4	3.2	3.8	0.10
Dumpling	7.4	4.6	2.3	5.6	<0.1
Dumpling	3.4	0.9	4.1	2.3	<0.1
Dumpling	1.4	0.5	0.0	2.8	<0.1
Dumpling	10.9	0.5	0.2	0.6	<0.1
Dumpling	5.7	5.1	1.6	4.2	0.1
Falafel	14.7	2.5	8.8	3.3	0.10
Falafel	5.2	1.2	2.1	1.8	0.10
Falafel	7.7	0.7	2.4	4.3	0.20
Falafel	10.4	2.6	3.6	4.1	0.10
Falafel	4.9	1.1	2.5	1.3	0.10
Falafel	10.1	0.9	3.5	5.6	0.10
Falafel	13.6	2.7	5.3	5.7	<0.1
Falafel	18.7	2.4	7.0	9.4	<0.1
Falafel	6.0	2.5	1.3	2.2	<0.1
Fried noodles	3.9	0.6	1.3	2.0	0.10
Fried noodles	3.9	0.4	1.2	2.3	<0.1
Fried noodles	2.9	0.6	1.5	0.8	<0.1
Fried noodles	3.4	0.4	0.9	1.9	0.20
Fried noodles	3.0	0.6	0.9	1.4	0.10
Fried noodles	3.86	0.97	1.65	1.24	0.00
Fried noodles	4.92	1.23	1.76	1.93	0.03
Fried noodles	4.4	0.5	1.4	2.5	<0.1
Fried noodles	6.6	1.3	3.0	2.3	<0.1
Fried noodles	6.7	1.8	1.4	3.5	<0.1
Fried noodles	9.1	3.8	1.0	4.3	<0.1
Fried noodles	5.0	1.1	2.2	1.7	<0.1
Fried noodles	4.5	1.9	0.5	2.1	<0.1
Hot chips	9.4	1.4	1.3	6.7	<0.1
Hot chips	12.8	2.9	3.2	6.5	0.20
Hot chips	9.2	4.5	1.2	3.3	0.20
Hot chips	19.0	10.3	1.5	6.9	0.20

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Hot chips	16.8	3.8	7.3	5.5	0.20
Hot chips	17.7	1.6	4.6	11.3	0.20
Hot chips	15.6	8.3	1.4	5.7	0.20
Hot chips	14.8	1.6	3.5	9.6	0.10
Hot chips	9.9	2.0	2.8	4.9	0.10
Hot chips	9.8	4.9	1.3	3.5	<0.1
Hot chips	10.4	5.3	1.1	3.8	0.10
Hot chips	12.0	1.4	3.3	7.2	0.10
Hot chips	11.2	2.3	3.2	5.6	0.10
Hot chips	15.6	1.7	3.7	10.3	<0.1
Hot chips	24.1	3.4	8.2	11.2	1.40
Hot chips	11.4	3.0	5.7	2.6	0.10
Hot chips	13.9	3.2	6.6	3.9	0.20
Hot chips	9.07	4.77	0.69	3.61	0.09
Hot chips	15.28	1.18	3.13	10.98	0.01
Hot chips	6.49	3.46	0.22	2.81	0.23
Hot chips	18.0	1.8	4.0	12.1	0.20
Hot chips	20.2	1.5	6.2	12.4	0.50
Hot chips	16.4	8.8	1.4	6.1	<0.1
Hot chips	11.5	6.1	0.9	4.5	0.10
Hot chips	14.1	1.4	4.2	8.4	0.30
Hot chips	12.2	2.1	4.3	5.7	<0.1
Hot chips	9.6	5.1	0.6	3.8	<0.1
Hot chips	15.3	8.2	1.3	5.8	<0.1
Hot chips	9.8	4.4	2.0	3.3	<0.1
Hot chips	12.2	5.8	2.3	4.1	<0.1
Hot chips	14.5	1.5	3.4	9.7	<0.1
Pizza	8.6	4.7	0.7	2.8	0.30
Pizza	8.5	4.0	2.0	2.2	0.30
Pizza	7.0	3.7	0.8	2.4	0.20
Pizza	6.3	3.7	0.9	1.6	0.10
Pizza	9.4	4.3	1.5	3.4	0.20
Pizza	7.12	4.06	0.79	2.27	0.23
Pizza	5.92	3.57	0.86	1.48	0.20
Pizza	5.9	3	1.3	1.6	0.20
Pizza	7	3.9	1	1.8	0.20
Pizza	5.4	2.8	1.0	1.6	<0.1
Pizza	8.0	3.1	2.6	2.3	<0.1
Pizza	6.7	2.7	0.6	3.4	<0.1
Pizza	10.6	4.3	1.8	4.5	<0.1
Pizza	10.4	4.7	1.7	4.0	<0.1
Spring rolls	13.0	5.8	1.9	5.2	0.10

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Spring rolls	12.0	6.0	1.0	3.7	1.30
Spring rolls	6.5	2.8	0.9	2.7	0.10
Spring rolls	9.4	2.6	1.6	5.0	0.30
Spring rolls	9.5	1.2	2.8	5.4	0.10
Spring rolls	19.0	2.9	3.8	12.1	0.10
Spring rolls	14.7	4.2	5.6	4.7	0.20
Spring rolls	18.7	1.9	4.9	11.7	0.20
Spring rolls	13.7	1.3	3.5	8.2	0.70
Spring rolls	15.4	3.8	7.3	4.2	0.20
Spring rolls	7.19	3.84	0.54	2.80	0.06
Spring rolls	10.5	1.6	6.1	2.8	<0.1
Spring rolls	4.6	2.4	0.2	2.0	<0.1
Spring rolls	11.9	3.4	5.8	2.7	<0.1
Spring rolls	7.4	3.5	0.6	3.2	<0.1
Spring rolls	9.7	4.4	1.1	4.2	<0.1
Sweet & sour pork	14.0	5.4	1.8	6.8	<0.1
Sweet & sour pork	6.6	2.2	1.6	2.6	0.10
Sweet & sour pork	8.4	1.4	1.9	5.1	<0.1
Sweet & sour pork	11.0	4.3	2.0	4.6	0.10
Sweet & sour pork	12.3	1.5	3.4	7.3	0.10
Sweet & sour pork	7.6	1.7	1.6	4.2	0.10
Sweet & sour pork	11.11	4.51	2.02	4.58	0.18
Sweet & sour pork	11.83	4.90	2.14	4.78	0.29
Sweet & sour pork	3.1	1	0.8	1.3	<0.1
Sweet & sour pork	1.7	0.6	0.4	0.7	<0.1
Sweet & sour pork	9.1	4.1	1.0	4.0	<0.1
Sweet & sour pork	12.5	5.4	1.2	5.8	<0.1
Sweet & sour pork	11.7	4.4	1.9	5.4	<0.1
Sweet & sour pork	1.5	0.5	0.3	0.8	<0.1

Snack foods (gram per 100 grams of food)

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Corn cakes	3.9	0.6	2.4	1.0	<0.1
Corn cakes	11.2	1.3	1.0	8.8	<0.1
Corn cakes	8.6	1.3	4.9	2.5	<0.1
Extruded snacks	27.3	8.4	7.2	11.6	0.10
Extruded snacks	23.1	11.3	2.9	8.7	0.20
Extruded snacks	24	12	2.3	9.5	<0.1
Extruded snacks	24.9	11.5	2.7	10.6	0.10
Popcorn	27.7	24.4	1.3	2.0	0.10
Popcorn	22.3	8.1	1.4	6.6	6.20
Popcorn	4.1	0.8	2.3	1.0	<0.1

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Popcorn	27.24	14.04	3.39	9.81	0.09
Popcorn	32.75	7.47	1.90	23.38	11.53
Popcorn	28.44	14.92	3.77	9.75	0.09
Popcorn	34.29	18.42	4.09	11.78	0.14
Popcorn	28.16	24.25	1.68	2.23	0.00
Popcorn	34.7	0.5	1.9	3.3	<0.1
Popcorn	24.5	18.6	3.0	2.9	<0.1
Potato crisps	6.3	0.7	0.7	3.5	1.40
Potato crisps	23.9	2.5	2.1	19.0	0.30
Potato crisps	35.8	16.3	3.9	15.5	0.20
Potato crisps	32.9	15.0	3.5	14.3	0.10
Potato crisps	30.6	13.8	3.4	13.1	0.30
Potato crisps	34.3	10.4	3.0	20.7	0.20
Potato crisps	34.0	10.5	3.1	20.3	0.10
Potato crisps	33.0	3.3	1.6	28.0	0.10
Potato crisps	38.9	17.7	4.4	16.7	0.10
Potato crisps	35.5	16.1	4.0	15.3	<0.1
Potato crisps	32.0	14.5	3.5	14.0	0.10
Potato crisps	37.6	11.9	11.7	13.9	0.10
Potato crisps	30.3	3.1	8.2	18.4	0.60
Potato crisps	29	3.3	2	23.5	<0.1
Potato crisps	34.3	10.4	11.4	12.5	0.50

Fats and oils (gram per 100 grams of food)

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Blended edible oil	100.0	7.3	30.8	61.0	0.90
Blended edible oil	100.0	15.9	59.3	21.7	3.10
Blended edible oil	100.0	24.0	34.3	41.4	0.30
Blended edible oil	100.0	7.2	30.8	60.1	1.90
Blended edible oil	100	51.2	9.4	39.1	1.50
Dressing	71.6	13.3	39.8	18.4	0.10
Dressing	5.3	0.7	2.1	2.4	<0.1
Dressing	81.2	13.8	38.6	28.1	0.40
Dressing	34.0	9.3	9.5	15.0	0.20
Dressing	64.7	10.4	38.4	15.7	0.20
Dressing	28.4	3.1	18.0	7.2	0.10
Dressing	78.5	5.8	23.7	48.7	0.30
Dressing	71.2	7.4	43.9	19.8	0.10
Dressing	80.9	13.2	47.0	19.9	0.70
Edible oil spread	62.8	15.3	16.7	29.9	0.80
Edible oil spread	69.5	16.3	30.7	22.4	0.10
Edible oil spread	65.0	18.6	26.1	20.2	0.20

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Edible oil spread	61.4	14.4	15.1	30.9	1.00
Edible oil spread	70.6	16.8	18.0	35.5	0.30
Edible oil spread	69.9	18.0	16.3	35.3	0.30
Edible oil spread	47.6	11.0	11.7	24.1	0.70
Edible oil spread	51.6	12.3	12.8	26.2	0.30
Edible oil spread	75.9	17.4	19.6	38.3	0.50
Edible oil spread	65.7	15.5	17.2	32.9	0.20
Edible oil spread	64.65	17.48	24.21	22.96	3.16
Edible oil spread	64.65	14.99	16.44	33.22	0.42
Edible oil spread	66.02	14.13	17.75	34.14	0.54
Edible oil spread	53.58	12.48	11.45	29.65	0.55
Edible oil spread	49.8	11.4	12.4	25.9	0.60
Edible oil spread	70.1	16.6	29.9	23.4	0.30
Edible oil spread	66.1	16	17.6	32.3	0.50

Meat and products (gram per 100 grams of food)

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Meat pies	12.9	6.3	1.1	4.6	0.80
Meat pies	11.0	5.5	0.9	3.9	0.80
Meat pies	9.2	4.7	0.8	3.1	0.50
Meat pies	12.7	6.3	1.1	4.4	0.90
Meat pies	10.1	5.1	1.6	2.9	0.60
Meat pies	10.8	5.1	0.8	4.4	0.60
Meat pies	9.8	5.1	0.9	3.5	0.20
Meat pies	15.0	8.1	0.9	5.4	0.60
Meat pies	9.3	5.0	0.9	2.9	0.50
Meat pies	12.1	6.0	0.8	4.5	0.90
Meat pies	15.49	8.75	0.97	5.77	0.81
Meat pies	11.13	6.33	0.77	4.03	0.15
Meat pies	12.01	6.07	0.76	5.17	0.60
Meat pies	9.6	5.0	1.3	3.3	0.20
Meat pies	12.1	5.7	1.2	4.5	0.60
Meat pies	10.7	5.5	0.9	4.4	<0.1
Meat pies	9.4	4.5	1.0	3.8	0.3
Meat pies	12.8	6.8	1.1	4.9	<0.1
Meat pies	11.0	5.5	0.8	4.7	0.2
Meat pies	9.9	5.1	0.7	4.0	0.4
Sausage rolls	15.3	8.0	1.0	4.1	2.10
Sausage rolls	13.7	9.3	0.7	3.4	0.30
Sausage rolls	12.4	6.3	1.0	4.3	0.80
Sausage rolls	11.5	5.8	0.9	3.7	1.20
Sausage rolls	17.2	10.4	0.9	5.0	0.90

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Sausage rolls	11.9	5.8	0.9	4.0	1.20
Sausage rolls	13.8	8.6	0.5	4.0	0.80
Sausage rolls	15.2	9.1	1.5	4.3	0.30
Sausage rolls	12.6	6.4	1.1	4.3	0.80
Sausage rolls	11.4	5.6	1.0	3.4	1.50
Sausage rolls	14.12	6.81	1.15	6.16	0.55
Sausage rolls	17.16	9.69	0.61	6.85	1.08
Sausage rolls	14.1	8.2	1.0	2.8	0.50
Sausage rolls	15.5	8.5	0.6	5.6	0.70
Sausage rolls	10.9	5.4	0.8	4.6	0.6
Sausage rolls	12.9	7.0	0.9	5.1	0.1
Sausage rolls	13.5	6.8	1.1	5.6	1.4
Sausage rolls	12.5	7.6	1.0	4.0	<0.1
Sausage rolls	11.3	5.8	1.0	4.4	0.9

Bakery products (gram per 100 grams of food)

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Chocolate biscuit	24.8	17.0	1.8	5.9	0.20
Chocolate biscuit	17.2	10.2	1.5	5.4	0.20
Chocolate biscuit	28.9	16.0	2.4	10.3	0.30
Chocolate biscuit	16.2	12.6	1.1	2.5	<0.1
Chocolate biscuit	25.5	17.7	2.5	5.2	0.10
Chocolate biscuit	25.4	14.3	2.1	8.7	0.30
Chocolate biscuit	19.4	11.7	1.6	5.9	0.20
Chocolate biscuit	23.1	1.2	2.3	8.5	0.10
Chocolate biscuit	22.10	9.51	5.10	7.49	0.15
Chocolate biscuit	22.57	10.44	4.17	7.96	0.38
Chocolate biscuit	26.4	15.1	1.9	9.3	0.20
Chocolate biscuit	20.5	12	2	6.4	0.10
Chocolate biscuit	22.5	11.8	2.2	8.4	0.30
Cream biscuit	33.0	24.4	1.6	6.6	0.30
Cream biscuit	22.7	13.8	2.6	5.8	0.50
Cream biscuit	22.5	16.1	1.5	4.7	0.20
Cream biscuit	26.5	13.1	3.0	10.2	0.20
Cream biscuit	23.1	11.3	3.3	7.8	0.60
Cream biscuit	21.7	11.1	2.3	8.1	0.30
Cream biscuit	26.1	19.1	1.9	5.1	0.10
Cream biscuit	26.0	20.2	1.6	4.0	0.10
Cream biscuit	26.2	20.0	1.6	4.5	0.10
Cream biscuit	25.2	17.9	2.1	5.3	<0.1
Cream biscuit	31.1	22.8	1.8	6.0	0.40

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Cream biscuit	25.3	13	2.6	9.7	0.40
Cream biscuit	24	12	3.1	8.2	0.80
Croissant	24.9	17.9	0.9	4.6	1.40
Croissant	12.4	8.2	0.8	2.6	0.80
Croissant	20.8	14.2	0.8	4.7	1.10
Croissant	17.4	11.3	1.1	4.4	0.60
Croissant	22.5	14.4	1.2	5.5	1.40
Croissant	24.2	16.5	0.8	6.2	0.60
Croissant	22.0	15.5	0.8	4.6	1.20
Croissant	14.1	8.8	0.7	3.5	1.10
Croissant	16.8	11.8	0.7	3.2	1.00
Croissant	16.8	10.6	0.8	4.0	1.40
Croissant	22.0	15.6	1.0	5.3	1.00
Croissant	24.6	17.2	1.2	6.7	1.20
Croissant	19.3	12.8	1.6	4.9	1.0
Croissant	15.3	9.5	1.4	4.5	0.2
Croissant	17.2	10.5	1.5	5.2	0.2
Croissant	21.8	14.5	1.5	5.8	0.8
Croissant	12.9	8.4	1.2	3.3	0.6
Custard Danish	12.7	9.4	0.4	2.3	0.60
Custard Danish	6.5	3.4	0.4	2.4	0.30
Custard Danish	17.9	13.5	0.5	3.2	0.70
Custard Danish	12.5	8.7	0.5	2.7	0.70
Custard Danish	17.4	10.3	1.0	4.9	1.20
Custard Danish	19.0	11.2	1.3	5.9	0.60
Custard Danish	14.4	8.5	1.0	4.4	0.50
Custard Danish	16.6	11.2	0.8	3.7	0.80
Custard Danish	16.1	10.1	0.9	3.9	1.20
Custard Danish	11.4	7.7	0.5	2.5	0.70
Custard Danish	17.13	9.93	1.36	5.84	0.73
Custard Danish	14.5	7.7	1.2	5.5	0.40
Custard Danish	14.5	10.4	1	3	<0.1
Custard Danish	23.1	4.7	1.0	4.4	0.4
Custard Danish	15.7	11.4	2.2	9.5	0.4
Custard Danish	13.1	8.5	1.9	5.3	<0.1
Custard Danish	17.2	9.1	0.0	4.1	0.4
Custard Danish	12.6	11.1	1.2	4.8	0.9
Donut	17.9	7.2	3.2	7.0	0.50
Donut	18.9	9.8	2.4	6.5	0.30
Donut	15.7	8.3	1.4	5.3	0.70
Donut	18.3	9.1	2.7	6.4	0.10

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Donut	14.8	7.4	2.1	5.2	0.10
Donut	13.2	6.1	1.7	5.3	0.10
Donut	29.9	16.5	2.9	10.3	0.20
Donut	24.4	12.9	2.9	8.4	0.10
Donut	19.42	8.42	1.56	9.44	0.94
Donut	28.73	14.06	5.88	8.79	0.39
Donut	20.11	8.42	1.50	10.19	1.10
Donut	12.5	6.3	1.4	4.8	0.60
Donut	15.5	9.6	1.2	4.7	0.50
Donut	21.4	10	2.4	8.8	0.10
Donut	13.1	6.5	1.6	4.9	<0.1
Donut	17.7	5.6	2.0	5.7	<0.1
Donut	10.1	7.7	2.5	7.5	<0.1
Donut	9.7	3.1	1.5	5.5	1.3
Donut	20.2	4.6	1.1	4.0	<0.1
Donut	10.2	7.5	3.7	9.0	<0.1
Donut	21.20	11.60	1.60	7.20	0.80
Donut	22.60	12.70	1.70	7.50	0.70
Donut	21.30	11.60	1.70	7.40	0.50
Muffins	17.2	3.4	3.4	10.2	0.20
Muffins	21.9	4.9	3.0	13.9	0.10
Muffins	15.7	2.7	4.1	8.8	0.10
Muffins	19.3	8.5	5.7	4.7	0.40
Muffins	19.3	4.0	4.8	10.4	<0.1
Muffins	2.5	1.0	0.4	1.0	0.20
Muffins	12.7	1.4	3.8	7.1	0.40
Muffins	18.4	2.7	4.4	11.3	<0.1
Muffins	20.2	4.2	4.6	11.5	<0.1
Muffins	13.1	4.2	3.3	5.6	<0.1
Muffins	21.95	7.97	4.56	9.42	0.14
Muffins	18.17	10.54	4.18	3.45	0.21
Muffins	15.09	1.25	4.38	9.46	0.15
Muffins	21.14	9.18	7.06	4.89	0.07
Muffins	10.3	3.5	3.3	3.5	<0.1
Muffins	17.5	4	4.5	8.9	0.10
Muffins	16.9	3.3	4.5	9.1	<0.1
Muffins	16.6	3.4	4.3	8.8	<0.1
Muffins	18.3	9.6	1.7	7.1	0.2
Muffins	16.6	3.5	4.0	9.1	0.2
Muffins	16.6	3.4	4.0	9.1	<0.1
Pikelets	5.6	0.8	1.6	3.2	0.10

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Pikelets	2.3	0.8	0.5	0.9	<0.1
Pikelets	5.6	1.0	0.8	3.7	<0.1
Pikelets	5.8	0.8	1.7	3.3	<0.1
Pikelets	5.4	0.7	1.8	2.9	0.10
Pikelets	6.23	0.67	1.81	3.75	0.04
Pikelets	2.7	0.7	0.9	1.2	<0.1
Pikelets	4.0	0.4	1.2	2.4	<0.1
Pikelets	4.0	0.4	1.2	2.4	<0.1
Pikelets	3.7	0.4	1.1	2.2	<0.1
Pikelets	3.8	0.4	1.2	2.2	<0.1
Prepared pastry	4.6	1.0	2.4	1.1	0.00
Prepared pastry	22.3	10.8	1.4	7.3	2.80
Prepared pastry	22.6	10.2	2.2	8.3	1.90
Prepared pastry	3.1	0.6	1.2	1.3	0.00
Prepared pastry	19.4	8.6	1.7	7.5	1.50
Prepared pastry	15.1	7.2	0.7	5.3	1.90
Prepared pastry	18.2	8.7	0.8	6.4	2.20
Prepared pastry	11.5	5.6	0.6	4.0	1.40
Prepared pastry	25.4	11.9	2.9	10.0	0.70
Prepared pastry	15.3	7.4	0.8	5.7	1.40
Prepared pastry	20.13	11.56	0.82	7.74	1.04
Prepared pastry	13.87	8.41	0.41	5.05	0.66
Prepared pastry	20.30	13.06	0.91	6.33	1.31
Prepared pastry	21.33	12.20	1.08	8.06	0.90
Prepared pastry	14.80	8.78	1.14	4.88	0.02
Prepared pastry	22.99	13.35	1.09	8.56	0.99
Prepared pastry	22.3	10.1	2	10.1	1.60
Prepared pastry	14.3	7.1	0.8	6.4	1.40
Prepared pastry	32.1	14.7	4.0	13.4	<0.1
Savoury biscuit	25.6	12.0	3.2	10.4	0.10
Savoury biscuit	27.5	12.7	3.5	11.3	0.10
Savoury biscuit	27.2	12.8	3.4	10.9	0.10
Savoury biscuit	26.3	12.1	3.3	10.7	0.10
Savoury biscuit	23.1	10.5	3.2	9.2	0.20
Savoury biscuit	31.3	16.3	3.5	11.4	0.10
Savoury biscuit	12.6	3.1	3.0	4.9	1.60
Savoury biscuit	20.7	10.2	2.7	7.6	0.30
Savoury biscuit	18.5	2.9	2.4	13.2	<0.1
Savoury biscuit	17.1	8.3	2.4	6.2	0.10
Savoury biscuit	17.8	8.1	2.3	7.3	<0.1
Savoury biscuit	24.3	12.7	2.5	9	<0.1

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
Shelf stable cakes	2.8	0.8	0.6	1.3	0.10
Shelf stable cakes	6.6	5.3	0.3	0.9	<0.1
Shelf stable cakes	25.8	11.5	4.0	10.2	0.10
Shelf stable cakes	10.5	6.1	1.2	3.0	0.20
Shelf stable cakes	8.6	3.6	1.8	3.2	<0.1
Shelf stable cakes	8.7	4.1	1.1	3.5	0.20
Shelf stable cakes	14.7	7.9	0.8	5.9	0.60

Others (g/100g of food)

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
dry instant soup mix	5.2	1.0	0.9	3.4	0.10
dry instant soup mix	9.0	4.5	1.1	3.2	0.10
dry instant soup mix	1.7	0.3	0.5	0.8	0.10
dry instant soup mix	1.6	0.8	0.2	0.4	0.20
dry instant soup mix	13.7	6.2	1.2	5.4	1.00
dry mix pasta	10.5	6.8	0.8	2.3	0.50
dry mix pasta	5.0	2.5	1.1	1.1	0.30
dry mix pasta	6.5	3.2	1.1	2.0	0.20
dry mix pasta	5.7	2.8	1.1	1.6	0.20
dry mix pasta	3.0	1.5	0.9	0.6	0.10
gravy mix	1.4	0.5	0.6	0.3	0.10
gravy mix	32.7	21.7	2.0	7.9	1.00
gravy mix	4.3	1.9	0.5	1.8	0.20
gravy mix	5.8	3.4	0.5	1.9	0.10
gravy mix	1.3	0.4	0.7	0.2	0.10
gravy mix	0.66	0.39	0.05	0.22	0.00
gravy mix	1.50	0.72	0.17	0.61	0.01
sauces	10.1	1.2	3.8	5.1	0.10
sauces	10.6	2.5	1.2	7.0	<0.1
sauces	15.9	3.1	8.4	4.3	<0.1
sauces	2.4	0.5	1.3	0.6	<0.1
sauces	0.8	0.1	0.3	0.3	<0.1
sauces	8.80	5.39	1.02	2.39	0.10
spread	47.7	8.3	6.9	32.5	0.00
spread	51.6	10.5	1.9	39.2	<0.1
spread	49.8	10.0	12.6	27.2	<0.1
spread	30.8	9.5	4.4	16.9	<0.1
spread	36.0	8.1	7.8	20.0	0.10

Food	Total fat	Saturated fat	Polyunsaturated fat	Monounsaturated fat	Trans fat
toasted muesli cereal	12.3	3.8	3.5	4.9	<0.1
toasted muesli cereal	7.3	1.4	2.7	3.0	0.10
toasted muesli cereal	19.5	3.3	6.7	9.4	0.10
toasted muesli cereal	10.0	1.7	3.0	5.1	0.10
toasted muesli cereal	17.6	2.4	6.0	9.1	0.10
breakfast bars	6.6	4.9	0.6	0.7	0.40
breakfast bars	5.4	1.8	0.7	2.8	0.10
breakfast bars	8.5	2.7	0.3	3.0	2.60
breakfast bars	9.5	1.9	2.6	5.0	<0.1
breakfast bars	13.1	6.9	1.4	4.8	<0.1
breakfast bars	12.4	11.3	0.3	0.7	0.10
muesli bars	12.0	4.3	1.6	6.1	<0.1
muesli bars	21.2	5.9	2.6	12.7	<0.1
muesli bars	16.8	2.0	4.3	10.4	<0.1
muesli bars	7.2	2.0	2.0	3.2	<0.1
muesli bars	10.7	3.9	2.5	4.2	0.20
muesli bars	12.2	3.4	2.1	6.5	0.20
muesli bars	2.7	1.4	0.5	0.9	<0.1
muesli bars	2.9	1.1	1.0	0.8	<0.1
muesli bars	2.9	1.4	0.8	0.8	<0.1

Appendix 3: Total fat and fatty acid content variation in 42 samples tested in both 2005-2007 and 2008/09 surveys

Product ⁶	Total fat variation g/100g food (%)	SFA variation g/100g food (%)	PUFA variation g/100g food (%)	MUFA variation g/100g food (%)	TFA variation g/100g food (%)
Chicken nuggets, product a	2.04 (14.4)	0.54 (9.4)	1.05 (44.0)	0.61 (10.5)	-0.14 (-55.5)
Chicken nuggets, product b	-2.00 (-11.4)	-0.47 (-16.0)	-0.51 (-14.8)	-0.60 (-5.6)	-0.43 (-80.0)
Hot chips, product a	0.67 (7.2)	0.45 (9.7)	-0.02 (-1.9)	0.19 (5.3)	-0.04 (-27.2)
Hot chips, product b	-1.56 (-9.1)	-0.22 (-12.5)	-0.58 (-14.1)	-0.79 (-7.0)	-1.16 (-92.3)
Potato crisps, product a	2.60 (12.2)	0.20 (8.7)	0.80 (61.5)	1.30 (7.3)	0.30
Potato crisps, product b	-1.20 (-3.2)	-0.30 (-1.8)	-1.20 (-23.5)	0.20 (1.3)	-1.40 (-87.5)
Potato crisps, product c	1.10 (3.5)	0.40 (2.7)	N/A	N/A	-1.30 (-92.9)
Potato crisps, product d	0.40 (1.2)	-5.20 (-33.3)	-1.30 (-30.2)	6.70 (47.9)	-1.20 (-85.7)
Potato crisps, product e	-0.40 (-1.2)	-0.50 (-4.6)	0.00	0.00	-0.20 (-66.7)
Potato crisps, product f	2.50 (8.2)	0.20 (6.5)	-1.30 (-44.8)	3.50 (14.3)	-1.70 (-94.4)
Potato crisps, product g	1.90 (5.3)	-1.80 (-13.1)	3.40 (41.0)	0.20 (1.5)	-0.30 (-75.0)
Potato crisps, product h	0.80 (2.7)	-10.40 (-77.0)	N/A	N/A	0.00
Oil based dressings, product a	0.50 (0.7)	-0.80 (-9.8)	N/A	N/A	0.00
Edible oil spreads, product a	-6.60 (-11.7)	1.90 (20.0)	-0.20 (-1.6)	-8.40 (-24.5)	-1.50 (-71.4)
Edible oil spreads, product b	-4.03 (-5.8)	-0.06 (-0.4)	0.05 (0.3)	-4.39 (-12.0)	0.31 (104.6)
Edible oil spreads, product c	0.30 (0.4)	-0.35 (-2.1)	-1.10 (-3.5)	1.60 (7.5)	0.00
Edible oil spreads, product d	0.30 (0.4)	1.40 (9.1)	0.10 (0.6)	-1.50 (-4.1)	0.10 (50.0)
Meat pies, product a	-3.55 (-24.2)	-3.60 (-40.0)	0.47 (78.8)	-0.88 (-17.2)	0.05 (9.1)
Meat pies, product b	-3.65 (-25.9)	-3.48 (-39.6)	0.32 (64.1)	-0.83 (-17.4)	0.20 (49.3)
Meat pies, product c	-1.77 (-13.8)	-4.17 (-39.7)	0.67 (665.4)	1.73 (75.3)	-0.05 (-24.4)
Sausage rolls, product a	1.05 (10.3)	0.49 (9.2)	0.32 (45.6)	0.14 (3.4)	-0.12 (-12.5)

⁶ Some of the results are the average value obtained from different batches of the same brand

Product ⁶	Total fat variation g/100g food (%)	SFA variation g/100g food (%)	PUFA variation g/100g food (%)	MUFA variation g/100g food (%)	TFA variation g/100g food (%)
Sausage rolls, product b	-0.40 (-3.1)	0.55 (7.9)	0.05 (5.7)	-1.01 (-20.1)	N/A
Chocolate biscuits, product a	-2.10 (-7.5)	-1.50 (-9.3)	0.00	-0.70 (-7.2)	0.15 (150.0)
Cream biscuits, product a	-1.60 (-6.6)	-0.10 (-0.6)	-0.10 (-6.3)	-1.60 (-25.4)	0.10 (100.0)
Cream biscuits, product b	4.20 (21.2)	3.30 (37.9)	-0.40 (-11.4)	0.50 (6.5)	-0.60 (-42.9)
Cream biscuits, product c	-0.50 (-1.9)	0.05 (0.4)	-0.10 (-3.5)	-0.55 (-5.2)	-0.10 (-25.0)
Croissants, product a	2.45 (14.9)	1.90 (17.4)	-0.15 (-10.1)	0.87 (21.3)	0.44 (87.0)
Croissants, product b	-3.48 (-18.5)	-2.93 (-23.6)	-0.11 (-7.1)	-0.44 (-9.1)	-0.20 (-49.5)
Croissants, product c	0.37 (2.2)	-0.50 (-4.6)	0.05 (3.7)	0.82 (18.8)	-0.08 (-26.4)
Custard Danish, product a	2.85 (19.6)	2.69 (31.3)	0.36 (26.0)	3.19 (70.8)	0.18 (59.8)
Donuts, product a	6.74 (55.5)	4.59 (88.0)	0.70 (41.2)	1.99 (44.0)	-0.44 (-59.6)
Donuts, product b	0.37 (1.7)	5.60 (87.8)	0.61 (57.7)	-1.53 (-17.2)	-5.18 (-88.6)
Prepared pastry, product a	0.75 (3.5)	0.40 (4.1)	-0.25 (-10.6)	-0.40 (-4.2)	0.60 (52.2)
Prepared pastry, product b	-3.80 (-20.1)	-1.80 (-20.0)	-2.50 (-78.1)	-1.40 (-21.0)	0.90 (90.0)
Prepared pastry, product c	2.80 (12.4)	1.50 (14.4)	-0.30 (-9.4)	1.00 (11.1)	0.30 (75.0)
Savoury biscuits, product a	5.30 (23.9)	2.10 (19.8)	0.50 (16.7)	2.70 (31.4)	-0.10 (-50.0)
Savoury biscuits, product b	0.80 (3.2)	0.40 (3.5)	-0.10 (-3.0)	0.50 (5.1)	0.00
Savoury biscuits, product c	0.50 (1.8)	0.30 (2.1)	0.00	0.10 (1.0)	-0.05 (-50.0)
Shelf stable cakes, product a	1.70 (19.3)	3.10 (103.3)	N/A	N/A	-0.90 (-81.8)
Shelf stable cakes, product b	0.30 (12.0)	0.30 (60.0)	N/A	N/A	-0.20 (-66.7)
Shelf stable cakes, product c	-0.30 (-4.4)	0.20 (3.9)	N/A	N/A	-0.20 (-100.0)
Shelf stable cakes, product d	-2.00 (-18.9)	0.30 (9.1)	0.00	-0.70 (-18.0)	-1.50 (-100.0)