Mineral composition of commonly consumed ethnic foods in Europe

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Abstract

Background: Ethnic foods are an integral part of food consumption in Europe contributing towards the overall nutrient intake of the population. Food composition data on these foods are crucial for assessing nutrient intake, providing dietary advice and preventing diseases.

Objective: To analyse selected minerals in authentic and modified ethnic foods commonly consumed in seven EU member states and Israel.

Design: A list of ethnic foods commonly consumed in selected European countries was generated, primary samples collected and composite sample prepared for each food, which were analysed for dietary minerals at accredited laboratories. Methods for sampling, analysis, data scrutiny and documentation were based on harmonised procedures.

Results: New data on 128 ethnic foods were generated for inclusion in the national databases of seven EU countries and Israel within the European Food Information Resource (EuroFIR), an EU Network of Excellence. The Na, K, Ca, P, Mg, Mn, Cl, Fe, Cu, Zn, Se and I contents of 39 foods is presented for the first time in this study.

Conclusion: The data will serve as an important tool in future national and international food consumption surveys, to target provision of dietary advice, facilitate implementation of policies and inform policymakers, health workers, food industry and researchers.

Keywords: immigrant foods; ethnic foods; food composition data; micronutrients; minerals; analysis

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Diet-related chronic diseases are responsible for two thirds of all deaths in the world (1) and it has been hypothesised that this might be due to intra-uterine programming linked to early micronutrient deficiencies. Furthermore, dietary intake of micronutrients is of public health concern due to the consequences of their deficiency in the diet and severe micronutrient-malnutrition (2). Dietary inadequacy of key minerals compared to D-A-CH (Germany, Austria and Switzerland) recommendations (3) have been reported for the European population, in particular lower intakes of Ca, Mg, Fe and I in female adolescents; lower intakes of Ca, Mg and Fe (women only) in adults and the elderly and lower iron intakes in girls (10–14 years age) (4). Calcium (Ca) and iron (Fe) are of greater concern due to difficulties in meeting increased requirements at certain stages in life, such as during pregnancy. Recent studies on the increased intakes of calcium, magnesium and potassium suggest that these are protective against unfavourable increases in serum lipid concentration (5), blood pressure (6, 7) and, therefore, the risk of coronary heart diseases (CHD) (8–10) which is the major cause of death worldwide, especially in developed countries (11).

Although ethnic foods are widely consumed in Europe, there is limited data on their composition. This makes it difficult to accurately estimate the nutrient intakes of the general population and, especially, of ethnic groups...
Materials and methods

Prioritisation of commonly consumed ethnic foods
A list of ethnic foods commonly consumed in Belgium, Denmark, France, Israel, Italy, Spain, The Netherlands and the UK was generated and prioritised to ensure the data was representative according to criteria reported by Khokhar et al. (16). Factors considered in the prioritisation of foods included: the size and significance of ethnic populations in the partner countries; the records of foods and migrants who are known to have higher incidences of nutrition-related problems. A cross-sectional study of black, Hispanic, and white men in Boston, USA demonstrated that the racial/ethnic heterogeneity affected bone mass and density through variations in body composition, diet, and socio-demographic factors (12).

Migrants also have higher rates of mortality and morbidity due to nutrition-related diseases when compared with the mainstream host population (13), as well as to the populations of their native country (14) which necessitates reliable data on ethnic diets. The objective of this study was, therefore, to analyse selected minerals in authentic1 and modified2 ethnic foods commonly consumed in seven EU member states and Israel; this was one of the objectives of the Ethnic Food Work Package within the EU’s Sixth Framework Programme European Food Information Resource (EuroFIR) project. The most popular ethnic cuisines in European countries were identified as South Asian (for the UK), North African (France and Italy), Turkish and Pakistani (Denmark), Congolese (Belgium), Romanian (Italy), Mediterranean and Ethiopian (Israel), Latin American (Spain and Italy), Surinamese (The Netherlands) and Asian (Italy and Spain). The macronutrient composition of these foods has already been published (15).

Sample collection and preparation
For the analysis of modified ethnic foods, primary samples were collected from various sources (supermarkets, takeaways, restaurants and ethnic food stores) with sample numbers ranging from 1 to 12 for each food. Authentic ethnic foods (up to 11 primary samples) were collected from households where they were prepared by members of relevant ethnic groups, and collected from different street market stalls, ethnic restaurants and specialist ethnic shops. Composite3 samples for each selected food were analysed for dietary minerals.

Mineral analyses
The sodium (Na), potassium (K), calcium (Ca), phosphorus (P), magnesium (Mg), manganese (Mn), chloride (Cl), iron (Fe), copper (Cu), zinc (Zn) selenium (Se) and iodine (I) contents of the selected foods were determined using standardised methods based on CEN (European Committee for Standardisation) methods and/or UKAS-accredited methods at selected laboratories. These laboratories were accredited (ISO-17025), routinely participated in proficiency testing schemes (FAPAS) and complied with the Joint Code of Practice for Quality Assurance in Research. Appropriate guidelines (e.g. the use of appropriate equipment such as plastic, glass, stainless steel, rubber gloves, sodium-free detergents and distilled water for rinsing equipment) including those for preventing contamination of dietary samples with Fe, Zn or Cu, were strictly adhered to during sample preparation. The analytical methods are presented in Table 2.

Results
The mineral content of the selected foods was determined and reported per 100 g edible portion (Table 3). The most abundant minerals were Na, K, Ca, Mg, Fe and Cl, with Zn being present in small amounts. Overall, there were large variations in the mineral contents of the foods analysed, ranging from 4 mg (frik) to 3,207 mg (salted beef) for Na; 23 mg (Cantonese rice) to 710 mg (harissa sauce) for K; 5 mg (sarmale) to 579 mg (biteku-teku) for Ca; 6 mg (chikwangue) to 125 mg (biteku-teku) for Mg; 7 mg (meloukhia sauce) to 296 mg (kebab) for P; 89 mg (frik) to 2,712 mg (brik) for Cl; 0.4 mg (mkayabo and chikwangue) to 17.1 mg (injera) for Fe; <0.04 mg (salted beef, chikwangue and mbinzo) to 0.90 mg (jalafel) for Cu; 0.1 mg (Cantonese rice, sarmale and chikwangue) to 6.4 mg (salted beef) for Zn; <1 mg (brik, harissa sauce and meloukhia sauce) to 11.2 mg (buttermilk) for Mn; 0 µg (jalafel) to 23 µg (injera) for Se; and from <10 µg (frik and meloukhia sauce) to 44 µg (harissa sauce) for I. Such variation could be due to several factors, such as the processing and agronomic/cultivation conditions, but are also thought to involve different ingredients.

1Authentic ethnic food: ‘A food from countries other than the home market contribution to a different food culture than the traditional cuisine of the host country. Food may be adapted by combining local and imported ingredients and is prepared at home’ (15).

2Modified ethnic food: ‘A commercially-modified version of food as prepared in an immigrant country to suit the taste and preference of host country’ (15).

3Primary samples were mixed to make a composite sample of approximately 2 kg and were stored at appropriate conditions. Details of sampling have been published (15, 16).
Table 1. Description of selected ethnic foods commonly consumed in seven European countries and Israel

| Cuisine type and food name | Number and source of samples | Description |
|---------------------------|-----------------------------|-------------|
| **France: North African (Maghreb); Strasbourg area** | | |
| Modified ethnic foods | | |
| *Brik* pastry sheet, baked | 3 samples, supermarkets and grocery stores | Pastry sheet, baked |
| *Harissa* sauce | 3 samples, supermarkets and grocery stores | Spicy sauce/paste |
| *Buttermilk* | 3 samples, supermarkets and grocery stores | Fluid, cultured, low fat |
| *Frik*, dry | 2 samples, supermarkets and grocery stores | Roasted crushed immature hard wheat, dry |
| *Molokhia* sauce | 1 sample, supermarkets and grocery stores | Sauce made with dried *Tossa Jute* (*Corchorus olitorius* L.) leaves powder |
| **Israel: Mediterranean and Ethiopian; Beer-Sheva, Tel-Aviv and Haifa** | | |
| Modified ethnic foods | | |
| *Falafel* | 12 samples, restaurants | Fried chick peas |
| *Commercial soya patty* | 10 samples, supermarkets and grocery stores | Commercial vegetarian patty |
| *Industrialised hummus* | 10 samples, supermarkets and grocery stores | Mashed chick peas |
| **Authentic ethnic foods** | | |
| *Dark bread* | 10 samples, homemade | Common subsidize bread |
| *Injera* | 10 samples, homemade | Ethiopian pita |
| **Spain: Latin American and Asian; Barcelona** | | |
| Modified ethnic foods | | |
| *Spring roll* | 8 samples, supermarkets and restaurants | Vegetable filled roll |
| *Rice 3 delight* | 11 samples, supermarkets and restaurants | Cooked rice with peas, ham, shrimp, carrots and egg |
| *Guacamole* | 3 samples, supermarkets and restaurants | Avocado puree |
| *Mexican salsa* | 5 samples, supermarkets and restaurants | Tomato and chilli salsa |
| **Authentic ethnic foods** | | |
| *Ceviche* | 5 samples, homemade | Raw marinated fish or seafood in lemon juice |
| **Denmark: Middle Eastern; Copenhagen** | | |
| Modified ethnic foods | | |
| *Du¨ru¨m rolls* | 4 samples, fast-food restaurants and takeaways | Flat bread with salad and strips of meat |
| *Pita sandwich with kebab* | 4 samples, fast-food restaurants and takeaways | Pita bread with grilled kebab meat (normally lamb or beef) and salad |
| *Sandwich with kebab* | 4 samples, fast-food restaurants and takeaways | Various types of bread with kebab and salad [typically lamb or beef] |
| *Sandwich with falafel* | 4 samples, fast-food restaurants and takeaways | Various types of bread with falafel and salad |
| *Kebab mix* | 4 samples, fast-food restaurants and takeaways | A mix of kebab, chips, salad and dressing |
| **Italy: Asian, Latin American, Mediterranean and Romanian; Rome and Milan** | | |
| Modified ethnic foods | | |
| *Cantonese rice* | 5 samples, supermarkets and restaurants | Cooked rice with peas, vegetables, ham and egg |
| *Nachos* | 9 samples, supermarkets and restaurants | Fried corn tortilla chips |
| *Falafel* | 6 samples, supermarkets and restaurants | Broad bean and chickpea balls |
| *Kebab* | 10 supermarkets and restaurants | ‘Rotating meat’ lamb or beef grilled |
| **Authentic ethnic foods** | | |
| *Sarmale* | 4 samples, homemade | Cooked rolls of cabbage leaves with rice and meat |
| **Netherlands: Surinamese; Zeist and The Hague** | | |
| Authentic ethnic foods | | |
| *Salted beef* | 3 samples, ethnic food store | Salt cured beef, boiled |
| *Yellow split peas* | 1 sample, ethnic food store | Legumes, husked and split in half, boiled |
| *Pomtayer* | 1 sample, ethnic food store | Roots of the tayer plant (*Xanthosoma sagittifolium*), prepared without fat |
| *Tayer leaves* | 3 samples, market | Large green leaves of the tayer plant (*Xanthosoma sagittifolium*), prepared without fat |

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Table 1 (Continued)

| Cuisine type and food name | Number and source of samples* | Description |
|----------------------------|--------------------------------|-------------|
| Belgium: Congolese; Brussels |                                |             |
| Authentic ethnic foods     |                                |             |
| Biteku-teku                | 6 samples, ethnic food store   | Amaranthus leaves |
| Saka-saka                  | 11 samples, ethnic food store  | Cassava leaves |
| Chikwangue                 | 5 samples, ethnic food store   | Fermented cassava loaf |
| Mbinzo worms               | 5 samples, ethnic food store   | Small black worms |
| Mkayabo                    | 7 samples, ethnic food store   | Dried and salted cod |
| UK: South Asian; London, Leeds and Birmingham |                                |             |
| Modified ethnic foods      |                                |             |
| Chicken bhuna              | 10 samples, supermarkets, restaurants and takeaway | Medium spiced curry with tomato and onion, garlic and fresh coriander |
| Chicken rogan josh         | 12 samples, supermarkets       | Chicken with a chilli, tomato and onion sauce |
| Aloo bombay                | 6 samples, supermarkets        | Chunks of potato in a spicy, tomato and onion sauce |
| Authentic ethnic foods     |                                |             |
| Rasmalai                   | 9 samples, homemade and ethnic food stores | Milky dessert made with specialised milk powder, milk cream and cardamom |
| Lamb kebab                 | 6 samples, homemade and ethnic food store | Patties made with spiced minced lamb |

*Number of primary samples was based on the availability of a brand. EuroFIR criteria were used to collect commonly consumed foods which are important in the diet.

A commercially-modified version of food as prepared in an immigrant country to suit the taste and preference of host country.

A food from countries other than the home market contribution to a different food culture than the traditional cuisine of the host country. Food may be adapted by combining local and imported ingredients and is prepared at home.

in composite foods and recipes; for example, falafel examined in Israel and Italy showed different Na contents (853 mg versus 677, respectively). Lack of published mineral composition data in these ethnic foods precluded comparison of the data with that from other studies. However, the present data were determined at accredited laboratories and certified reference materials (CRMs) were used to ensure the validity and reliability of results obtained.

Discussion
Macro- and micronutrient food composition data of commonly consumed ethnic foods in seven EU countries and Israel have been generated for the first time for

Table 2. List of analytical methods for dietary minerals analysis

| Dietary mineral | Methods and references |
|----------------|------------------------|
| Sodium         | ICP-OES; AES; AES (A 08/09/77; PNTA0016), EAS; flame – atomic absorption spectroscopy after ashing (AOAC 965.09) |
| Potassium      | ICP-OES; AES (A 08/09/77; PNTA0016), EAS; flame – atomic absorption spectroscopy (AOAC 965.09) |
| Calcium        | ICP-OES; AES; SAA AAS (A 08/09/77), flame – atomic absorption spectroscopy (AOAC 965.09; PNTA0016) |
| Phosphorus     | ICP-OES; AES; Colorimetric (A 08/09/77), spectrometric (PNTQ1025), UV absorption (AOAC 970.39), atomic absorption |
| Magnesium      | ICP-OES; AAS (A 08/09/77), flame – atomic absorption spectroscopy (AOAC 965.09; PNTA0016) |
| Manganese      | Graphite furnace – atomic absorption spectroscopy after microwave digestion (BS 14084) |
| Chloride       | Potentiometry (NF ISO 5943, NF ISO 5725, NFV 05116, NFV04289, NF EN ISO 5810, ISO 1841-2, NF ISO 5943 mod) |
| Iron           | ICP-OES; AES; AAS (Dir 78/993), ICP-MS; flame – atomic absorption spectroscopy (AOAC 965.09), graphite furnace AAS (PNTA0017) |
| Copper         | ICP-OES; AES; graphite furnace AAS (PNTA0017) |
| Zinc           | ICP-OES; AES (Dir 78/933/NF V76-113), ICP-MS; flame – atomic absorption spectroscopy (AOAC 965.09; PNTA0016) |
| Selenium       | Hydride (PNTA0059), fluorescence; AAS; ICP-MS; graphite furnace – atomic absorption spectroscopy after microwave digestion (BS 14627) |
| Iodine         | Colorimetric; bromation/titrimetry (AOAC 935.14) |
Inclusion in national food composition databases including new data on the dietary mineral presented in this paper. Some minerals considered of greater dietary significance including Na, Ca, Fe and Se ranged widely in these ethnic foods.

### Table 3. Mineral composition of authentic and modified ethnic foods (per 100 g edible portion)

| Country/Organisation | Food name | Na | K | Ca | Mg | P | Fe | Cu | Zn | Cl | Mn | Se | I |
|----------------------|-----------|----|----|----|----|---|----|----|----|----|----|----|---|
| France/AFSSA         | Brik pastry sheet, baked | 1672 | 175 | 110 | 24 | 97 | 1.1 | < 1 | < 1.0 | 2712 | < 1 | < 5 | 18 |
| Harissa sauce        | 1122 | 710 | 78 | 47 | 63 | 3.1 | < 1 | < 1.0 | 1915 | < 1 | < 5 | 44 |
| Buttermilk           | 50    | 159 | 118 | 12 | 90 | 1.0 | < 1 | 1    | 139  | 11.2 | < 5 | 18 |
| Frik, dry            | 4.2   | 499 | 52 | 114 | 258 | 5.2 | < 1 | 3.6  | 89   | 3.6  | < 5 | < 10 |
| Meloukia sauce       | 378   | 179 | 82 | 37 | 7  | 1.9 | < 1 | < 1.0 | 764  | < 1 | < 5 | < 10 |
| Israel/BGU           | Falafel | 853 | 340 | 56 | 53 | 157 | 2.3 | 0.38 | 1.4  |     |     | < 18 |
| Dark bread           | 489   | 156 | 123 | 36 | 119 | 2.7 | 0.17 | 1.0  |     |     |     | < 18 |
| Commercial soy patty | 548   | 255 | 133 | 46 | 172 | 3.5 | 0.24 | 2.3  |     |     |     | < 18 |
| Injera               | 12    | 249 | 90 | 102 | 200 | 17.1 | 0.47 | 2.0  |     |     |     | 23   |
| Industrialised hummus| 472   | 205 | 45 | 71 | 164 | 1.9 | 0.35 | 1.4  |     |     |     | < 18 |
| Spain/CESNID         | Spring roll | 516 | 162 | 41 | 15 | 143 | 0.9 | 0.10 | 0.5  |     |     | < 5  |
| Rice 3 delight       | 410   | 82  | 22 | 12 | 202 | 0.7 | 0.10 | 0.6  |     |     |     | < 5  |
| Guacamole            | 644   | 147 | 58 | 13 | 117 | 0.5 | 0.10 | < 0.5 |     |     |     | < 5  |
| Mexican salsa        | 663   | 294 | 27 | 17 | 73  | 0.6 | 0.10 | < 0.5 |     |     |     | < 5  |
| Ceviche              | 491   | 170 | 28 | 26 | 204 | 1.5 | 0.10 | 0.5  |     |     |     | 12   |
| Denmark/DTU          | Durum rolls | 532 | 286 | 19 | 21 | 134 | 1.3 |     | 2.6  |     |     |     |
| Pita sandwich with kebab | 365 | 231 | 25 | 18 | 102 | 1.1 |     | 1.7  |     |     |     |     |
| Sandwich with kebab  | 443   | 193 | 47 | 17 | 93  | 1.1 |     | 1.6  |     |     |     |     |
| Sandwich with falafel| 382   | 236 | 45 | 29 | 96  | 1.1 |     | 0.7  |     |     |     |     |
| KEBAB mix            | 545   | 472 | 17 | 27 | 154 | 1.5 |     | 2.1  |     |     |     |     |
| Italy/INRAN          | Cantonese rice | 552 | 23  | 16 | 78 | 121 | 0.5 | 0.66 | 0.1  | 1151 |     | 1   |
| Nachos               | 462   | 201 | 47 | 62 | 144 | 1.2 | 0.10 | 1.2  | 1070 |     | 1   |
| Falafel              | 677   | 355 | 45 | 41 | 163 | 2.5 | 0.90 | 0.2  | 1016 |     | 0   |
| Kebab                | 849   | 531 | 22 | 32 | 296 | 1.6 | 0.12 | 3.8  | 1660 |     | 2   |
| Sarmale              | 707   | 27  | 5  | 22 | 10  | 0.5 | 0.93 | 0.1  | 1252 |     | 1   |
| The Netherlands/RIVM | Salted meat | 3207 | 40 | 15 | 16 | 135 | 1.6 | < 0.04 | 6.4 |     |     |     |
| Tayer leaves         | 122   | 541 | 354 | 39 | 61 | 1.0 | 0.10 | 1.3  |     |     |     |     |
| Pomtayer             | 17    | 606 | 51 | 49 | 105 | 1.0 | 0.30 | 0.5  |     |     |     | 5   |
| Yellow split peas    | 6     | 309 | 20 | 31 | 140 | 1.1 | 0.11 | 0.9  |     |     |     |     |
| Belgium/UGhent       | M Kayabo | 2533 | 64 | 190 | 40  | < 0.4 | 0.04 | 3.7  |     |     |     |     |
| Saka-saka            | 168   | 153 | 47  |     | 2.9 | 0.05 | 1.2  |     |     |     |     |
| Chi kwangue          | 5     | 75  | 8  | 6   | 0.4 | < 0.04 | 0.1 |     |     |     |     |
| Mbirzo worms         | 13    | 121 | 56 | 43  |     | 3.5 | < 0.04 | 3.7 |     |     |     |
| Biteku-teku          | 131   | 157 | 125 |     | 1.3 | 0.04 | 0.6  |     |     |     |     |
| UK/UL                | Chicken bhuna | 340 | 255 | 27 | 20 | 90  | 0.7 | 0.06 | 0.5  |     |     | 9    |
| Lamb kebab           | 528   | 410 | 30 | 32 | 175 | 2.5 | 0.15 | 3.2  |     |     |     | 19   |
| Aloo bombay          | 298   | 284 | 28 | 18 | 38  | 0.8 | 0.06 | 0.3  |     |     |     |     |
| Rasmalai             | 54    | 186 | 206 | 16 | 149 | 0.6 | < 0.06 | 0.9 |     |     |     |
| Chicken rogan josh   | 316   | 262 | 33 | 20 | 81  | 0.9 | 0.06 | 0.5  |     |     |     | 12   |

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Sodium

The sodium content of mkayabo (dried and salted cod) and salted meat would be considered high because the amount of Na in 100 g edible portion (mkayabo 2.5 g, salted meat 3.2 g) in these foods exceeds the European...
recommendation (17) of <1.5 g/day (equivalent to 3.8 g of salt). Higher dietary intakes of Na exceeded the recommendation for both genders across 23 European countries as reported by Elmadfa (4). Furthermore, prolonged consumption of such foods could be an issue of concern since Na intake above the recommended value for CHD, which is a major cause of death in Europe (6, 18–21). Levels of Na can, however, be very variable due to other sodium-containing compounds such as mono-sodium glutamate (MSG) used in cooking or added by manufacturers.

**Potassium**

An adequate intake of potassium has been found to prevent high blood pressure and reduce the risk of stroke (22, 23). The low potassium content of the foods analysed may be considered critical in view of the UK recommendation of 3.5 mg/day (24). Thus, individuals who regularly consume these foods need to increase their daily intake of fruits and vegetables in order to meet their potassium needs.

**Calcium**

Calcium is essential for bone development and prevention of osteoporosis (11, 17), and may also reduce the absorption of dietary fat thereby lowering serum total cholesterol and low-density lipoprotein cholesterol concentrations (8). The calcium content of the foods analysed in this study ranged widely between 5 mg (sarmale) and 579 mg (biteku-teku) per 100 g edible portion. Furthermore, the amount of calcium actually absorbed is dependent on individual vitamin D status and on the presence of binding substances, such as uronic acid, phytate and oxalate, in the food (25); in milk products its bioavailability is relatively higher.

**Iron**

According to a WHO report, over 2 million people in developed and developing countries have iron deficiency anaemia which leads to loss of productivity (26). Anaemia has been shown to be strongly linked to maternal mortality and premature child birth (27). In addition, iron deficiency, which is prevalent in ethnic groups, has also been reported in European countries (28). The reported prevalence ranged from 2.5 to 32% (29–32). Its bioavailability is low and is affected by dietary factors which could increase (presence of meat or fish or organic acids such as ascorbic acid, citric acid, lactic acid) or inhibit its availability (phytate, calcium, tannins, fibre, polyphenols in tea, coffee, bran), as well as the iron status of individuals (33); haem iron found only in meat and fish has a relatively high bioavailability (15–25%) (34). These data emphasise the need for appropriate dietary advice to be given to the population and especially to ethnic groups who tend to consume these food regularly and also have a higher incidence of anaemia (35, 36).

**Selenium**

Several functional roles of Se have been reported, including enzyme activity, decreasing the risk of CHD through its antioxidant effect (17, 37) and possibly offering protection against prostate cancer (38). Low intakes of Se in European countries especially in the UK have been reported (39) and increased consumption in the diet is encouraged. WHO recommends Se intakes of 40 μg/day for men and 30 μg/day for women (40). For Europe, the recommendation is 55 μg per day for both genders (41). *Injera*, an ethnic food from Israel, (after Israel) contained a great amount of Se (23 μg) and so may be considered as an excellent source of this mineral.

These data highlight potential health benefits of foods such as *injera* which contain higher amount of Fe than that of meat products and also high levels of selenium; however, there were several foods which were generally low in minerals presenting some concerns in populations regularly consuming these foods. The adequacy of intake must also take account of both the specific portion size of the food and its frequency of consumption in the daily diet, and not of the mineral contents in isolation. It is also important to underline that there are many factors, both dietary and physiological, that may influence mineral bioavailability.

There are substantial differences in the preparation of meals, eating habits, nutritional composition of the diets of migrants (including those of South Asian and black African-Caribbean origin) and Caucasians living in the UK and other European countries. Greater in-depth knowledge of these differences related to reliable food composition data could help to explain both macronutrient and micronutrient intakes of these groups. For example, intakes of Ca and haem Fe have been found to be lower for South Asian children than for white European children. Similarly, African-Caribbean children have also been found to present lower intakes of Ca (42). Additionally, low intakes of iron among Moroccan and Turkish women have been found by their low iron status; prevalence of low iron status was highest among Turkish women (43). The diets of migrants showed both positive (macronutrients) and negative (micronutrients) differences in comparison with the mainstream European diets (43).

**Conclusions**

Ethnic foods are increasingly becoming popular in Europe and therefore will impact upon the overall nutrient intake of the population. As such, reliable information on their mineral content is crucial for assessing the intakes of the population and the provision of dietary
advice for preventing the risk of deficiency and diet-related disease. These new food composition data on 39 prioritised ethnic foods (commercial and homemade) consumed by both the mainstream and ethnic population in Europe has been generated using harmonised methods, scrutinised for methodological and analytical errors and is made available through EuroFIR and national compilers for inclusion in the national databases. The new data have been documented for inclusion in national food composition databases in Belgium, Denmark, France, Italy, Spain, the Netherlands, UK and Israel, and is also available from EuroFIR.4 In addition to the provision of dietary advice to both mainstream and ethnic populations, the validated data presented in the current study will serve as an important tool in future national and international food consumption surveys, inform policymakers, clinicians, dieticians, health professionals, food industry and epidemiological research.

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