

# **Analysis of trans and saturated fatty acids in fats/oils and takeaway products from areas of deprivation in Scotland**



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## Executive summary

Trans fatty acids (TFA) are found in the food chain naturally in dairy products and meat from ruminant animals (e.g. beef, lamb etc.). They are also produced during the industrial process to harden fats which forms partially hydrogenated fats, a source of TFAs. These fats are sometimes used during the manufacturing of foods and for use in catering outlets. TFAs are linked to an increased risk of coronary heart disease.

It has been reported that those living in more deprived sectors of the population may have high intakes of TFA, as a result of consuming deep-fried foods and doner kebabs. This study aimed to address this claim by investigating the fatty acid profiles of around 200 samples comprising: fat/oils, deep fried takeaway food products (single items and full meals) and doner kebabs from the most deprived areas of Scotland.

The Scientific Advisory Committee on Nutrition (SACN) advises that no more than 2% daily food energy should be provided by TFAs<sup>a</sup> (TFA intake is calculated as percentage of daily food energy intake). This recommendation applies to total energy consumed per day and does not apply per meal or per food (for a healthy weight female with an average intake of 2000 kcal this would be equivalent to around 5g TFA per day). SACN also recommend that lipid composition of the diet is monitored because there is some indication that a reduction in TFA has resulted in an increase in saturated fatty acid consumption. A diet high in saturated fatty acids (SFA) can result in raised blood cholesterol levels which can increase the risk of developing heart disease. Currently data on food intakes in the UK<sup>b</sup> and in Scotland<sup>c</sup> indicate that average intakes of saturated fatty acids are too high.

### Key study findings:

- The levels of TFAs in the deep fried food samples analysed were low; single food items averaged 1.0g TFA per portion and full meals averaged 1.5g TFA per portion.
- The study showed a clear association between oil type and amount of saturated fats; foods fried in oils of animal origin provided significantly more SFAs.
- Levels of SFAs were high in many of the sample tested; SFAs averaged at 13.1g per single deep fried item and 16.9g SFA in a full meal.
- Doner kebabs contained higher levels of TFA (average 3.7g per portion); this may be partially due to the lamb meat which contains naturally occurring TFAs. It was not possible to distinguish between industrially produced and naturally occurring TFA from the analysis methodology used in this study.
- Levels of SFA in doner kebabs were very high (29.7g per portion on average) and 85% had high levels of saturates (>5g/100g).

In summary, levels of TFA in foodstuffs investigated in this study are within the expected ranges and not found to be particularly elevated in the fats/oils and foods sampled. Of far greater concern are the very high levels of SFAs in a large number of takeaway foods that were tested. The levels of SFAs were related to the type of frying oil and the amount of SFAs in deep fried takeaway foods could be significantly reduced by using liquid oil that is not hydrogenated.

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<sup>a</sup> [http://www.sacn.gov.uk/pdfs/sacn\\_trans\\_fatty\\_acids\\_report.pdf](http://www.sacn.gov.uk/pdfs/sacn_trans_fatty_acids_report.pdf)

<sup>b</sup> [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/documents/digitalasset/dh\\_128550.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_128550.pdf)

<sup>c</sup> [http://www.foodbase.org.uk//admintools/reportdocuments/749-1-1324\\_Final\\_Report\\_2001-2009.pdf](http://www.foodbase.org.uk//admintools/reportdocuments/749-1-1324_Final_Report_2001-2009.pdf)

## Background

Trans fatty acids (TFA) are unsaturated fatty acids found in the food chain. They have one or more double bonds found in the 'trans' orientation rather than the more common 'cis' orientation. TFA occur naturally at low levels in dairy products and meat from ruminant animals (e.g. beef, lamb etc.). They are also produced during industrial hydrogenation and deodorisation of vegetable oils to produce more solid fats that are sometimes used in manufacturing of foods (e.g. margarines, biscuits) and for use in catering outlets. The process of hydrogenation results in oils with a longer shelf life and increased stability; the TFA in these oils are referred to as industrially produced trans fatty acids (IPTFA).

IPTFAs may be added to products during processing or maybe absorbed from the oils they are cooked in. It is also possible that a small amount of IPTFAs may be produced as a result of frequent high temperature frying and therefore that levels of TFA in oils may increase as oils are repeatedly used. Using routine analytical methods, it is not possible to determine the difference between naturally occurring and industrially produced TFAs.

The main health concerns relating to IPTFA are an association between raised serum cholesterol levels and increased risk of coronary heart disease with increased intakes of IPTFA. Increased TFA intakes raise levels of low density lipoprotein ('bad' cholesterol) and lower the levels of high density lipoprotein ('good' cholesterol).

The current recommendation of the Scientific Advisory Committee on Nutrition (SACN) is that energy from TFA should not exceed 2% of energy intake.<sup>1</sup> Recent National Diet and Nutrition Survey (NDNS) data<sup>2</sup> (combined data from years 1-3 of the rolling programme) indicate that UK population intakes are well below this upper limit, with TFA providing 0.7-0.8% of food energy for all age and sex groups. The majority of this intake is from naturally occurring TFAs. The FSA Low Income Diet and Nutrition Survey (LIDNS), carried out in 2004, estimated that intakes were around 1.3 % energy<sup>3</sup> with the main contributor to TFA intake being fat spreads. Since 2004 the food industry has reformulated fat spreads to largely remove TFAs and therefore current intakes in this group are likely to be much lower than this value.

The Scottish Government has a population level dietary goal<sup>4</sup> for trans fats that recognises the current population intakes of around 0.7-0.8% food energy and therefore sets a lower threshold than SACN, of below 1% food energy. There is also a Scottish dietary goal for saturated fats to reduce intake to no more than 11% food energy.

The view that trans fatty acid intakes are a particular problem in the most vulnerable in society persists and has been embedded in position statements of both the National Institute of Clinical Excellence<sup>5</sup> (NICE) and the National Heart Forum (NHF)<sup>6</sup>, leading to both bodies calling for Government legislation to ban IPTFAs. These groups maintain that individuals from more deprived areas are more likely to consume hydrogenated fats and TFA than other sectors of the population. The view of NICE and NHF reflects a growing trend for out of home food purchasing, particularly from those living in deprived areas. Data from FSAS<sup>7</sup> indicates that around 15% of calories are consumed from food and drinks eaten outside the home.

Foods from takeaways often contain very high amounts of energy (calories), fat, saturated fatty acids (SFA) and salt.<sup>8,9</sup> Despite the paucity of published data available on the levels of TFAs in takeaway products from independent caterers, it has been argued that a persistence of TFA in cheaper, frequently consumed takeaway foods and snacks may mean that some individuals in deprived areas could have higher intakes of TFAs.

The data from which these conclusions were drawn had measured TFAs in a small number of takeaway products; the highest levels of TFA were found in a doner kebab (which should contain naturally occurring TFA from the lamb meat).<sup>10</sup> Previous studies have shown doner kebabs to contain a number of different meats, a number containing a mixture of lamb and other meat such as beef<sup>11</sup>. At present, there is inadequate evidence of the effects on health of IPTFA versus naturally occurring TFAs; however calls for a ban are centred on the elimination of IPTFAs. Given that high profile claims about intakes of TFAs in deprived populations and calls for legislation persist, more information is required on levels of TFAs from takeaway foods to add to the evidence base for FSAS and Scottish Government.

## **1. Aim of study**

This project was designed to address claims that those in the most deprived sectors of the population may have high intakes of TFA, due to the use of cheap oils (which may be high in IPTFA) and as a result of consuming deep-fried takeaway foods and doner kebabs.

The aim of this study was to provide data on the levels of fatty acid profiles of both fat/oils and in takeaway food products from deprived areas of Scotland.

## **2. Methodology**

### **2.1. Rationale**

There is a lack of data on the current levels of trans fatty acids in fats/oils and takeaway products from independent takeaways in Scotland. Many deep fried foods from takeaways will contain a mixture of naturally occurring TFA (from ruminant animal products) and IPTFA, but it is not possible to distinguish between using them the routine analytical methodologies in this study. The analysis methodology used measured total trans and fatty acid profile of the oil/fat used for frying and from deep fried takeaway products. Measurement of the fatty acid composition of the oils allows an assessment of how much TFA is from the oil and how much from the deep fried foodstuff. Both used and unused oil/fat were collected (where possible) to provide an estimation of the levels of TFA in oil/fat before and after frying; thus allowing an investigation as to whether there was an increase in TFAs in the used oils.

### **2.2. Sampling Area**

The sampling area for this survey was designed to incorporate the most deprived areas of Scotland, to investigate claims that those living in the most deprived areas may have high intakes of TFA because of greater exposure to TFA in the foods available to them.

Details of the most deprived 15% datazones<sup>d</sup> in the Scottish population are published on the Scottish Government website<sup>12</sup>. Of the 15% most deprived datazones, over 50% are within the Glasgow City area and for this reason Glasgow city was selected as the focus for the project. The most deprived datazones in Glasgow City as characterised using the Scottish Index of Multiple deprivation (SIMD) were identified; the population living within this area is approximately 56,000 people.

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<sup>d</sup> The data zone is the key small-area statistical geography in Scotland. SNS has introduced, for the first time, a common, stable and consistent, small-area geography called data zones. The data-zone geography covers the whole of Scotland and nests within local authority boundaries. Data zones are groups of 2001 Census output areas and have populations of between 500 and 1,000 household residents. Where possible, they have been made to respect physical boundaries and natural communities. They have a regular shape and, as far as possible, contain households with similar social characteristics.

Previous work on out of home food outlets including takeaways in Glasgow city<sup>13</sup> provided an estimate of 50 takeaways / fast food chains within the selected survey area, which should be sufficient to achieve 200 samples (assuming 5 samples per establishment). The Food Safety Unit of Glasgow City Council provided a list of all takeaway outlets and the full postcode listed for each outlet.

### **2.3. Sampling methodology**

The survey was managed by the Public Analyst laboratory in Glasgow. This included coordinating sample collection and reporting results to UK Food Surveillance System (UKFSS) and FSA in Scotland. The UKFSS is a national database for central storage of analytical results from feed and food samples taken by enforcement authorities (local authorities and port health authorities) as part of their official controls.

The sampling officers used in the study were members of the Glasgow public analyst staff, as it was not possible to use environmental health officers due to their other work commitments. In the selected postcode areas, sampling officers conducted the survey by sampling oil/fat and takeaway items from establishments listed within the deprived datazones. Any additional premises that had recently opened within the survey area were also included. The target number of samples for analysis was around 200; the samples were analysed for full fatty acid profiles including TFA, saturated fatty acids (SFA), polyunsaturated fatty acids and total fat. The Glasgow Public Analyst laboratory is UKAS accredited for fatty acid analysis, including TFA.

It has been reported that repeated use of oils or re-frying at high temperatures may result in the formation of TFAs. Therefore, samples of new (unused) oil/fat and the oil/fat currently in use were taken where possible. The sampling officers also aimed to collect information, on the details and suppliers of the type of oil/fat, and typical cooking practices (including frying temperatures frequency of oil changing).

Previous claims that high levels of TFA in takeaway foods were based on analysis of a doner kebab purchased in Tower Hamlets, London.<sup>10</sup> To further investigate the level of TFA in doner kebabs in this Scottish (Glasgow) sample area, the food samples that were analysed included a doner kebab sample from those takeaways that sold this product. In addition to this, the two most popular deep fried items were sampled. In takeaways that did not sell doner kebabs, the three most commonly purchased deep-fried items were sampled (this was ascertained from the individual establishments).

The sampling was designed so that the samples would consist of a mixture of new and used fats/oils and commonly consumed takeaway products.

The sampling was designed so that 5 samples were taken from each outlet consisting:

1. New oil
2. Used oil
3. Doner kebabs (where available)
4. Most popular deep fried item
5. Second most popular deep fried item
6. *Third most popular deep fried item (if doner kebab was not available)*

The takeaway premises were categorised as follows:

Fish and chip shop, Chinese/Oriental takeaway, Indian takeaway, Kebab shop, Pizza shop, Other (such combination 3 in 1 shops).

### 3. Results

#### 3.1. Samples collected

The aim of the study was to collect and analyse around 200 oil and food samples. Samples were collected between January and March 2012. The results below summarise the fatty acid profile data from the new/used oils (74), the most popularly purchased deep-fried food items (80), full meals (19) and doner kebabs (20).

#### 3.2. Oils

A total of 52 takeaway outlets were sampled for takeaway foods. Of these, 41 provided sampling officers with a sample of oil or fat. It was not possible to obtain oil samples in 11 establishments who either did not agree to have an oil sample taken, or were too busy at the time of sampling to provide an oil sample. Typically a visit by the sampling officers could take up to an hour to complete. The majority of the time was required to explain the details of the survey get agreement for sampling and to obtain the oil samples (it was difficult to obtain hot oils whilst in use).

- 35 pairs of new and used fat/oil were obtained (23 vegetable and 12 animal oils).
- 24 premises reported using vegetable oils
- 17 reported using oils of animal origin (e.g. beef dripping).

The average levels of TFA (and the ranges found) are detailed in Table 1.1. As expected, the oils from animal origin contain higher levels of TFA, due to naturally occurring TFA within the oils. Note that some of the levels of trans were very low (less than 0.5g/100g) and on the limits of the method of detection.

**Table 1.1 Trans fatty acid levels from oil samples**

Oil/fat	Mean Trans fatty acids (g/100g oil)	Range of values (g/100g oil)	No. samples analysed	Published value <sup>14</sup> (g/100g oil)
Beef dripping (new)	4.8 ± 0.3	2.8-5.9	13	4.42
Animal origin oil (used)	4.6 ± 0.3	2.3-5.9	15	n/a
Vegetable oil blended (new)	1.4 ± 0.1	0.5-2.2	23	Tr
Vegetable oil (used)	1.8 ± 0.2	0.5-4.3	23	n/a

Table 1.2 shows the results of the saturated fatty acid analysis from the oils that were sampled. The results show that the oils of vegetable origin had a much lower level of saturated fat when compared with oils from animal origin.

**Table 1.2 Saturated fatty acid levels from oil samples**

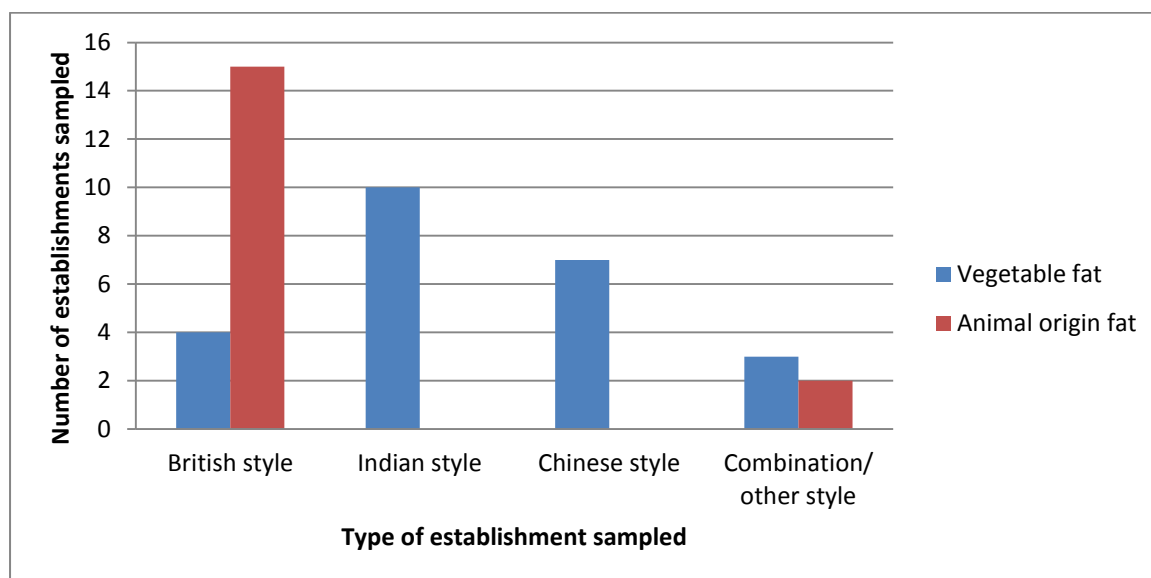
Oil/fat	Mean Saturated fatty acids (g/100g oil)	Range of values (g/100g oil)	No. samples analysed	Published value <sup>14</sup> (g/100g oil)
Beef dripping (new)	50.4	48.1-54.9	13	50.6
Animal origin oil (used)	52.5	45.4-57.5	15	n/a
Vegetable oil (new)	15.9	7.0-50.1	23	11.7
Vegetable oil (used)	19.5	8.2-52.8	23	n/a

### 3.3. The types of oils used by different types of takeaway establishment

A total of 52 outlets were sampled: 23 Fish and chips shops, 11 Indian style, 11 Chinese/Oriental style, and an additional 7 combination/other style establishments were sampled.

The types of oils used by establishments were investigated and are summarised in Figure 1. All of the Chinese and Indian style takeaways used vegetable oils when deep frying. The fish and chip shops most commonly used oil from animal origin (such as beef dripping) for frying (15 animal versus 4 vegetable).

**Figure 1: Description of types of oil and type of establishments sampled**



### 3.4. Comparison of trans fatty acids in new versus used oils

In order to investigate whether repeated use of oils results in generation of IPTFAs, new and used oils were compared. Thirty five pairs of oils were obtained from takeaways and compared; these comprised 12 pairs of oils from animal origin and 23 pairs of new and used vegetable oils.

There was strong evidence that the differences between the TFA (g/100g oil) between new and used oils, were not normally distributed and so non-parametric paired tests were used for the analysis.

For animal oils, non-parametric paired tests did not show any significant evidence that the TFA content (g/100g oil) of the unused oil differs on average from the TFA content of the used oil (Wilcoxon Signed Ranks Test – p-value: 0.074, Sign Test – p-value < 0.180).

For vegetable oils there was evidence that the two differ on average (Wilcoxon Signed Ranks Test – p-value: 0.004, Sign Test – p-value < 0.021). There is a small but significant increase in the amount of TFA in the used vegetable oils compared with the new oil samples.

### 3.5. Use of chips as a proxy for used oils

Due to the difficulties in collecting used oil samples (e.g difficulties at busy times to get access to the hot oil and the reluctance of some establishments to provide oil samples), we investigated whether it would be possible to use data from a fried item as a proxy for used oil. As chips were commonly sampled and contain no inherent TFA, these were selected for comparison with used oil.



An assessment was made of used oils and oil from chips that were cooked in the same oil. A total of 18 used oil samples had corresponding chip samples. There was strong evidence that the differences between the TFA (g/100g oil) in chips and the corresponding oil samples were not normally distributed and therefore non-parametric paired tests were used.

Non parametric paired tests did not show any significant evidence that the TFA content from chips (g/100g oil) differs on average from the TFA content of the used oil (Wilcoxon Signed Ranks Test – p-value: 0.168, Sign Test – p-value: 0.581).

In most cases there appears to be good correspondence between the TFA content (g/100g oil) of the sample of chips and the TFA content of the oil used. The mean value for used oil was 3.7 gTFA/100g and 3.8 gTFA/100g from oil within the chip samples. However in 4 out of the 18 cases there were large discrepancies (more than 20% of the TFA content of the oil). The 4 cases with the larger discrepancies appeared to have issues with the analysis and in two of the chip samples TFA levels were at the lower limits of detection. Other samples that were analysed had higher levels of TFA in the chips than in the oil, suggesting perhaps that more than one fryer was in use in the establishment.

### 3.6. Levels of Trans fatty acids in takeaway food samples

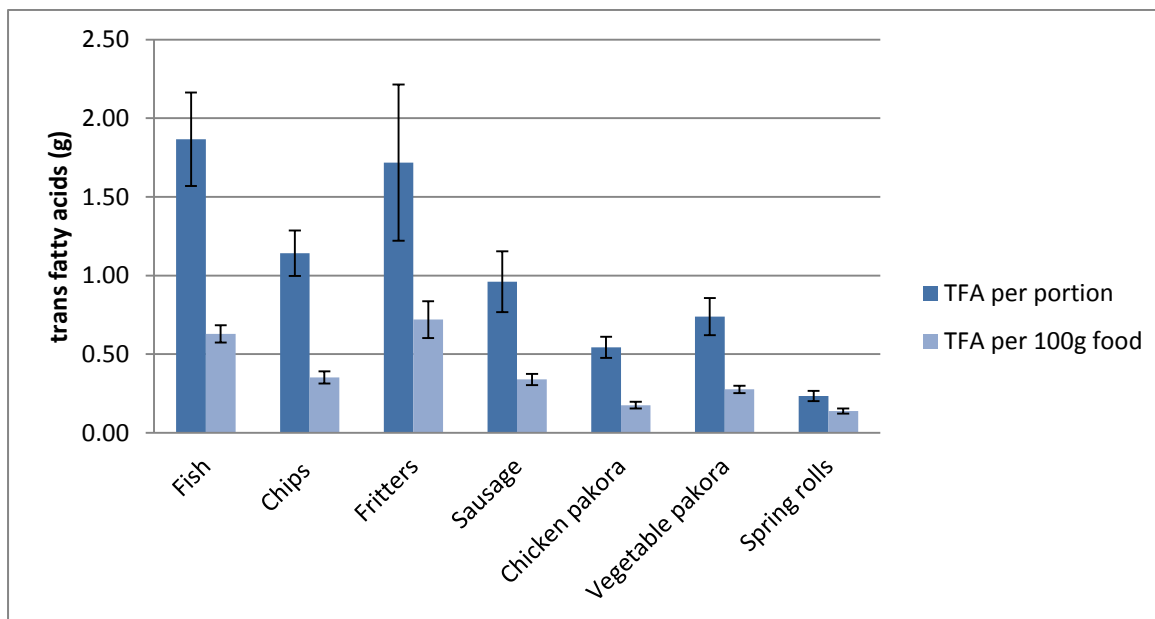
In addition to sampling oils/fats, officers were instructed to sample three of the most popular deep fried items from each outlet. The most popular deep fried products included a large number of different items; the items that were sampled most frequently are summarised in Table 2.

**Table 2: Levels of TFA in takeaway food items**

Foodstuff sampled	Mean Trans fatty acids (g/portion)	Range of values (g/portion)	Mean trans fatty acids (100g food)	Range of values (trans g/100g)	No. samples analysed
<b>Spring rolls</b>	0.23	0.2-0.4	0.14	0.1-0.2	6
<b>Chicken pakora</b>	0.54	0.14-0.9	0.18	0.1-0.3	11
<b>Vegetable pakora</b>	0.74	0.3-1.8	0.28	0.1-0.4	15
<b>Sausage</b>	0.96	0.3-2.5	0.33	0.2-0.5	12
<b>Chips</b>	1.14	0.12-2.6	0.35	0.04-0.6	20
<b>Fritters</b>	1.72	0.3-4	0.73	0.2-1.1	7
<b>Fish</b>	1.9	0.8-3.6	0.63	0.5-0.9	9

Figure 1 shows the TFA content of the most commonly purchased takeaway food items. The highest amounts of TFAs were found in foods that were most commonly fried in beef dripping (which is higher in naturally occurring TFAs than vegetable oils) such as fish and chips. The average TFA per single food item was 1.0g per portion. The greatest TFA in a single portion was from a portion of fish which contained 3.6g of TFA. The descriptive statistics used in Figure 1 are means  $\pm$  standard error.

**Figure 1 Trans fatty acid content in takeaway food items**

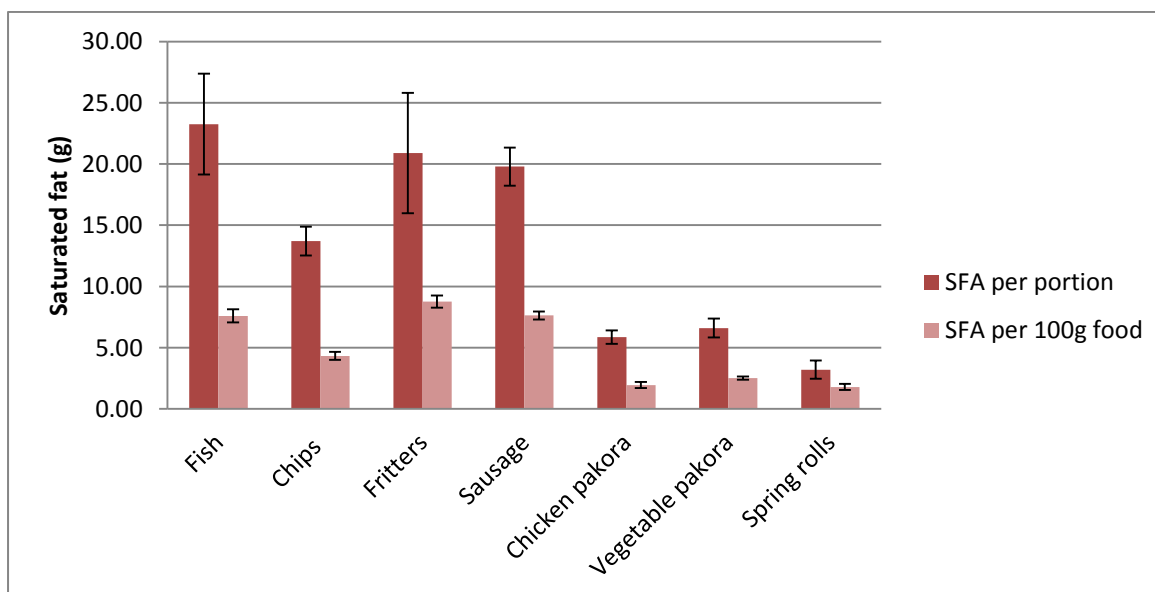


**3.7. Levels of saturated fatty acids in takeaway food samples**

Measurement of the fatty acid profile of the takeaway food samples also included analysis of the amount of SFA in the foods.

Figure 2 shows the amount of SFA per 100g and per portion in commonly purchased takeaway food items. The results show that an average portion of fish, fritters or sausage contains around 20g of saturated fat per portion. The descriptive statistics used in Figure 2 are  $\pm$  standard error. Overall, the average SFA content was 13.1g per single deep-fried item.

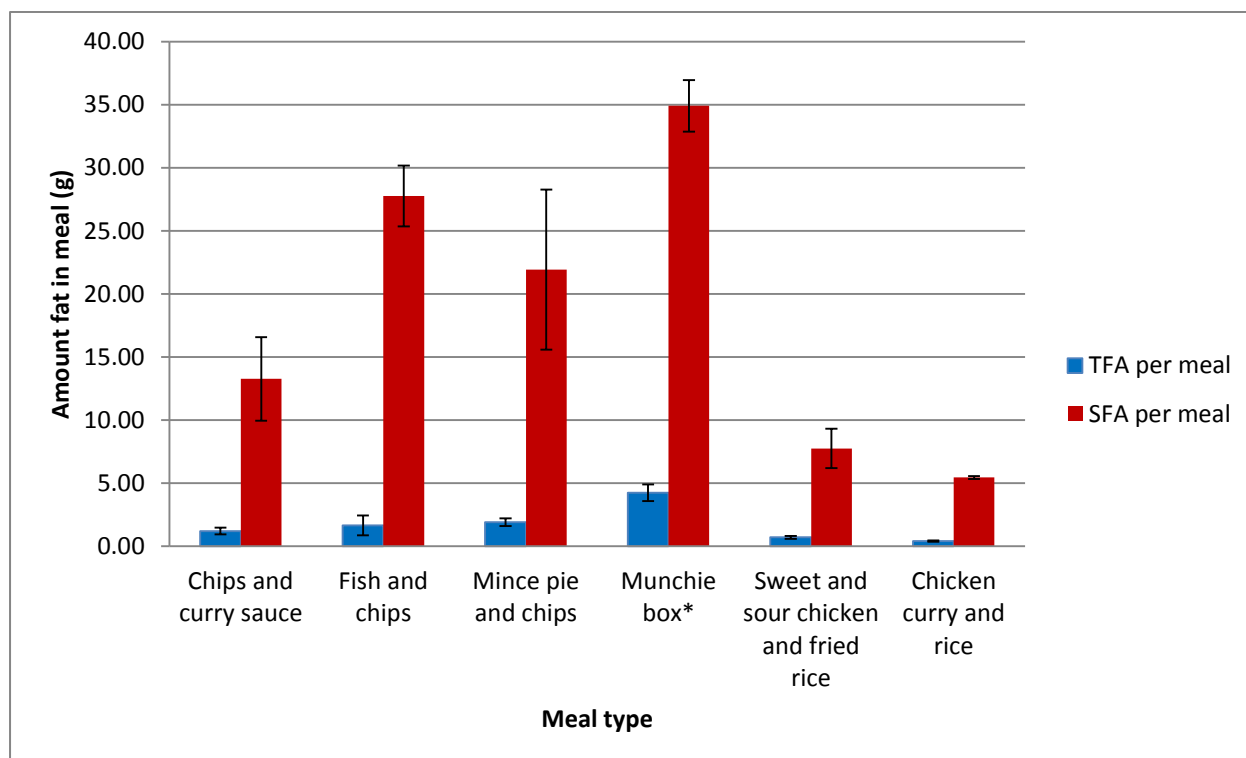
**Figure 2 Saturated fatty acid content in takeaway foods sampled**



#### 4.7.1 Levels of fatty acids in full takeaway meals

In addition to single items, the most popular deep-fried meals were sampled and the fatty acid profile was analysed. Figure 3 shows some examples of the amounts of TFA and SFA provided by these meals. Of the 19 meals summarised in Figure 3, one third had high levels of saturated fat (i.e. >5g/100g). The meals from Chinese/Oriental style takeaways had lower levels of both TFA and SFA, largely due to the use of vegetable oils, rather than animal oils in these establishments

**Figure 3 Trans and saturated fatty acid per portion of takeaway meals sampled**



\*munchie box refers to a variable assortment of different fast foods served in a large pizza box

#### 3.8. Levels of fatty acids in doner kebab meals

The concerns regarding high level of TFAs from takeaway products in deprived areas were largely based on a small study in Tower Hamlets (London)<sup>10</sup> and derived from the levels of TFAs from a doner kebab. This study was designed to sample doner kebabs (where sold) in order to provide a more robust estimate of the levels of TFAs they typically contain.

Doner kebabs should be predominantly made of lamb meat which contains natural TFAs (the published value of TFA for cooked minced lamb is 0.9 g TFA/100g<sup>14</sup>). The NDNS nutrient databank has a value for a full doner kebab (i.e. including pitta, salad etc.) of 0.94; which is similar to the average value of doner kebabs sampled in this survey (0.89g TFA/100g), see Table 3.

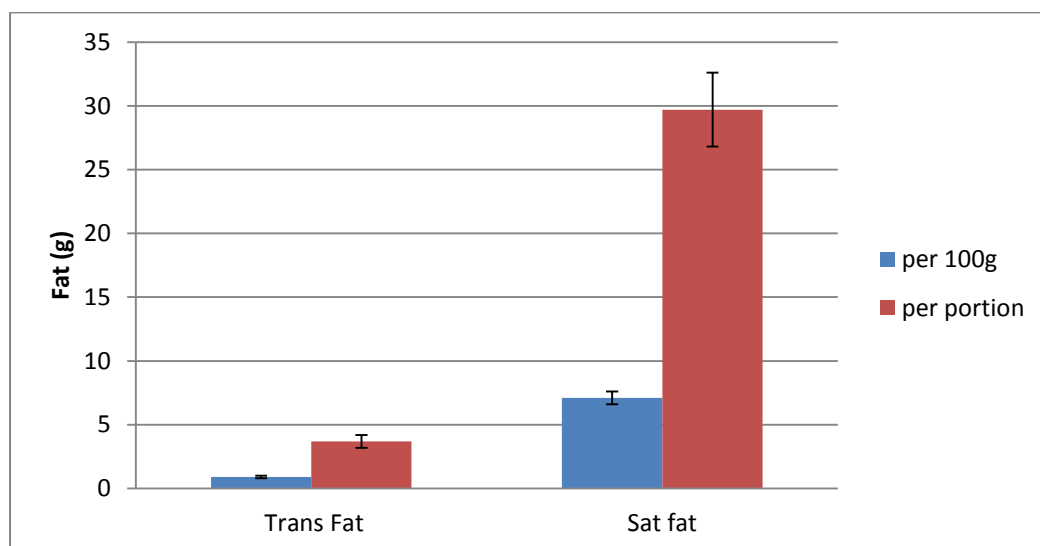
**Table 3**

	Mean fatty acids (g/100g food)	Trans acids	Median	Range values (g/100g food)	No. of samples analysed	Value from NDNS (g/100g food)	Mean kebab weight (g)
<b>Doner kebab</b>	0.89 ± 0.1		0.84	0.2-1.8	20	0.94	439.9±37

Twenty doner kebabs were sampled, this included the whole meal (i.e. pitta, salad, sauce etc) and a summary of the data is presented in Table 4. The values of TFA from kebabs sampled in the study fell within the range between 0.2 and 1.8 g/100g (Table 3).

Table 3 also shows the mean kebab weights which was around 440g but ranged from 192g up to 848g, showing the large variation in sizes of kebabs that were purchased.

In addition to the analysis of trans fatty acids, the samples were also analysed for saturated fatty acids, the results of this analysis are shown in Figure 4. The results show that the level of saturated fatty acids in the doner kebab samples averaged 29.7g/portion and ranged from 14.6-71.4g of saturated fatty acids per portion depending on the size of the doner. The average level of saturated fatty acids within the doner kebabs was very high (7.1g/100g); 85% of the kebabs that were sampled contained high levels of SFA (>5g/100g).

**Figure 4: Average levels of fatty acids from doner kebabs**

## **4. Discussion and conclusions**

This study represents an investigation into the levels of fatty acids from fat/oils and takeaway foods from deprived areas of Scotland. The results indicated that traditional fish and chip shop style takeaways are more likely to use fats/oils from animal origin such as beef dripping, which typically contain more SFA and TFA than those from vegetable origin. In this study, Chinese/Oriental and Indian takeaways more commonly used vegetable oils.

### **Repeated use of oils and levels of TFAs**

It had been suggested that repeated use of oils could result in an increased level of TFA. This study looked at levels of TFAs in new and used oils. Although no significant differences were observed when comparing new and used oils from animal origin, there was a small but significant increase in the used vegetable oil samples. This may have implications for the prolonged use of such oils, however it should be noted that the vegetable oils sampled contained low levels of TFA (<2%) which included both the new and used samples (see Table 1.2 and Section 3.4). It could be possible that repeated frying of vegetable oils could result in increased levels of TFA; however this study was not designed to investigate this.

### **Using chips as a proxy for used oil**

During the sampling phase of the study, officers found difficulty in obtaining oils, particularly hot oils that were currently in use in busy takeaways. The possibility of using the TFA content of chips (which contain no inherent TFA) instead of used oil was investigated. The TFA in the chips and used oils correlated well, therefore in future studies of this type it would be possible to sample a deep fried vegetable item such as chips to provide an indication of the levels of trans fatty acids in used oil samples. This could potentially make the sampling more straightforward.

### **Levels of TFAs in oil/fat samples**

During the oil/fat sampling, officers identified that many of the establishments had little knowledge of the type of oil that was being used and for example whether the oils were hydrogenated. Following fatty acid analysis of the samples, a number of the establishments had to be re-contacted to provide more information on the type of oil used. In three samples, the analysis of the oil showed high values for polyunsaturated from samples that had been labelled as beef dripping; these establishments were re-contacted and the oils were subsequently re-classified as vegetable oil.

There were also issues regarding the classification of the vegetable oil samples and a number of the establishments were re-contacted to obtain more information regarding the oils used. As a result, two samples were re-classified as animal origin and another was excluded from the analysis as there was more than one type of oil being used in the same premises.

Overall however, the average values of TFA in oils/fats compare well with published values for amounts of trans fats in oils with the exception that that levels of TFA in vegetable oils were slightly higher than published values.

### **Levels of trans fatty acids in takeaway food items**

The Scientific Advisory Committee on Nutrition (SACN) advises that no more than 2% daily food energy should be provided by TFAs<sup>1</sup> (TFA intake is calculated as percentage of daily food energy intake). This recommendation applies to total energy consumed per day and does not apply per meal or per food. As percentage energy from TFAs is calculated from energy consumed in a day, it is possible that individual foods or meals could contain more than 2% energy from TFA, but as most

foods contain no TFA, it is unlikely that average intake over the day could exceed 2% energy from TFA (this is equivalent of around 5g TFA per day for an average calorie intake of around 2000 kcal).

The amount of TFA derived from individual deep fried takeaway products analysed in this study were low; average values of TFA in individual takeaway foods were 1.0g TFA/per portion and full meals averaged 1.5gTFA/portion. It should be noted that there should be little naturally occurring TFAs from the most commonly sampled items (with the exception of sausage and spring rolls which may contain small amounts depending on the type). This highlights that the type of oil the foods are fried in and the portion size of the takeaway food had the largest effect on the amount of trans fatty acids consumed.

### **Saturated fatty acids in takeaway foods**

A diet high in saturated fatty acids can result in raised blood cholesterol levels which can increase the risk of developing heart disease. Currently data on food intakes in the UK<sup>15</sup> and in Scotland<sup>16</sup> indicate that average intakes of saturated fatty acids are too high. Recommended intakes are for SFA intakes to be less than 11% food energy and intakes in Scotland are around 15% FE<sup>16</sup>.

Current recommendations are for an average woman not to exceed around 20g of saturated fat a day (30g for men). The data from this survey provide an indication as to how much SFA can come from the takeaway food items. Foods fried in oils of animal origin provided considerably more SFA (fritters 8.7gSFA/100g versus pakora 2.5gSFA/100g), therefore one way to reduce the levels of SFA from takeaway foods would be deep fry in a fat with lower levels of saturates. The amount of SFA in the takeaway foods sampled was extremely high in many of the samples. The results show that a number of the meals sampled contained over 20g of saturated fat (fish and chips, mince pie and chips and munchie box<sup>e</sup>), which is above the daily recommended maximum for women.

### **Doner Kebabs**

Lamb meat has relatively high levels of naturally occurring TFAs (0.89g/100g in cooked minced lamb<sup>14</sup>) with lamb fat containing around 5gTFA/100g, whereas beef fat contains 2gTFA/100g. Therefore, as expected doner kebabs we found to contain more TFA per portion (3.7g/portion) than the deep-fried items sampled. The TFA in the doner kebabs should be predominantly naturally occurring from the lamb meat, however in this study it was not possible to distinguish between naturally occurring and industrially produced TFAs.

Analysis of doner kebabs showed that average levels of SFAs were extremely high. Average values were around the maximum recommended daily intake for men (29.7g) and 85% of doner kebabs contained SFA above levels above 5g/100g. It is also worth noting that the level of fats in the doner kebabs was influenced by portion size; the average size was 440g.

### **Conclusions**

Overall, levels of TFA in foodstuffs investigated in this study were around expected/published levels. The results therefore do not indicate that the levels of TFA in takeaway meals including doner kebabs to be at a level that would be of concern for the population. The results do however indicate very high levels of SFA in a number of samples that were tested. It should be noted that a limitation of the study is that due to the routine analytical methods used, it was not possible to distinguish between naturally occurring and industrially produced TFAs

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<sup>e</sup> A variable assortment of different fast foods served in a large pizza box

## 5. Implications

In terms of the health of the Scottish population, the results of the survey indicate that saturated fat intake from takeaways could pose a greater risk to health than TFAs. The survey shows that the oils used in takeaway establishments can have a large impact on the amount of TFA and SFA within foodstuffs that are deep fried. In order to reduce intakes of saturated fat, switching to liquid oils that are lower in saturated fats (such as vegetable), cooking at the correct temperatures and practices such as changing oils frequently could significantly reduce the saturated fat content of takeaway meals.

The survey also indicates that in order to reduce saturates from items that are not deep fried, particular attention should be given to portion size. A number of the doner kebab portions in the current study were very large (>500g) in size. A reduction in overall portion size could significantly reduce fat intakes particularly from doner kebabs which have high inherent SFA and TFA levels.

## 6. References

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- <sup>1</sup> Update on trans fatty acids and health: Position statement by the Scientific Advisory Committee on Nutrition (2007) [http://www.sacn.gov.uk/pdfs/sacn\\_trans\\_fatty\\_acids\\_report.pdf](http://www.sacn.gov.uk/pdfs/sacn_trans_fatty_acids_report.pdf)
  - <sup>2</sup> Bates et al, National Diet and Nutrition Survey Headline results from years 1, 2 and 3 (combined) of the Rolling Programme (2008/2009 – 2010/11) <http://transparency.dh.gov.uk/2012/07/25/ndns-3-years-report/>
  - <sup>3</sup> Nelson et al (2007), Low Income Diet and Nutrition Survey [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH\\_128166LIDNS](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_128166LIDNS)
  - <sup>4</sup> <http://www.scotland.gov.uk/Resource/0042/00421385.pdf>
  - <sup>5</sup> NICE CVD guidance expert testimony paper 9 – CVD EP9: Expert testimony on the public health harm caused by industrially produced Trans Fatty Acids and actions to reduce and eliminate them from the food system in the UK. <http://www.nice.org.uk/nicemedia/pdf/CVDEP9TransFats.pdf>
  - <sup>6</sup> NHF position paper on the elimination of IPTFAs from foods consumed within the UK, June 2010 [http://nhfshare.heartforum.org.uk/RMAssets/NHFpositionstatements/NHF\\_position\\_paper\\_on\\_IPTFAs\\_June\\_2010.pdf](http://nhfshare.heartforum.org.uk/RMAssets/NHFpositionstatements/NHF_position_paper_on_IPTFAs_June_2010.pdf)
  - <sup>7</sup> [http://www.foodbase.org.uk//admintools/reportdocuments/749-1-1277\\_S14035\\_Energy\\_Density\\_Final\\_Report.pdf](http://www.foodbase.org.uk//admintools/reportdocuments/749-1-1277_S14035_Energy_Density_Final_Report.pdf)
  - <sup>8</sup> The composition and labelling of doner kebabs: A LACORS co-ordinated food standards survey. Number 9. January 2009. <http://lacors.conseq.net/lacorsdev/tio/269018>
  - <sup>9</sup> Jaworowska A et al (2012) Determination of salt content in hot takeaway meals in the UK; *Appetite* 59 (517-522)
  - <sup>10</sup> Lloyd et al (2010) Fish and chips with a side order of Trans fat: The nutrition implications of eating from fast-food outlets: a report on eating out in east London [http://www.city.ac.uk/\\_data/assets/pdf\\_file/0008/86858/Report-on-eating-out-in-east-London.pdf](http://www.city.ac.uk/_data/assets/pdf_file/0008/86858/Report-on-eating-out-in-east-London.pdf)
  - <sup>11</sup> The composition and labelling of doner kebabs: A LACORS coordinated food standards survey Number 9 <http://www.lacors.gov.uk/lacors/NewsArticleDetails.aspx?id=21002>
  - <sup>12</sup> <http://www.scotland.gov.uk/Topics/Statistics/SIMD/PostcodeLookup15MostDepr>
  - <sup>13</sup> Macintyre S, McKay L, Cummins S, Burns C. Out-of-home food outlets and area deprivation: Case study in Glasgow, UK. *International Journal of Behavioural Nutrition and Physical Activity* 2005; 2.16.
  - <sup>14</sup> Fatty Acids, Seventh supplement to McCance and Widdowson's *The composition of foods*, MAFF 1998
  - <sup>15</sup> Bates et al, National Diet and Nutrition Survey Headline results from Years 1 and 2 (combined) of the Rolling Programme (2008/2009 – 2009/10) [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/documents/digitalasset/dh\\_128550.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_128550.pdf)

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<sup>16</sup> Barton KL Wrieden WL et al. 2012 Estimation of Food and Nutrient Intakes from Food Survey data in Scotland 2001-2009 [http://www.foodbase.org.uk//admintools/reportdocuments/749-1-1324\\_Final\\_Report\\_2001-2009.pdf](http://www.foodbase.org.uk//admintools/reportdocuments/749-1-1324_Final_Report_2001-2009.pdf)