McCance & Widdowson's Composition of Foods
Integrated Dataset (CoF IDS)

USER DOCUMENT

Introduction

The Food Standards Agency (FSA) maintains the UK Nutrient Databank, which contains extensive information on the nutrient content of foods commonly consumed in the UK. A range of books based on information from the databank and containing nutrient composition data have been produced. These books comprise the McCance and Widdowson's *The Composition of Foods* series (CoF) which provide extensive data for different food groups. Because of the way in which the series has evolved there are often two or more separate entries for a particular food, each entry including different nutrients and/or different values. A dataset containing a single entry for each food has been produced by examining each of the multiple entries and using the values which are most appropriate. The UK Nutrient Databank does not contain values for all nutrients for all foods and therefore the CoF IDS will not have a value for every nutrient for every food. Foods calculated by recipe or calculated based on another food (e.g. foods weighed with waste) have been recalculated to include the most recent data for ingredients and the dataset therefore contains some newly created codes which have not previously been published.

Files included in the integrated dataset

The following data files corresponding to CoF publications [1-12] are currently available from FSA:

6th Summary Edition (2002) [1]
Fatty Acids, supplement (1998) [2]
Meat Products and Dishes, supplement (1996) [3]
Meat, Poultry and Game, supplement (1995) [4]
Miscellaneous Foods, supplement (1994) [5]
Fish and Fish Products, supplement (1993) [6]
Vegetable Dishes, supplement (1992) [7]
Fruit and Nuts, supplement (1992) [8]
Vegetables, Herbs and Spices, supplement (1991) [9]
Milk Products and Eggs, supplement (1989) [10]
Cereals and Cereal Products, supplement (1988) [11]
Immigrant Foods (1985) [12]

The files above contain all the data in the main tables and most of the data in the supplementary tables from the corresponding printed publications. All these files have been reviewed to produce this integrated dataset.

Errata

Errors identified since publication of the CoF 6th summary edition have been amended within the CoF IDS.

Media and General Format

The files use:
- Excel spreadsheets.
- 7-bit ASCII files which are compatible with DOS, Windows, DEC VAX and Apple Macintosh (using Apple File Exchange) or any computer system capable of reading the ISO 646 character set. (Available from FSA on request).

Format of Excel files

The Excel spreadsheet consists of 16 separate sheets:

Factors
Proximates
Inorganics
Vitamins
Vitamin Fractions
Saturated fatty acids per 100g fatty acids
Saturated fatty acids per 100g food
Monounsaturated fatty acids per 100g fatty acids
Monounsaturated fatty acids per 100g food
Polyunsaturated fatty acids per 100g fatty acids
Polyunsaturated fatty acids per 100g food
Other fatty acids per 100g food
Phytosterols
Organic acids
Labelling
Nutrient Footnotes

Each sheet contains column headings in row 1 of the spreadsheet, then data values for each individual foodstuff such that the same food occurs on the same row in each sheet. For example, data values for a specific food code will occur in the same row in each of the first 15 sheets. The Nutrient Footnotes sheet, is an exception to this, as it lists the footnotes in order of food code, specific to a given nutrient.

The following notes apply to the data values:

1. Nutrient values within round brackets, ( ), are estimated.

2. A trace value for a nutrient is represented by Tr.

3. Where a nutrient is present in significant quantities, but there is no reliable information on the amount, the value is represented by N.

Food Identification

Food Code (or **Food Number (NUMB)** in ASCII files) is a number, up to six digits, representing the Integrated Dataset code, as a rule it will refer to the most recent supplement which included that food and its food number. The table below details the full range of food codes.

File	Food Code Range
5th Summary Edition	50-001 - 50-1188
Cereals and Cereal Products	11001 - 11360
Milk Products and Eggs	12001-305; 12801-830
Vegetables, Herbs and Spices	13001-419; 13801-861
Fruit and Nuts	14001-289; 14801-851
Vegetable Dishes	15001 - 15347
Fish and Fish Products	16001 - 16308
Miscellaneous Foods	17001 - 17418
Meat, Poultry and Game	18001 - 18429
Meat Products and Dishes	19001 - 19286
Fatty acids/6th Summary Edition/IDS	For foods where new data has been incorporated into an existing food, a new food code number has been given using the prefix for the appropriate supplement. For ease of use, the old food code is given in the 'Previous' field.

Previous (PREV) is assigned to each food which has an earlier food code with different nutrient values associated with it. It is a number, up to six digits, indicating previous food codes (4th or 5th Edition or a supplement). Some foods may have more than one previous code associated with them.

Constant (CONST) is a number, up to five digits, indicating the earliest file (4th or 5th Edition or a supplement) in which the food appeared and its food number from that original file.

For the Constant Food Number field only, the following should be noted:

i) 4th Edition (1978) numbers are in the range 1-969.
ii) 5th Edition numbers are denoted by the addition of 50,000 to the food number *i.e.* are in the range 50,001-51,188.
iii) Immigrant Foods (1979) numbers are in the range 5001-5237.

The Previous and Constant therefore can be used to locate original data set for a food.

Group (Food sub-group code). In these files (but not in the printed publications) a one, two or three letter code is assigned to every food. The code letter(s) provide identification of the food group and food type to which the food belongs. A full list of the codes and their description is given in Annex 4.

Description (DESC). Details of references in this field may be found in the corresponding printed publication.

Comments (Data source). Information on the source of data is provided.

Details of Nutrient Data

For the detailed definition and expression of the nutrients you should refer to the introductory pages of the 6th summary edition of CoF (Annex 2) and of the supplement publications.

1. The more significant points for certain nutrients are provided in the notes below for convenience. For some nutrients, data which is 'old' and was analysed significantly earlier and on a different sample to the bulk of the nutrients is available. This data has not been updated but it is the only data available and may be of interest to some users and is available as a separate file (from FSA on request). This applies to fibre fractions, Southgate fibre and sulphur. Data for obsolete food codes i.e. products no longer commercially available or codes superseded by a more recent supplement code (including current and ‘old’ nutrients) are also available as a separate file (from FSA on request).

Proximates

Protein (PROT). For most foods, protein is calculated by multiplying total nitrogen values (TOTNIT) by the factors as described in the introduction of CoF 6th summary edition (Annex 2). The proportion of non-protein nitrogen is high in many foods, notably fish, fruits and vegetables. For foods which contain a measurable amount of non-protein nitrogen in the form of urea, purines and pyrimidines, the non-protein nitrogen has been subtracted before multiplication by the appropriate factor.

A separate file listing the **amino acid** breakdown of foods from CoF 4th summary edition supplement, is available as a separate file (from FSA on request).

Fat (FAT). Values are for total fat and not just the triglycerides.

Carbohydrate (CHO). Total carbohydrate (and its components, starch and total sugar) are expressed wherever possible as their monosaccharide equivalents. In a few cases, total carbohydrate values have been derived "by difference" which are obtained by subtracting measured amounts of the other proximates from the total weight and many include a contribution from any dietary fibre present as well as errors from the other proximate analyses.

Energy

Energy value (KCALS). Calculated using the conversion factors: protein 4 kcal/g, fat 9 kcal/g, carbohydrate (available, expressed as monosaccharides) 3.75 kcal/g and alcohol 7 kcal/g.

Energy value (KJ). Calculated using the conversion factors: protein 17 kJ/g, fat 37 kJ/g, carbohydrate (available, expressed as monosaccharides) 16 kJ/g and alcohol 29 kJ/g.

Sugars

Expressed as the monosaccharide equivalents.

Total sugars (TOTSUG). Sugars include free monosaccharides and disaccharides. In cereals the contribution from glucofructans is also included. The value does not include any contribution from oligosaccharides present in the food.

Starch and Fibre

The starch values are expressed as the monosaccharide equivalents, but the fibre values are as the weight of the actual component.

Starch (STAR). Includes dextrins but excludes resistant starch. Expressed as the monosaccharide equivalents.

Non-starch polysaccharides (Englyst method) (ENGFIB). Includes both insoluble fibre (cellulose, insoluble non-cellulosic polysaccharides) and soluble fibre (soluble cellulosic polysaccharides).

Total dietary fibre (AOAC method) (AOACFIB). Includes substances measuring as lignin and also resistant starch.

Fat-soluble Vitamins

The two components of vitamin A are given separately as Retinol (RET) and Carotene (CAREQU). Retinol is expressed as the weight of *all-trans*-retinol equivalent, *i.e.* the sum of *all-trans*-retinol plus contributions from the other forms after correction to account for their relative activities.[13]

Carotene (CAREQU). Represents the β-carotene activity and is the sum of the β-carotene and half of any α-carotene or cryptoxanthins present.[14]

Total retinol equivalent. The generally accepted relationship is that 6 µg β-carotene or 12 µg of other active carotenoids are equivalent to 1 µg of retinol[15] *i.e.:*

$$\text{Vitamin A potency as retinol equivalent} = \mu g \text{ retinol} + \frac{\mu g\ \beta\text{-carotene equivalent}}{6}$$

Retinol (RET). Includes contributions from *all-trans*-retinol (ALRET), 13-*cis*-retinol (13CISRET), retinaldehyde (RETALD) and dehydroretinol (DEHYRET).

Cholecalciferol (VITD3). Animal products can contain Vitamin D_3 (cholecalciferol) derived from the action of sunlight on the animal's skin or from its own food. Circulating Vitamin D is mainly in the form of the more active **25-hydroxy Vitamin D (25OHD3)**.

Vitamin E (α-tocopherol equivalent) **(VITE)**. Values take into account Vitamin E activity using the conversion factors,[16] and are expressed as α-tocopherol equivalents.

Vitamin K_1 (VITK1). Phylloquinone, the predominant, naturally-occurring, vitamin K in foods.

Water-soluble Vitamins

Thiamin (THIA). Values are expressed as thiamin hydrochloride.

Niacin (NIAC). Values are the sum of nicotinic acid and nicotinamide.

Tryptophan/60 (TRYP60). Potential nicotinic acid from the amino acid tryptophan, calculated as tryptophan divided by 60.

Vitamin B_6 (VITB6). Values are expressed as pyridoxine hydrochloride.

Folate (FOLT). Values are expressed as total folates measured after deconjugation of the polyglutamyl forms.

Pantothenate (PANTO). Values are expressed as calcium D-pantothenate.

Vitamin C (VITC). Values include ascorbic and dehydroascorbic acids.

Fatty Acids

Total fatty acids (groups) in a given weight of food are calculated using conversion factors as shown in the introduction of CoF 6th summary edition which gives a worked example (See Annex 2).

Miscellaneous and Additional Values

Edible proportion (EDPOR). For raw food this refers to the edible material remaining after inedible waste has been trimmed away. For canned foods unless all contents are consumed this refers to the edible contents after the liquid has been drained off.

All foods are expressed per 100g edible portion.

Oligosaccharides (OLIGO). Expressed as the monosaccharide equivalents.

Alcohol (ALCO). Values are given as g/100 ml. Pure ethyl alcohol has a specific gravity of 0.79, dividing values by 0.79 converts them to alcohol by volume (ml/100 ml).

Labelling (LEnergy, LCarbohydrate, LStarch, LProtein etc). Some values have been recalculated in the format required for nutritional labelling. Labelling data has only been calculated on foods that had multiple entries. Foods originally occurring in just one supplement or calculated as recipes will not have labelling figures. Manufacturer's labelling data have been used when available. In other instances figures have been recalculated using the following criteria:

- Protein given as total nitrogen x 6.25
- Carbohydrates expressed as the weight of the carbohydrates themselves, not their monosaccharide equivalents
- Different factors are used to calculate energy values, as shown below:

Energy conversion factors used in food labelling

	kcal/g	kJ/g
Protein	4	17
Carbohydrate expressed as weight	4	17
Fat	9	37
Alcohol	7	29
All organic acids	3	13
Sorbitol and other polyols	2.4	10

Format of 7-bit ASCII files

A line called RECTYPE starts each new record and is used to indicate the record type.[17] For example, it may show that the record is an explanatory text record, a data record (nutrient values), a recipe record *etc*.

Each record is terminated with three asterisks "***" starting in column 1 of the line.

The files currently contain three record types:

RECTYPE 0
This is a header record and gives information about the data and includes the title, version, creation date, copyright statement and any other relevant notes.

RECTYPE -1
This is the descriptor record and gives explanatory text
for RECTYPE 1 (data) records. The RECTYPE -1 record contains all possible fields of the RECTYPE 1 (data) records in the file and provide a full description of the meaning of the acronyms used in the data records. Generally, the RECTYPE -1 records will precede the corresponding data records. Each descriptor is output as a separate line preceded by the field acronym, a vertical bar (ASCII Dec.124, Hex.7C) and a space *e.g.:*

CHOL| Cholesterol mg

where CHOL is the acronym used in the data records for cholesterol and mg are the units in which the nutrient value for cholesterol is expressed per 100g of food. The units information is separated from the nutrient description by two space characters. The order of the information in the RECTYPE -1 record is alphabetical by field acronym.

A complete listing of all field acronyms, their descriptions and units used (per 100g or 100ml of food) is given in Annex 3.

RECTYPE 1
Each of the records of this type contain the data for a food. Each nutrient value (or food name, food number *etc*) is output on a separate line and is preceded by its field acronym *e.g.*:

NAME| Compound cooking fat
CHOL| 425

Where the information in a field occupies more than one line, *e.g.* data source, the acronym for the field is repeated at the start of each new line.

Food records are ordered by food code and the order of data for an individual food in this record type are as in the corresponding printed publication.

The following notes apply to data in RECTYPE 1 records:

1. Nutrient values within round brackets, ( ), are estimated.

2. A trace value for a nutrient is represented by Tr.

3. Where a nutrient is present in significant quantities, but there is no reliable information on the amount, the value is represented by N.

4. Footnote information is appended to the field to which it applies and is enclosed in square braces, [ ], and is separated from the corresponding value by three space characters.

Copyright

Please note that the integrated dataset files are available from FSA website free of charge, however the data itself is subject to Crown copyright. The terms and conditions for use of the food composition datasets, as set out by The Controller of Her Majesty's Stationery Office, are detailed in **Annex 1**.

If you wish to re-use the food composition data, either within, or to create, another product, you are required to **purchase** a copyright licence (a Click-Use Value Added Licence) from Office of Public Sector Information (OPSI). Details of which can be found at:
http://www.opsi.gov.uk/click-use/value-added-licence-information/index.htm.

Further Information

Please contact: Food Standards Agency
Room 808
Aviation House
125 Kingsway
London
WC2B 6NH
Tel: 020 7276 8981
Email: Nut-A-Enquiries@foodstandards.gsi.gov.uk

References and Endnotes

1. McCance and Widdowson's The Composition of Foods, Sixth summary edition. Food Standards Agency (2002). Cambridge: Royal Society of Chemistry. ISBN 0-85404-428-0.
2. Fatty Acids. Ministry of Agriculture, Fisheries and Food. (1998). Seventh supplement to 5th edition of McCance and Widdowson's The Composition of Foods. The Royal Society of Chemistry, Cambridge.
3. Meat Products and Dishes. Chan, W. Brown, J. Church, S.M. and Buss, D.H. (1996). Sixth supplement to 5th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
4. Meat, Poultry and Game. Chan, W. Brown, J. Lee, S, and Buss, D.H. (1995). Fifth supplement to 5th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
5. Miscellaneous Foods. Chan, W. Brown, J. and Buss, D.H. (1994). Fourth supplement to 5th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
6. Fish and Fish products. Holland, B. Brown, J. and Buss, D.H. (1993). Third supplement to 5th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
7. Vegetable Dishes. Holland, B. Welch, A.A. and Buss, D.H. (1992). Second supplement to 5th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
8. Fruit and Nuts. Holland, B. Unwin, I.D. and Buss, D.H. (1992). First supplement to 5th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
9. Vegetables, Herbs and Spices. Holland, B. Unwin, I.D. and Buss, D.H. (1991). Fifth supplement to McCance and Widdowson's The Composition of Foods, Royal Society of Chemistry, Cambridge.
10. Milk Products and Eggs. Holland, B. Unwin, I.D. and Buss, D.H. (1989). Fourth supplement to McCance and Widdowson's The Composition of Foods, Royal Society of Chemistry, Cambridge.
11. Cereals and Cereal Products. Holland, B. Unwin, I.D. and Buss, D.H. (1988). Third supplement to McCance and Widdowson's The Composition of Foods, Royal Society of Chemistry, Cambridge.
12. Immigrant Foods. Tan S.P, Wenlock, R.W, Buss, D.H. (1985). Second supplement to McCance and Widdowson's The Composition of Foods. Her Majesty’s Stationery Office, London.
13. Sivell, L. M., Bull N. L., Wiggins, R. A., Scuffam, D., Jackson, P. A. Vitamin A activity in foods of animal origin. *J. Sci. Food. Agric.,* 1984, 35, 931-939
14. Olson, J. A. Provitamin A function of carotenoids: The conversion of β-carotene into vitamin A. *J. Nutr.,* 1989, 119, 105-108
15. Department of Health (1991). Dietary reference values for food energy and nutrients for the United Kingdom. Report on Health and Social Subjects No. 41, HMSO, London
16. McClaughlin, P. J. and Weihrauch, J. L. Vitamin E content of foods. *J. Am. Diet. Assoc.,* 1979, 75, 647-665

17. To avoid the confusion that sometimes occur when referring to logical records and physical records, the terms "line" and "record" will be used here. A "line" is a character string terminated by a carriage-return and line-feed sequence. In other words, it corresponds to a line of information that would be seen if the file were to be listed. A "record" comprises all the data values for any individual foodstuff and will comprise several “lines"

ANNEX 1

TERMS AND CONDITIONS OF INDIVIDUAL USE

DEFINITIONS

"the Database"	The electronic data files of CoF series
"the Data"	The data that makes up the Database.
"the Controller"	THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE, Her Majesty's Stationery Office, Kew, Richmond, Surrey, TW9 4DU
"Food Standards Agency"	The Food Standards Agency, responsible for the maintenance of the Data.

1. The Data contained on the Database is supplied to the End-User for in-house use only.

   The End-User may:

   a. use one copy of the Data contained on the Database on a single computer.
   b. print out selected portions of the Data for internal use;
   c. download or transfer selected portions of the data in machine-readable format into the End-User's own computer for further reference. All transferred Data remain the copyright of the Crown;
   d. make a copy of the Database for back-up/archival/disaster recovery purposes.

   The End-User **MAY NOT** under any circumstances:

   a. sell or distribute the Data in whole or in part or any extract therefrom to any third party or to another location;
   b. use the Database or extracts therefrom whether in machine-readable, optical or printed form to produce other products of any kind without the written permission from the Controller;
   c. use the Data or Database to provide consultancy services to third parties.

2. The End-User acknowledges that no warranty is given by the Food Standards Agency as to the accuracy and comprehensiveness of the Database.

3. The End-User agrees to indemnify the Controller and the Food Standards Agency and hold them harmless from and against:

   a. all loss, costs, claims and damages arising from any breach by the End-User of his obligation under these terms and conditions;
   b. any claim by a third party who alleges he has sustained damages from use of information obtained directly or indirectly through the End-User from the Database.

ANNEX 2

INTRODUCTION TO McCANCE AND WIDDOWSON'S COMPOSITION OF FOODS 6TH SUMMARY EDITION

1.1 Background

"A knowledge of the chemical composition of foods is the first essential in the dietary treatment of disease or in any quantitative study of human nutrition" (McCance & Widdowson, 1940).

1.1.1 This sixth summary edition of the UK food composition tables extends and updates a series which began with the vision of R A McCance and Elsie Widdowson in the 1930s, under the auspices of the Medical Research Council. Following publication of the fourth edition of McCance and Widdowson's *The Composition of Foods* in 1978, the Ministry of Agriculture, Fisheries and Food (MAFF) took on the responsibility for maintaining and updating the official tables of food composition in the United Kingdom. In 1987, the Ministry joined with the Royal Society of Chemistry to begin production of a computerised UK National Nutrient Databank from which a number of detailed supplements (Table 1) and the fifth edition of *The Composition of Foods* (Holland *et al.*, 1991) were produced. Responsibility for data compilation returned to MAFF in 1997 and a detailed supplement on the fatty acid composition of foods was published in 1998 (MAFF, 1998). Responsibility for the maintenance of the UK National Nutrient Databank transferred to the Food Standards Agency on its establishment in April 2000. The data for this sixth summary edition were compiled, under contract, by the Institute of Food Research.

1.1.2 This sixth summary edition is intended to be a convenient book which includes in one volume the most recent values for a range of commonly-consumed foods. As such, it comprises a sub-set of published and new data with the range of both foods and nutrients being limited. It replaces the fifth edition, but not the detailed supplements (Table 1), which make up the UK National Nutrient Databank.

1.1.3 Computer-readable files of the data for most of the supplements and the fifth and sixth editions are available. Details can be obtained from the Food Standards Agency.

1.1.4 Now that the series of supplements is complete, a comprehensive integrated dataset will be produced. However, prior to this, it was decided to publish this summary edition in response to the widely expressed need for a convenient book which includes in one volume the most recent nutrient values for the whole range of common foods.

Table 1 *Supplements to '**The Composition of Foods'***

Amino Acids and Fatty Acids	Paul *et al.*, 1980
Immigrant Foods	Tan *et al.*, 1985
Cereals and Cereal Products	Holland *et al.*, 1988
Milk Products and Eggs	Holland *et al.*, 1989
Vegetables, Herbs and Spices	Holland *et al.*, 1991
Fruit and Nuts	Holland *et al.*, 1992
Vegetable Dishes	Holland *et al.*, 1992
Fish and Fish Products	Holland *et al.*, 1993
Miscellaneous Foods	Chan *et al.*, 1994
Meat, Poultry and Game	Chan *et al.*, 1995
Meat Products and Dishes	Chan *et al.*, 1996
Fatty Acids	MAFF, 1998

1.2 Sources of data and methods of evaluation

1.2.1 It is essential that food composition tables are regularly updated for a number of reasons. Since the fifth summary edition was published, many new fresh and manufactured foods have become familiar items in our shops, and values for these have been included wherever possible. In addition, the nutritional value of many of the more traditional foods has changed. This can happen when there are new varieties or new sources of supply for the raw materials; with new farming practices which can affect the nutritional value of both plant and animal products; with new manufacturing practices including changes in the type and amounts of ingredients (including reductions in the amount of fat, sugar and salt added or new fortification practices); and with new methods of preparation and cooking in the home.

1.2.2 To ensure that the UK food composition tables could continue to have as wide a coverage and be as up to date as possible, the Ministry of Agriculture, Fisheries and Food (MAFF) decided in the early 1980s to set up a rolling programme of food analysis. Responsibility for this programme transferred to the Food Standards Agency on its establishment in April 2000. The analytical reports from recent studies (1990 onwards) are available from the Food Standards Agency library. (A small charge will be made to cover copying and postage). A few reports are available on the Food Standards Agency website (www.food.gov.uk). These reports comprise raw laboratory data and have not been evaluated to the same extent as data incorporated into the *Composition of Foods*.

1.2.3 Most of the values included in these Tables have been taken from the detailed supplements, themselves mainly derived from MAFF's series of analytical studies. This edition also includes new, and previously unpublished, analytical data for a number of key foods, particularly cereals and cereal products, and milk and milk products. Further details are given in the introduction to each food group. In addition, foods for which new data are included can easily be identified by the inclusion of a new food code in the food index. Reports from which new data for this summary edition were taken are included in the *References* section.

1.2.4 Where new analytical data were not available the values have been taken from a number of sources including the scientific literature, manufacturers' data and by calculation. All recipes have been recalculated, using the most recent available data for ingredients.

1.2.5 Where the values in the Tables were derived by direct analysis of the foods, great care was taken when designing sampling protocols to ensure that the foods analysed were representative of those used by the UK population. For most foods a number of samples were purchased at different shops, supermarkets or other retail outlets. The samples were not analysed separately but were pooled before analysis. When the composite sample was made up from a number of different brands of food, the numbers of the individual brands purchased were related to their relative shares of the retail market. If the food required preparation prior to analysis, techniques such as washing, soaking, cooking, etc. were as similar as possible to normal domestic practices.

1.2.6 A summary of the analytical techniques used for this edition is given in Section 4.1.

1.2.7 Where data from literature sources were included in the Tables preference was given to reports where the food was similar to that in the UK, where the publication gave full details of the sample and its method of preparation and analysis, and where the results were presented in a detailed and acceptable form. The criteria for assessing literature values are summarised in Table 2.

1.2.8 Where manufactured foods with proprietary names are included in the database they are restricted to leading brands with an established composition. It should be noted that manufacturers can change their products from time to time and this will influence nutrient content. This is particularly relevant for foods where nutrients are added for fortification purposes, or for technological purposes, such as antioxidants or as colouring agents. The inclusion of a particular brand does not imply that it has a special nutritional value.

1.2.9 The final selection of values published here is dependent on the judgement of the compilers and their interpretation of the available data. There can be no guarantee that a particular item will have precisely the same composition as that in these Tables because of the natural variability of foods.

1.2.10 Users are advised to consult other sources of data (e.g. product labels, manufacturers' data), where appropriate. For example, users who require data on the nutrient content of foods consumed by South Asians in the UK are advised to refer to Judd *et al*. (2000).

Table 2	*Criteria applied before acceptance of literature values*[a]
Name of food	Common name, with local and foreign synonyms Systematic name with variety where known.
Origin	Plants: Country of origin Locality, with details of growth conditions if available Animals: Country of origin Locality and method of husbandry and slaughter (if available)
Sampling	Place and time of collection Number of samples and how these were obtained Nature of sample (e.g. raw, prepared, deep frozen, prepacked etc.) Ingredient details
Treatment of samples Before analysis	Conditions and length of storage Preparative treatment e.g. material discarded as waste and whether washed or drained Cooking details (where applicable) e.g. length of cooking, temperature and the cooking medium.
Analysis	Details of material analysed Methods used, with appropriate reference and details of any modifications
Methods of expression of Results	Statistical treatment of analytical values Whether expressed on an 'as purchased', 'edible matter' or 'dry matter', etc. basis

[a] Modified from Southgate (1974), Greenfield and Southgate (1994)

1.3 Arrangement of the Tables

1.3.1 This book is composed of three parts, the Introduction, the Tables and a number of Additional Tables and Appendices.

1.3.2 The **Tables** contain four pages of information for each food.

The **first page** gives the food number, name and description along with data for edible proportion and the major constituents (water, nitrogen, protein, fat, carbohydrate and energy).

Food number

For ease of reference, each food has been assigned a consecutive publication number for the purposes of this edition only. In addition, each food has a unique food code number which is given in the index and will allow read-across to the supplements or the fifth edition, where appropriate. For foods that have already been included in supplements or in the fifth edition and for which there are no new data, their food code number (including the unique 2 digit prefix) has been repeated. These prefixes are 11 - *Cereals and Cereal Products*, 12 - *Milk Products and Eggs*, 13 - *Vegetables, Herbs and Spices,* 14 - *Fruit and Nuts*, 15 - *Vegetable Dishes*, 16 - *Fish and Fish Products*, 17 - *Miscellaneous Foods*, 18 - *Meat, Poultry and Game*, 19 - *Meat Products and Dishes*, and 50 - *Fifth Edition*. Foods that have not previously been included have been given a new food code number in the supplement using that prefix (e.g. plain bagel (11-534)). Where new data have been incorporated for an existing food, a new food code has also been allocated but with the same supplement prefix (e.g. beef bourguignon was 19-161, now 19-330). For ease of use, the original food code number is given alongside the new one in the index for the foods concerned. These are the numbers that will be used in nutrient databank applications.

Food name

The food name has been chosen as that most recognisable and descriptive of the food referenced.

Description

Information given under the description and number of samples describes the number and nature of the samples taken for analysis. Sources of values derived either from the literature or by calculation are also indicated under this heading. Further summary information on the sources of data used for each food are given in the computer-readable files for this edition.

The **second page** gives starch, total and individual sugars (glucose, fructose, sucrose, maltose, lactose), dietary fibre (expressed as non-starch polysaccharide), fatty acid totals, and cholesterol.

The **third page** gives data for inorganic elements and the **fourth page** data for the vitamin composition of the foods.

All nutrients are quoted per 100g edible portion of food with the exception of the alcoholic beverages group where they are per 100ml.

Foods have been arranged in groups with common characteristics. The arrangement of the food groups in the Tables are as follows:- cereals and cereal products, milk and milk products, eggs, fats and oils, meat and meat products, fish and fish products, vegetables, herbs and spices, fruits, nuts, sugars, preserves and snacks, beverages, alcoholic beverages and sauces, soups, and miscellaneous foods. Generally the order within the groups is similar to that in the corresponding supplement. A few foods have been placed in different groups from those in which they previously appeared where this is more appropriate for a general work covering all food groups. Each food group is preceded by text covering points of specific relevance to the foods in that group.

1.3.3 **Additional tables** cover alternative methods for determining dietary fibre, phytosterols, carotenoid and vitamin E fractions, and vitamin K_1 (phylloquinone).

1.3.4 Information contained in the **Appendices** includes a summary of analytical techniques, weight changes on the preparation of foods, cooked foods and dishes, the recipes, calculation of nutrient content for foods 'as purchased' or 'as served', a table of alternative and taxonomic names for foods and references to the Tables and Introduction. These sections provide useful supporting information for the data in the Tables.

1.3.5 A combined food index and coding list is provided at the end of the appendices. This also includes cross-references from alternative food names and taxonomic names to the food names used in the Tables.

1.4 The definition and expression of nutrients

1.4.1 *The expression of nutrient values*

For this summary edition, all foods are expressed per 100g edible portion. The primary reason for this was to maximise the number of different foods that could be included in the book, while ensuring that it did not become unduly large. For foods that are generally purchased or served with waste, guidance for calculating nutrient content 'as purchased' or 'as served' is given in Section 4.2.

Generally the values have been expressed to a constant number of decimal places for each nutrient. However, exceptions have been made where appropriate, either within groups of foods or for individual values. For example, the iron content of liquid milks has been expressed to 2 decimal places, because the amounts that can be drunk render this value significant. The values of the more variable vitamins such as biotin have been expressed to less than their usual number of places where large values render the extra places non-significant.

Many foods are purchased or served with inedible material and a factor is given which shows the proportion of the edible matter in the food. For raw food this refers to the edible material remaining after the inedible waste has been trimmed away, e.g. the outer leaves of a cabbage. For canned foods such as vegetables the factor refers to the edible contents after the liquid has been drained off.

For this summary edition, all foods are expressed per 100g edible portion. The primary reason for this was to maximise the number of different foods that could be included in the book, while ensuring that it did not become unduly large. For foods that are generally purchased or served with waste, guidance for calculating nutrient content 'as purchased' or 'as served' is given in Section 4.2.

1.4.2 *Protein*

For most foods, protein has been calculated by multiplying the total nitrogen value by the factors shown in Table 3.

Table 3 *Factors for converting total grams of nitrogen in foods to protein*[a]

Cereals		Nuts	
Wheat		-Peanuts, Brazil nuts	5.41
-Wholemeal flour	5.83	-Almonds	5.18
-Flours, except wholemeal	5.70	-All other nuts	5.30
-Pasta	5.70	Milk and milk products	6.38
-Bran	6.31	Gelatin	5.55
Maize	6.25	All other foods	6.25
Rice	5.95		
Barley, oats, rye	5.83		
Soya	5.70		

[a]FAO/WHO (1973)

The proportion of non-protein nitrogen is high in many foods, notably fish, fruits and vegetables. In most of these, however, this is amino acid in nature and therefore little error is involved in the use of a factor applied to the total nitrogen, although protein in the strictest sense is overestimated. For those foods which contain a measurable amount of non-protein nitrogen in the form of urea, purines and pyrimidines (e.g. mushrooms) the non-protein nitrogen has been subtracted before multiplication by the appropriate factor.

1.4.3 *Fat*

The fat in most foods is a mixture of triglycerides, phospholipids, sterols and related compounds. The values in the Tables refer to this total fat and not just to the triglycerides.

1.4.4 *Carbohydrates*

Total carbohydrate and its components, starch and total and individual sugars (glucose, fructose, sucrose, maltose, lactose), but not fibre, are wherever possible expressed as their monosaccharide equivalent. The values for total carbohydrate in the Tables have generally been obtained from the sum of analysed values for these components of ‘available carbohydrate’, contrasting with figures for carbohydrate ‘by difference’ which are sometimes used in other food tables or on the labels of manufactured foods. Such figures are obtained by subtracting the measured weights of the other proximates from the total weight and many include the contribution from any dietary fibre present as well as errors from the other analyses. A few values have been included from other tables, or from manufacturers, and are printed in italics to distinguish them from direct analyses.

Available carbohydrate is the sum of the free sugars (glucose, fructose, galactose, sucrose, maltose, lactose and oligosaccharides) and complex carbohydrates (dextrins, starch and glycogen). These are the carbohydrates which are digested and absorbed, and are glucogenic in man. This corresponds to the term “glycaemic carbohydrates” proposed in the FAO/WHO report on Carbohydrates in Human Nutrition (FAO, 1998).

Carbohydrate values expressed as monosaccharide equivalents can exceed 100g per 100g of food because on hydrolysis 100g of a disaccharide such as sucrose gives 105g monosaccharide (glucose and fructose). 100g of a polysaccharide such as starch gives 110g of the corresponding monosaccharide (glucose). Thus white sugar appears to contain 105g carbohydrate (expressed as monosaccharide) per 100g sugar. For conversion between carbohydrate weights and monosaccharide equivalents, the values shown in Table 4 should be used.

Table 4 Conversion of carbohydrate weights to monosaccharide equivalents

Carbohydrate	Equivalents after hydrolysis g/100g	Conversion to monosaccharide equivalents
Monosaccharides e.g. glucose, fructose and galactose	100	no conversion necessary
Disaccharides e.g. sucrose, lactose and maltose	105	x 1.05 or ÷ 0.95
Oligosaccharides e.g.		
raffinose (trisaccharide)	107	x 1.07 or ÷ 0.93
stachyose (tetrasaccharide)	108	x 1.08 or ÷ 0.93
verbascose (pentasaccharide)	109	x 1.09 or ÷ 0.92
Polysaccharides e.g. starch	110	x 1.10 or ÷ 0.90

Any known or measured contribution from oligosaccharides and/or maltodextrins has been included in the total carbohydrate value but not in the columns for starch or total sugars. In most foods oligosaccharides are present in relatively low quantities. In vegetables however, and some processed foods where glucose syrups and maltodextrins are added, oligosaccharides will make a significant contribution to carbohydrate content. Because of this the sum of starch and total sugars will be less than the total carbohydrate for these foods and where this occurs the values have been marked in the Tables with footnotes.

1.4.5 *Dietary fibre*

Different methods give different estimates of the total fibre content of food. The values shown in the main Tables are total non-starch polysaccharides (NSP) (Englyst and Cummings, 1988). An additional table comparing values obtained by the NSP (Englyst) method and the AOAC method (AOAC, 2000), for the very few foods for which analytical data on the same samples are available, is also included. For nutritional labelling purposes, it is recommended that fibre values obtained by AOAC methodology are used.

1.4.6 *Alcohol*

The values for alcohol are given as g/100ml of alcoholic beverages. Pure ethyl alcohol has a specific gravity of 0.79 and dividing the values of 0.79 converts them to alcohol by volume (i.e. ml/100ml). The specific gravities of the alcoholic beverages are given in the introduction to that section of the Tables so that calculations can be made if the beverages are measured by weight. The alcohol contents of a range of strengths 'by volume' are also given in the introduction to the section on Alcoholic Beverages in the Tables.

1.4.7 *Energy value - kcal and kJ*

The metabolisable energy values of all foods are given in both kilocalories (kcal) and kilojoules (kJ). These energy values have been calculated from the amounts of protein, fat, carbohydrate and alcohol in the foods using the energy conversion factors shown in Table 5.

Table 5 *Metabolisable energy conversion factors used in these Tables*[ab]

	kcal/g	kJ/g
Protein	4	17
Fat	9	37
Available carbohydrate		
Expressed as monosaccharide	3.75	16
Alcohol	7	29

[a] Royal Society (1972)
[b] See Section 1.9 for the conversion factors that should be used in food labelling

These factors permit the calculation of the metabolisable energy of a typical United Kingdom mixed diet with a level of accuracy which compares well with values obtained in human subjects using calorimetry (Southgate and Durnin, 1970). No contribution from NSP or sugar alcohols is included in these calculations. There is currently some debate about the use of these factors (Livesey *et al.*, 2000).

The energy value of foods in kilojoules can also be calculated from the kilocalorie value using the conversion factor 4.184 kJ/kcal. Whilst it is more accurate to apply the kilojoule factors in Table 5 to protein, fat, carbohydrate and alcohol, a direct kcal/kJ conversion produces differences of little dietetic significance (1-2 per cent).

1.4.8 *Fatty acids*

For this edition, only total saturated, monosaturated, and polyunsaturated and total *trans* unsaturated fatty acids are given. More detailed information on individual fatty acids is available in the *Fatty Acids* supplement (MAFF, 1998).

The fat in most foods contains non fatty acid material such as phospholipids and sterols. To allow the calculation of the total fatty acids in a given weight of food, the conversion factors shown in Table 6 were applied.

A worked example is shown below (TFA = total fatty acids; taken from MAFF, 1998):

		Total fat in Beef , lean only	= 5.1g/100g
		Conversion factor	= 0.916
		Total fatty acids in beef = 5.1 x 0.916	= **4.7**g/100g
Saturates	at 43.7g/100g	TFA x 4.7 ÷ 100	= 2.0g/100g food
Monosaturates	at 47.9g/100g	TFA x 4.7 ÷ 100	= 2.2g/100g food
Polyunsaturates	at 3.8g/100g	TFA x 4.7 ÷ 100	= 0.2g/100g food

N.B. The values do not add up to the total fatty acids because branched-chain and *trans* fatty acids have been excluded from the saturated and unsaturated fatty acids respectively.

Table 6 *Conversion factors to give total fatty acids in fat*[a]

Wheat, barley and rye[b]		Beef lean[d]	0.916
whole grain	0.720	Beef fat[d]	0.953
flour	0.670	Lamb, take as beef	
bran	0.820	Pork lean[e]	0.910
		Pork fat[e]	0.953
Oats, whole[b]	0.940	Poultry	0.945
Rice, milled[b]	0.820	Heart[e]	0.789
Milk and milk products	0.945	Kidney[e]	0.747
Eggs	0.830	Liver[e]	0.741
		Fish, fatty[f]	0.900
Fats and oils		white[f]	0.700
all except coconut oil	0.956	Vegetables and fruit	0.800
Coconut oil	0.942	Avocado pears	0.956
		Nuts	0.956

[a]Paul & Southgate (1978)
[b]Weihrauch *et al.* (1976)
[c]Posati *et al.* (1975)
[d]Anderson *et al.* (1975)
[e]Anderson (1976)
[f]Exler *et al.* (1975)

1.4.9 *Cholesterol*

Cholesterol values are included for all foods in this publication and are expressed as mg/100g food. To convert to mmol cholesterol, divide the values by 386.6.

1.4.10 *Inorganic constituents*

Details of the inorganic constituents covered in Tables are given in Table 7. Further information on variability can be found in Section 1.5 and on bioavailability in Section 1.6.

Table 7 *Inorganic constituents*

Atomic symbol	Name	Units	Atomic weight[a]
Na	Sodium	mg/100g	23
K	Potassium	mg/100g	39
Ca	Calcium	mg/100g	40
Mg	Magnesium	mg/100g	24
P	Phosphorus[b]	mg/100g	31
Fe	Iron	mg/100g	56
Cu	Copper	mg/100g	64
Zn	Zinc	mg/100g	65
Cl	Chloride	mg/100g	35
Mn	Manganese	mg/100g	55
Se	Selenium	µg/100g	79
I	Iodine	µg/100g	127

[a] To convert the weight of a mineral to mmol or µmol divide by the atomic weight
[b] To convert mg P to mg PO_4 multiply by 3.06

Selenium

Many new values for selenium have been incorporated into this edition, taken from the analytical programme and from a specially commissioned analytical study (Barclay *et al.*, 1995). The selenium content of soil has a large effect on the foods harvested from it. The levels of selenium in UK soils are low and analysed values reflect this. Data from literature sources have been taken from those countries with similar soil profiles to the UK. Where the values selected are of non-UK origin (or a food is from an overseas source) the values appear in brackets.

1.4.11 *Vitamins*

Details of vitamins covered in the Tables are given in Table 8.

Table 8 *Vitamins*

Vitamin	**Units**	**International Units (IU)**[a]
Vitamin A	µg/100g	0.3µg
Retinol	µg/100g	0.6µg
Carotene (β-carotene equivalents)	µg/100g	0.025µg
Vitamin D		
Cholecalciferol, ergocalciferol	mg/100g	0.67mg
Vitamin E		
α-Tocopherol equivalents	µg/100g	
Vitamin K1 (phylloquinone)		
(additional table only)	mg/100g	
Thiamin	mg/100g	
Riboflavin		
Niacin	mg/100g	
Total preformed niacin	mg/100g	
Tryptophan (mg) divided by 60	mg/100g	
Vitamin B_6		
All forms (pyridoxine, pyridoxal,		
pyridoxamine and phosphates of these)	µg/100g	
Vitamin B_{12}	µg/100g	
Folate		
Total folate	mg/100g	
Pantothenate	µg/100g	
Biotin	mg/100g	
Vitamin C		
Total ascorbic and dehydroascorbic acid		

[a] Amount equivalent to one International Unit

Vitamin A: retinol and carotene

The two main components of the vitamin are given separately in the Tables.

Retinol is found in many animal products, the main forms being all-trans retinol and 13-*cis* retinol. The latter has about 75% of the activity of the former (Sivell *et al.,* 1984). Eggs and fish roe also contain retinaldehyde which has 90% of the activity of all-trans retinol. Retinol is expressed in the Tables as the weight of all-trans retinol equivalent, i.e. the sum of all-trans retinol plus contributions from the other two forms after correction to account for their relative activities.

Approximately 600 carotenoids are found in plant products and milks but few have vitamin A activity (Olson, 1989). Of these, the most important is β-carotene. The other main forms with vitamin A activity are α-carotene and α- and β-cryptoxanthins, which have approximately half the activity of β-carotene. Carotene is expressed in the Tables in the form of β-carotene equivalents, that is the sum of the β-carotene and half the amounts of α-carotene and α- and β-cryptoxanthins present. Where the carotenoid profile was incomplete, it has been assumed that all is β-carotene. This may result in an overestimate but as α-carotene and cryptoxanthin are usually present in low levels in foods without complete carotenoid profiles, it is likely that any error is small.

Retinol equivalents

In the UK the requirement for vitamin A is expressed as retinol equivalents (Department of Health, 1991). This measure of the overall potency of vitamin A relates to the lower biological efficiency of carotenoids compared with retinol. The absorption and utilisation of carotenes vary, for example with the amount of fat in the diet and ß-carotene concentration (Brubacher and Weiser, 1985), and there is currently much debate about use of retinol equivalents (Scott & Rodriquez-Amaya, 2000). However, the generally accepted relationship is still that 6µg β-carotene or 12µg of all other active carotenoids are equivalent to 1µg retinol (Department of Health, 1991), so that:-

$$\text{Vitamin A potency as µg retinol equivalents} = \text{µg retinol} + \frac{\text{µg β-carotene equivalents}}{6}$$

Recent work suggests that this convention may need revision in the future.

The relationship between the different units used to express vitamin A is shown in Table 9.

Table 9 *Relationship and conversion between the units used to express retinol and carotene*

Retinol µg/100g	→			x 3.3	→			**Retinol I.U.**
	←			x 0.3	←			
				Retinol equivalents µg	→	x 3.3	→	
	←	x 1	→					
					←	x 0.3	←	
β-Carotene equivalents µg/100g	←	x 6	←		→	x 10	→	**β-Carotene Equivalents I.U.**
	→	÷ 6	→		←	x 0.1	←	
	→			x 1.67	→			
	←			x 0.60	←			

Vitamin D

Few foods contain vitamin D. All those which do so naturally are animal products and contain D_3 (cholecalciferol) derived, as in humans, from the action of sunlight on the animal's skin or from its own food. Vitamin D_2 (ergocalciferol) made commercially has the same potency in man. Both vitamin D_2 and vitamin D_3 are used to fortify a number of foods.

Meat can contain vitamin D_3 (cholecalciferol) derived from the action of sunlight or, for pigs and poultry, from the feed. This may be present in the form of the more active 25-hydroxy vitamin D_3. For meat, meat products, and poultry, therefore, the total vitamin D activity has been taken as the sum of vitamin D_3 (cholecalciferol) and five times 25-hydroxy vitamin D_3 (25-hydroxy cholecalciferol), where data are available. There is, however, some debate about the factor that should be used for 25-hydroxy vitamin D_3 when estimating total vitamin D activity.

Vitamin E

The vitamin E in food is present as various tocopherols and tocotrienols, each having a different level of vitamin E activity. In most animal products the α-form is the only significant form present but in plant products, especially seeds and their oils, γ-tocopherol and other forms are present in significant amounts. The values for vitamin E are expressed as α-tocopherol equivalents, using the factors shown in Table 10.

Table 10	*Conversion factors for vitamin E activity*[a]		
	alpha-tocopherol	x	1.00
	beta-tocopherol	x	0.40
	gamma-tocopherol	x	0.10
	delta-tocopherol	x	0.01
	alpha-tocotrienol	x	0.30
	beta-tocotrienol	x	0.05
	gamma-tocotrienol	x	0.01

[a] McLaughlin and Weihrauch (1979)

Vitamin K_1

The predominant, naturally occurring, vitamin K that occurs in foods is phylloquinone (vitamin K_1) and it is this that is reported in the Additional table (Section 3.5). Phylloquinone is lipid soluble and is found in the photosynthetic tissue of plants. As such, the darker green the plant leaves, the more phylloquinone is present (Shearer *et al*., 1996; Bolton-Smith *et al*., 2000). Certain vegetable oils, namely rapeseed, soybean and olive oils are also relatively high in phylloquinone compared to corn (maize) and sunflower seed oil. The phylloquinone content of plants (and therefore presumably plant oils) also varies by climate and soil conditions (Ferland & Sadowski, 1992).

Hydrogenation of oils results in the conversion of phylloquinone to 1,3, dihydro-phylloquinone (Davidson *et al*., 1996) and this may be a significant proportion of total vitamin K present in some foods, such as biscuits and margarines. In the USA, estimates of 2,3, dihydro-phylloquinone intake suggest it may be the major dietary form of vitamin K in some population groups (Booth *et al*., 1996b). The biological activity of the dihydro form may be less than that of native phylloquinone, however the precise relationship is unclear, and food content data for the UK is currently unavailable.

A second family of, naturally occurring, functional vitamin K compounds, the menaquinones (MKn, where n represents the number of isoprene units in the side chain) are formed by bacteria. They are likely to occur in variable quantities in fermented foods, and to a minor extent in some cheese, as a result of the bacterial inoculation during their production. Menaquinones may also be found in some meats, such as chicken, as a result of feeding with the synthetic form of vitamin K, menadione, which is activated in vivo by conversion to MK4. Inadequate information on the MK content of foods is available for inclusion in the current table.

Thiamin

The majority of values for thiamin are expressed as thiamin chloride hydrochloride using either the direct thiochrome method, HPLC with fluorimetric detection or microbiological assay (see Section 4.1).

Niacin

The values are the sum of nicotinic acid and nicotinamide which are collectively known as niacin.

Tryptophan is converted in the body to nicotinic acid with varying efficiency. On average, 60mg tryptophan is equivalent to 1mg niacin, so the tryptophan content of the protein in each food has been shown after division by 60. This may be added to the amount of niacin to give the niacin equivalent for the food.

Vitamin B_6

Vitamin B_6 occurs in foods as pyridoxine, pyridoxal, pyridoxamine and their phosphates. However, the active form in the tissues is pyridoxal phosphate. In the main, pyridoxine is expressed in the Tables as pyridoxine hydrochloride by microbiological assay, or the sum of the individual forms by HPLC, and expressed as the sum of pyridoxine hydrochloride, pyridoxal hydrochloride and pyridoxamine dihydrochloride (see Section 4.1). The newer HPLC values for vitamin B6 do not always agree closely with total B6 values obtained by microbiological assay. This can be due to the different extraction procedures employed for the methods, and the varying response of the organism to the vitamers in the microbiological assay (Ollilainen *et al.*, 2001).

Folate

For folates, the value refers to total folates measured by microbiological assay after deconjugation of the polyglutamyl forms. Folic acid (PteGlu) is the predominant form used for fortification purposes. Other major folates present in food are 5-methyltetrahydrofolates ($5\text{-}CH_3H_4PteGlu_n$; mainly plant- and dairy-based foods), 5- and 10-formyltetrahydrofolates (5- and $10\text{-}CHOH_4PteGlu_n$; mainly animal-based foods) and tetrahydrofolates ($H_4PteGlu_n$). Some HPLC-derived values are available for 5-methyltetrahydrofolate (Laboratory of the Government Chemist, 1996), but the values for other folates are much less reliable.

Pantothenate

The majority of values for pantothenate are expressed as calcium D-pantothenate.

Vitamin C

Values include both ascorbic and dehydroascorbic acids, as both forms are biologically active. In fresh foods the reduced form is the major one present but the amount of the dehydro-form increases during cooking and processing. The older values for vitamin C (prior to the 4^{th} edition of *The Composition of Foods*) are based on the titrimetric procedure which only determines ascorbic acid. For the newer data, total ascorbate (ascorbic acid + dehydroascorbic acids) have been determined using either the fluorimetric procedure or HPLC with UV or fluorescence detection (see Section 4.1).

1.5 The variability of nutrients in foods

1.5.1 Although values in these Tables have been derived from careful analyses of representative samples of each food, it is important to appreciate that the composition of any individual sample may differ considerably from this. There are two main reasons for the variability, apart from the apparent differences caused by analytical variations.

1.5.2 *Natural variation*

All natural products vary in composition. Two samples from the same animal or plant may well be different, but the composition of meat, milk and eggs are also affected by season and by the feeding regime and age of the animal. Different varieties of the same plant may differ in composition, and their nutritional value will also vary with the country of origin, growing conditions and subsequent storage. In general, those nutrients that are closely associated with structure and metabolic function show rather less variation than those which accumulate in particular locations of the plant or animal or those which are unstable. For instance, nitrogen and phosphorus tend to show less variation than vitamin A, iron or vitamin C.

A major influence on the nutrient concentration in foods is the water content and this is particularly important in plant foods where water is the main constituent. As the length and conditions of food storage affect the water content of foods, these will have an effect on their nutrient content per 100g. Many individual nutrients will also be affected by storage conditions with the greatest effect being on the more labile vitamins such as vitamin C, vitamin E and folate. Thus if the storage conditions of a food item differ from those for the samples analysed for the Tables, the nutrient values may differ from those given.

The level of fat in food can vary greatly and result in large variations in the nutrient content of each 100g of the food. It will also influence energy and the level of fat-soluble vitamins. An example of how fat and moisture content vary (in minced meat) is given in Table 11.

Table 11 *Fat and moisture content of minced meats*

	No. samples	**Moisture %** mean (range)	**Fat %** mean (range)
Beef mince, raw[a]	10	64.0 (57.3-70.0)	16.6 (7.8-26.5)
Beef mince, extra lean, raw[a]	10	69.6 (63.8-72.6)	8.3 (3.9-16.9)
Lamb mince, raw[b]	10	66.8 (58.1-71.6)	13.5 (8.1-22.8)
Pork, mince, raw[c]	10	70.6 (64.3-73.2)	9.3 (5.4-19.5)

[a] Laboratory of the Government Chemist (1993a)
[b] Laboratory of the Government Chemist (1993b)
[c] Laboratory of the Government Chemistry (1994b)

1.5.3 Extrinsic differences

Further differences in composition can be introduced by food manufacturers, caterers, and in the home. For example, manufacturers may change both their recipes and their fortification practices, and dishes prepared in the home or by caterers may vary widely in the amounts and types of ingredient used and thus differ in nutritional value from those included here.

Examples of some external influences on nutrient contents are shown below:

Sodium — The level found in many foods will depend upon the amount of salt and other sodium-containing compounds used in cooking or added by manufacturers, and can therefore be very variable. The majority of vegetables analysed for the food tables were cooked in distilled water without salt, although there are a few to which salt was added and these are indicated in the Tables. For planning low-sodium diets the Table values are adequate.

Potassium — The potassium content of boiled vegetables is dependent on the amount of water, length of cooking time and the state of preparation of the vegetable. The user should refer to the description and main data sources for the foods in the Tables to ensure sample foods are comparable.

Calcium — Most vegetables in the Tables were cooked in distilled water. Foods cooked in and prepared with tap water, which contains variable amounts

	of calcium, may not have the same levels as in these Tables. The concentration of calcium in baking powder is high and variations in the quantity used will affect the calcium content of some cereal products.
Iron	Food can become contaminated with iron from knives, pans, soil particles and processing machinery. This has most effect on the iron content of ground foods such as spices.
Chloride	Chloride variation will be similar to that of sodium.
Iodine	Iodine levels in milk are affected by the levels in animal feedstuffs, and to a lesser degree by the iodine levels in the solutions used for teat dips, sanitizers and the lactation promoter iodinated casein (Phillips *et al.,* 1988).
β-Carotene	This is sometimes used as a food colouring additive (E160a). In certain manufactured foods such as orange squash, samples may contained added β-carotene.
Vitamin C	This is added to a number of foods for fortification or antioxidant purposes (E300, L-ascorbic acid) and so may be present in unexpectedly high levels in some foods, including some meat products and soft drinks.

1.6 Bioavailability of nutrients

1.6.1 The term bioavailability (biological availability) is a term used to describe the proportion of a nutrient in food that is utilised for normal body function (Fairweather-Tait, 1998). There are many factors, both dietary and physiological, that influence nutrient bioavailability and because these interactions are so variable, it is not possible to provide an accurate measure of bioavailability in these Tables.

Dietary-related factors include

- the physical form of the nutrient within the food structure, and the ease with which the nutrient can be released from that structure,

- the chemical form of the nutrient in a food and its solubility in the lumen,

- the presence of enhancers of absorption (e.g. ascorbic acid for iron, some organic acids, sugars, amino acids, bulk lipid for fat-soluble vitamins and specific fatty acids), and

- presence of inhibitors (primarily of inorganic absorption, e.g. phosphates (especially phytate), polyphenols including tannins, oxalate and carbohydrate (especially dietary fibre)).

Physiological factors include the composition and volume of gastric and intestinal secretions, and a number of host-related variables, many of which are essential parts of the body's homeostatic regulatory mechanism (e.g. nutritional status, development state, mucosal cell regulation and gut microflora (Fairweather-Tait, 1998).

Allowance has been made for reduced biological activities of different forms of three of the vitamins given in the Tables: 13-cis-retinol and retinaldehyde (vitamin A), carotenes other than β-carotene, and tocopherols and tocotrienols other than α-tocopherol (vitamin E), as described in Section 1.4. Other nutrients in the tables which are absorbed and utilised with varying degrees of efficiency include iron, calcium, magnesium, zinc, copper, manganese, selenium, folate, niacin and vitamin B_6. For all these, no allowance is made in these Tables for the potential lower availability, and the values quoted represent the actual content in foods.

Some additional information on the bioavailability of selected micronutrients follows.

1.6.2 *Iron*

Dietary iron occurs in two major forms, haem (found in haemoglobin and myoglobin in foods derived from animal tissues), and non-haem iron. These forms exhibit different levels of absorption via separate pathways. Haem iron is always relatively well absorbed (20-30%) and only marginally affected by dietary factors or iron status of an individual. Non-haem iron easily forms complexes which are less readily solubilised and absorbed than non-haem iron. The absorption of non-haem iron is highly variable depending on the nature of the meal. Dietary factors which enhance absorption of non-haem iron include; meat, ascorbic acid and certain other organic acids. Polyphenols (including tannins from tea), phytate and calcium decrease bioavailability. Non-haem iron bioavailability is also profoundly influenced by physiological variables, notably body iron status. Previous dietary iron will also affect the bioavailability of subsequent iron (Fairweather-Tait, 1999).

1.6.3 *Zinc*

Zinc is absorbed more efficiently than non-haem iron and it is affected by fewer dietary factors. Phytate is probably the most important zinc antagonist, especially in the presence of calcium, as it forms a chelate with zinc which is unavailable for absorption. Copper, cadmium and iron can also reduce zinc bioavailability. Some proteins have been shown to improve bioavailability but the mechanisms for the effect are not yet clear. Body zinc status plays an important role in determining dietary zinc bioavailability (Fairweather-Tait, 1999).

1.6.4 *Calcium*

The amount of calcium absorbed is dependent on individual vitamin D status, the customary level of calcium intake and needs of the individual and the presence of binding substances in the food (Allen, 1982). Dietary inhibitors include phytate and oxalate. High levels of dietary protein and sodium increase urinary calcium excretion which is accompanied by an increase in intestinal absorption. However, this results in a reduction of calcium utilised by the body and thus lower bioavailability. Lactose promotes absorption and calcium from milk and milk products has a relatively high bioavailability (Fairweather-Tait & Hurrell, 1996).

1.6.5 *Selenium*

Selenium bioavailability depends to a great extent on the chemical form present. Selenium is present as organic and inorganic forms. The two main organic forms are selenomethionine (Se-Met), principally in plant foods, and selenocysteine in foods of animal origin. Se-Met is readily absorbed and results in higher blood selenium concentration than inorganic selenium. The inorganic forms (selenite and selenate) do not occur naturally in foods but are often used as supplements. As with other elements, solubility is the key factor in determining absorption. The main dietary factors which influence selenium bioavailability are methionine, thiols, heavy metals and vitamin C (Fairweather-Tait & Hurrell, 1996).

1.6.6 *Vitamins A & E and Carotenoids*

These compounds need to be dissolved and carried in lipid and lipid+bile salt systems (micelles) in order to be absorbed at the brush border. Protein or protein-calorie malnutrition is often associated with malabsorption of vitamin A. Zinc deficiency, alcohol and some food constituents (e.g. nitrites) are associated with malabsorption of vitamin A (Biesalski, 1997). A number of other dietary factors influence the carotenoid bioavailability especially food structure and the physical form of the carotenoid within the food matrix. The absorption of carotenoids from raw foods can be very low, but cooking, chopping and other types of food preparation enhance absorption by increasing the ease with which carotenoids are extracted from the food matrix (Faulks *et al*., 1997). In vitro results indicate that gastric pH is an important physiological determinant of carotenoid availability (Rich *et al.*, 1998).

α-Tocopherol accounts for almost all of the vitamin E activity in foods of animal origin. Under normal dietary conditions about 20-80% of ingested vitamin E is absorbed, depending on dose and lipid content of the meal. High intakes of pectin, wheat bran, alcohol and polyunsaturated fatty acids also reduce vitamin E absorption. Dietary constituents such as vitamin A, iron, selenium and zinc may affect vitamin E utilisation (Cohn, 1997).

1.6.7 *Folate*

Folate exists in nature primarily as reduced one-carbon substituted forms of pteroylpolyglutames. About 80% of dietary folate occurs as the polyglutamyl form of folate and must be cleaved to the monoglutamate form for absorption. There appears to be little or no difference in the extent of absorption of the various monoglutamyl forms, although stability in the gastro-intestinal tract and in vivo retention may differ.

Numerous dietary and physiological factors influence the deconjugation and absorption of folate, and its subsequent utilisation in the body. Dietary factors may reduce folate bioavailability and include conjugase inhibitors (e.g. in pulses), milk folate binding proteins and dietary fibre (e.g. wheat bran). Physiological factors include intraluminal pH, decreased conjugase enzyme activity associated with ageing, and certain deficiencies (e.g. Zn, B_{12} and folate). The action of endogenous conjugase enzymes during food preparation may increase the bioavailability of naturally occurring polyglutamyl forms (Gregory, 1997a).

1.6.8 *Vitamin B_6*

Vitamin B_6 exists in foods as either the free or phosphorylated forms of pyridoxine, pyridoxamine and pyridoxal. Plant foods contain glucoside bound forms of pyrodoxine which may be unavailable for absorption. Orange juice and wheat bran reduce vitamin B_6 absorption (Gregory, 1997b).

1.6.9 *Niacin*

Much of the niacin occurring naturally in cereals (especially maize) is in a bound form and may be unavailable for absorption. However, alkali treatment, as used in some traditional processing methods, renders the niacin more bioavailable. Sorghum, wheat, barley and rice contain niacin in chemically bound forms (van den Berg, 1997).

1.7 Calculation of nutrient intakes using the Tables

1.7.1 *Calculation*

There are several steps involved in the calculation of nutrient intake from the Tables. The first is to choose the item in the Tables which corresponds most closely with the food consumed. The index includes many alternative names and it should be noted that a food may be found in a different food group from the one in which it is expected.

If the food consumed is not in the Tables then it is necessary to choose a suitable alternative by consideration of the food type, general characteristics and likely nutrient profile. The results, however, are likely to be less accurate. Alternatively, users might wish to seek other sources of data (e.g. manufacturers).

Once the food has been chosen, calculation of nutrient intake is achieved by multiplying the nutrient figure quoted in the Tables by the weight of the food consumed (nutrients are expressed either per 100g of the edible portion of the food, or per 100ml for alcoholic beverages), e.g. if 80g food has been consumed, the nutrient should be multiplied by 0.8, and if 120g consumed multiplied by 1.2. The results from these calculations are then summed to give the total intake.

1.7.2 *Computerised calculation*

Calculation of nutrient intake ‘by hand’ is a time consuming process which has largely been superseded by the use of computers. Information concerning the datafiles and packages available for personal computers and mainframes can be obtained from the Food Standards Agency.

Recipes

If the sample of food consumed is a cooked dish prepared with a different recipe from any of those in this book, the nutrients for the new recipe can be calculated using the methods given in Section 4.3.

Portion sizes

If the weight of food consumed has not been recorded or if an estimate is required, publications such as Bingham and Day (1987), MAFF (1993), and Davies and Dickerson (1991) may be used to provide information on portion sizes. In fieldwork, representations such as pictures (Nelson *et al.*, 1997), models or household measures may also be used to obtain estimates of portion size.

1.8 Potential pitfalls when using the Tables-

"*There are two schools of thought about food tables. One tends to regard the figures in them as having the accuracy of atomic weight determinations; the other dismisses them as valueless on the ground that a foodstuff may be so modified by the soil, the season, or its rate of growth that no figure can be a reliable guide to its composition. The truth, of course, lies somewhere between these two points of view."* (Widdowson & McCance, 1943).

Those who are unfamiliar with the uses of these tables should note the following points which can reflect on the accuracy of the information obtained from them. Further details are available in Greenfield & Southgate (1994).

- When comparing the nutrient values in these Tables with those of other countries or literature reports, the expression of units and conversion factors used in calculation may vary.

- As nutrients are increasingly added to foods for fortification, antioxidant and colorant purposes, users should check the labels of manufactured products.

- Missing nutrient values in food composition tables should not be treated as zero values during calculation otherwise an underestimation of nutrient intake will result. However, the major sources of any nutrient are likely to have been analysed and included in these Tables.

- Errors will arise if food is classified incorrectly, for instance it may be assumed that milk has been consumed in the full fat form when it was in fact skimmed.

- Misclassification of foods may arise as a result of a food having several names. It is therefore important to be familiar with local and alternative names when using food tables, e.g. roast potatoes are known as baked potatoes in some parts of the country.

- In manual coding systems incorrect food code numbers may be used. Computerised systems which avoid the use of numbers and input information only by the food name tend to reduce this problem. However, it is still possible for names to be identified incorrectly during the use of the Tables and calculation software.

- It is possible that errors can be made both in the measurement and recording of food weights which will affect the calculation of nutrient intakes.

- Sources of estimated weight are more prone to error than the recorded weight of food because the portion size chosen by an investigator may not give a true indication of the actual amount eaten or an individual may misinterpret the amount shown in a representation of a portion size.

- There are several methods for collecting food intake data which range from weighed intakes to food frequency questionnaires giving information which is either quantitative or qualitative. It is worthwhile consulting appropriate publications (e.g. Bingham (1987), Cameron and van Staveren (1988), Nelson and Bingham (1997)) to find which method is the most suitable for the level of information required.

- As any one person exhibits a great deal of variation in diet, varied lengths of recording time are needed to assess representative intakes of nutrients. For example a 7-day weighed record collection (not necessarily consecutive days) may be necessary to assess energy and protein intakes assuming that an accuracy of ±10% standard error is acceptable. It may be possible to observe people with very stable eating habits for a shorter time but those with greater variation may require longer. For most other nutrients the recording period would need to be longer than for energy and protein, particularly for those concentrated in only a few foods. For example, vitamin C may require 36 days of recording to be within ±10% of the true intake. This topic is covered in greater detail in Bingham (1987), Cameron and van Staveren (1988) and Nelson *et al*. (1989).

1.9 Food labelling

Nutrition information is increasingly being given on food labels. Values from these food composition tables may be used for this purpose, but only if certain conditions are met. Values that meet the criteria below are included in the computer-readable files, where possible.

The rules which govern nutrition labelling are contained in Directive 90/496/EEC on Nutrition Labelling for Foodstuffs. In Great Britain these rules are implemented by the Food Labelling Regulations 1996 (as amended). Northern Ireland has similar but separate legislation. These rules are there to ensure consistency and accuracy, and to prevent misleading claims. Nutrition labelling is not compulsory unless a nutrition claim is made, but when such information is given the details in one of the following groups must be shown per 100 grams or per 100ml of the food as sold:

Either

energy value in kJ and kcal, **and**
protein, carbohydrate and fat, in grams, **and**
the amount of any other nutrients for which a claim is made

Or

energy value in kJ and kcal, **and**
protein, carbohydrate, sugars, fat, saturates, fibre and sodium, all in grams, **and**
the amount of any other nutrient for which a claim is made

Preference should be given to values derived from analyses of representative samples of the food. However, if the product or its ingredients are similar to those described in this book or the supplements, these values may be used instead. Nevertheless, it is important to note the following differences:-

1. Protein should be given as total nitrogen x 6.25 for every food, whereas more specific factors have been used in this book.
2. Carbohydrate is to be declared as the weight of the carbohydrates themselves and not their monosaccharide equivalents.

The following factors may be used to convert monosaccharide equivalents from these Tables to actual weights:

Total carbohydrate	Divide by 1.05 unless it is known to be mainly starch
Starch	Divide by 1.10
Sucrose and lactose	Divide by 1.05
Glucose, etc.	As given

3. Different factors are to be used to calculate energy values. These are shown in Table 12.

Table 12 *Energy conversion factors to be used in food labelling*

	kcal/g	**kJ/g**
Protein	4	17
Carbohydrate expressed as weight	4	17
Fat	9	37
Alcohol	7	29
All organic acids	3	13
Sorbitol and other polyols	2.4	10

ANNEX 3

ACRONYMS, DESCRIPTIONS AND UNITS

ACRONYM	DESCRIPTION	UNITS
13CISRET	13-cis-retinol	µg
25OHD3	25-hydroxy vitamin D3	µg
5METHF	5-methyl folate	µg
ACAR	Alpha-carotene	µg
ACEA	Acetic acid	g
ALCO	Alcohol	g
ALTRET	All-trans-retinol	µg
AOACFIB	AOAC fibre	g
ATOPH	Alpha-tocopherol	mg
ATOTR	Alpha-tocotrienol	mg
BCAR	Beta-carotene	µg
BIOT	Biotin	µg
BRASPHYTO	Brassicasterol	mg
BSITPHYTO	Beta-sitosterol	mg
BTOPH	Beta-tocopherol	mg
BTOPH	Beta-tocopherol	mg
BTOTR	Beta-tocotrienol	mg
CA	Calcium	mg
CAMPHYTO	Campesterol	mg
CAREQU	Carotene	µg
CHO	Carbohydrate	g
CHOL	Cholesterol	mg
CITA	Citric acid	g
CL	Chloride	mg
COMM	Comments and data source	
CONST	Constant food number	
CRYPYT	Cryptoxanthins	µg
CU	Copper	mg

D5AVEN	Delta-5-avenasterol	mg
D7AVEN	Delta-7-avenasterol	mg
D7STIG	Delta-7-stigmastenol	mg
DEHYRET	Dehydroretinol	µg
DESC	Food description	
DTOPH	Delta-tocopherol	mg
DTOTR	Delta-tocotrienol	mg
EDPOR	Edible proportion	
ENGFIB	Englyst fibre	g
FAC10:0	Decanoic acid per 100g fatty acids	g
FAC10:1	Decenoic acid per 100g fatty acids	g
FAC10:1c	cisDecenoic acid per 100g fatty acids	g
FAC11:0xb		g
FAC12:0	Dodecanoic acid per 100g fatty acids	g
FAC12:0xb	ex Br Dodecanoic acid per 100g fatty acids	g
FAC12:1	Dodecenoic acid per 100g fatty acids	g
FAC12:1c	cisDodecenoic acid per 100g fatty acids	g
FAC13:0xb		g
FAC14:0	Tetradecanoic acid per 100g fatty acids	g
FAC14:0xb	ex Br Tetradecanoic acid per 100g fatty acids	g
FAC14:1	Tetradecenoic acid per 100g fatty acids	g
FAC14:1c	cisTetradecenoic acid per 100g fatty acids	g
FAC15:0	Pentadecanoic acid per 100g fatty acids	g
FAC15:0xb	ex Br Pentadecanoic acid per 100g fatty acids	g
FAC15:1	Pentadecenoic acid per 100g fatty acids	g
FAC15:1c	cisPentadecenoic acid per 100g fatty acids	g
FAC16 poly	unknown C16 polyunsaturated fatty acids per 100g fatty acid	g
FAC16:0	Hexadecanoic acid per 100g fatty acids	g
FAC16:0xb	ex Br Hexadecanoic acid per 100g fatty acids	g
FAC16:1	Hexadecenoic acid per 100g fatty acids	g
FAC16:1c	cisHexadecenoic acid per 100g fatty acids	g

FAC16:2c	cis Hexadecadienoic acid per 100g fatty acids	g
FAC16:3c	cis Hexadecatrienoic acid per 100g fatty acids	g
FAC16:4	Hexadecatetraenoic acid per 100g fatty acids	g
FAC16:4c	cis Hexadecatetraenoic acid per 100g fatty acids	g
FAC16:UNID	16:unidentified fatty acid per 100g FA	g
FAC17:0	Heptadecanoic acid per 100g fatty acids	g
FAC17:0xb	ex Br Heptadecanoic acid per 100g fatty acids	g
FAC17:1	Heptadecenoic acid per 100g fatty acids	g
FAC17:1c	cisHeptadecenoic acid per 100g fatty acids	g
FAC18 poly	unknown C18 polyunsaturated fatty acids per 100 fatty acid	g
FAC18:0	Octadecanoic acid per 100g fatty acids	g
FAC18:0xb	ex Br Octadecanoic acid per 100g fatty acids	g
FAC18:1	Octadecenoic acid per 100g fatty acids	g
FAC18:1c	cisOctadecenoic acid per 100g fatty acids	g
FAC18:1n7	n-7 Octadecenoic acid per 100g fatty acids	g
FAC18:1n9	n-9 Octadecenoic acid per 100g fatty acids	g
FAC18:2	Octadecadienoic acid per 100g fatty acids	g
FAC18:2cn6	cis n-6 Octadecadienoic acid per 100g fatty acids	g
FAC18:3	Octadecatrienoic acid per 100g fatty acids	g
FAC18:3cn3	cis n-3 Octadecatrienoic acid per 100g fatty acids	g
FAC18:3cn6	cis n-6 Octadecatrienoic acid per 100g fatty acids	g
FAC18:4	Octadecatetraenoic acid per 100g fatty acids	g
FAC18:4cn3	cis n-3 Octadecatetraenoic acid per 100g fatty acids	g
FAC20 poly	unknown C20 polyunsaturated fatty acid per 100 fatty acid	g
FAC20:0	Eicosanoic acid per 100g fatty acids	g
FAC20:0xb	ex Br Eicosanoic acid per 100g fatty acids	g
FAC20:1	Eicosenoic acid per 100g fatty acids	g
FAC20:1c	cisEicosenoic acid per 100g fatty acids	g
FAC20:2	Eicosadienoic acid per 100g fatty acids	g
FAC20:2cn6	cis n-6 Eicosadienoic acid per 100g fatty acids	g

FAC20:3	Eicosatrienoic acid per 100g fatty acids	g
FAC20:3cn6	cis n-6 Eicosatrienoic acid per 100g fatty acids	g
FAC20:4	Eicosatetraenoic acid per 100g fatty acids	g
FAC20:4cn6	cis n-6 Eicosatetraenoic acid per 100g fatty acids	g
FAC20:5	Eicosapentaenoic acid per 100g fatty acids	g
FAC20:5cn3	cis n-3 Eicosapentaenoic acid per 100g fatty acids	g
FAC20:UNID	20:unidentified fatty acid per 100g FA	g
FAC21:5	Heneicosapentaenoic acid per 100g fatty acids	g
FAC21:5cn3	cis n-3 Heneicosapentaenoic acid per 100g fatty acids	g
FAC22 poly	unknown C22 polyunsaturated fatty acid per 100g fatty acid	g
FAC22:0	Docosanoic acid per 100g fatty acids	g
FAC22:0xb	ex Br Docosanoic acid per 100g fatty acids	g
FAC22:1	Docosenoic acid per 100g fatty acids	g
FAC22:1c	cisDocosenoic acid per 100g fatty acids	g
FAC22:1n11	n-11 Docosenoic acid per 100g fatty acids	g
FAC22:1n9	n-9 Docosenoic acid per 100g fatty acids	g
FAC22:2	Docosadienoic acid per 100g fatty acids	g
FAC22:2cn6	cis n-6 Docosadienoic acid per 100g fatty acids	g
FAC22:3cn6	cis n-6	g
FAC22:4	Docosatetraenoic acid per 100g fatty acids	g
FAC22:4cn6	cis n-6 Docosatetraenoic acid per 100g fatty acids	g
FAC22:5	Docosapentaenoic acid per 100g fatty acids	g
FAC22:5cn3	cis n-3 Docosapentaenoic acid per 100g fatty acids	g
FAC22:6	Docosahexaenoic acid (DHA) per 100g fatty acids	g
FAC22:6cn3	cis n-3 Docosahexaenoic acid (DHA) per 100g FA	g
FAC22:UNID	22:unidentified fatty acid per 100g FA	g
FAC24:0	Tetracosanoic acid per 100g fatty acids	g
FAC24:0xb	ex Br Tetracosanoic acid per 100g fatty acids	g
FAC24:1	Tetracosenoic acid per 100g fatty acids	g
FAC24:1c	cisTetracosenoic acid per 100g fatty acids	g

FAC25:0xb		g
FAC4:0	Butanoic acid per 100g fatty acids	g
FAC6:0	Hexanoic acid per 100g fatty acids	g
FAC8:0	Octanoic acid per 100g fatty acids	g
FACTRANS	Total Trans fatty acids per 100g fatty acids	g
FAT	Fat	g
FE	Iron	mg
FOD10:0	Decanoic acid per 100g food	g
FOD10:1	Decenoic acid per 100g food	g
FOD10:1c	cis Decenoic acid per 100g food	g
FOD11:0xb		g
FOD12:0	Dodecanoic acid per 100g food	g
FOD12:0xb	ex Br Dodecanoic acid per 100g food	g
FOD12:1	Dodecenoic acid per 100g food	g
FOD12:1c	cis Dodecenoic acid per 100g food	g
FOD13:0	Tridecanoic acid per 100g food	g
FOD13:0xb	ex Br Tridecanoic acid per 100g food	g
FOD14:0	Tetradecanoic acid per 100g food	g
FOD14:0xb	ex Br Tetradecanoic acid per 100g food	g
FOD14:1	Tetradecenoic acid per 100g food	g
FOD14:1c	cis Tetradecenoic acid per 100g food	g
FOD15:0	Pentadecanoic acid per 100g food	g
FOD15:0xb	ex Br Pentadecanoic acid per 100g food	g
FOD15:1	Pentadecenoic acid per 100g food	g
FOD15:1c	cis Pentadecenoic acid per 100g food	g
FOD16 poly	unknown C16 polyunsaturated fatty acids per 100g food	g
FOD16:0	Hexadecanoic acid per 100g food	g
FOD16:0xb	ex Br Hexadecanoic acid per 100g food	g
FOD16:1	Hexadecenoic acid per 100g food	g
FOD16:1c	cis Hexadecenoic acid per 100g food	g
FOD16:2	Hexadecadienoic acid per 100g food	g

FOD16:2c	cis Hexadecadienoic acid per 100g food	g
FOD16:3	Hexadecatrienoic acid per 100g food	g
FOD16:3c	cis Hexadecatrienoic acid per 100g food	g
FOD16:4	Hexadecatetraenoic acid per 100g food	g
FOD16:4c	cis Hexadecatetraenoic acid per 100g food	g
FOD16:UNID	16:unidentified fatty acid per 100g food	g
FOD17:0	Heptadecanoic acid per 100g food	g
FOD17:0xb	ex Br Heptadecanoic acid per 100g food	g
FOD17:1	Heptadecenoic acid per 100g food	g
FOD17:1c	cis Heptadecenoic acid per 100g food	g
FOD18 poly	unknown C18 polyunsaturated fatty acid per 100g food	g
FOD18:0	Octadecanoic acid per 100g food	g
FOD18:0xb	ex Br Octadecanoic acid per 100g food	g
FOD18:1	Octadecenoic acid per 100g food	g
FOD18:1c	cis Octadecenoic acid per 100g food	g
FOD18:1n7	n-7 Octadecenoic acid per 100g food	g
FOD18:1n9	n-9 Octadecenoic acid per 100g food	g
FOD18:2	Octadecadienoic acid per 100g food	g
FOD18:2cn6	cis n-6 Octadecadienoic acid per 100g food	g
FOD18:3	Octadecatrienoic acid per 100g food	g
FOD18:3cn3	cis n-3 Octadecatrienoic acid per 100g food	g
FOD18:3cn6	cis n-6 Octadecatrienoic acid per 100g food	g
FOD18:4	Octadecatetraenoic acid per 100g food	g
FOD18:4cn3	cis n-3 Octadecatetraenoic acid per 100g food	g
FOD19:0	Nonadecanoic acid per 100g food	g
FOD20 poly	unknown C20 polyunsaturated fatty acid per 100g food	g
FOD20:0	Eicosanoic acid per 100g food	g
FOD20:0xb	ex Br Eicosanoic acid per 100g food	g
FOD20:1	Eicosenoic acid per 100g food	g
FOD20:1c	cis Eicosenoic acid per 100g food	g

FOD20:2	Eicosadienoic acid per 100g food	g
FOD20:2cn6	cis n-6 Eicosadienoic acid per 100g food	g
FOD20:3	Eicosatrienoic acid per 100g food	g
FOD20:3cn6	cis n-6 Eicosatrienoic acid per 100g food	g
FOD20:4	Eicosatetraenoic acid per 100g food	g
FOD20:4cn6	cis n-6 Eicosatetraenoic acid per 100g food	g
FOD20:5	Eicosapentaenoic acid per 100g food	g
FOD20:5cn3	cis n-3 Eicosapentaenoic acid per 100g food	g
FOD20:UNID	20:unidentified fatty acid per 100g food	g
FOD21:5	Heneicosapentaenoic acid per 100g food	g
FOD21:5cn3	cis n-3 Heneicosapentaenoic acid per 100g food	g
FOD22 poly	unknown polyunsaturated fatty acid per 100g food	g
FOD22:0	Docosanoic acid per 100g food	g
FOD22:0xb	ex Br Docosanoic acid per 100g food	g
FOD22:1	Docosenoic acid per 100g food	g
FOD22:1c	cis Docosenoic acid per 100g food	g
FOD22:1n11	n-11 Docosenoic acid per 100g food	g
FOD22:1n9	n-9 Docosenoic acid per 100g food	g
FOD22:2	Docosadienoic acid per 100g food	g
FOD22:2cn6	cis n-6 Docosadienoic acid per 100g food	g
FOD22:3cn6	cis n-6	g
FOD22:4	Docosatetraenoic acid per 100g food	g
FOD22:4cn6	cis n-6 Docosatetraenoic acid per 100g food	g
FOD22:5	Docosapentaenoic acid per 100g food	g
FOD22:5cn3	cis n-3 Docosapentaenoic acid per 100g food	g
FOD22:6	Docosahexaenoic acid (DHA) per 100g food	g
FOD22:6cn3	cis n-3 Docosahexaenoic acid (DHA) per 100g food	g
FOD22:UNID	22:unidentified fatty acid per 100g food	g
FOD24:0	Tetracosanoic acid per 100g food	g
FOD24:0xb	ex Br Tetracosanoic acid per 100g food	g
FOD24:1	Tetracosenoic acid per 100g food	g
FOD24:1c	cis Tetracosenoic acid per 100g food	g

FOD25:0xb		g
FOD4:0	Butanoic acid per 100g food	g
FOD6:0	Hexanoic acid per 100g food	g
FOD8:0	Octanoic acid per 100g food	g
FODTRANS	Trans fatty acids per 100g food	g
	NB This field replaces TOTTRANS for data releases from 1995	
FOLT	Folate	µg
FRUCT	Fructose	g
GALACT	Galactose	g
GLUC	Glucose	g
GROUP	Food sub-group code	
GTOPH	Gamma-tocopherol	mg
GTOTR|	Gamma-tocotrienol	mg
I	Iodine	µg
K	Potassium	mg
KCALS	kcal	
KJ	kJ	
LACA	Lactic acid	g
LACT	Lactose	g
LCHO	LCarbohydrate	g
LKCAL	LEnergy (kcal)	kcal
LKJ	LEnergy (kJ)	kJ
LPROT	LProtein	g
LSTAR	LStarch	g
LTOTSUG	LTotal Sugars	g
LUT	Lutein	µg
LYCO|	Lycopene	µg
MALA	Malic acid	g
MALT	Maltose	g
MG	Magnesium	mg

MN	Manganese	mg
MONOFAC	Monounsaturated fatty acids per 100g fatty acids	g
MONOFACc	cis-Monounsaturated fatty acids /100g FA	g
MONOFACtr	trans monounsaturated fatty acids per 100 FA	g
MONOFOD	Monounsaturated fatty acids per 100g food	g
MONOFODc	cis-Monounsaturated fatty acids /100g Food	g
MONOFODtr	trans monounsaturated fatty acids per 100g food	g
NA	Sodium	mg
NAME	Full food name (including any preparation details)	
NCF	Nitrogen conversion factor	
NIAC	Niacin	mg
NIACEQU	Niacin equivalent	mg
NUMB	Food number	
OLIGO	Oligosaccharide	g
Other CHOL and PHYTO	Other Cholesterol and Phytosterols	mg
P	Phosphorus	mg
PANTO	Pantothenate	mg
PHYTO	Phytosterol	mg
POLYFAC	Polyunsaturated fatty acids per 100g fatty acids	g
POLYFACc	cis-Polyunsaturated fatty acids /100g FA	g
POLYFACtr	trans polyunsatsaturated fatty acid per 100g fatty acid	g
POLYFOD	Polyunsaturated fatty acids per 100g food	g
POLYFODc	cis-Polyunsaturated fatty acids /100g Food	g
POLYFODtr	trans polyunsaturated fatty acid per 100g food	g
PREV	Previous food number	
PROT	Protein	g
PYR	Pyridoxine	mg
PYRAL	Pyridoxal	mg
PYRALP	Pyridoxal phosphate	mg
PYRANP	Pyridoxamine phosphate	mg
PYRNE	Pyridoxamine	mg

PYRPH	Pyridoxine phosphate	mg
RET	Retinol	µg
RETALD	Retinaldehyde	µg
RETEQU	Total retinol equivalent	µg
RIBO	Riboflavin	mg
SATFAC	Saturated fatty acids per 100g fatty acids	g
SATFACx6	Saturated fatty acids excluding branch per 100 g fatty acid	g
SATFOD	Saturated fatty acids per 100g food	g
SATFODx6	Saturated fatty acids excluding branch per 100 g food	g
SE	Selenium	µg
SOLD	Total solids	g
SPECGRAV	Specific gravity	
STAR	Starch	g
STIGPHYTO	Stigmasterol	mg
SUCR	Sucrose	g
THIA	Thiamin	mg
Total PHYTO	Total Phytosterols	mg
TOTBRFAC	Total branched chain per 100g fatty acid	g
TOTBRFOD	Total branched chain per 100g food	g
TOTn3PFAC	Total n-3 polyunsaturated fatty acids per 100g fatty acid	g
TOTn3PFOD	Total n-3 polyunsaturated fatty acids per 100g food	g
TOTn6PFAC	Total n-6 polyunsaturated fatty acids per 100g fatty acid	g
TOTn6PFOD	Total n-6 polyunsaturated fatty acids per 100g food	g
TOTNIT	Total nitrogen	g
TOTSUG	Total sugars	g
TRYP60	Tryptophan divided by 60	mg

UNIDFAC	Unidentified fatty acid per 100g FA	g
UNIDFOD	Unidentified fatty acid per 100g food	g
VITB12	Vitamin B12	µg
VITB6	Vitamin B6	mg
VITC	Vitamin C	mg
VITD	Vitamin D	µg
VITD3	Cholecalciferol	µg
VITE	Vitamin E	mg
VITK1	Phylloquinone	µg
WATER	Water	g
ZN	Zinc	mg

The following notes are relevant to this Annex.

1 The nutrients covered vary for different publications.
2 Additional nutrients may be added in future distribution files.
3 Units quoted here are for all current data but they may change in future distribution files.

ANNEX 4

FOOD SUB-GROUP CODES

Cereals and cereal products	A
Flours, grains and starches	AA
Sandwiches	AB
Rice	AC
Pasta	AD
Pizzas	AE
Breads	AF
Rolls	AG
Breakfast cereals	AI
Infant cereal foods	AK
Biscuits	AM
Cakes	AN
Pastry	AO
Buns and pastries	AP
Puddings	AS
Savouries	AT
Milk and milk products	B
Cows milk	BA
Breakfast milk	BAB
Skimmed milk	BAE
Semi-skimmed milk	BAH
Whole milk	BAK
Channel Island milk	BAN
Processed milks	BAR
Other milks	BC
Infant formulas	BF
Whey-based modified milks	BFD
Non-whey-based modified milks	BFG
Soya-based modified milks	BFJ
Follow-on formulas	BFP
Milk-based drinks	BH

Creams	BJ
Fresh creams (pasteurised)	BJC
Frozen creams (pasteurised)	BJF
Sterilised creams	BJL
UHT creams	BJP
Imitation creams	BJS
Cheeses	BL
Yogurts	BN
Whole milk yogurts	BNE
Low fat yogurts	BNH
Other yogurts	BNS
Ice creams	BP
Puddings and chilled desserts	BR
Savoury dishes and sauces	BV
Eggs	C
Eggs	CA
Egg dishes	CD
Savoury egg dishes	CDE
Sweet egg dishes	CDH
Vegetables	D
Potatoes	DA
Early potatoes	DAE
Main crop potatoes	DAM
Chipped old potatoes	DAP
Potato products	DAR
Beans and lentils	DB
Peas	DF
Vegetables, general	DG
Vegetables, dried	DI
Vegetable dishes	DR
Fruit	F
Fruit, general	FA
Fruit juices	FC

Nuts and seeds	G
Nuts and seeds, general	GA
Herbs and spices	H
Baby foods	IF
Baby foods, granulated/powder	IFB
Baby foods, canned/bottled	IFC
Fish and fish products	J
White fish	JA
Fatty fish	JC
Crustacea	JK
Molluscs	JM
Fish products and dishes	JR
Meat and meat products	M
Meat	MA
Bacon	MAA
Beef	MAC
Lamb	MAE
Pork	MAG
Veal	MAI
Poultry	MC
Chicken	MCA
Duck	MCC
Goose	MCE
Grouse	MCG
Partridge	MCI
Pheasant	MCK
Pigeon	MCM
Turkey	MCO
Game	ME
Hare	MEA
Rabbit	MEC
Venison	MEE

Offal	MG
Burgers and grillsteaks	MBG
Meat products	MI
Other meat products	MIG
Meat dishes	MR
Fats and oils	O
Spreading fats	OA
Animal fats	OB
Oils	OC
Non-animal fats	OE
Cooking fats	OF
Beverages	P
Powdered drinks, essences and infusions	PA
Powdered drinks and essences	PAA
Infusions	PAC
Soft drinks	PC
Carbonated drinks	PCA
Squash and cordials	PCC
Juices	PE
Alcoholic beverages	Q
Beers	QA
Ciders	QC
Wines	QE
Fortified wines	QF
Vermouths	QG
Liqueurs	QI
Spirits	QK
Sugars, preserves and snacks	S
Sugars, syrups and preserves	SC
Confectionery	SE
Chocolate confectionery	SEA

Non-chocolate confectionery	SEC
Savoury snacks	SN
Potato-based snacks	SNA
Potato and mixed cereal snacks	SNB
Non-potato snacks	SNC
Soups, sauces and miscellaneous foods	W
Soups	WA
Home made soups	WAA
Canned soups	WAC
Packet soups	WAE
Sauces	WC
Dairy sauces	WCD
Salad sauces, dressings and pickles	WCG
Non-salad sauces	WCN
Pickles and chutneys	WE
Miscellaneous foods	WY