Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Summary report (revised version - macro and micro-nutrients)

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Contents

Executive summary

A survey to determine the nutrient composition of a range of processed foods has been carried out in response to recent reformulation work by the food industry to lower the artificial *trans* fatty acid content of processed products.

Artificial *trans* fats can be produced by the industrial hydrogenation of vegetable oils to produce the semi-solid and solid fats that are widely used in food manufacture (eg fat spreads, biscuits) and catering outlets, whereas natural *trans* fats occur at low levels in dairy products and meats from ruminant animals (eg beef, lamb).

This survey, carried out by a consortium led by the Institute of Food Research (and including Susan Church (Independent Nutritionist), British Nutrition Foundation, Laboratory of the Government Chemist and Eurofins Laboratories), forms part of the Department of Health's[1] rolling programme of nutrient analysis which provides up-to-date and reliable information on the nutrient content of foods[2]. The results from this programme of work are incorporated into the Department of Health's nutrient databanks that support the National Diet and Nutrition Survey and other national dietary surveys. These national surveys are used by Government to monitor the nation's diet. This programme of work to determine the nutrient composition of foods is key to ensuring that estimates of nutrient intakes from dietary surveys are robust. The results of this survey will also be incorporated into the Composition of Foods Integrated Dataset[3] and future publications of *McCance and Widdowson's The Composition of Foods* series. The results also confirm information provided by the food industry in 2007 on the levels of *trans* fats in key processed food sectors, as part of a review of the evidence of the health impacts of *trans* fats[4].

65 composite samples each made up of a number of different brands, were analysed for energy and a range of nutrients including fat, fatty acids (including *trans*), protein, carbohydrate, fibre and a full range of vitamins and minerals. Results from the analysis of macronutrients and individual fatty acids were published in an earlier similarly titled report. This revised report republishes this data and also includes:

- New data for micronutrients in all composites
- New data for macro and micro-nutrients in three confectionery samples (composites 48, 52 and 53).

In addition to the above:

- Individual fatty acid data is published alongside this analytical report to correct data previously published for composite 55 (Cream of tomato soup, canned)

A list of composite samples to be analysed was determined by reviewing existing data held on the contribution of processed foods to *trans* fat intakes (based on existing composition data

and data from year 1 of the National Diet and Nutrition Survey Rolling Programme)[5]. Information obtained from the food industry on reformulation activity to reduce the levels of *trans* fats in manufactured foods was also considered. The composite list was finalised following consultation with the Expert User Group associated with this project (which includes representatives from the food industry, academia, catering suppliers, nutritionists and dietitians). Market share information was then used (where available), and industry consulted, to determine which products/brands should make up the sub-samples included within each composite sample.

Amongst the foods analysed were pizza, garlic bread, breakfast cereals, quiche, fat spreads, a range of fish and meat products (retail and takeaway), chips (retail and takeaway), savoury snacks, confectionery and ice cream. Biscuits, buns, cakes and pastries were not included as these were analysed in a separate project, reported elsewhere[6]. Results show that levels of *trans* fat have reduced considerably compared with previous analyses of similar foods carried out over the last 20-30 years where available.

Background

The Department of Health undertakes a rolling programme of nutrient analysis surveys to ensure that reliable, up-to-date information on the nutritional value of foods is available for use in conjunction with food consumption data collected in dietary surveys to monitor the nutritional value of the nation's diet. Therefore, these nutrient surveys need to provide a single, robust set of nutrient values that is indicative of the potentially broad choice available to the consumer when selecting any particular type of food. As a result, composite samples made up of a number of different brands have been analysed for this survey rather than samples made up of single brands, and a generic name is given to each composite.

The aim of this particular survey was to provide up-to-date nutrient composition data for a range of foods that historically contributed to intakes of artificial *trans* fats. Artificial *trans* fats can be produced by the industrial hydrogenation of vegetable oils to produce the semi-solid and solid fats that are widely used in food manufacture (eg fat spreads, biscuits) and catering outlets (eg frying fats used in takeaways). Natural *trans* fats occur at low levels in dairy products and meats from ruminant animals (eg beef, lamb).

Methodology

A list of composite samples to be analysed was determined by reviewing existing data held on the contribution of processed foods to *trans* fat intakes (based on existing composition data and using data from year 1 of the National Diet and Nutrition Survey Rolling Programme)[5]. Information obtained from the food industry on reformulation activity to reduce the levels of *trans* fats in manufactured foods was also considered. The composite list was finalised following consultation with the Expert User Group associated with this project (which includes representatives from the food industry, academia, catering suppliers, nutritionists and dietitians). Market share information was then used (where available), and industry consulted, to determine which products/brands should make up the sub-samples included within each composite sample.

607 individual products were purchased and prepared for analysis between January and April 2010, with the exception of some confectionery products (composites 48, 52 and 53) which were purchased and prepared for analysis between January and February 2012. Purchase of these confectionery samples was delayed so that reformulation of some key products could be taken into account. The majority of these were purchased from retail outlets in the Norwich area. Regional sampling (within the Norwich area, Leeds and Surrey) was carried out for samples from takeaway outlets. Products were purchased from supermarkets, independent

retailers, catering suppliers and takeaway outlets. The food samples consisted of various manufactured food products ie pizza, garlic bread, breakfast cereals, quiche, fat spreads, cooking fats and oils, chicken products (retail and takeaway), meat pies, fish products and chips (retail and takeaway), coleslaw, crisps and savoury snacks, confectionery, chocolate spread, soup, mayonnaise, baby rusks and ice cream.

These food samples were combined into 65 composite samples for analysis. Each composite was made up of between 5 and 16 sub-samples, combined on an equal weight basis. This process allows a single, robust set of nutrient values to be derived for each product type, covering an appropriate cross-section of products available. Sub-samples requiring preparation/cooking were prepared in accordance with manufacturers' instructions and using normal domestic practices, and then combined into composite samples for analysis. A full list of the composite food samples analysed is given in Annex A. The full sampling report is available at www.dh.gov.uk/publications.

Each composite sample was analysed for fat and fatty acids and a range of other nutrients depending on the importance of the particular food as a dietary source for each nutrient, and existing compositional data available. A full list of macronutrients and micronutrients is given in Annex B. The methods used to conduct the analyses are included at Annex D.

Values provided by analytical laboratories were compiled in Excel spreadsheets for data evaluation. Where possible, analytical values were compared to other sources of comparable data, such as UK Food Composition tables, other food composition tables and information from manufacturers and retailers. Ingredients lists were also evaluated to check that the values reported corresponded to the ingredients included in the samples. Where analytical values appeared incorrect or questionable, data was checked against original laboratory reports and re-analysed if necessary.

Results

Each of the composite samples was analysed for an extensive range of nutrients, and therefore this project generated a large number of individual results. A summary of results for energy, protein, carbohydrate, fat and fatty acids, fibre, cholesterol, vitamins and minerals is provided in Annex C. The full set of results are provided in the analytical report associated with this project which is available at www.dh.gov.uk/publications.

The results show that levels of artifical *trans* fats in processed foods have reduced considerably compared with previous analyses of similar foods carried out over the last 20-30 years where available. Where samples contain higher levels of *trans* fats this is generally due to the presence of natural sources of trans fat in the product (eg dairy sources). These results confirm information provided by the food industry in 2007 on the levels of *trans* fats in key processed food sectors, as part of a review of the evidence of the health impacts of *trans* fats[4].

Interpretation

This survey has determined the nutrient composition of a range of processed foods that are potential sources of artificial *trans* fatty acids in the diet. These results confirm information provided by the food industry in 2007 on the levels of *trans* fats in key processed food sectors, as part of a review of the evidence of the health impacts of *trans* fats[4].

The results from this survey provide us with robust, up-to-date data, which will be incorporated into the Department of Health's nutrient databanks which support our National Diet and Nutrition Survey and other national dietary surveys enabling the Government to monitor the nation's diet. In particular, the results enable us to track *trans* fat intakes across the population more accurately, and determine key sources of *trans* fat in the diet.

The results of this survey will also be incorporated into future publications in the *McCance and Widdowson's The Composition of Foods* series.

Further Information

The report of this survey (entitled Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids) is available at www.dh.gov.uk/publications.

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Annex A: Details of composite samples analysed

Sample	Food Group
1	Cheese and tomato pizza, retail, all bases, not stuffed crust
2	Garlic and herb baguette, baked
3	Crunchy clusters type breakfast cereal without nuts
4	Crunchy/crispy muesli type cereal with nuts
5	Quiche Lorraine with shortcrust pastry, retail
6	Low fat spread (26-39%), not polyunsaturated (including dairy type)
7	Low fat spread (26-39%), not polyunsaturated, olive oil
8	Low fat spread (26-39%), polyunsaturated
9	Hard block margarine
10	Compound cooking fat, not polyunsaturated
11	Ghee made from vegetable oil
12	Reduced fat spread (41-62%), polyunsaturated
13	Reduced fat spread (41-62%), not polyunsaturated
14	Reduced fat spread (41-62%), not polyunsaturated, with olive oil
15	Reduced fat spread (62-75%), not polyunsaturated
16	Takeaway chicken pieces, coated, deep fried
17	Coated chicken pieces, takeaway
18	Chicken/turkey burger, coated, baked
19	Breaded/battered chicken/turkey pieces, cooked
20	Chicken breast/steak, coated, baked
21	Beef pie, purchased, puff or shortcrust pastry, family size
22	Beef pie, purchased, individual, puff or shortcrust pastry
23	Cornish pasty, purchased
24	Pork pie, individual
25	Sausage roll, purchased, ready-to-eat, flaky pastry
26	Chicken/turkey pasties/slices, puff pastry
27	Cod in batter, fried in commercial oil, from takeaway fish and chip shops
28	Cod in batter, frozen/chilled, baked
29	Cod in breadcrumbs, oven baked
30	Fish fingers, pollock, grilled
31	Coleslaw, purchased, not low calorie
32	Chips, fried in commercial oil, from takeaway fish and chip shops
33	Chips, fine cut, from fast food outlets
34	Potato chips, oven ready, baked
35	Potato chips, oven ready, with batter, baked

36	Potato crisps, fried in vegetable oil, not Walkers, not premium crisps, not fried in sunflower oil
37	Potato crisps fried in sunflower oil, including premium, not Walkers
38	Potato crisps fried in high oleic sunflower oil
39	Potato rings, eg Hula Hoops
40	Composite withdrawn[1]
41	Tortilla chips in sunseed or high oleic sunflower oil, eg Doritos
42	Corn snacks, eg Monster Munch, Wotsits
43	Mixed toffees (including liquorice toffees), not premium
44	Chew sweets (eg Starburst, Chewits, Blackjacks)
45	Milk chocolate bar
46	Chocolate covered caramels (eg Cadburys caramel)
47	Dark chocolate with crème or mint fondant centre
48	Mars bars (and own brand equivalents)
49	Maltesers (and similar products)
50	Milk chocolate covered caramel and biscuit fingers
51	Chocolate-covered bar with caramel and cereal
52	Milky Way bars (and own brand equivalents)
53	Snickers bars (and own brand equivalents)
54	Chocolate spread
55	Cream of tomato soup, canned
56	Instant soup, as purchased
57	Mayonnaise, retail, standard
58	Baby rusks
59	Ice cream, non dairy, vanilla, soft scoop
60	Ice cream, dairy, vanilla, soft scoop
61	Chocolate/choc mint and nut cone (eg Cornetto)
62	Ice cream, luxury, dairy, with chocolate/caramel
63	Luxury choc ices, eg Walls Dream, Bounty, Magnum
64	Butter, spreadable (75-80% fat)
65	Butter, spreadable, light (60% fat)
66	Coleslaw, purchased, economy products only

[1] Composite sample number 40 was withdrawn at the initial planning stage and was not analysed due to lack of products on the market..

Annex B: List of nutrients analysed

Proximates	Water Protein (nitrogen and nitrogen factor) Fat Dry Ash content
Fatty acids	Individual fatty acids (*cis* & *trans* isomers, positional isomers, branched chain) (expressed as percentage total fatty acids and per 100g food)
Sterols	Cholesterol
Carbohydrate	(All expressed as monosaccharide equivalents) Starch, total sugars, total carbohydrate, glucose, fructose, sucrose, maltose, lactose, galactose Oligosaccharides
Fibre	As non-starch polysaccharide i.e. Englyst method, and AOAC method
Inorganics	Sodium, potassium, calcium, magnesium, phosphorus, iron, copper, zinc, chloride, manganese, iodine, selenium
Water soluble vitamins	Thiamin, riboflavin, niacin, tryptophan (to calculate niacin equivalent), vitamin B_6, vitamin B_{12}, folate, pantothenic acid, biotin, vitamin C
Vitamin A	Retinol, carotenoids (alpha-carotene, beta-carotene, cryptoxanthins)
Other carotenoids	Lutein, lycopene, zeaxanthin
Vitamin D	Vitamin D_3, 25-OH vitamin D
Vitamin E	Alpha-tocopherol, beta-tocopherol, delta-tocopherol, gamma-tocopherol, alpha-tocotrienol, gamma-tocotrienol

Note: Each of the samples was analysed for a range of nutrients in the above list, depending on existing compositional data available and the importance of the particular food as a dietary source of each nutrient

Annex C: Analytical data
Macronutrients

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
1	Cheese and tomato pizza, retail, all bases, not stuffed crust	38.1	12.2	9.8	2.0	36.1	272	1148	1.7	2.9	32.2	3.9	0.8	0.9	<0.1	2.1	<0.1	<0.1	N/A	4.12	3.56	0.33	1.06	1.39	0.11	19
2	Garlic and herb baguette, baked	25.8	7.0	16.7	1.8	45.1	348	1459	0.8	2.7	42.2	2.9	0.1	0.2	<0.1	2.5	<0.1	<0.1	N/A	8.63	5.09	0.32	1.24	1.56	0.31	31
3	Crunchy clusters type breakfast cereal without nuts	1.7	7.2	11.6	1.2	71.0	399	1687	4.3	7.2	45.7	25.3	3.6	3.8	16.6	1.3	<0.1	<0.1	N/A	4.15	4.46	0.19	2.14	2.33	0.01	2
4	Crunchy/crispy muesli type cereal with nuts	3.3	8.4	20.5	1.4	61.9	450	1892	4.4	7.9	38.7	23.1	1.4	1.6	20.2	<0.1	<0.1	<0.1	N/A	4.61	10.62	0.31	3.91	4.22	0.01	3
5	Quiche Lorraine with shortcrust pastry, retail	52.5	9.1	17.6	1.6	19.7	269	1121	0.9	1.3	16.5	3.2	0.4	0.3	0.3	0.7	1.5	<0.1	N/A	8.31	6.27	0.30	1.54	1.84	0.18	80
6	Low fat spread (26-39%), not polyunsaturated (including dairy type)	57.5	0.2	39.0	1.6	N/A	N/A*	N/A*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.76	17.27	1.61	8.21	9.82	0.12	<0.7
7	Low fat spread (26-39%), not polyunsaturated, with olive oil	58.9	0.1	38.9	1.2	0.5	353	1450	N/A	N/A	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	N/A	8.90	21.54	1.43	4.93	6.36	0.14	5

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
8	Low fat spread (26-39%), polyunsaturated	52.5	Tr	36.9	1.2	N/A	N/A*	N/A*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.55	11.45	2.02	12.94	14.96	0.05	N/A
9	Hard block margarine	22.2	Tr	76.4	1.8	N/A	688†	2827†	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	26.41	33.94	2.96	9.25	12.21	0.07	N/A
10	Compound cooking fat, not polyunsaturated	0.2	Tr	100.0	<0.1	N/A	900†	3700†	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42.30	40.01	2.45	10.38	12.83	0.06	8
11	Ghee made from vegetable oil	<0.1	0.1	100.0	<0.1	N/A	900†	3702†	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	46.72	38.84	0.17	9.31	9.48	0.08	<0.1
12	Reduced fat spread (41-62%), polyunsaturated	40.0	Tr	59.2	1.2	Tr#	533	2190	N/A	N/A	N/A	Tr	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	13.21	17.57	2.80	22.37	25.17	0.13	N/A
13	Reduced fat spread (41-62%), not polyunsaturated	37.4	0.4	60.6	1.7	N/A	N/A§	N/A§	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.61	29.80	3.18	8.72	11.90	0.15	5
14	Reduced fat spread (41-62%), not polyunsaturated, with olive oil	38.8	0.2	59.1	1.4	N/A	N/A§	N/A§	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13.22	31.26	2.12	9.41	11.53	0.11	3
15	Reduced fat spread (62-75%), not polyunsaturated	24.6	0.3	73.2	1.8	Tr	660	2713	N/A	N/A	<0.1	Tr	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	N/A	24.35	33.24	3.04	8.76	11.80	0.14	10
16	Takeaway chicken pieces, coated, deep fried	54.5	24.8	12.8	2.0	4.8‡	233	972	0.8	2.9	4.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.07	6.48	0.39	1.98	2.38	0.11	90

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
17	Coated chicken pieces, takeaway	44.5	18.5	14.1	2.3	17.6[$]	267	1118	1.1	1.3	17.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.32	7.12	0.47	3.37	3.84	0.02	45
18	Chicken/turkey burger, coated, baked	48.3	14.2	15.5	1.8	18.7	266	1113	N/A	N/A	17.7	0.9	0.2	<0.1	0.2	0.5	<0.1	<0.1	N/A	2.63	7.54	0.76	3.72	4.48	0.03	36
19	Breaded/battered chicken/turkey pieces, cooked	46.9	14.4	13.9	1.6	19.6	256	1073	1.1	3.5	18.5	1.1	0.2	<0.1	0.4	0.5	<0.1	<0.1	N/A	2.11	7.16	0.76	3.14	3.90	0.02	4
20	Chicken breast/steak, coated, baked	51.6	17.7	11.6	2.0	15.8	234	982	1.1	0.8	14.6	1.1	0.3	<0.1	0.3	0.6	<0.1	<0.1	N/A	1.78	6.31	0.65	2.25	2.90	0.02	48
21	Beef pie, purchased, puff or shortcrust pastry, family size	58.1	8.9	13.0	1.3	18.1	220	921	2.0	2.0	16.8	1.2	0.2	0.2	0.4	0.5	<0.1	<0.1	N/A	5.53	5.19	0.24	1.26	1.50	0.06	16
22	Beef pie, purchased, individual, puff or shortcrust pastry	44.1	9.2	17.7	1.3	25.5	292	1220	1.3	2.1	24.3	1.2	0.2	0.1	0.2	0.7	<0.1	<0.1	N/A	7.90	6.80	0.21	1.67	1.88	0.13	24
23	Cornish pasty, purchased	47.3	7.0	17.8	1.7	24.0	278	1161	1.1	2.9	21.9	2.1	0.5	0.4	0.4	0.9	<0.1	<0.1	N/A	8.53	6.65	0.15	1.37	1.52	0.14	13
24	Pork pie, individual	32.1	9.9	26.0	1.8	25.7	370	1542	1.2	2.9	24.2	1.5	0.2	<0.1	0.1	1.2	<0.1	<0.1	N/A	10.12	10.90	0.34	3.25	3.59	0.06	35
25	Sausage roll, purchased, ready-to-eat, flaky pastry	36.5	8.4	24.1	1.8	27.0	352	1467	2.7	3.4	25.6	1.3	0.2	<0.1	0.2	1.0	<0.1	<0.1	N/A	10.36	9.39	0.34	2.73	3.07	0.03	2
26	Chicken/turkey pasties/slices, puff pastry	48.4	8.1	18.5	1.4	23.9	289	1205	1.0	2.9	22.8	1.2	0.2	0.1	0.2	0.7	<0.1	<0.1	N/A	9.17	6.40	0.18	1.74	1.92	0.05	24

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
27	Cod in batter, fried in commercial oil, from takeaway fish and chip shops	57.3	16.8	14.7	1.4	10.7	240	1001	0.5	0.5	9.7	1.0	0.1	0.2	0.3	0.3	<0.1	<0.1	N/A	7.58	5.01	0.13	0.75	0.87	0.34	60
28	Cod in batter, frozen/chilled, baked	56.0	12.3	11.8	1.7	N/A^	N/A^	N/A^	0.8	1.5	17.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.71	6.63	0.67	2.08	2.75	0.02	37
29	Cod in breadcrumbs, oven baked	55.5	13.7	8.3	1.5	19.8	204	858	1.7	1.9	18.9	0.9	0.2	<0.1	0.1	0.6	<0.1	<0.1	N/A	1.33	4.62	0.50	1.39	1.90	0.01	36
30	Fish fingers, pollock, grilled	54.6	13.9	9.2	1.6	20.0	213	897	1.6	2.0	18.7	1.3	0.4	0.1	<0.1	0.8	<0.1	<0.1	N/A	1.23	4.29	0.50	2.68	3.18	0.01	44
31	Coleslaw, purchased, not low calorie	73.0	0.8	16.3	1.1	6.0	173	714	1.7	1.2	<0.1	6.0	1.4	1.2	3.5	<0.1	<0.1	<0.1	N/A	1.65	10.07	1.10	2.59	3.69	0.02	11
32	Chips, fried in commercial oil, from takeaway fish and chip shops	51.0	3.5	8.4	1.7	33.2	214	902	3.7	3.2	32.7	0.6	0.1	0.1	0.3	<0.1	<0.1	<0.1	N/A	4.29	3.02	0.02	0.44	0.47	0.16	1
33	Chips, fine cut, from fast food outlets	38.5	3.5	14.2	1.6	39.7	290	1219	3.2	3.8	39.4	0.3	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	N/A	2.50	7.80	0.42	2.77	3.19	0.02	<0.7
34	Potato chips, oven ready, baked	54.2	3.2	4.9	1.5	35.3	189	800	2.7	3.5	34.3	1.0	0.4	0.3	0.4	<0.1	<0.1	<0.1	N/A	0.78	1.36	0.02	2.43	2.45	<0.01	N/A
35	Potato chips, oven ready, with batter, baked	51.9	3.4	6.1	1.7	35.6	202	852	2.9	3.3	35.2	0.4	0.1	<0.1	0.3	<0.1	<0.1	<0.1	N/A	1.30	1.84	0.02	2.77	2.80	0.01	<0.7

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
36	Potato crisps, fried in vegetable oil, not Walkers, not premium crisps, not fried in sunflower oil	1.9	4.3	31.8	3.0	57.4	519	2168	2.4	2.9	55.9	1.5	0.3	0.2	1.1	<0.1	<0.1	<0.1	N/A	8.41	19.70	0.05	2.80	2.85	0.06	N/A
37	Potato crisps fried in sunflower oil, including premium, not Walkers[2]	1.9	6.0	29.8	3.7	55.7	501	2096	4.7	4.5	55.2	0.5	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	N/A	2.96	18.36	0.09	6.70	6.78	0.03	N/A
38	Potato crisps fried in high oleic sunflower oil	4.3	6.2	28.8	4.2	55.8	493	2064	4.6	4.4	54.9	0.9	<0.1	<0.1	0.9	<0.1	<0.1	<0.1	N/A	2.48	22.41	0.07	2.44	2.51	0.03	N/A
39	Potato rings, e.g. Hula Hoops	2.0	3.6	22.4	3.6	70.5	480	2018	1.7	2.6	70.2	0.3	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	N/A	1.92	17.11	0.26	1.99	2.25	0.02	N/A
41	Tortilla chips in sunseed or high oleic sunflower oil (eg Doritos)	1.3	7.2	27.4	2.6	60.8	504	2110	5.7	5.9	58.3	2.5	0.2	0.2	1.1	<0.1	1.0	<0.1	N/A	2.89	20.01	0.07	3.02	3.09	0.08	N/A
42	Corn snacks (eg Monster Munch, Wotsits)	1.3	6.0	30.4	3.0	60.8	526	2199	1.4	1.3	55.3	5.5	<0.1	<0.1	0.6	<0.1	4.9	<0.1	N/A	2.76	18.35	2.21	5.24	7.45	0.04	N/A
43	Mixed toffees (including liquorice toffees), not premium	4.0	2.1	15.9	1.2	62.9	387	1630	N/A	N/A	<0.1	39.1	5.9	<0.1	29.9	3.3	<0.1	<0.1	23.8	8.60	5.26	0.05	1.05	1.10	0.07	N/A

[2] Composite was analysed, and re-analysed to confirm data. This data does not reflect that expected for potato crisps fried in sunflower oil (levels of polyunsaturated fatty acids are very low, levels of monounsaturated fatty acids are very high). The data is published here for completeness, but will not be incorporated into the Department of Health's nutrient databanks which support the National Diet and Nutrition Survey and other national dietary surveys.

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
44	Chew sweets (eg Starburst, Chewits, Blackjacks)	3.8	0.9	6.0	<0.1	85.1	377	1599	N/A	N/A	<0.1	54.5	6.3	<0.1	40.5	7.7	<0.1	<0.1	30.6	3.57	1.72	0.01	0.38	0.39	0.01	N/A
45	Milk chocolate bar	1.6	7.3	31.1	1.7	56.0	519	2171	1.3	2.3	<0.1	56.0	<0.1	<0.1	46.8	<0.1	9.2	<0.1	N/A	18.71	9.44	0.10	1.03	1.13	0.16	22
46	Chocolate covered caramels (eg Cadburys caramel)	4.8	4.2	23.6	1.4	70.2	493	2068	0.3	1.6	<0.1	56.0	4.7	<0.1	39.6	4.2	7.5	<0.1	14.3	13.78	7.42	0.07	1.01	1.08	0.10	13
47	Dark chocolate with crème or mint fondant centres	5.4	3.7	16.3	0.9	71.9	431	1816	1.9	4.7	<0.1	62.9	4.0	2.4	56.5	<0.1	<0.1	<0.1	9.0	9.80	5.10	0.04	0.50	0.54	0.01	3
48	Mars bars (and own brand equivalents)	7.1	4.1	15.3	1.3	66.6	404	1703	0.8	1.5	3.3	63.3	7.8	0.3	38.7	7.8	8.7	<0.1	N/A	7.31	6.35	0.04	0.77	0.81	0.05	10
49	Maltesers (and similar products)	1.8	7.6	23.3	2.1	63.0	476	1998	0.4	1.7	7.5	55.5	2.3	<0.1	36.9	2.1	14.2	<0.1	N/A	14.16	6.94	0.06	0.90	0.96	0.07	12
50	Milk chocolate covered caramel and biscuit fingers	3.6	5.0	23.6	1.2	70.0	495	2079	1.5	2.5	12.2	45.4	4.5	<0.1	31.6	3.5	5.8	<0.1	12.4	13.52	7.49	0.05	1.27	1.32	0.05	10
51	Chocolate-covered bar with caramel and cereal	5.0	5.2	25.8	1.4	66.2	501	2102	0.8	1.9	11.6	46.4	2.1	<0.1	32.9	2.0	9.4	<0.1	8.2	16.26	7.05	0.05	1.05	1.10	0.09	9
52	Milky Way bars (and own brand equivalents)	5.8	3.8	15.7	1.4	76.6	444	1872	0.6	1.0	6.9	69.7	6.5	0.3	47.1	7.5	8.3	<0.1	N/A	7.73	6.37	0.05	0.69	0.74	0.06	9

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
53	Snickers bars (and own brand equivalents)	5.4	7.5	28.2	1.6	52.2	479	2005	2.4	2.8	6.1	46.1	4.8	0.1	31.0	4.4	5.8	<0.1	N/A	9.15	15.58	0.05	2.03	2.08	0.03	4
54	Chocolate spread	1.0	3.3	37.7	1.2	59.4[#]	575	2402	1.0	2.0	N/A	59.4	<0.1	<0.1	49.5	<0.1	10.0	<0.1	N/A	8.13	19.90	1.92	5.71	7.63	0.03	9
55	Cream of tomato soup, canned	89.0	0.9	2.0	1.0	7.8	51	215	0.5	0.6	2.2	5.5	1.3	1.5	2.2	<0.1	0.5	<0.1	N/A	0.27	1.15	0.15	0.34	0.50	0.01	3
56	Instant soup, as purchased	4.3	5.9	13.4	7.5	64.1	384	1621	2.5	5.6	29.2	17.4	2.1	1.7	6.7	6.3	0.6	<0.1	17.5	8.70	3.08	0.03	0.97	1.00	0.01	9
57	Mayonnaise, (retail), standard	19.3	1.1	74.8	1.6	2.4	686	2824	N/A	N/A	<0.1	2.4	0.3	0.4	1.7	<0.1	<0.1	<0.1	N/A	5.65	45.51	5.83	14.10	19.93	0.04	57
58	Baby rusks	5.7	6.5	10.7	1.5	73.0	396	1674	2.1	2.4	49.6	23.4	2.3	1.4	19.7	<0.1	<0.1	<0.1	N/A	4.59	3.82	0.07	1.70	1.77	0.01	3
59	Ice cream, non dairy, vanilla, soft scoop	65.6	2.6	7.7	0.7	29.8[#]	192	807	N/A	N/A	N/A	23.5	5.0	0.8	11.4	1.1	5.3	<0.1	6.3	5.01	1.89	0.01	0.41	0.42	0.04	13
60	Ice cream, dairy, vanilla, soft scoop	64.9	3.2	8.2	0.7	22.0	169	711	N/A	N/A	<0.1	22.0	2.7	0.9	11.9	1.5	5.1	<0.1	N/A	5.19	1.95	0.08	0.24	0.32	0.18	29
61	Chocolate/choc mint and nut cone (eg Cornetto)	41.9	3.5	14.4	0.8	39.6	292	1225	1.1	1.2	11.7	27.9	2.0	1.5	19.1	2.0	3.3	<0.1	N/A	11.04	2.01	0.02	0.62	0.64	0.03	6
62	Ice cream, luxury, dairy, with chocolate/caramel	48.4	4.2	13.9	0.9	32.2	262	1100	0.9	1.3	2.9	28.4	1.2	1.2	22.2	<0.1	3.8	<0.1	0.9	8.97	3.12	0.10	0.49	0.59	0.23	58
63	Luxury choc ices (eg Walls Dream, Bounty, Magnum)	40.4	3.9	21.1	1.0	34.9	336	1405	N/A	N/A	<0.1	32.9	1.4	1.5	23.9	<0.1	6.2	<0.1	1.9	14.21	5.00	0.06	0.56	0.62	0.11	19
64	Butter, spreadable (75-80% fat)	18.7	0.4	79.1	1.2	0.5[#]	715	2941	N/A	N/A	N/A	0.5	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	N/A	34.15	28.17	2.55	7.45	10.00	1.38	153
65	Butter, spreadable, light (60% fat)	37.3	0.5	60.2	1.2	0.8[#]	547	2248	N/A	N/A	N/A	0.8	<0.1	<0.1	<0.1	<0.1	0.8	<0.1	N/A	25.70	21.67	1.93	5.83	7.75	1.01	111

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Water g/100g	Protein g/100g	Total fat g/100g	Ash g/100g	Carbohydrate g/100g	Energy (kcal)/100g	Energy (kJ)/100g	Englyst fibre g/100g	AOAC fibre g/100g	Starch g/100g	Total sugars g/100g	Glucose g/100g	Fructose g/100g	Sucrose g/100g	Maltose g/100g	Lactose g/100g	Galactose g/100g	Oligosaccharides g/100g	Saturated fatty acids g/100g	*Cis*-monounsaturated fatty acids g/100g	*Cis*-n3 fatty acids g/100g	*Cis*-n6 fatty acids g/100g	*Cis*-polyunsaturated fatty acids g/100g	*Trans* fatty acids g/100g	Cholesterol milligrams/100g
66	Coleslaw, purchased, economy products only	80.8	0.9	9.1	0.9	6.5	110	456	1.8	1.6	<0.1	6.5	1.6	1.3	3.7	<0.1	<0.1	<0.1	N/A	0.73	5.51	0.73	1.63	2.36	0.01	12

Micronutrients

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
1	Cheese and tomato pizza, retail, all bases, not stuffed crust	134 [œ]	<0.1	0.15	0.15	1.0	2.8	2	1.68	<0.02	0.4	4	0.20	4.1	397	223	217	24	179	1.1	0.10	1.3	630	17	0.4	4
2	Garlic and herb baguette, baked	188 [œ]	<0.1	0.23	0.13	1.1	1.7	N/A	1.79	0.14	0.1	11	0.20	0.6	476	149	126	21	88	1.6	0.08	0.7	730	3	0.6	1
3	Crunchy clusters type breakfast cereal without nuts	<5 [¥]	N/A	1.02	1.06	4.0	2.8	N/A	1.38	0.17	N/A	90	0.32	8.9	41	310	40	72	232	2.7	0.30	1.6	100	2	2.1	6
4	Crunchy/crispy muesli type cereal with nuts	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.26	N/A	N/A	N/A	N/A	9.5	138	290	46	83	245	4.0 [@]	0.34	1.8	240	N/A	2.3	19
5	Quiche Lorraine with shortcrust pastry, retail	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	339	155	147	15	177	0.6	0.03	1.0	450	N/A	0.1	7
6	Low fat spread (26-39%), not polyunsaturated (including dairy type)	893	3.0	N/A	N/A	N/A	N/A	N/A	12.50	N/A	N/A	N/A	N/A	N/A	692	61	12	2	9	0.02	<0.001	0.02	970	15	<0.0001	<0.012
7	Low fat spread (26-39%), not polyunsaturated, with olive oil	892	4.5	N/A	N/A	N/A	N/A	N/A	13.00	N/A	N/A	N/A	N/A	N/A	488	48	9	1	6	0.04	<0.001	0.03	690	N/A	0.01	<1

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
8	Low fat spread (26-39%), polyunsaturated	962	8.4	N/A	N/A	N/A	N/A	N/A	10.10	N/A	N/A	N/A	N/A	N/A	482	31	4	0.39	4	0.01	0.01	<0.001	770	N/A	<0.0001	<0.012
9	Hard block margarine	905	8.8	N/A	N/A	N/A	N/A	N/A	12.20	N/A	N/A	N/A	N/A	N/A	878	<0.032	1	0.04	<0.013	0.1	<0.001	0.04	1220	N/A	<0.0001	<0.012
10	Compound cooking fat, not polyunsaturated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11	Ghee made from vegetable oil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.70	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	Reduced fat spread (41-62%), polyunsaturated	683	5.8	N/A	N/A	N/A	N/A	N/A	26.3	N/A	N/A	N/A	N/A	N/A	600	21	3	0.22	1	0.02	0.01	0.02	870	N/A	<0.0001	1
13	Reduced fat spread (41-62%), not polyunsaturated	940	9.9	N/A	N/A	N/A	N/A	N/A	12.40	N/A	N/A	N/A	N/A	N/A	689	43	14	2	12	0.03	0.01	0.1	990	N/A	<0.0001	0.22
14	Reduced fat spread (41-62%), not polyunsaturated, with olive oil	817	4.2	N/A	N/A	N/A	N/A	N/A	12.50	N/A	N/A	N/A	N/A	N/A	551	46	7	1	7	0.04	<0.001	0.01	800	N/A	<0.0001	0.19
15	Reduced fat spread (62-75%), not polyunsaturated	920	8.4	<0.001	0.07	<0.1	<0.1	N/A	15.90	<0.02	0.1	1	0.02	0.3	747	17	10	1	9	0.02	<0.001	0.03	1070	N/A	<0.0001	0.43
16	Takeaway chicken pieces, coated, deep fried	N/A	<0.1	0.09	0.25	8.4	5.9	N/A	1.65	0.42	0.2	4	1.25	1.2	477	338	20	28	204	0.9	0.06	1.4	660	3	0.1	15

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
17	Coated chicken pieces, takeaway	<0.1[ce]	<0.1	0.09	0.12	7.4	4.9	N/A	2.70	0.45	1.7	8	1.15	0.9	535	350	28	27	218	0.7	0.07	0.6	700	N/A	0.2	8
18	Chicken/turkey burger, coated, baked	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	383	337	41	23	160	1.0	0.09	0.8	610	N/A	0.2	9
19	Breaded/battered chicken/turkey pieces, cooked	N/A	<0.1	0.07	0.17	7.1	3.1	N/A	2.75	0.39	0.2	27	0.61	2.9	360	278	31	24	169	1.1	0.08	0.8	510	N/A	0.2	7
20	Chicken breast/steak, coated, baked	N/A	<0.1	0.10	0.11	7.2	4.2	N/A	2.47	0.42	2.8	21	1.23	0.6	466	300	30	26	203	0.7	0.07	0.6	580	N/A	0.2	7
21	Beef pie, purchased, puff or shortcrust pastry, family size	N/A[¢]	<0.1	0.04	0.14	1.1	1.5	N/A	0.77	0.04	0.4	3	0.15	1.4	332	150	41	12	91	1.1	0.07	1.7	510	N/A	0.2	3
22	Beef pie, purchased, individual, puff or shortcrust pastry	N/A[¢]	<0.1	0.08	0.15	2.1	1.8	N/A	1.50	0.20	1.2	2	0.16	1.5	346	163	49	15	83	1.2	0.07	1.5	560	N/A	0.3	4
23	Cornish pasty, purchased	4	<0.1	N/A	N/A	N/A	N/A	N/A	0.85	N/A	N/A	N/A	N/A	N/A	470	200	47	16	69	1.0	0.08	1.0	720	N/A	0.3	3
24	Pork pie, individual	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	542	153	53	7	23	2.9	0.04	0.5	830	2	0.1	1
25	Sausage roll, purchased, ready-to-eat, flaky pastry	N/A	<0.1	0.08	0.11	1.7	1.7	N/A	2.11	0.18	0.2	2	0.24	0.7	577	129	61	14	89	1.2	<0.001	0.7	880	2	0.3	5
26	Chicken/turkey pasties/slices, puff pastry	N/A	<0.1	0.08	0.15	1.8	1.1	N/A	1.38	0.07	N/A	3	0.34	0.9	360	169	36	15	81	0.7	0.07	0.5	570	6	0.2	4

Nutrient analysis of a range of processed foods with particular reference to *trans* fatty acids

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
27	Cod in batter, fried in commercial oil, from takeaway fish and chip shops	<0.1[§]	N/A	0.07	0.12	2.1	3.6	N/A	1.48	0.24	2.1	16	0.18	1.4	175[¨]	326	79	26	208	0.4	0.04	0.5	220[¨]	214	0.1	22
28	Cod in batter, frozen/chilled, baked	<0.1[§]	N/A	0.07	0.07	0.9	2.7	N/A	2.38	0.20	1.7	12	0.09	1.4	424	230	32	21	158	0.5	0.04	0.4	530	99	0.1	17
29	Cod in breadcrumbs, oven baked	N/A	N/A	0.08	0.11	1.6	2.9	N/A	1.84	0.19	1.0	7	0.17	3.0	330	245	41	22	137	0.5	0.05	0.4	480	N/A	0.2	21
30	Fish fingers, pollock, grilled	N/A	N/A	0.09	0.12	0.8	3.3	N/A	2.70	0.18	0.3	32	0.16	0.4	401	263	23	26	143	0.5	0.08	0.5	580	47	0.2	15
31	Coleslaw, purchased, not low calorie	153	<0.1	0.02	0.42	0.2	0.3	1	3.93	0.13	0.1	56	0.12	0.6	296	156	36	8	21	0.3	<0.001	0.1	450	3	0.1	1
32	Chips, fried in commercial oil, from takeaway fish and chip shops	N/A	N/A	0.10	0.10	0.6	0.5	2	0.32	0.05	N/A	46	0.51	0.3	16”	804	16	32	63	0.7	0.14	0.4	120”	N/A	0.2	<0.012
33	Chips, fine cut, from fast food outlets	N/A	N/A	0.07	0.09	0.6	0.4	2	3.28	0.04	N/A	38	0.49	0.2	193[ž]	544	18	29	143	0.7	0.08	0.4	260[ž]	N/A	0.2	<0.012
34	Potato chips, oven ready, baked	N/A	N/A	0.05	0.12	1.4	0.7	1	1.37	0.20	N/A	22	0.25	0.3	31	641	14	31	95	0.7	0.12	0.4	100	N/A	0.2	0.10
35	Potato chips, oven ready, with batter, baked	N/A	N/A	0.09	0.11	3.2	0.7	1	1.84	0.20	N/A	13	0.22	0.5	193	602	17	32	111	0.7	0.15	0.4	320	N/A	0.2	<0.012

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
36	Potato crisps, fried in vegetable oil, not Walkers, not premium crisps, not fried in sunflower oil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.80	N/A	N/A	N/A	N/A	N/A	599	706	35	40	103	1.1	0.17	0.7	850	N/A	0.3	0.19
37	Potato crisps fried in sunflower oil, including premium, not Walkers[3]	N/A	N/A	0.09	0.16	3.9	0.9	17	9.79	0.31	N/A	62	0.78	0.6	451	1249	35	65	128	1.3	0.20	0.9	820	N/A	0.4	2
38	Potato crisps fried in high oleic sunflower oil	5[¥]	N/A	N/A	N/A	N/A	N/A	N/A	9.05	N/A	N/A	N/A	N/A	N/A	604	1328	48	63	135	1.5	0.20	0.9	1000	2	0.4	1
39	Potato rings, e.g. Hula Hoops	N/A	N/A	0.05	0.27	1.1	0.8	3	7.64	0.40	N/A	5	0.28	0.2	845	781	26	34	108	0.8	0.16	0.6	1490	N/A	0.2	1
41	Tortilla chips in sunseed or high oleic sunflower oil (eg Doritos)	35[f]	N/A	0.11	0.18	0.5	0.9	N/A	7.11	0.15	N/A	10	0.28	0.8	636	285	103	78	234	1.5	0.10	1.2	900	N/A	0.4	5
42	Corn snacks (eg Monster Munch, Wotsits)	39[f]	N/A	0.23	0.31	0.3	0.5	N/A	8.43	<0.02	N/A	5	0.30	1.3	909	329	71	20	96	0.3	0.05	0.4	1120	N/A	0.2	9
43	Mixed toffees (including liquorice toffees), not premium	N/A	N/A	N/A	<0.01	N/A	0.7	N/A	<0.01	N/A	0.2	1	0.21	0.2	312	132	85	11	65	0.3	0.04	0.3	460	20	0.03	1

[3] Composite was analysed, and re-analysed to confirm data. This data does not reflect that expected for potato crisps fried in sunflower oil (levels of polyunsaturated fatty acids are very low, levels of monounsaturated fatty acids are very high). The data is published here for completeness, but will not be incorporated into the Department of Health's nutrient databanks which support the National Diet and Nutrition Survey and other national dietary surveys.

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
44	Chew sweets (eg Starburst, Chewits, Blackjacks)	25[f]	N/A	N/A	N/A	N/A	N/A	N/A	1.20	N/A	N/A	N/A	N/A	N/A	30	10	3	2	4	0.1	<0.01	0.02	30	N/A	0.01	<0.012
45	Milk chocolate bar	70[œ]	N/A	0.12	0.53	0.3	2.4	N/A	0.40	0.21	2.1	9	0.73	2.4	89	451	226	57	224	2.1	0.31	1.1	190	51	0.3	3
46	Chocolate covered caramels (eg Cadburys caramel)	93[œ]	<0.1	0.02	0.30	0.2	1.1	N/A	1.46	<0.02	N/A	4	0.55	1.7	160	297	154	37	156	1.3	0.17	0.8	280	40	0.2	2
47	Dark chocolate with crème or mint fondant centres	77[œ]	<0.1	0.16	0.01	0.5	0.6	N/A	1.52	0.35	N/A	1	0.04	1.6	6	389	49	13	104	0.7	0.06	0.6	30	8	0.1	3
48	Mars bars (and own brand equivalents)	35	0.1	0.17	0.20	0.40	1.0	N/A	2.00	0.03	N/A	5	0.54	1.5	174	269	118	35	125	1.66	0.18	0.64	346	N/A	0.22	1
49	Maltesers (and similar products)	48 [œ]	N/A	0.04	0.47	0.6	1.4	N/A	0.84	0.02	1.3	14	0.78	4.6	156	565	266	50	269	2.0	0.20	1.0	270	53	0.2	5
50	Milk chocolate covered caramel and biscuit fingers	35[œ]	N/A	0.03	0.23	0.2	1.0	N/A	1.28	<0.02	0.5	4	0.40	1.8	191	242	100	30	118	1.6	0.13	0.6	310	16	0.3	1
51	Chocolate-covered bar with caramel and cereal	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.94	N/A	N/A	N/A	1.31	1.8	161	329	140	40	158	4.6[@]	0.24	0.8	230	N/A	0.4	4
52	Milky Way bars (and own brand equivalents)	24	0.20	0.18	0.21	0.4	1.0	N/A	1.96	0.03	N/A	5	0.56	1.7	220	240	117	25	114	2.0	0.13	0.5	354	N/A	0.13	1

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
53	Snickers bars (and own brand equivalents)	11	1.5	0.12	0.16	2.1	1.7	N/A	4.28	0.04	N/A	11	0.69	1.7	187	388	101	80	210	1.9	0.35	1.4	385	N/A	0.60	6
54	Chocolate spread	N/A	N/A	0.17	<0.05	0.3	0.6	N/A	7.70	0.19	N/A	10	0.26	0.8	58	362	91	51	128	4.9	0.32	0.7	160	15	0.4	1
55	Cream of tomato soup, canned	25[œ]	N/A	<0.001	0.11	0.6	0.1	1	1.42	0.06	N/A	14	0.04	1.2	245	179	14	8	19	0.2	0.04	0.1	420	2	0.1	0.33
56	Instant soup, as purchased	118[f]	N/A	N/A	N/A	N/A	N/A	N/A	1.79	0.06	N/A	6	0.29	2.5	2376	782	99	28	211	1.3	0.12	0.7	3570	N/A	0.3	2
57	Mayonnaise, (retail), standard	78[œ]	<0.1	<0.001	0.1	<0.1	0.1	N/A	22.10	0.09	0.3	9	0.15	0.7	131	4	2	0.3	5	0.2	<0.001	0.1	330	7	<0.0001	0.41
58	Baby rusks	N/A	N/A	N/A	N/A	7.4	N/A	N/A	1.38	<0.02	N/A	22	0.24	0.5	88	240	336[@]	29	108	6.5[@]	0.11	0.7	150	2	0.6	6
59	Ice cream, non dairy, vanilla, soft scoop	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	76	178	80	12	68	0.4	<0.001	0.2	130	22	<0.0001	1
60	Ice cream, dairy, vanilla, soft scoop	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	63	163	104	13	85	0.1	0.02	0.3	110	30	<0.0001	1
61	Chocolate/choc mint and nut cone (eg Cornetto)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	90	212	62	33	88	1.5	0.13	0.4	140	17	0.3	1
62	Ice cream, luxury, dairy, with chocolate/ caramel	148	<0.1	0.02	0.80	0.3	0.9	N/A	0.49	<0.02	0.2	4	0.36	1.3	75	249	108	27	110	1.4	0.15	0.6	160	17	0.2	3
63	Luxury choc ices (eg Walls Dream, Bounty, Magnum)	502	<0.1	0.10	0.17	0.1	0.7	N/A	0.71	0.13	0.3	7	0.5	1.9	64	250	121	27	119	1.2	0.15	0.5	140	23	0.1	3
64	Butter, spreadable (75-80% fat)	562[œ]	N/A	N/A	N/A	N/A	N/A	N/A	10.5	N/A	0.1	N/A	N/A	N/A	484	16	11	1	12	0.04	<0.001	0.1	720	4	<0.0001	<0.012
65	Butter, spreadable, light (60% fat)	437[œ]	N/A	N/A	N/A	N/A	N/A	N/A	8.27	N/A	N/A	N/A	N/A	N/A	467	26	17	0.06	15	0.3	<0.001	0.1	680	8	<0.0001	1

Composite sample number	Sample description	Vitamin A micrograms/100g*	Vitamin D micrograms/100g	Thiamin milligrams/100g	Riboflavin milligrams/100g	Niacin milligrams/100g	Tryptophan/60 milligrams/100g	Vitamin C milligrams/100g	Vitamin E milligrams/100g	Vitamin B_6 milligrams/100g	Vitamin B_{12} micrograms/100g	Folate micrograms/100g	Pantothenic acid milligrams/100g	Biotin micrograms/100g	Sodium milligrams/100g	Potassium milligrams/100g	Calcium milligrams/100g	Magnesium milligrams/100g	Phosphorus milligrams/100g	Iron milligrams/100g	Copper milligrams/100g	Zinc milligrams/100g	Chloride milligrams/100g	Iodine micrograms/100g	Manganese milligrams/100g	Selenium micrograms/100g
66	Coleslaw, purchased, economy products only	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.41	N/A	N/A	N/A	N/A	N/A	197	175	40	8	20	0.2	0.02	0.1	320	N/A	0.1	1

N/A = Not Analysed

< = Result was below the analytical limit of quantification (LOQ) or limit of detection (LOD). There is no distinction between '<' and 'not detected'

Tr = Trace

* = Energy values have not been calculated because carbohydrate was not measured in this sample. Based on sub-sample ingredients and product information, small quantities of starch and sugars are likely to be present

§ = Energy values have not been calculated because carbohydrate was not measured in this sample. Based on sub-sample ingredients and product information, small quantities of sugars are likely to be present

^ = Energy values and available carbohydrate have not been calculated because sugars were not measured in this sample. Based on sub-sample ingredients and product information, small quantities of sugars are likely to be present

† = Energy values have been calculated on the assumption (based on sub-sample ingredients and product information) that carbohydrates are not present

= Available carbohydrate calculated on the assumption (based on sub-sample ingredients and product information) that no starch is present

‡ = Available carbohydrate calculated on the assumption (based on sub-sample ingredients and product information) that sugars are not present

$ = Available carbohydrate calculated on the assumption (based on sub-sample ingredients and product information) that sugars are present in trace amounts

" = No salt or vinegar added at point of purchase

@ = Samples within composite fortified with calcium and/or iron

œ= Total vitamin A calculated from retinol and beta-carotene assuming no alpha-carotene or cryptoxanthins present

¥= Total vitamin A calculated assuming (based on sub-sample ingredients and product information) that retinol, alpha-carotene or cryptoxanthins are not present

¢= Total vitamin A has not been calculated because retinol was not measured in this sample and small quantities of retinol may be present (based on sub-sample ingredients and product information)

š = Total vitamin A calculated assuming (based on sub-sample ingredients and product information) that carotenoids are not present

ƒ= Total vitamin A calculated assuming (based on sub-sample ingredients and product information) that retinol is not present

ž= Sample contains sub-samples with and without added salt

Note: Composite numbers do not run sequentially as one composite was withdrawn at the project planning stage (see Annex A)

Annex D: Analytical methods used

Moisture:
A homogenised portion of the sample is mixed with sand and heated to 102°C. The moisture loss is determined gravimetrically.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
Ref: BS 4401 pt3:1997
LOQ 0.1 g/100g

Ash:
A homogenised portion of the sample is ashed in a muffle furnace at 550°C. The ash is determined gravimetrically.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
Ref: BS 4401 pt11:1998
LOQ 0.1 g/100g

Protein:
The sample is analysed using Leco instrumentation following the Dumas procedure: The sample is combusted in an oxygen atmosphere, the gaseous product is cleaned and nitrogen compounds converted to nitrogen which is measured by a thermal conductivity cell. The crude protein is calculated by multiplying by the appropriate conversion factor.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
LOQ 0.1 g/100g

Fat:
The sample is acid hydrolysed with hydrochloric acid, cooled, filtered and dried. The fat is extract from the residue with petroleum ether and the dried fat determined gravimetrically.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
Ref: BS 4401 pt4:1970 (Weibull Stoldt)
LOQ 0.1 g/100g

Fatty acids:
The lipid fractions of the sample are solvent extracted. The isolated fat is transesterified with methanolic sodium methoxide to form fatty acid methyl esters (FAMES). The FAME profile is determined using capillary gas chromatography (GC). Quantification and identification of individual FAMEs in the test material is achieved with reference to calibration standards.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
LOQ 0.01 mg/100g

Sugars:
The sugars are extracted with water, clarified and chromatographically separated on an amine column with an acetonitrile/water mobile phase. The sugars are detected using an evaporative light scattering detector and quantified with reference to calibration standards.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
LOQ 0.1 g/100g

Starch:
The method consists of two separate determinations. The sample is treated with warm diluted hydrochloric acid, clarified and filtered; the optical rotation of the resulting solution is determined. In the second determination, the sample is extracted with 40% ethanol and filtered. The filtrate is acidified with hydrochloric acid, clarified and filtered again; the optical rotation of the resulting solution is determined at 20 ±2ºC.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
Ref: The Feeding Stuffs (Sampling and Analysis) Regulations 1982 Method 30a.
LOQ 2 g/100g

Oligosaccharides:
Malto-oligosaccharides (DP1-7) are determined individually by High Performance Anion

Exchange Chromatography with Pulsed Amperometric Detection. In-house method

LOQ 0.1 g/100g

Dietary Fibre:
AOAC
The sample is weighed and de-fatted if necessary. It is then gelatinised and treated with α-amylase and further digested enzymatically with protease and amyloglucosidase to remove the starch and protein. The dietary fibre is precipitated with IMS, filtered, washed, dried and weighed. Total dietary fibre is then determined gravimetrically and corrected for protein and ash.
Accredited to BS/EN ISO/IEC 17025:2005. UKAS 0680
Ref: AOAC 985.29/45.4.07 (2007)
LOQ 0.5 g/100g

Englyst (Non-starch polysaccharides)
Englyst Fibrezym kit with colorimetric end point
LOQ 0.2 g/100g

Cholesterol:
Method Lipid in sample is saponified at high temperature with ethanolic KOH solution. Unsaponifiable fraction containing cholesterol and other sterols is extracted with toluene. Sterols are derivatized to trimethylsilyl (TMS) ethers and then quantified by GC.
LOQ 0.7 mg/100 g
Reproducibility 20%
Reference Method ISO 6799: 1992

Inorganics:
Sodium, Potassium, Calcium, Magnesium, Copper, Iron, Manganese, Zinc, Phosphorus, Selenium
Samples are digested in acid under oxidising conditions, using sealed ‘bombs’ in automated microwave digestors, to prevent losses of volatile metals/inorganics, Metals (and some inorganics) are then determined by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) or by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). These techniques allow the sensitive and accurate (true and precise) determination of metals in foods and allow matrix interferences to be overcome.
In house methods - UKAS accredited.

Iodide:
Concentrations are determined by high resolution ICP-MS after extraction with tetra methyl ammonium hydroxide.
UKAS accredited.

Chloride:
Concentrations are determined using a Corning Chloride Analyser after extraction with nitric acid.
In house method FFF/B1-2104 - UKAS accredited.

Vitamins – Water Soluble:
Thiamin, Riboflavin & Vitamin B6
Thiamin, riboflavin and Vitamin B6 are determined by HPLC after appropriate and controlled acid and enzymatic hydrolysis. The methods are based on published CEN Standards. The selected method enables determination of total B6 as pyridoxine and is most appropriate to samples of this type where pyridoxine or its phosphate will form the major vitamin B6 component.
UKAS accredited.

Niacin, Total Folate, Biotin, Pantothenic acid
Determined using microbiological assay (MBA) procedures with detection carried out using VitaFast® MBA test kits.
UKAS accredited.

Tryptophan
Determined by HPLC using fluorescence detection after alkaline hydrolysis. Tryptophan contributes to the available Niacin on the basis that Niacin = Tryptophan/60.

Vitamin B12
Vitamin B12 is extracted from food by autoclaving in acetate buffer in the presence of cyanide. Vitamin B12 is determined by microbiological assay using *L.Delbrueckii.Lactis.*
UKAS accredited.

The B-vitamin results are expressed as follows:

Thiamin:	thiamin chloride hydrochloride
Riboflavin:	free riboflavin
Niacin:	nicotinic acid
Vitamin B6:	pyridoxine hydrochloride
Pantothenate:	pantothenic acid
Biotin:	d-biotin
B12:	cyanocobalamin
Total folate:	pteroyglutamic acid

Vitamin C
Vitamin C is determined by HPLC using fluorescence detection.

Oil Soluble Vitamins:
Vitamins A, D, E and the carotenoids are determined using an in house procedure involving saponification of the sample, solvent extraction and HPLC determination - UKAS accredited methods based on:

- Vitamin A – Retinol: BS EN 12823-1:2000. Foodstuffs-Determination of Vitamin A by High Performance Liquid Chromatography-Part 1: Measurement of Retinol.
- Vitamin A – β-Carotene: BS EN 12823-2:2000. Foodstuffs-Determination of Vitamin A by High Performance Liquid Chromatography-Part 2: Measurement of β-Carotene.
- Vitamin D: BS EN 12821:2000. Foodstuffs-Determination of Vitamin D by High Performance Liquid Chromatography-Measurement of Cholecalciferol (D3) and Ergocalciferol (D2).
- Vitamin E: BS EN 12822:2000. Foodstuffs-Determination of Vitamin E by High Performance Liquid Chromatography-Measurement of α-, β-, γ- and δ-tocopherols.

The total vitamin E figure takes into account the relative biological activities of the different isomers. Vitamin E is given as mg/100g of α - tocopherol equivalent. The activities used for these calculations are as shown below:

α - tocopherol	1.0
β - tocopherol	0.4
γ - tocopherol	0.1
δ - tocopherol	0.01

Total vitamin A is expressed as ug/100g all-trans retinol equivalent (ATRE) and is calculated as follows:

All-trans retinol + (0.75*13-cis retinol) +(β-carotene/6) +(other active carotenoids/12)

UKAS accredited.

Details of the quality control measures employed are given in the analytical report associated with this project, available at www.dh.gov.uk/publications.

References

[1] Responsibility for nutrition policy in England transferred from the Food Standards Agency to the Department of Health (DH) on 1st October 2010. Management of the rolling programme of nutrient analysis has also transferred to DH

[2]Food Standards Agency. *Management of the Food Standards Agency programme of nutrient analysis and associated work* http://collections.europarchive.org/tna/20100907111047/http://food.gov.uk/science/dietarysurveys/analyticalsurveys/n10040/ (accessed 1 February 2013)

[3]Food Standards Agency. *McCance & Widdowson's The Composition of Foods integrated dataset* http://tna.europarchive.org/20110116113217/http://www.food.gov.uk/science/dietarysurveys/dietsurveys/ (accessed 1 February 2013)

[4]Food Standards Agency. *Re-estimate of trans fat intake in adults* http://collections.europarchive.org/tna/20100907111047/http://food.gov.uk/science/dietarysurveys/ndnsdocuments/ndnspreviousurveyreports/reestimatetransfats (accessed 1 February 2013)

[5]Food Standards Agency. *National Diet and Nutrition Survey: headline results from year 1 (2008/2009)* http://collections.europarchive.org/tna/20100907111047/http://food.gov.uk/science/dietarysurveys/ndnsdocuments/ndns0809year1 (accessed 1 February 2013)

[6] Report on the nutrient analysis survey of biscuits, buns, cakes and pastries is available at www.dh.gov.uk/publications