



## Comparison between analyzed and calculated nutrient content of fast foods using two consecutive versions of the Danish food composition databank: FOODCOMP and FRIDA

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1           **Comparisons between analyzed and calculated nutrient content of fast foods using two**  
2           **consecutive versions of the Danish food composition databank FOODCOMP and FRIDA<sup>1</sup>.**

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11 **Abstract**

12 The objective of this study was to compare the content of selected nutrients of fast foods found by  
13 chemical analysis versus estimated by recipe calculation based on data from two versions of the  
14 Danish food composition databank, FOODCOMP and the latest FRIDA. 155 samples of ready to  
15 eat fast foods were collected from fast food outlets, separated into their components and weighed.  
16 Typical components were bread, French fries, vegetables, meat, and dressings. The fast foods were  
17 analyzed and the content of energy, protein, saturated fat, iron, thiamin, potassium and sodium were  
18 compared to recipe calculation. When using the FOODCOMP in recipe calculation the error  
19 percentage was largest for saturated fat (28%). When using FRIDA the error percentage for  
20 saturated fat decreased to 11% and was below 15% for all nutrients. The correlations ranged from  
21 0.49 to 0.89 with both databanks. For the individual fast foods there were both acceptable (<15%)  
22 and large differences (>50%). Future challenges for the databank in relation to recipe calculation,  
23 could be to include more varieties and a better coverage of foods used as ingredients and inclusion  
24 of analytical values of mixed dishes if they are commonly eaten from outlets as fast foods.

25

26 **Key words:** mixed dishes, nutritional composition, recipe calculation, chemically analysis,  
27 chemical composition, dietary assessment, food composition, food analysis.

28

29 **1. Introduction:**

30 Food composition data are used as a cost effective alternative to chemical analysis for among others  
31 the assessment of diet and nutritional status at a population level (e.g. National dietary surveys and  
32 epidemiological studies); development of therapeutic diets (e.g. managing diabetes and nutritional  
33 deficiencies) and of institutional diets (e.g. schools, hospitals, nursing homes); nutrition labelling of  
34 processed foods and recipe calculation of mixed dishes (Church, 2015; Gibson, 2005; Schakel et al.,  
35 1997). Denmark has a long tradition for producing food composition data, the first data was  
36 published as early as 1888. The latest version FRIDA was released in 2015. Since 1981 the  
37 compilation of data has been governmentally funded (Møller and Hels, 2008).

38 A part of dietary intake includes mixed dishes or foods containing foods from two or more food  
39 groups commonly used as entrees such as sandwiches, burgers, pizza, pasta or rice mixed dishes,  
40 stir-fries, soups, and meat or poultry mixed dishes. Unpublished results from the Danish national  
41 survey of diet and physical activity 2011-2013 (DANSDA 2011-13) shows that in Denmark mixed  
42 dishes on average account for 15% of energy intake and of this 44% comes from fast food. In  
43 comparison mixed dishes accounts for 29% of all energy consumed in the US (Dietary Guidelines  
44 Advisory Committee, 2015). The diversity of mixed dishes is extensive and includes foods prepared  
45 at home, in restaurant or by the food industry. Furthermore, the abundance of mixed dishes are  
46 variable, poorly defined, differ from person to person, and within persons on a day-to-day basis.  
47 Therefore limited chemical analysis have been conducted on mixed dishes, and their nutritional  
48 compositions are frequently calculated based on recipes and the nutritional composition of each  
49 ingredient, taking into account losses (or gains) of water, fat, minerals and vitamins which occur  
50 during cooking. Knowing the exact ingredient amount and compositional data is therefore important  
51 for the correct estimations of nutrient intakes through dietary assessment and for assessing the  
52 adequacy of diets.

## Analyzed vs. calculated nutrient content

53 However, the food supply is ever changing and the task of providing timely and accurate food  
54 composition data is made complex by constant change in food regulations and policy, food choices,  
55 public health initiatives, food production, development and processing methods that introduce  
56 compositional variability.

57 Food composition data normally presents the average composition of a class of foods. Therefore,  
58 perfect agreement between calculated and analyzed composition for a food item or for a mixed dish  
59 should not be expected, even not for up to date data.

60 Few have investigated the size of bias introduced when calculating the nutrient content of a mixed  
61 dish from a recipe compared to conducting chemical analysis. Usually studies only include energy  
62 and macronutrients (Vasilopoulou et al., 2003) or are of older date (Matthews R.H., 1988) or have  
63 been carried out on carefully designed and produced experimental diets (Heinonen et al., 1997;  
64 McCullough et al., 1999; Siebelink et al., 2015). To the authors knowledge none have investigated  
65 the bias from a representative sample of mixed dishes exactly as costumers buy and eat them. The  
66 error introduced when conducting recipe calculation can have impact on nutrient intake evaluation  
67 and the prevalence of inadequate or high intakes. This emphasizes the need to determine the  
68 possible extent of such bias, and if the biases can be diminished by using a more timely version of a  
69 food composition databank (FCDB).

70 Fast foods as burgers, sandwiches, falafels, kebabs and hot dogs are universal. The intake of fast  
71 foods contributes with a considerable amount of energy. On average 7% of energy intake comes  
72 from fast foods as burgers, sandwiches and tacos among 4-75 year olds in Denmark (unpublished  
73 results DANSDA 2011-13), in the US it is 14% (Dietary Guidelines Advisory Committee, 2015).  
74 From 1995 through 2005-08, the caloric intake from fast foods almost doubled in Danish children  
75 aged 4-18 years (6% to 11%) (Unpublished results DANSDA 2005-08). Among US children aged

76 2–18 years caloric intake from fast food increased from 10% to 13% between 1994 to 2006 (Poti  
77 and Popkin, 2011). Fast foods are also mixed dishes, excluding side dishes but including more  
78 than one food group as a bun, meat (i.e. beef, chicken or fish), condiments (i.e. ketchup, mustard,  
79 mayonnaise) which could include vegetables (i.e. lettuce, tomato, onions) and it would normally  
80 require a recipe to calculate their nutritional composition. This makes them a relevant food group to  
81 investigate.

82 The aim of the present study was to compare the content of selected nutrients determined by  
83 chemical analysis of representative samples of fast foods to the content estimated by recipe  
84 calculation based on data from two consecutive versions of the Danish FCDB; the FOODCOMP  
85 and the newly updated FRIDA.

86

## 87 **2. Materials and methods**

88

### 89 *2.1. Study design*

90 The present study was based on 155 samples of fast foods representative for the consumption of the  
91 Danes. One unit of each sample was separated into its components, which were described and  
92 weighed. Another unit was photographed as served as well as ‘opened’ to show the individual  
93 components. Several units of each sample were homogenized and analyzed for selected nutrients.  
94 The nutrients were selected either because they were critical or indicators of intake.  
95 The recipe calculations used the weights of the individual components from the fast food samples,  
96 and the nutrient composition was calculated using similar components/ingredients from

Analyzed vs. calculated nutrient content

97 FOODCOMP and FRIDA. The calculated recipe contents for both versions of the database were  
98 then compared to the analyzed content of nutrients.

99

## 100 *2.2. Food composition data banks*

101 Denmark has had an official FCDB since 1983. The data in the FCDB is continuously being  
102 updated, but a release of data is only done occasionally. The data has been available on the internet  
103 since 2002, originally at <http://www.foodcomp.dk>, and now after a major reconstruction in 2015 at  
104 <http://frida.fooddata.dk>. The work with the FCDB strives for getting compositional information on  
105 foods marketed in Denmark, and the tables comprise data from local analytical projects  
106 supplemented with relevant external data in order to display as much information as relevant on  
107 each food entry. The local analytical projects are joint efforts between the Danish Veterinary and  
108 Food Administration (DVFA) and the National Food Institute at the Technical University of  
109 Denmark (NFI). NFI plans the projects, and within each project supervises the sampling and the  
110 analytical part of the project including quality control and the final reporting, while the laboratories  
111 at DVFA generally do the actual sampling and analytical work. The number of nutrients analyzed  
112 varies by project, but typically involves proximate constituents, including fatty acids, plus vitamins  
113 and minerals. Data from the analyses only appears in the published database after a thorough  
114 process of compilation and data curation. Likewise, external data may come from several sources,  
115 but are included in the database only through procedures ensuring the quality of the data. The  
116 internal procedures for handling and presenting data are updated with the newest version, and with  
117 the enhanced focus on data consistency the dataset will appear more logical and complete for the  
118 end user.

119 In the updated FRIDA, compositional data for mixed dishes or fast foods were included for the first  
120 time. Furthermore, data for iodine and salt in bread, fish and fish products, minced meat, cuts of  
121 pork among others were updated since the last version (FOODCOMP 7.01, released 2009). In  
122 addition, newly analyzed data on total fat content for several foods were added and fatty acid  
123 composition adjusted accordingly if not analyzed.

124

### 125 *2.3. Fast food and sampling*

126 The present study defined fast food as ‘ready to eat food’ or ‘street food, no fork or knife needed’.  
127 It was based on 155 samples collected from fast food outlets throughout Denmark, at big and  
128 smaller cities and at countryside based on a market analysis. Groups of fast foods included burgers,  
129 sandwiches, toasts, pork roast and meatball sandwiches, pita, durum wraps, hot dogs and kebab  
130 mixes. Examples of the fast food types are illustrated in Table 1. Typical components were bread,  
131 French fries, vegetables (lettuce, tomato and cucumber), meat, and dressings.

132 Samples were bought at the outlets aiming at getting the samples prepared in the usual way and  
133 thereby getting usual amounts of e.g. salt and dressings. About five units were collected of each fast  
134 food sample and brought to the analyzing laboratory. One unit was intended for separation into  
135 individual components at the laboratory, and if estimating that a later separation of the sample  
136 would be impossible, these components were collected separately in plastic cups (e.g. dressing for a  
137 sandwich, cheese for burgers that would otherwise melt down into the meat).

138

### 139 *2.4. Selected nutrients and analyses*



## Analyzed vs. calculated nutrient content

140 The fast food samples were analyzed for contents of proximate constituents, fatty acids, selected  
141 vitamins and minerals. The contents of energy, protein, saturated fat, vitamin B1, sodium, and  
142 potassium found by chemical analysis and by recipe calculation were then compared.

143 The nutrients were selected either because they were critical nutrients or indicators of intake. Fast  
144 foods contribute with significant amounts of energy, saturated fat and salt to the diet, nutrients that  
145 should all be limited in the general diet. Iron is a critical mineral for 53% of Danish women who  
146 have an intake below Average Requirement (AR) (Hindborg, 2015), and vitamin B1 was chosen to  
147 include a vitamin where bread, cereals and meat are the main source, since fast foods often include  
148 these foods. Protein and potassium were chosen because they are indicators of meat and fruit and  
149 vegetable intake, respectively.

150 When arriving at the laboratory one of the five collected units of each sample was separated by  
151 trained laboratory technicians into individual components to describe and collect the weight of each  
152 component. Another unit was photographed as served as well as 'opened' to show the individual  
153 components. Preparing for chemical analysis of selected nutrients approximately 3 units, or at least  
154 400 g, were weighed individually before aliquots were homogenized and stored in plastic bags at  
155  $\pm 20$  °C until analysis. In short, the nutrient analyses were performed by the following principles:  
156 Energy (kJ) was calculated from contents of protein, fat, and total carbohydrate using the factors 17,  
157 37 and 17, respectively (Nordic Council of Ministers, 2014) to allow for conversion to kilojoules.  
158 Protein was determined as nitrogen by the Kjeldahl procedure and protein calculated with factor  
159 6.25 (Nordic Committee on Food Analysis, 2003). Fat and fatty acids were determined by boiling  
160 the sample with hydrochloric acid, filtering, drying, and extracting the lipids with diethylether and  
161 petroleum ether (Bysted et al, 2009). For fat determination, an aliquot was evaporated to dryness  
162 and the remaining fat was weighed after drying to constant weight. Fatty acid methyl esters  
163 (FAME) were prepared from another aliquot and following extraction with n-heptane the methyl

164 esters of the fatty acids were determined by capillary GLC (Bysted et al, 2009). Carbohydrate  
165 content was calculated from amounts of dry matter, protein, fat and ash (Nordic councils of  
166 Ministers, 2014). Content of dry matter was determined by drying an aliquot under vacuum at 70 °C  
167 to constant weight (Nordic Committee on Food Analysis, 2002). Ash content was found by  
168 gravimetric determination after sample degradation at 525 °C (Nordic Committee on Food  
169 Analysis, 2005). Acid hydrolysis and enzymatic degradation followed by reverse phase HPLC and  
170 fluorometric detection after post column reaction (Jakobsen, J. 2008). Iron, potassium, and sodium  
171 were determined by ICP-OES after digestion of the sample by nitric acid in a microwave oven, like  
172 indicated by the European Committee for Standardization (CEN, 2014 and CEN, 2016).  
173 All nutrient parameters were analyzed accredited, according to the ISO standards. Contents were  
174 found by single determinations and continuous monitoring the quality of the analyses, by including  
175 reference materials, duplicate determinations, recoveries etc. in the analytical series. The quality  
176 assurance showed that the quality of the analyses was satisfactory.

177

### 178 *2.5. Recipe calculations*

179 The recipe calculations used the weights of the individual components obtained from the fast food  
180 samples and the photographs were used to help estimating dressing portions if not collected  
181 separately and where it had been difficult to weigh the dressing because of mixing with other  
182 components. The recipes were calculated using data for similar “ready to eat” food components in  
183 either the FOODCOMP or FRIDA. The General Intake Estimation System Version 1.000 i5 - 2014-  
184 09-10 developed at the Danish National Food Institute were used to perform the calculations, all in  
185 agreement with the harmonization of recipe calculation suggested by EuroFIR (Reinivuo et al.,  
186 2009).

187

188 *2.6. Statistics*

189 Paired sample T-test, Wilcoxon signed rank test, Pearson's and Spearman's correlations were used  
190 to compare nutrient values between recipe calculations using the two versions of FCDB's and  
191 chemical analysis.

192 Furthermore, the bias of recipe calculation was estimated in relation to chemical analysis as the  
193 difference between calculated nutrient content and chemical analysis, and as an error percentage:  
194  $(\text{Calculated content} - \text{Chemical analysis}) / \text{Chemical analysis} \times 100$ .

195 The statistical analysis was carried out with the SPSS statistical package (SPSS, version 23, 2015).

196

197 **3. Results**

198 Table 2 illustrates that for fast foods overall differences were found between the chemical analysis  
199 and the recipe calculations when using FOODCOMP for energy, protein, saturated fat and iron,  
200 but not for vitamin-B1, potassium and sodium ( $P > 0.05$ ). The error percentage was largest for  
201 saturated fat (28%) and smallest for sodium (-1%), potassium (1%) and energy (-4%). Correlations  
202 ranged from 0.49 for iron to 0.89 for potassium. When using FRIDA there were differences for  
203 energy, protein and saturated fat ( $P < 0.05$ ), but not for vitamin B1, potassium, iron or sodium  
204 ( $P > 0.05$ ). The error percentage for saturated fat decreased to 11%. The error percentages were still  
205 smallest for sodium (-3%) and potassium (-1%) and for vitamin B1 (2%) which all were smaller  
206 than energy (-6%). The correlations ranged from 0.50 to 0.87, and were at the same levels with both  
207 composition databanks.

208 Looking at the different types of fast food (Table 2) especially sandwiches/ toasts and pitas/durum  
209 wraps had large error percentages for saturated fat (48%-63%) using both versions of the FCDB.  
210 The mean difference in saturated fat between the recipe calculation and analysis, however, became  
211 smaller for all types using the FRIDA, except for pork roast/meatball sandwiches (5% to -12%) and  
212 hot dogs (both values -3%). With a few exceptions the error percentages and correlations for other  
213 nutrients were at the same level using both databases.

214 Hamburger/meatball sandwiches, hot dogs and sausage/kebab mix also had high error percentages  
215 for iron ranging from -25% (sausage/kebab mix) to 49% (hot dogs), and protein was underestimated  
216 in pitas/durum wraps and sausage/kebab mix with up to 30% using both versions of the FCDB.

217 In general, energy, protein and sodium were underestimated in recipe calculations with both  
218 versions of the FCDB, with the exception of energy and sodium in sausage/kebab.

219 For the different fast food types, significant differences were found for 1-4 out of the 7 nutrients.

220 For burgers there was only one significant difference in iron ( $P=0.29$ ) content when using the  
221 FOODCOMP. There were significant correlations for 4-6 nutrients out of 7 for all fast food types  
222 using both FCDB's, except for hot dogs and sausage/kebab mix that only had 1-2 significant  
223 correlations, and the mix had negative correlations for iron.

224

#### 225 **4. Discussion**

226 For fast foods overall we found acceptable differences for 7 nutrients between calculated and  
227 analyzed nutrient values. Average differences between calculated and analyzed values did not  
228 exceed 13% when using the newest FCDB FRIDA.

## Analyzed vs. calculated nutrient content

229 For fast foods overall using FRIDA compared to the former version, reduced the error percentages  
230 for saturated fat from 28% to 11% and the iron content was no longer significantly different  
231 compared to the analyzed reference. FRIDA reduced the error percentage for saturated fat for all  
232 types of fast foods except for the hamburger/meatball sandwich type and for hot dogs where the  
233 content was equal for both versions. An older Finnish study also showed improvement in calculated  
234 fatty acid values when using an updated FCDB (Heinonen et al., 1997).

235 Food policies might also influence contents of nutrients in foods, e.g. the regulation of trans fatty  
236 acids in 2004 in Denmark, stating that contents of industrially produced trans fatty acids in foods  
237 must not exceed 2 g per 100 g of oil or fat. This had implications for the content and composition of  
238 fat/fatty acids for many foods. Consequently, the values for fatty acids were recalculated in the  
239 FRIDA and this improved the accuracy of the calculated values.

240 For the individual fast foods the picture was more mixed, and even though there were acceptable  
241 differences between nutrient content (less than 15%) (Siebelink et al., 2015) also much larger  
242 differences of up to 60% for saturated fat (pitas/durum wraps) were found even when using FRIDA,  
243 the newest release of the FCDB. For these products, however, it was especially difficult to always  
244 weigh dressings and spreads when these were absorbed into the other components, in particular  
245 bread, and these had to be estimated from the photographs of the separated products.

246 In comparison to the present study other studies have looked at chemical analysis and calculated  
247 energy and macronutrient contents of diets or recipes. In a Dutch study from 2015 (Siebelink et al.,  
248 2015) calculated and analyzed energy and macronutrient content of 25 duplicated intervention diets  
249 were performed over a period of 10 years. The calculations used different releases of the Dutch  
250 FCDB. Similar differences were found for energy (6% vs. -6%) and saturated fat (10% vs 11%), but  
251 lower differences for protein (0.4% vs. -13%) compared to the present study (latest version FCDB).

252 In the present study there were somewhat higher correlations for energy (0.83 vs. 0.57), but lower  
253 correlations for saturated fat (0.70 vs 0.92) and protein (0.64 vs. 0.96) compared to the Dutch study.  
254 However, in the Dutch study they planned the recipes and made up the diets from the recipes. They  
255 analyzed important foods in advance, and used these analyzed values for planning the diets. In the  
256 present study, the recipes were constructed from the prepared and analyzed food, which involved  
257 some uncertainties especially conducting accurate weighing of dressings, and fat spreads, because  
258 they might stick to or mix with other components of the food. Furthermore, we did not have  
259 analyzed values for the exact same components of the fast foods, but chose what we considered the  
260 best representation for a similar component from the FCDB. The availability of foods in FCDB has  
261 its limits and it was not always possible to choose a good representation of the  
262 component/ingredient in the recipe. In an American study from 1999 menus of intervention diets  
263 (n=36) were analyzed and compared to calculated values performed with 4 different nutrient  
264 databases. In this study they compared 13 nutrient values and in common with the present study  
265 energy, saturated fat, potassium, iron and sodium. They found as in the present study that several  
266 calculated values deviated significantly from analyzed values, but overall the differences were small  
267 (<10%) (McCullough et al., 1999). This is in accordance with an older American study which,  
268 however, found greater discrepancies for vitamins and minerals (>20%). In the study of  
269 McCullough et al, 1999 they calculated the diets on a brand name level. This is different from the  
270 present study which used generic food composition data from the FCDB. However, the generic  
271 level in the FCDB is based on representative samples on the market.

272 In a Greek study from 2003, investigators compared analyzed and calculated values of energy and  
273 macronutrients of five Greek traditional mixed dishes. The study found error percentages for energy  
274 from -10 to 1%, for protein from -22 to 2% and for saturated fat from -10 to 25% for the mixed

275 dishes (Vasilopoulou et al., 2003). This is in agreement with the present study that showed similar  
276 variability in the results for individual mixed dishes/foods.

277 The reasons for discrepancies between analyzed and calculated values could be many. Other than  
278 food policy as in the case of saturated fat in the present study, public health initiatives may also  
279 have impact. A whole grain recommendation was instituted in Denmark in 2008 and since then  
280 manufacturers have developed and reformulated breads to contain more whole grain, even white  
281 flour and fast food breads. This may cause discrepancies in the analyzed and calculated values of  
282 vitamin B1 and Iron. In addition one should remember that the FCDB presents the average  
283 composition of a class of foods. Therefore, perfect agreement should not be expected. There may  
284 also be differences for products on the retail and catering market e.g. for the fat content and other  
285 constituents in meat patties used in burgers, fast food breads and dressings. Therefore it may be  
286 important to include analyzed values of mixed foods such as fast foods in FCDB if they are  
287 commonly bought from fast foods outlets. Many databases include the most commonly consumed  
288 composite foods and dishes at retail level (Church, 2015), the same should apply on catering level.

289 The FCDB contains values from chemical analysis of the foods as well as other non-analytical  
290 values calculated via conversion factors. This may also contribute to some inaccuracy.

291 The limitations of this study are that it was not always possible to weigh dressings precisely.  
292 Furthermore we did not have the actual recipe of ingredients. However, the large sample of  
293 different fast foods representing fast foods exactly as the consumers buy and eat them from outlets  
294 on the market in Denmark is a strength. The study therefore represents a realistic situation and  
295 realistic results in relation to dietary assessment where participants have eaten a prepared food and  
296 report the portion sizes of the recipe/components.

## 297 **5. Conclusion**

298 This study indicated that for fast foods overall it was possible to find the contents of the seven  
299 tested nutrients by recipe calculations based on data from the latest version of the Danish Food  
300 Composition Databank. Acceptable differences between calculated and analyzed values were found  
301 for the 155 fast foods overall, and average differences did not exceed 13% when using the latest  
302 FCDB. For fast foods overall using the updated FRIDA compared to the older FCDB reduced the  
303 error percentages for saturated fat from 28% to 11 %.

304 However, results for the individual fast food types provided a more ambiguous picture showing  
305 acceptable as well as large differences between analyzed and calculated values. This indicates that  
306 regular updates of FCDB are important for accurate dietary assessment including recipe- and  
307 nutrient calculation and subsequent evaluation of inadequate and high intakes. Analyzed values for  
308 somewhat standardized foods such as fast foods usually eaten from fast food outlets and more  
309 varieties of foods used as ingredients could improve future FCDBs further.

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312 Administration, the laboratory at Lystrup for skillfully performing sampling and chemical analyses  
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315

#### 316 **Conflict of interest**

317 The authors declare no conflict of interest.

318



319

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Analyzed vs. calculated nutrient content

378 Table 1. One example of each of the different fast foods types that were chemically analyzed for  
 379 selected nutrients which were then compared to recipe calculation using the weights of their  
 380 components. Illustrated as served and open faced

Fast food type	EAs served	E Open faced
Burgers		
Sandwiches/toast		
HPork roast/meatball sandwiches		
Pitas and durum wraps		

Analyzed vs. calculated nutrient content

Hot dogs		Not separated further
Sausage/kebab mix		Not separated further

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Analyzed vs. calculated nutrient content

390 Table 2. Comparison of analyzed and calculated nutrient values of fast foods (n=155) using two consecutive versions of the Danish food  
 391 composition databank FOODCOMP and the latest version FRIDA.

	Mean weight g/portion (range)	Analyzed reference values		Calculated values FOODCOMP				Calculated values FRIDA			
		Mean	SD	Mean <sup>1</sup>	SD	Mean difference %	Paired correlation <sup>2</sup>	Mean <sup>1</sup>	SD	Mean difference %	Paired Correlation <sup>2</sup>
<b>All fast foods (n=155)</b>											
Energy (kJ/100 g)		982	203	940**	220	-4	0.83**	919**	201	-6	0.83**
Protein (g/100 g)		9.9	2.8	8.9**	2.8	-10	0.68**	8.6**	2.9	-13	0.64**
Saturated fatty acids (g/100 g)		2.7	1.5	3.5**	1.9	28	0.76**	3.0*	1.3	11	0.70**
Vit.B1 (mg/100 g)		0.13	0.08	0.12	0.07	-6	0.71**	0.13	0.08	2	0.78**
Iron (mg/100 g)		0.90	0.38	0.96*	0.29	8	0.49**	0.93	0.29	4	0.50**
Potassium (mg/100 g)		224	92	227	109	1	0.89**	221	92	-1	0.87**
Sodium (mg/100 g)		493	147	490	175	-1	0.67**	477	166	-3	0.67**
<b>Burgers (n=36)</b>	286 (90-419)										
Energy (kJ/100 g)		973	113	953	108	-2	0.64**	932**	125	-4	0.72**
Protein (g/100 g)		10.8	2.5	10.7	2.5	-1	0.67**	10.2	3.0	-6	0.47**
Saturated fatty acids (g/100 g)		2.9	1.0	3.1	1.0	7	0.81**	2.9	0.9	0	0.83**
Vit.B1 (mg/100 g)		0.07	0.01	0.08	0.04	11	0.27	0.08*	0.03	10	0.28
Iron (mg/100 g)		1.02	0.36	1.10*	0.28	8	0.80**	1.08	0.32	6	0.83**
Potassium (mg/100 g)		212	34	224	37	6	0.34*	219	46	3	0.17
Sodium (mg/100 g)		447	110	413	85	-8	0.34*	390*	83	-13	0.16

Analyzed vs. calculated nutrient content

<b>Sandwiches and toasts (n=47)</b>	211 (86-359)										
Energy (kJ/100 g)		950	166	930	146	-2	0.60**	923	147	-3	0.63**
Protein (g/100 g)		10.1	2.0	9.3**	2.4	-8	0.76**	9.1**	2.4	-9	0.77**
Saturated fatty acids (g/100 g)		2.1	1.2	3.2**	1.7	53	0.72**	3.1**	1.6	48	0.76**
Vit.B1 (mg/100 g)		0.13	0.05	0.14	0.05	6	0.70**	0.14*	0.05	8	0.73**
Iron (mg/100 g)		0.79	0.30	0.80	0.11	1	0.06	0.80	0.11	1	0.10
Potassium (mg/100 g)		172	39	159**	25	-7	0.79**	160**	26	-7	0.79**
Sodium (mg/100 g)		533	128	522	138	-2	0.64**	518	140	-3	0.64**
<b>Pork roast and meatball sandwiches (n=24)</b>	281 (157-368)										
Energy (kJ/100 g)		1006	102	885**	93	-12	0.63**	880**	96	-12	0.62**
Protein (g/100 g)		11.3	3.3	10.5	2.6	-7	0.60**	10.3	2.5	-9	0.60**
Saturated fatty acids (g/100 g)		3.0	0.9	3.2	1.6	5	0.70**	2.7*	1.0	-12	0.75**
Vit.B1 (mg/100 g)		0.20	0.13	0.19	0.11	-3	0.81**	0.23*	0.15	18	0.86**
Iron (mg/100 g)		0.87	0.37	1.17**	0.27	34	0.89**	1.12**	0.30	29	0.90**
Potassium (mg/100 g)		213	31	221	46	4	0.35	229	44	7	0.49*
Sodium (mg/100 g)		454	79	379**	52	-17	0.29	376**	52	-17	0.27
<b>Pitas and durum wraps (n=24)</b>	335 (212-605)										
Energy (kJ/100 g)		758	188	651**	141	-14	0.77**	650**	142	-14	0.77**
Protein (g/100 g)		7.8	3.5	5.7**	1.2	-27	0.54**	5.6**	1.2	-28	0.56**
Saturated fatty acids (g/100 g)		1.5	0.7	2.4**	0.9	63	0.53**	2.3**	0.9	60	0.51*
Vit.B1 (mg/100 g)		0.09	0.02	0.10	0.03	5	0.21	0.10	0.03	10	0.27
Iron (mg/100 g)		0.78	0.44	0.77	0.37	-1	0.50*	0.76	0.37	-3	0.50*

Analyzed vs. calculated nutrient content

Potassium (mg/100 g)		214	65	191	45	-11	0.43*	192	46	-10	0.44*
Sodium (mg/100 g)		366	124	356	75	-3	0.76**	358	72	-2	0.75**
<b>Hot dogs (n=8)<sup>3,4</sup></b>	170 (146-223)										
Energy (kJ/100 g)		1143	101	1147	139	0	0.88**	1129	139	-1	0.81*
Protein (g/100 g)		9.3	1.0	8.1*	1.1	-13	0.79*	8.1*	1.1	-14	0.83*
Saturated fatty acids (g/100 g)		4.4	0.4	4.3	0.6	-3	0.48	4.3	0.8	-3	0.43
Vit.B1 (mg/100 g)		0.22	0.05	0.09*	0.01	-56	0.67	0.11*	0.01	-49	0.57
Iron (mg/100 g)		0.78	0.07	1.15*	0.11	47	0.14	1.16*	0.11	49	0.62
Potassium (mg/100 g)		177	25	182	35	3	0.17	184	35	4	0.17
Sodium (mg/100 g)		711	74	684	68	-4	-0.08	684	74	-4	-0.08
<b>Sausage and kebab mix (n=16)<sup>3,4</sup></b>	292 (181-508)										
Energy (kJ/100 g)		1313	136	1348	115	3	0.18	1231*	107	-6	0.46
Protein (g/100 g)		8.4	2.1	6.7*	1.3	-20	0.22	5.9**	1.3	-30	0.25
Saturated fatty acids (g/100 g)		5.1	1.6	7.3**	1.2	45	0.43	4.4	1.2	-13	0.55*
Vit.B1 (mg/100 g)		0.15	0.05	0.10**	0.01	-34	0.77**	0.13*	0.02	-16	0.23
Iron (mg/100 g)		1.18	0.43	0.97	0.13	-18	-0.56*	0.89	0.14	-25	-0.50*
Potassium (mg/100 g)		460	41	515*	51	12	0.05	452	42	-2	0.06
Sodium (mg/100 g)		616	169	840**	96	36	0.40	783**	97	27	0.47

392 <sup>1</sup>Paired samples T-test

393 <sup>2</sup>Pearsons correlation coefficient

394 <sup>3</sup>Wilcoxon

395 <sup>4</sup> Spearman correlation coefficient

396 \*<0.05 tested against reference

397 \*\*<0.01 tested against reference

