Composition of Foods
Raw, Processed, Prepared
USDA National Nutrient Database for Standard Reference, Release 23

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Contents

Introduction

The USDA National Nutrient Database for Standard Reference (SR) is the major source of food composition data in the United States. It provides the foundation for most food composition databases in the public and private sectors. As information is updated, new versions of the database are released. This version, Release 23 (SR23), contains data on 7,636 food items and up to 146 food components. It replaces SR22 issued in September 2009.

Updated data have been published electronically on the USDA Nutrient Data Laboratory (NDL) web site since 1992. SR23 includes composition data for all the food groups and nutrients published in the 21 volumes of "Agriculture Handbook 8" (U.S. Department of Agriculture 1976–92), and its four supplements (U.S. Department of Agriculture 1990–93), which superseded the 1963 edition (Watt and Merrill, 1963). SR23 supersedes all previous releases, including the printed versions, in the event of any differences.

In July 2001, when NDL converted to a new version of its Nutrient Databank System (NDBS), formats were changed and fields added to improve the descriptive information for food items and the statistical information about the nutrient values. While data in previous releases have been moved to the new NDBS, they may not have been updated through the complete system. Therefore, many of these new fields contain data only for those items that have been processed through the new NDBS and it will take a number of years before they are populated for all food items in the database.

Data have been compiled from published and unpublished sources. Published sources include the scientific literature. Unpublished data include those obtained from the food industry, other government agencies, and research conducted under contracts initiated by USDA's Agricultural Research Service (ARS). These contract analyses are currently conducted under the National Food and Nutrient Analysis Program (NFNAP), in cooperation with the National Cancer Institute (NCI) and other offices and institutes of the National Institutes of Health (Haytowitz *et al*., 2008). Data from the food industry represents the nutrient content of a specific food or food product at the time the data is sent to NDL. The values may change due to reformulations or other processing changes by individual companies between the time that SR is released and the next update of SR. Values in the database may be based on the results of laboratory analyses or calculated by using appropriate algorithms, factors, or recipes, as indicated by the source code in the Nutrient Data file. Not every food item contains a complete nutrient profile.

Specific Changes for SR23

The major changes to the database since the last release are listed below.

- New foods and nutrient profiles added for SR23 using data generated by USDA through the NFNAP or submitted by the food industry: among these are ground turkey (raw and cooked two ways) at three fat levels; a variety of new breakfast cereals; several new oils that are being used in commercial products; sorghum and millet flour; and eight frozen

brand name pizzas. A complete list of the added food items can be found in the ADD_Food file (p. 36).

- A beef composition study was conducted on several boneless cuts fabricated from the chuck primal to reflect what is currently being sold in the marketplace with 0-inch fat trim. Beef primal sampling was statistically designed to reflect animal type (breed, gender) and grade in the food supply. Twelve new beef chuck cuts, raw and cooked (braised, roasted or grilled depending on the cut) at three grade levels, have been added. A new cut (beef, chuck, under-blade pot roast, boneless) has replaced beef, chuck, blade roast.

- A study was conducted to update selected non-enhanced fresh pork loin cuts. The cuts were: blade chops/roasts, bone–in; center loin chops, bone-in; center rib chops, bone-in; top loin chops, boneless; center loin roast, bone-in; center rib roasts, bone-in; and back ribs. The cuts were purchased from 12 retail outlets using the nationwide sampling plan developed for NFNAP. Measurements of chop thickness, external fat thickness, and weights were determined. The samples were analyzed for nutrient content in both raw and cooked form. Values for 30 fresh pork cuts (separable lean only, and separable lean and fat) have been updated in SR and one new pork cut (back ribs, raw) has been added.

- As part of efforts to increase American Indian/Alaska Native foods in the database, data for five Hopi foods were added. These items are included in food group 35, Ethnic Foods.

- As part of an ongoing effort to expand the number of Latino food items in the database, profiles for a number of Latino cheeses, fruits, crackers, and restaurant items such as pupusas, arepas, bunuelos, and tamales, have been added. Each of these items are entered in the database in their respective food groups, i.e. the cheeses are in food group 01, Dairy and Egg Products, while the crackers are in food group 18, Baked Products.

- Data for menaquinone-4 and dihydrophylloquinone have been included in this release. See the discussion on vitamin K for more details (p. 18).

- Among the foods with updated nutrient values are: 19 species of fish; raw eggs; maple syrup; and sugar wafers. Fast food French fries were updated to reflect new fatty acid profiles. Foods which are major contributors of sodium to the diet—primarily processed foods—have been reviewed using data from company web sties and package labels, and where the difference from previously published values is greater than or equal to 10% per 100g, the sodium value has been updated. A complete list of the updated nutrients can be found in the CHG_NUTR file (p. 37).

- Products, such as mixed dishes and breakfast cereals, that are no longer on the market or for which data are no longer current, have been removed. A complete list of deleted food items can be found in the DEL_FOOD file (p. 37)

- Starting with SR23, food descriptions for a number of food groups, containing agricultural commodities, have been assigned factor terms using the LanguaL Thesaurus (Moeller and Ireland, 2009). This provides expanded information regarding other relevant parameters (e.g., its ingredients, treatments applied to the food, claims, etc.). See text under food descriptions (p. 5) for more details.

- A section on Notes on Foods has been added after the references in the documentation. When the earlier paper copies of Agriculture Handbook No. 8, Composition of Foods: Raw, Processed, Prepared were released in separate sections by food group there was a section for each food group called Notes on Foods. The Notes gave additional information about the foods, such as the definitions of lean and fat for meats or enrichment for grain products. For some food groups, a brief description of research projects conducted to generate nutrient data were described. In this release Notes for Beef, Eggs, and Pork have been added.

Data Files

The data files for SR23 are available in ASCII format and as a Microsoft Access 2003 database. A description of each field in these files and the relationships between each begins on p. 23. The Access database contains all the SR23 files and relationships, with a few sample queries and reports. An abbreviated file (p. 34), with fewer nutrients (46) but all the food items, is also included. A Microsoft Excel 2003 spreadsheet of this file is also provided. These database and spreadsheet files are generally compatible with later releases of the same software package or with other software packages released at the same time.

Database Reports

The data in SR23 are available as reports in two different presentations. The first presents items in SR23 as page images containing all the data for each food. These data are separated into files by food groups. The second presentation contains selected foods and nutrients in SR23. Those reports are sorted either alphabetically by food description or in descending order by nutrient content in terms of common household measures. The food items and weights in these reports are adapted from those in the "U.S. Department of Agriculture Home and Garden Bulletin 72, Nutritive Value of Foods" (Gebhardt and Thomas, 2002).

Adobe Reader is needed to see these files. There is a link from the NDL web site to Adobe''s web site where it can be downloaded at no charge.

Database Content

The database consists of several sets of data: food descriptions, nutrients, weights and measures, footnotes, and sources of data. The sections below provide details about the information in each. More extensive details on many specific foods are available in the printed "Agriculture Handbook 8" sections (U.S. Department of Agriculture, 1976-92).

Food Descriptions

This file includes descriptive information about the food items. For more details on the Food Description file, see "Food Description File Formats" (p. 25). A full description (containing the name of the food with relevant characteristics, e.g., raw or cooked, enriched, color) and a short description (containing abbreviations) are provided. Abbreviations used in creating short descriptions are given in Appendix A. In creating the short description, the first word in the long description is not abbreviated. In addition, if the long description is 25 characters or less, the short description contains no abbreviations. Abbreviations used elsewhere are given in Appendix B. Brand names used in food descriptions are in upper case. Scientific names, common names, manufacturers' names, amounts of refuse, and refuse descriptions are provided where appropriate. The common name field includes alternative names for a product, e.g., soda or pop, for a carbonated beverage. In addition this field also includes Uniform Retail Meat Identity Standard (URMIS) identification numbers and USDA commodity codes as appropriate. The food group to which the food item belongs is also indicated. A code is also provided indicating if the item is used in the Food and Nutrient Database for Dietary Studies (FNDDS; USDA, ARS, 2010). The factors used to calculate protein from nitrogen are included, as well as those used to calculate kilocalories. There are no factors for items prepared using the recipe program of the NDBS or for items where the manufacturer calculates protein and kilocalories.

The refuse and refuse description fields contain amounts and descriptions of inedible material (for example, seeds, bone, and skin) for applicable foods. These amounts are expressed as a percentage of the total weight of the item as purchased, and they are used to compute the weight of the edible portion. Refuse data were obtained from USDA-sponsored contracts and U.S. Department of Agriculture Handbooks 102 (Matthews and Garrison, 1975) and 456 (Adams, 1975). To calculate "amount of nutrient in edible portion of 1 pound as purchased," use the following formula:

$$Y = V*4.536*[(100-R)/100]$$

where

Y = nutrient value per 1 pound as purchased,
V = nutrient value per 100 g (Nutr_Val in the Nutrient Data file), and
R = percent refuse (Refuse in the Food Description file).

For meat cuts containing bone and connective tissue, the amount of connective tissue is included in the value given for bone. Separable fat is not shown as refuse if the meat is described as separable lean and fat. Separable fat generally refers to seam fat and external trim fat. Separable lean refers to muscle tissue that can be readily separated from fat, bone, and connective tissue in the intact cut; it includes any fat striations (marbling) within the muscle. For boneless cuts, the refuse value applies to connective tissue or connective tissue plus separable fat. The percentage yield of cooked, edible meat from 1 pound of raw meat with refuse can be determined by using the following formula:

$$Y = (W_c/453.6)*100$$

where

Y = nutrient value per 1 pound as purchased, and
W_c = weight of cooked, edible meat.

LanguaL. To address the needs of diverse users of the USDA food composition databases in addition to the food descriptions, starting with SR23 NDL is providing an expanded standardized food description for selected food groups (spices and herbs, fruits and fruit juices, pork products, vegetables and vegetable products, and beef products) based on the LanguaL Thesaurus (Moeller and Ireland, 2009). The use of this multi-hierarchical food classification system will permit the harmonization of food description terms and definitions across many cultures and languages to support food research, food safety, nutrition monitoring, and food marketing**.**

LanguaL stands for "**Langua aL**imentaria" or "language of food". The work on LanguaL was started in the late 1970's by the Center for Food Safety and Applied Nutrition (CFSAN) of the United States Food and Drug Administration as an ongoing co-operative effort of specialists in food technology, information science, and nutrition.

Since then, LanguaL has developed in collaboration with the NCI, and, more recently, its European partners, notably in France, Denmark, Switzerland, and Hungary. Since 1996, the European LanguaL Technical Committee has administered the thesaurus.

The thesaurus provides a standardized language for describing foods, specifically for classifying food products for information retrieval. LanguaL is based on the concept that:

- Any food (or food product) can be systematically described by a combination of characteristics or facets
- These characteristics can be categorized into viewpoints and coded for computer processing
- The resulting viewpoint/characteristic codes can be used to retrieve data about the food from external databases

The current facets for foods in SR23 include: product type; food source; part of plant or animal; physical state, shape or form; extent of heat treatment; cooking method; treatment applied; preservation method; packing medium; container or wrapping; food contact surface; consumer group/dietary use/label claim; geographic places and regions; and adjunct characteristics of food.

The specific tables added to SR are the LanguaL Factor File (p. 27) and the LanguaL Factors Description File (p. 27). For more information on LanguaL, see the web site: www.langual.org

Nutrients

The Nutrient Data file contains mean nutrient values per 100 g of the edible portion of food, along with fields to further describe the mean value. The following statistical attributes are provided to better describe the data:

- Nutrient value – the mean of the data values for a specific parameter. Nutrient values have

been rounded to the number of decimal places for each nutrient as specified in the Nutrient Definition file (p. 29).
- Number of data points – the number of data points used to estimate the mean.
- Standard error – the standard error of the mean: a measure of variability of the mean value as a function of the number of data points.
- Number of studies—the number of analytical studies used to generate the mean. A study is a discrete research project conducted or reported for a specific food. A study can be the analysis of one nutrient in one food, one nutrient in many foods, or many nutrients in many foods.
- Minimum value—the smallest observed value in the range of values.
- Maximum value—the largest observed value in the range of values.
- Degrees of freedom—the number of data values that are free to vary after certain restrictions are placed on the estimates; used in probability calculations.
- Lower- and upper-error bounds—represents a range of values within which the population mean is expected to fall, given a pre-specified confidence level. For SR23 and related releases, the confidence level is 95 percent.
- Statistical comments—provide additional details about certain assumptions made during statistical calculations. The definition of each comment is given after the description of the Nutrient Data file under "File Formats" (p. 27).

Other fields provide information on how the values were generated, as follows:

- Derivation code—gives more information about how a value was calculated or imputed. Procedures used to impute a nutrient value are described by Schakel et al. (1997).
- Reference NDB number—indicates the NDB number of the food item that was used to impute a nutrient value for another food. This field is only populated for items which have been added or updated since SR14 for which an imputed value is provided.
- Added nutrient marker—a "Y" indicates that a mineral or vitamin was added for enrichment or fortification. This field is populated for ready-to-eat breakfast cereals and many brand-name hot cereals in food group 08. In future releases, this field will be populated for other food groups, where applicable.
- Confidence code—indicates the relative quality of the data. This code is derived using the data quality criteria first described by Mangels et al. (1993). These criteria have been expanded and enhanced for the NDBS (Holden et al., 2002). This field is included as a placeholder for future releases.

For more details on the Nutrient Data file, see "Nutrient Data File Formats" (p. 27). Nutrient values indicate the total amount of the nutrient present in the edible portion of the food, including any nutrients added in processing. Table 1 gives an idea of the comprehensiveness of the database by listing for each nutrient the number of food items that contain data.

Table 1.—Number of Foods in the Database (*n* = 7,636) Containing a Value for the Specified Nutrient

Nutr. No.	Nutrient	Number of foods	Nutr. No.	Nutrient	Number of foods
255	Water* †	7632	417	Folate, total* †	6589
208	Energy* †	7636	431	Folic acid* †	6252
203	Protein* †	7636	432	Food folate* †	6433
204	Total lipid (fat)* †	7636	435	Folate (DFE)* †	6246
205	Carbohydrate, by difference* †	7636	421	Choline, total * †	3918
207	Ash †	7631	454	Betaine	1679
291	Total dietary fiber* †	6921	418	Vitamin B_{12}* †	6692
269	Total sugars* †	5444	578	Vitamin B_{12}, Added*	3962
210	Sucrose	1182	320	Vitamin A (RAE)* †	6477
211	Glucose	1186	319	Retinol* †	6195
212	Fructose	1185	321	β-carotene* †	4490
213	Lactose	1169	322	α-carotene* †	4396
214	Maltose	1154	334	β-cryptoxanthin* †	4386
287	Galactose	1026	318	Vitamin A (IU) †	7234
209	Starch	787	337	Lycopene* †	4356
301	Calcium* †	7500	338	Lutein+zeaxanthin* †	4331
303	Iron* †	7514	323	α-tocopherol (vitamin E)* †	4665
304	Magnesium* †	6936	573	Vitamin E, Added *	3850
305	Phosphorus* †	7033	341	β-tocopherol	1365
306	Potassium* †	7220	342	γ-tocopherol	1361
307	Sodium* †	7554	343	δ-tocopherol	1344
309	Zinc* †	6967	328	Vitamin D (D_2 + D_3), µg *†	4335
312	Copper*	6814	325	Vitamin D_2 (ergocalciferol)	33
315	Manganese†	6072	326	Vitamin D_3 (cholecalciferol)	1073
317	Selenium* †	6253	324	Vitamin D, IU†	4336
313	Fluoride	558	430	Vitamin K* †	4321
401	Vitamin C, total ascorbic acid* †	7195	428	Menaquinone-4	449
			429	Dihydrophylloquinone	1245
404	Thiamin* †	6964	606	Total saturated fatty acids* †	7306
405	Riboflavin* †	6984	607	4:0*	4705
406	Niacin* †	6959	608	6:0*	4749
410	Pantothenic acid†	6182	609	8:0*	5019
415	Vitamin B_6* †	6789	610	10:0*	5501

*Indicates the 65 nutrients included in the USDA Food and Nutrient Database for Dietary Studies (FNDDS).

† Nutrients included in the Abbreviated file (p. 34).

Table 1.—Number of Foods in the Database (*n* = 7,636) Containing a Value for the Specified Nutrient—(continued)

Nutr. No.	Nutrient	Number of foods	Nutr. No.	Nutrient	Number of foods
611	12:0*	5781	670	18:2 conjugated linoleic acid (CLAs)	434
696	13:0	253			
612	14:0*	6164	851	18:3 n-3 *cis, cis, cis* (ALA)	982
652	15:0	1490	685	18:3 n-6 *cis, cis, cis*	830
613	16:0*	6382	856	18:3 i (other isomers)	79
653	17:0	1647	627	18:4*	4725
614	18:0*	6370	672	20:2 n-6 *cis,cis*	1419
615	20:0	1727	689	20:3 undifferentiated	1296
624	22:0	1507	852	20:3 n-3	266
654	24:0	1104	853	20:3 n-6	274
645	Total monounsaturated fatty acids* †	6923	620	20:4 undifferentiated*	5503
			855	20:4 n-6	8
625	14:1	1642	629	20:5 n-3* (EPA)	4897
697	15:1	1205	857	21:5	99
626	16:1 undifferentiated*	6121	858	22:4	404
673	16:1 *cis*	396	631	22:5 n-3* (DPA)	4847
662	16:1 *trans*	275	621	22:6 n-3* (DHA)	4895
687	17:1	1356	605	Fatty acids, total *trans*	1792
617	18:1 undifferentiated*	6403	693	Fatty acids, total *trans*-monoenoic	762
674	18:1 *cis*	779			
663	18:1 *trans*	794	695	Fatty acids, total *trans*-polyenoic	563
628	20:1*	132			
630	22:1 undifferentiated*	4930	601	Cholesterol* †	7304
676	22:1 *cis*	345	636	Phytosterols	523
664	22:1 *trans*	266	638	Stigmasterol	112
671	24:1 *cis*	569	639	Campesterol	112
646	Total polyunsaturated fatty acids* †	6930	641	β-sitosterol	112
			501	Tryptophan	4657
618	18:2 undifferentiated*	6419	502	Threonine	4700
675	18:2 n-6 *cis,cis*	733	503	Isoleucine	4702
666	18:2 i (other isomers)	63	504	Leucine	4702
669	18:2 *trans, trans*	219	505	Lysine	4715
665	18:2 *trans*, not further defined	303	506	Methionine	4713
			507	Cystine	4642
619	18:3 undifferentiated*	6312	508	Phenyalanine	4698

*Indicates the 65 nutrients included in the USDA Food and Nutrient Database for Dietary Studies (FNDDS).

† Nutrients included in the Abbreviated file (p. 34).

Table 1.—Number of Foods in the Database (*n* = 7,636) Containing a Value for the Specified Nutrient—(continued)

Nutr. No.	Nutrient	Number of foods	Nutr. No.	Nutrient	Number of foods
509	Tyrosine	4667	517	Proline	4630
510	Valine	4702	518	Serine	4643
512	Histidine	4695	521	Hydroxyproline	945
513	Alanine	4641	221	Alcohol*	4562
514	Aspartic acid	4644	262	Caffeine*	4314
515	Glutamic acid	4644	263	Theobromine*	4290
516	Glycine	4642			

* Indicates the 65 nutrients included in the USDA Food and Nutrient Database for Dietary Studies (FNDDS).
† Nutrients included in the Abbreviated file (p. 34).

In general, levels of fortified nutrients are the values calculated by the manufacturer or by NDL, based on the Nutrition Labeling and Education Act (NLEA) label declaration of % Daily Value (DV) (CFR, Title 21, Pt. 101) (U.S. Food and Drug Administration–Department of Health and Human Services, 2004). Such values represent the minimum nutrient level expected in the product. If analytical values were used to estimate levels of added nutrients, a number is present in the sample count field for these nutrients.

Nutrient Retention and Food Yield. When nutrient data for prepared or cooked products are unavailable or incomplete, nutrient values are calculated from comparable raw items or by recipe. When values are calculated in a recipe or from the raw item, appropriate nutrient retention (USDA, 2007) and food yield factors (Matthews and Garrison, 1975) are applied to reflect the effects of food preparation on food weights and nutrient content. To obtain the content of nutrient per 100 g of cooked food, the nutrient content per 100 g of raw food is multiplied by the nutrient retention factor and, where appropriate, adjustments are made for fat and moisture gains and losses.

Nutrient retention factors are based on data from USDA research contracts, research reported in the literature, and USDA publications. Most retention factors were calculated by the True Retention Method (%TR) (Murphy et al., 1975). This method, as shown below, accounts for the loss or gain of moisture and the loss of nutrients due to heat or other food preparation methods:

$$\%TR = (N_c * G_c) / (N_r * G_r) * 100$$

Where
TR = true retention
N_c = nutrient content per g of cooked food,
G_c = g of cooked food,
N_r = nutrient content per g of raw food, and
G_r = g of food before cooking.

Proximates. The term proximate component refers to those macronutrients that include water (moisture), protein, total lipid (fat), total carbohydrate, and ash. To be included in the database, a nutrient profile must have values for the proximate components and at least one other nutrient.

Protein. The values for protein were calculated from the amount of total nitrogen (N) in the food, using the specific conversion factors recommended by Jones (1941) for most food items. The analytical methods used to determine the nitrogen content of foods are AOAC 968.06 (4.2.04) and 990.03 (combustion) and 991.20 (Kjeldahl) (AOAC, 2003). The specific factor applied to each food item is provided in the N_Factor field in the Food Description file. The general factor of 6.25 is used to calculate protein in items that do not have a specific factor. When the protein content of a multi-ingredient food (e.g., beef stew) is calculated using the recipe program of the NDBS the specific nitrogen to protein conversion factors are applied at the ingredient level. Therefore, the N-factor field will remain empty. When the manufacturer calculates protein the N-factor field will also be empty.

Protein values for chocolate, cocoa, coffee, mushrooms, and yeast were adjusted for nonprotein nitrogenous material (Merrill and Watt, 1973). The adjusted protein conversion factors used to calculate protein for these items are as follows:

chocolate and cocoa	4.74
coffee	5.3
mushrooms	4.38
yeast	5.7

When these items are used as ingredients, such as chocolate in chocolate milk or yeast in bread, only their protein nitrogen content was used to determine their contribution to the calculated protein and amino acid content of the food. Protein calculated from total nitrogen, which may contain nonprotein nitrogen, was used in determining carbohydrate by difference. This unadjusted protein value is not given in the Nutrient Data file for SR23; rather, it is given as a footnote in printed sections of "Agriculture Handbook 8."

For soybeans, nitrogen values were multiplied by a factor of 5.71 (Jones, 1941) to calculate protein. The soybean industry, however, uses 6.25 to calculate protein. The protein content of soy flours, soy meals, soy protein concentrates, and soy protein isolates is expressed both ways in the database. The item calculated using the 6.25 factor is identified as "crude protein basis."

Total Lipid. The total lipid (fat) content of most foods is determined by gravimetric methods, including extraction methods such as those that use ether or a mixed solvent system of chloroform and methanol, or by acid hydrolysis. Total lipid determined by extraction is reported as Nutrient No. 204. It is sometimes referred to as "crude fat" and includes the weight of all lipid components, including glycerol, soluble in the solvent system. Nutrient No. 204 may not be identical to the fat level declared on food labels under the NLEA, where fat is expressed as the amount of triglyceride that would produce the analytically determined amount of lipid fatty acids and does not include other lipid components not soluble in the solvent system. The term "NLEA fat" is commonly referred to as "total fatty acids expressed as triglycerides."

Carbohydrate. Carbohydrate, when present, is determined as the difference between 100 and the sum of the percentages of water, protein, total lipid (fat), ash, and, when present, alcohol. Total carbohydrate values include total dietary fiber. Carbohydrate in beer and wine is determined by methods 979.06 (27.1.21) and 985.10 (28.1.18) of AOAC International (AOAC 2003), respectively. Total dietary fiber content is determined by enzymatic-gravimetric methods 985.29 and 991.43 of the AOAC (2003). Total sugars is the term used for the sum of the individual monosaccharides (galactose, glucose, and fructose) and disaccharides (sucrose, lactose, and maltose). Analytical data for individual sugars are determined using AOAC methods (2003), with either high-performance liquid chromatography (HPLC) or gas-liquid chromatography (GLC). When analytical data for total sugars are unavailable for items in the FNDDS, values are imputed or obtained from manufacturers and trade associations. Starch is analyzed using the AOAC method 966.11 (2003). Because the analyses of total dietary fiber, total sugars, and starch are performed separately and reflect the analytical variability inherent to the measurement process, the sum of these carbohydrate fractions may not equal the carbohydrate-by-difference value.

Food Energy. Food energy is expressed in kilocalories (kcal) and kilojoules (kJ). One kcal equals 4.184 kJ. The data represent physiologically available energy, which is the energy value remaining after digestive and urinary losses are deducted from gross energy. Energy values, with the exception of multi-ingredient processed foods, are based on the Atwater system for determining energy values. Derivation of the Atwater calorie factors is discussed in "Agriculture Handbook 74" (Merrill and Watt, 1973). For multi-ingredient processed foods, kilocalorie values (source codes 8 or 9; for more information on source codes, see p. 30) generally reflect industry practices (as permitted by NLEA) of calculating kilocalories as 4, 4, or 9 kilocalories per gram of protein, carbohydrate, and fat, respectively, or as 4, 4, or 9 kilocalories per gram of protein, carbohydrate minus insoluble fiber, and fat. The latter method is often used for high-fiber foods.

Calorie factors for protein, fat, and carbohydrates are included in the Food Description file. For foods containing alcohol, a factor of 6.93 is used to calculate kilocalories per gram of alcohol (Merrill and Watt, 1973). No calorie factors are given for items prepared using the recipe program of the NDBS. Instead, total kilocalories for these items equal the sums of the kilocalories contributed by each ingredient after adjustment for changes in yield, as appropriate. For multi-ingredient processed foods, if the kilocalories calculated by the manufacturer are reported, no calorie factors are given.

Calorie factors for fructose and sorbitol, not available in the Atwater system, are derived from the work of Livesay and Marinos (1988). Calorie factors for coffee and tea are estimated from those for seeds and vegetables, respectively.

Minerals. Minerals included in the database are calcium, iron, magnesium, phosphorus, potassium, sodium, zinc, copper, manganese, selenium, and fluoride. Levels of minerals for most foods are determined by methods of the AOAC (2003). Calcium, iron, magnesium, phosphorus, sodium, potassium, zinc, copper, and manganese are usually determined by atomic absorption (AOAC 985.35) and inductively coupled plasma emission spectrophotometry (AOAC 984.27).

Analytical data for selenium were published earlier by USDA (1992) and were determined by

the modified selenium hydride and fluorometric methods. Selenium values for foods analyzed between 1998 and 2008 for NFNAP are determined by either the modified selenium hydride (AOAC 986.15) or stable isotope dilution gas chromatography-mass spectrometry (Reamer and Veillon, 1981) methods. The selenium content of plants, in particular cereal grains, is strongly influenced by the quantity of biologically available selenium in the soil in which the plants grow, that is, by their geographical origin (Kubota and Allaway, 1972). The values given are national averages and should be used with caution when levels of selenium in locally grown foods are of interest or concern.

Values for fluoride, previously released in the USDA National Fluoride Database of Selected Beverages and Foods, Release 2 (USDA, 2005), have been incorporated into SR23, but other analyzed values, including regional values, are not included in SR. Samples are analyzed using a fluoride ion-specific electrode, direct read method (VanWinkle, 1995) for clear liquids and a micro-diffusion method (VanWinkle, 1995) for other food samples. As with selenium, the values for fluoride are national averages and should be used with caution when levels of fluoride in locally produced foods and beverages are of interest or concern.

Vitamins. Vitamins included in the database are ascorbic acid (vitamin C), thiamin, riboflavin, niacin, pantothenic acid, vitamin B_6, vitamin B_{12}, folate, total choline and betaine, vitamin A, vitamin E (α-tocopherol), vitamin K (phylloquinone), and vitamin D.

Ascorbic acid. In the current database system, all data for ascorbic acid are listed under Nutrient No. 401, total ascorbic acid, determined by the fluorometric method (AOAC 967.22). Older values which have not been updated are primarily for reduced ascorbic acid and were determined by the dichloroindophenol method (AOAC 967.21)

Thiamin, Riboflavin, and Niacin. Thiamin is determined chemically by the fluorometric method (AOAC 942.23). Fluorometric (AOAC 970.65) or microbiological (AOAC 940.33) methods are used to measure riboflavin. Niacin is determined by microbiological methods (AOAC 944.13). The values for niacin are for preformed niacin only and do not include the niacin contributed by tryptophan, a niacin precursor. The term "niacin equivalent" applies to the potential niacin value; that is, to the sum of the preformed niacin and the amount that could be derived from tryptophan (the mean value of 60 mg tryptophan is considered equivalent to 1 mg niacin (IOM, 1998)). Although not included in SR, niacin equivalents can be estimated for those foods where amino acids are given:

mg Niacin equivalents = mg niacin + (mg tryptophan / 60)

Pantothenic acid, Vitamins B_6, and B_{12}. Pantothenic acid (AOAC 945.74 or 992.07), vitamin B_6 (AOAC 961.15), and vitamin B_{12} (AOAC 952.20) are determined by microbiological methods. Vitamin B_{12} is found intrinsically in foods of animal origin or those containing some ingredient of animal origin, e.g., cake that contains eggs or milk. For foods that contain only plant products, the value for vitamin B_{12} is assumed to be zero. Some reports contain values for vitamin B_{12} in certain fermented foods (soy sauce and miso). It is believed that this B_{12} is synthesized not by the microorganisms responsible for the fermentation of the food, but rather by other contaminating microorganisms. Therefore, one should not consider these foods to be a consistent source of

vitamin B_{12} (Liem et al., 1977) and these values are not included in the database.

The Dietary Reference Intakes (DRI) report on vitamin B_{12} recommended that people older than 50 years meet their Recommended Dietary Allowances (RDA) mainly by consuming foods fortified with vitamin B_{12} or a vitamin B_{12}-containing supplement (IOM, 1998). Since vitamin B_{12} added as a fortificant may provide a significant source of the vitamin in the diet, a nutrient number (#578) for "added vitamin B_{12}" has been added to the database. In this release, there are about 260 foods fortified with vitamin B_{12}. The vast majority are breakfast cereals, infant formulas, and plant-based meat substitutes. For these foods, the value for total vitamin B_{12} is used for "added vitamin B_{12}." Only a few cereals containing a milk ingredient would contain any intrinsic vitamin B_{12}. Milk-based infant formulas should contain intrinsic vitamin B_{12}. However, infants are not the population of concern for intake of fortified vitamin B_{12}. Plant-based meat substitutes should not contain intrinsic vitamin B_{12}.

Folate. Values are reported for folic acid (Nutr. No. 431), food folate (Nutr. No. 432), and total folate reported in µg (Nutr. No. 417) and as dietary folate equivalents (DFEs) (Nutr. No. 435). These varied folate forms are included and defined as described in the DRI report on folate (IOM, 1998). RDAs for folate are expressed in DFEs, which take into account the greater bioavailability of synthetic folic acid compared with naturally occurring food folate.

To calculate DFEs for any single food, it is necessary to have separate values for naturally occurring food folate and added synthetic folic acid in that item.

µg DFE = µg food folate + (1.7 * µg folic acid)

Folate values for foods analyzed through NFNAP are generated using the trienzyme microbiological procedure (Martin et al., 1990). For a small number of foods, total folate was determined as 5-methyltetrahydrofolate; these are indicated in the footnotes. Microbiological methods measure µg total folate; for enriched foods, folic acid and food folate are not distinguished from each other. Therefore, to be able to calculate DFE, multi-ingredient enriched foods are analyzed by an additional microbiological procedure without enzymes to estimate the amount of added folic acid (Chun et al., 2006). Food folate is then calculated by difference.

The addition of folic acid to enriched cereal-grain products subject to standards of identity began in the United States on January 1, 1998 (CFR, Title 21, Pts. 136–137). These products include flour, cornmeal and grits, farina, rice, macaroni, noodles, bread, rolls, and buns. Folic acid may continue to be added (with some restrictions on amounts) to breakfast cereals, infant formulas, medical foods, food for special dietary use, and meal replacement products.

For unenriched foods, food folate would be equivalent to total folate since folic acid (pteroylmonoglutamic acid) occurs rarely in foods. Therefore, the same value with its number of data points and standard error, if present, is used for total folate and food folate. The folic acid value is assumed to be zero.

For enriched cereal-grain products with standards of identity (flour, cornmeal and grits, farina, rice, macaroni, noodles, bread, rolls, and buns), the folic acid value is calculated by subtracting

the analytical folate value before fortification from the analytical value for the fortified product.

Enriched ready-to-eat (RTE) cereals have generally included folic acid fortification for over 25 years. Therefore, food folate values (before fortification) were not readily available for these products. Food folate was estimated by means of the NDBS formulation program for a variety of high-consumption cereals. Mean folate values were calculated for categories of RTE cereals based on grain content. Added folic acid was then calculated by subtracting estimated food folate from the total folate content. Generally, food folate values represent a small proportion of the total folate in the fortified products.

Choline. Beginning with SR19 (2006), total choline and betaine values from the USDA Database for the Choline Content of Common Foods (USDA, 2004) have been incorporated into SR. Values for the individual metabolites have not been added to SR, but are available in the USDA Database for the Choline Content of Common Foods.

For analysis, choline compounds are extracted, partitioned into organic and aqueous phases using methanol and chloroform, and analyzed directly by liquid chromatography-electrospray ionization-isotope dilution mass spectrometry (LC-ESI-IDMS) (Koc et al., 2002). Samples are analyzed for betaine and these choline-contributing compounds: free choline (Cho), glycerophosphocholine (GPC), phosphocholine (Pcho), phosphatidylcholine (Ptdcho), and sphingomyelin (SM).

Because there are metabolic pathways for the interconversion of Cho, GPC, Pcho, PtdCho, and SM (Zeisel et al., 1994), total choline content is calculated as the sum of these choline-contributing metabolites. Betaine values are not included in the calculation of total choline since the conversion of choline to betaine is irreversible (Zeisel et al., 2003).

Vitamin A. Beginning with SR15 (2002) values for vitamin A in µg of retinol activity equivalents (RAEs) and µg of retinol are reported. At the same time, values in µg of retinol equivalents (REs) were dropped from the database.

This change responded to new reference values for vitamin A in the DRI report issued by the Institute of Medicine of the National Academies (IOM, 2001). The report recommended changing the factors used for calculating vitamin A activity from the individual provitamin A carotenoids and introduced RAE as a new unit for expressing vitamin A activity. One µg RAE is equivalent to 1 µg of all-*trans*-retinol, 12 µg of all-*trans*-β-carotene, or 24 µg of other provitamin A carotenoids. The RAE conversion factors are based on studies showing that the conversion of provitamin A carotenoids to retinol was only half as great as previously thought.

Vitamin A is also reported in international units (IU), and will continue to be reported because it is still the unit used for nutrition labeling in the U.S. One IU is equivalent to 0.3 µg retinol, 0.6 µg β-carotene, or 1.2 µg other provitamin-A carotenoids (NAS/NRC, 1989) and thus over-estimates bioavailabilty.

Individual carotenoids (β-carotene, α-carotene, β-cryptoxanthin, lycopene, and

lutein+zeaxanthin) are reported. The analytical data are from NFNAP, generated using HPLC methodology (AOAC 941.15) and from the scientific literature. Most analytical systems do not separate lutein and zeaxanthin, so these carotenoids are shown combined. These values supersede those in Holden et al., 1999. Vitamin A activity values in RAE and IU were calculated from the content of individual carotenoids (β-carotene, α-carotene, and β-cryptoxanthin) using the appropriate factors. For food items used in the FNDDS, carotenoid values are imputed if analytical data are not available. For many of these items data are only available for vitamin A in IU. The variability in carotenoid levels due to cultivar, season, growing area, etc., as well as rounding within the NDBS, increases the difficulty in matching the calculated vitamin A activity values from imputed individual carotenoids to the existing IU values. As a result, the vitamin A IU value agrees within ±15 IU of the value calculated from individual carotenoids.

When individual carotenoids are not reported for plant foods (i.e. fruits, vegetables, legumes, nuts, cereal grains, and spices and herbs), µg RAE are calculated by dividing the IU value by 20. In foods of animal origin, such as eggs, beef, pork, poultry, lamb, veal, game, and fish (except for some organ meats and dairy), all of the vitamin A activity is contributed by retinol. For these foods, where analytical data are not available, µg RAE and µg of retinol are calculated by dividing the IU value by 3.33.

In foods that contain both retinol and provitamin A carotenoids, the amount of each of these components must be known to calculate RAE. Previously, most of the vitamin A data in the database were received as IU. Therefore, the amounts of the provitamin A carotenoids and retinol were then estimated from the ingredients. Once the components had been estimated, µg RAE were calculated as (IU from carotenoids/20) + (IU from retinol/3.33). Micrograms of retinol were calculated as IU from retinol/3.33.

Vitamin D Due to considerable public health interest in vitamin D, a multi-year project was undertaken by NDL to expand and update the relatively small existing dataset of vitamin D values in SR. Much of the original data for vitamin D had been published earlier in USDA's Provisional Table (PT-108) (Weihrauch and Tamaki, 1991), with values for fortified foods updated as needed with data received from the food industry.

The availability of vitamin D data for foods permitting subsequent dietary intake assessment is expected be a useful tool in investigating dietary requirements of vitamin D in vulnerable groups, one of the specific research recommendations of the 2005 Dietary Guidelines Committee (DGAC. 2004). An Institute of Medicine Committee to Review Dietary Reference Intakes for Vitamin D and Calcium was convened in 2009 to assess current relevant data and revise, as appropriate, the DRIs for vitamin D and calcium (http://www.iom.edu/?id=61170).

Before foods could be analyzed for vitamin D for inclusion in SR, analytical methodology had to be developed that could be used for a variety of food matrices (Byrdwell, 2008). Although a single method is not required for USDA-sponsored analyses, all participating laboratories must demonstrate that their analysis of quality control materials falls within an acceptable range of values. For vitamin D, all methods involved extraction with solvent(s), cleanup steps, and quantification by HPLC or by HPLC and LC/MS. In the absence of certified quality control materials for vitamin D, NDL, in collaboration with Virginia Tech, developed five matrix-

specific materials, one of which was sent with every batch of foods to be analyzed. The materials were: vitamin D_3 fortified fluid milk, a vitamin D_3 fortified multigrain ready-to-eat cereal, orange juice fortified with calcium and vitamin D_3, pasteurized process cheese fortified with vitamin D_3, and canned red salmon, a natural source of D_3 (Phillips et al. 2008). Vitamin D may also be present as 25-hydroxycholecalciferol in some foods such as fish, meat, and poultry. At this point the analytical methodology used to determine this metabolite of vitamin D has not been sufficiently validated; when work on this validation is completed 25-hydroxycholecalciferol values will be provided in future releases of SR.

Once an improved method of analysis was developed (Byrdwell, 2008), and the laboratories certified, a selection of foods, representing natural vitamin D sources and fortified sources, were chosen for sampling and analysis under the NFNAP (Haytowitz *et al*. 2008). Analyses have been completed for raw eggs and the following fortified products: fluid milk at 4 fat levels, reduced fat chocolate milk, fruit yogurt, and orange juice. Current analytical values for fish are based on limited analyses; additional samples are being analyzed and values will be updated in future SR releases. Vitamin D analyses have also been completed for selected cuts/pieces of chicken, pork, and beef.

Cholecalciferol (vitamin D_3; Nutr. No. 326) is the form naturally occurring in animal products and the form most commonly added to fortified foods. Ergocalciferol (vitamin D_2; Nutr. No. 325) is the form found in plants and is sometimes added to fortified foods, such as soy milk. In SR23, vitamin D (Nutr. No. 328) is defined as the sum of vitamin D_2 and vitamin D_3.

Vitamin D values in SR23 are provided in both micrograms (µg) and International Units (IU) to support both the analytical unit (µg) and the unit (IU) that is currently used in nutrient labeling of foods in the U.S. The biological activity of vitamin D is given as 40 IU/µg. Where available, specific isomers of vitamin D are reported only in µg. Calculations for vitamin D in SR include:

Vitamin D, µg (Nutr. No. 328) = vitamin D_2, µg + vitamin D_3, µg
Vitamin D, IU (Nutr. No. 324) = vitamin D, µg x 40

Vitamin D values in µg (Nutr. No. 328) are provided for all items in SR23 used to create the FNDDS.

In some cases, it was possible to identify food groups for which the foods do not provide or only contain trace amounts of vitamin D. Values for those foods were set to zero. For example, except for mushrooms, plant foods are not expected to contain any appreciable levels of vitamin D. In order to provide vitamin D estimates for the rest of the foods provided to create the FNDDS, data for other foods have been taken from the scientific literature or from other food composition databases, calculated from industry-declared % DV fortification levels, determined by formulation/recipe techniques, or estimated by other USDA imputation methods.

Fluid milk available at the retail level is fortified. The dairy industry provided guidance that most dairy products used as ingredients in formulated (commercial multi-ingredient) food, are not likely to be fortified with vitamin D. Likewise, margarine used in commercial products is generally not vitamin D-fortified; a relatively low percentage of vitamin D-fortified margarines

and spreads are available in the retail market. For ingredients that could be fortified at the retail level, but generally are not fortified at the food processing level, two related profiles are available in SR – one with added vitamin D and one without. When estimates were calculated for formulated foods, the unfortified profile was used. For home-prepared foods, such as pudding prepared with milk, the fortified ingredient(s) was selected for use in the recipe calculation of vitamin D. In the case of margarine, a market-share blend of fortified and unfortified product was used.

For some retail products, such as yogurt, there is considerable brand-to-brand difference in vitamin D fortification practices. One brand or line of products may be fortified with vitamin D, whereas another brand may not. Both types are included in the database. The market changes quickly and consumers concerned about vitamin D intake should always confirm vitamin D content by checking the product label.

Vitamin E. The DRI report (IOM, 2000) defines vitamin E as the naturally occurring form (*RRR*-α-tocopherol) and three synthetic forms of α-tocopherol. Since the release of SR16-1 (2003), NDL has reported vitamin E as mg of α-tocopherol (Nutr. No. 323) in accordance with the DRI report. Analytical values for tocopherols found in the database are determined by gas-liquid chromatography (GLC) or high-performance liquid chromatography (HPLC; Lee et al., 1999). Although β, γ, and δ-tocopherol do not contribute to vitamin E activity, they are included in the database when analytical data are available.

In the 2000 DRI report, a revised factor was recommended for calculation of the milligram amounts of α-tocopherol contributed by synthetic forms of vitamin E, since *all rac*-α-tocopherol contains 2*R*-stereoisomeric and 2*S*-stereoisomeric forms in equal amounts. Vitamin E activity is limited to the 2*R*-stereoisomeric forms of α-tocopherol to establish recommended intakes (IOM, 2000).

However, the unit for vitamin E required by the NLEA is IU and is based on the 1968 RDA definitions for vitamin E (CFR, Title 21, Pt. 101) (U.S. Food and Drug Administration– Department of Health and Human Services, 2004).

When NDL receives vitamin E data from the food industry expressed as IU, the values are converted to mg amounts based on the conversions of vitamin E in IU to mg as defined by the DRI report:

One mg of α-tocopherol = IU of the *all rac*-α-tocopherol compound × 0.45; and

One mg of α-tocopherol = IU of the *RRR*-α-tocopherol compound × 0.67.

The basis of the vitamin E tolerable upper intake level (UL), another important reference value defined in the DRI report, was established using all forms of supplemental α-tocopherol (IOM, 2000). Although the 2*S*-stereoisomers do not contribute to dietary requirements for vitamin E (IOM, 2000), they do contribute to the total intake relative to the UL. Nutrient number 573 is used to identify quantities of "added vitamin E." In this release, there are about 140 food items that have values for added vitamin E greater than 0. For the majority of these food items, the

form added is *all rac*-α-tocopherol; these values should be multiplied by 2 to relate intakes of this form to the UL. Items that are fortified with *RRR*-α-tocopherol are identified by a footnote and the added vitamin E value can be used directly to estimate its contribution to the UL.

Vitamin K. Much of the data for vitamin K has been generated under NFNAP and supersedes the values in the USDA Provisional Table (PT-104) (Weihrauch and Chatra, 1994). Vitamin K is extracted with hexane, purified with solid phase extraction using silica columns, and quantitated using HPLC with chemical reduction and fluorescence detection. Losses are corrected using vitamin $K_{1(25)}$ as the internal standard (Booth et al. 1994). Starting with SR23, in addition to data on vitamin K_1 (Nutr. No. 430), data on dihydrophylloquinone (Nutr. No.429) and menaquinone-4 (Nutr. No. 428) are also released. Dihydrophylloquinone is created during the commercial hydrogenation of plant oils. Menaquinone-4 is formed from vitamin K_1 and/or the synthetic form of vitamin K found in animal feed, and is found primarily in meats and meat products.

Lipid Components. Fatty acids are expressed as the actual quantity of fatty acid in g per 100 g of food and do not represent fatty acids as triglycerides. Historically, most fatty acid data were obtained as the percentage of fatty acid methyl esters and determined by GLC analyses (AOAC 996.06). These data were converted to g fatty acid per 100 g total lipid using lipid conversion factors and then to g fatty acid per 100 g edible portion of food using the total lipid content. Details of the derivation of lipid conversion factors were published by Weihrauch et al., 1977.

In the redesigned NDBS, fatty acid data may be imported in a variety of units and converted within the system. No conversions are required if data are received as g fatty acid per 100 g edible portion of food. Data received as fatty acid esters and as triglycerides are converted to fatty acids using Sheppard conversion factors. Sheppard conversion factors are based on the molecular weights of the specific fatty acid and its corresponding esters (butyl or methyl) and triglyceride (Sheppard, 1992). When fatty acid data are received as percentages of fatty acid methyl esters, methyl esters are converted to fatty acids using Sheppard conversion factors and then multiplied by total lipid (Nutrient No. 204) to give g fatty acid per 100 g edible portion of food. Occasionally, total lipid values are available from a variety of data sources, but individual fatty acids are available from fewer sources. In those cases, it may be necessary to normalize the individual fatty acids to the mean fat value of the food item. In the case of normalized fatty acids, the sum of the individual fatty acids will equal the mean fat value multiplied by the Weihrauch (1977) lipid conversion factor for that food item. No statistics of variability are reported for normalized fatty acids.

Individual Fatty Acids. The basic format for describing individual fatty acids is that the number before the colon indicates the number of carbon atoms in the fatty acid chain, and the number after the colon indicates the number of double bonds. For unsaturated fatty acids, additional nutrient numbers have been added to accommodate the reporting of many specific positional and geometric isomers. Of the specific isomers, there are two basic classifications considered: omega double bond position and *cis/trans* configuration of double bonds.

Omega-3 (n-3) and omega-6 (n-6) isomers are denoted in shorthand nomenclature as n-3 and n-6. The n- number indicates the position of the first double bond from the methyl end of the

carbon chain. The letter *c* or *t* indicates whether the bond is *cis* or *trans*. For polyunsaturated fatty acids, *cis* and *trans* configurations at successive double bonds may be indicated. For example, linoleic acid is an 18 carbon omega-6 fatty acid with 2 double bonds, both in *cis* configuration. When data are isomer specific, linoleic acid is described as 18:2 n-6 *c,c.* Other isomers of 18:2, for which nutrient numbers have now been assigned, include 18:2 *c,t*; 18:2 *t,c*; 18:2 *t,t;* 18:2 *t* not further defined; and 18:2 *i.* 18:2 *i* is not a single isomer but includes isomers other than 18:2 n-6 *c,c* with peaks that cannot be easily differentiated in the particular food item. Systematic and common names for fatty acids are given in Table 2.

Table 2 is provided for the convenience of users in attaching common names or systematic names to fatty acids in this database. Though individual fatty acids are more specific than in past releases, it is not possible to include every possible geometric and positional isomer. Where specific isomers exist for a fatty acid, the common name of the most typical isomer is listed for the undifferentiated fatty acid and an asterisk (*) designates the specific isomer by that name. For example, the most typical isomer for 18:1 is oleic. Thus, the specific isomer by that name, 18:1 c, is designated in Table 2 as oleic.

Table 2.—Systematic and Common Names for Fatty Acids

Fatty acid	Systematic name	Common name of most typical isomer	Nutrient number
Saturated fatty acids			
4:0	butanoic	butyric	607
6:0	hexanoic	caproic	608
8:0	octanoic	caprylic	609
10:0	decanoic	capric	610
12:0	dodecanoic	lauric	611
13:0	tridecanoic		696
14:0	tetradecanoic	myristic	612
15:0	pentadecanoic		652
16:0	hexadecanoic	palmitic	613
17:0	heptadecanoic	margaric	653
18:0	octadecanoic	stearic	614
20:0	eicosanoic	arachidic	615
22:0	docosanoic	behenic	624
24:0	tetracosanoic	lignoceric	654
Monounsaturated fatty acids			
14:1	tetradecenoic	myristoleic	625
15:1	pentadecenoic		697
16:1 undifferentiated	hexadecenoic	palmitoleic	626
16:1 *cis*			673*
16:1 *trans*			662
17:1	heptadecenoic		687

Table 2.—Systematic and Common Names for Fatty Acids—(continued)

Fatty acid	Systematic name	Common name of most typical isomer	Nutrient number
18:1 undifferentiated	octadecenoic	oleic	617
18:1 *cis*			674*
18:1 *trans*			663
20:1	eicosenoic	gadoleic	628
22:1 undifferentiated	docosenoic	erucic	630
22:1 *cis*			676*
22:1 *trans*			664
24:1 *cis*	cis-tetracosenoic	nervonic	671
Polyunsaturated fatty acids			
18:2 undifferentiated	octadecadienoic	linoleic	618
18:2 *trans* not further defined			665
18:2 *i* (mixed isomers)			666
18:2 n-6 *cis, cis*			675*
18:2 *trans, trans*			669
18:2 conjugated linoleic acid (CLAs)			670
18:3 undifferentiated	octadecatrienoic	linolenic	619
18:3 n-3 *cis, cis, cis*		alpha-linolenic	851*
18:3 n-6 *cis, cis, cis*		gamma-linolenic	685
18:3 *trans* (other isomers)			856
18:4	octadecatetraenoic	parinaric	627
20:2 n-6 *cis, cis*	eicosadienoic		672
20:3 undifferentiated	eicosatrienoic		689
20:3 n-3			852
20:3 n-6			853
20:4 undifferentiated	eicosatetraenoic	arachidonic	620
20:4 n-6			855
20:5 n-3	eicosapentaenoic (EPA)	timnodonic	629
21:5			857
22:4			858
22:5 n-3	docosapentaenoic (DPA)	clupanodonic	631
22:6 n-3	docosahexaenoic (DHA)		621

* Designates the specific isomer associated with the common name; the typical isomer is listed for the undifferentiated fatty acid.

Fatty acid totals. Only a small portion of the fatty acid data received for release in SR23 contains specific positional and geometric isomers. Therefore, it has been necessary to maintain the usual nutrient numbers corresponding to fatty acids with no further differentiation other than carbon

length and number of double bonds. To aid users of our data, specific isomers are always summed to provide a total value for the undifferentiated fatty acid. For example, mean values for the specific isomers of 18:2 are summed to provide a mean for 18:2 undifferentiated (Nutrient No. 618). Other fatty acid totals provided are (1) the sum of saturated, monounsaturated, and polyunsaturated fatty acids and (2) the sum of *trans*-monoenoic, the sum of *trans*-polyenoic, and the sum of all *trans* fatty acids.

Values for total saturated, monounsaturated, and polyunsaturated fatty acids may include individual fatty acids not reported; therefore, the sum of their values may exceed the sum of the individual fatty acids. In rare cases, the sum of the individual fatty acids may exceed the sum of the values given for the total saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), and polyunsaturated fatty acids (PUFA). These differences are generally caused by rounding and should be relatively small.

For multi-ingredient processed brand-name foods, industry data are often available for fatty acid classes (SFA, MUFA, and PUFA) but are lacking for individual fatty acids. In these cases, individual fatty acids are calculated from the fatty acids of the individually listed ingredients and normalized to the total fat level. A best-fit approximation has been made to fatty acid classes, but unavoidably, calculated sums of individual fatty acid totals do not always match industry data for fatty acid classes. Zero values for individual fatty acids should be understood to mean that trace amounts may be present. When g fatty acids per 100 g of total lipid are converted to g fatty acids per 100 g of food, values of less than 0.0005 are rounded to 0.

Cholesterol. Cholesterol values are generated primarily by gas liquid chromatographic procedures (AOAC 994.10). It is assumed that cholesterol is present only in foods of animal origin and foods containing at least one ingredient of animal origin (for example, cake that contains eggs). For mixtures containing ingredients derived from animal products, the cholesterol value may be calculated from the value for those ingredients. For foods that contain only plant products, the value for cholesterol is assumed to be zero.

Plant sterols. Data on plant sterols (campesterol, stigmasterol, and β-sitosterol) are obtained by gas-chromatographic procedures (AOAC 967.18) and summed to calculate total phytosterols.

Amino Acids. Amino acid data for a class or species of food are aggregated to yield a set of values that serve as the pattern for calculating the amino acid profile of other similar foods. The amino acid values for the pattern are expressed on a per-gram-of-nitrogen basis. Amino acids are extracted in three groups—tryptophan, sulfur-containing amino acids (methionine and cystine), and all others. Tryptophan is determined by alkaline hydrolysis/HPLC (AOAC 988.15), methionine and cystine by performic oxidation/HPLC (AOAC 994.12) and all others by acid hydrolysis/HPLC (AOAC 982.30). The amino acid patterns and the total nitrogen content are used to calculate the levels of individual amino acids per 100 g of food, using the following formula:

$$AA_f = (AA_n * V_p)/N_f$$

Where:

AA_f = amino acid content per 100 g of food,
AA_n = amino acid content per g of nitrogen,
V_p = protein content of food, and
N_f = nitrogen factor.

For foods processed in the NDBS since SR14 (2001), the number of observations used in developing an amino acid pattern will be released only with the pattern. The amino acid profiles calculated from these patterns will show the number of data points to be zero. In the past, the number of data points appeared only for the food item for which the amino acid pattern was developed, not on other foods that used the same pattern. It referred to the number of observations used in developing the amino acid pattern for that food.

If amino acid values are presented for an item with more than one protein-containing ingredient, the values may be calculated on a per-gram-of-nitrogen basis from the amino acid patterns of the various protein-containing ingredients. Then the amino acid contents for an item on the 100-g basis are calculated as the sum of the amino acids in each protein-containing ingredient multiplied by total nitrogen in the item. The number of data points for these values is given as zero.

Weights and Measures

Information is provided on household measures for food items (for example, 1 cup, 1 tablespoon, 1 fruit, 1 leg). Weights are given for edible material without refuse, that is, the weight of an apple without the core or stem, or a chicken leg without the bone, and so forth. The Weight file contains the gram weights and measure descriptions for each food item. This file can be used to calculate nutrient values for food portions from the values provided per 100 g of food. The following formula is used to calculate the nutrient content per household measure:

$$N = (V*W)/100$$

Where:
N = nutrient value per household measure,
V = nutrient value per 100 g (Nutr_Val in the Nutrient Data file), and
W = g weight of portion (Gm_Wgt in the Weight file).

The Weight file can be used to produce reports showing the household measure and nutrient values calculated for that portion. The weights are derived from published sources, industry files, studies conducted by USDA (Adams, 1975; Fulton et al., 1977), and the weights and measures used in the FNDDS (2006). However, weight information is not available for all food items in the database. Though special efforts have been made to provide representative values, weights and measures obtained from different sources vary considerably for some foods. The format of this file is described on p. 31.

Footnotes

Footnotes are provided for a few items where information about food description, weights and measures, or nutrient values could not be accommodated in existing fields. For example, if citric acid is added to a juice drink, this is indicated in the footnote. The format of this file is described on p. 32.

Sources of Data

The Sources of Data file (previously called References) was first added with SR14 (2001). The name of the file and fields reflect the fact that not all sources are journals or published literature, but also include the results of unpublished data from USDA-sponsored research and from research sponsored by others either separately or in collaboration with USDA. It contains data sources for the nutrient values and links to an identification number on each nutrient record. Since some of the data in this release were carried forward from SR13 (1999), nutrient-specific source documentation is not electronically available. As new data for these foods are generated and as additional documentation is entered into the new NDBS, data source information will increase in future releases. The format of this file is described on p. 32.

A file, the Sources of Data Link file, is provided to allow users to establish a relationship between the Sources of Data file and the Nutrient Data file. This lets the user identify specific sources of data for each nutrient value. For example, the user can use these files to identify where NFNAP data is used in the database. The format of this file is described on p.32.

Explanation of File Formats

The data appear in two different organizational formats. One is a relational format of four principal and six support files making up the database. The relational format is complete and contains all food, nutrient, and related data. The other is a flat abbreviated file with all the food items, but fewer nutrients, and not all of the other related information. The abbreviated file does not include values for starch, individual sugars, fluoride, betaine, vitamin D_2 or D_3, added vitamin E, added vitamin B_{12}, alcohol, caffeine, theobromine, phytosterols, individual amino acids, or individual fatty acids. See p. 34 for more information on this file.

Relational Files

The four principal database files are the Food Description file, Nutrient Data file, Gram Weight file, and Footnote file. The six support files are the Nutrient Definition file, Food Group Description file, Source Code file, Data Derivation Code Description file, Sources of Data file, and Sources of Data Link file. Table 3 shows the number of records in each file. In a relational database, these files can be linked together in a variety of combinations to produce queries and generate reports. Figure 1 provides a diagram of the relationships between files and their key fields.

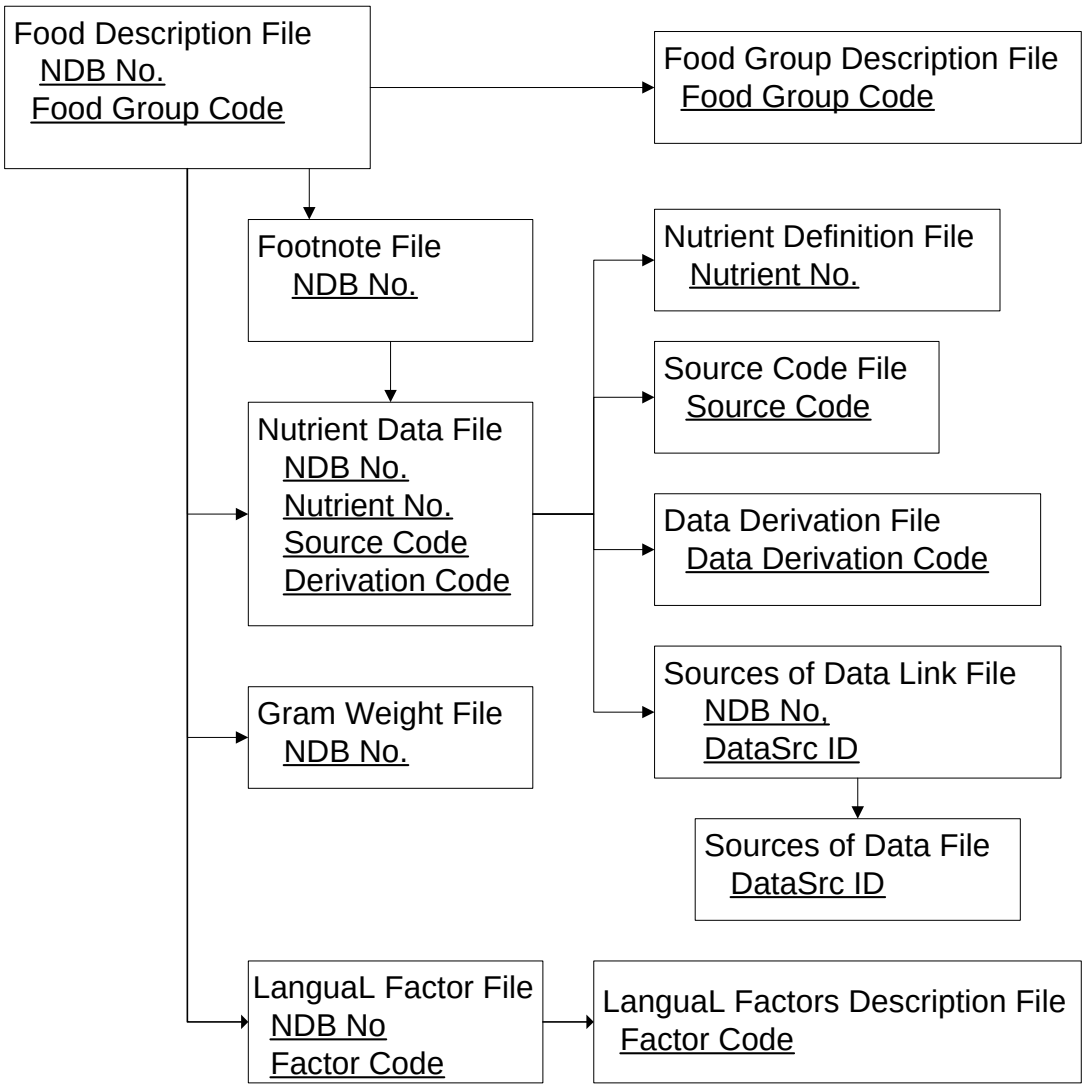
Table 3. – Number of Records in Principal and Support Files

File name	Table name	Number of records
Principal files		
Food Description	FOOD_DES	7636
Nutrient Data	NUT_DATA	555726
Weight	WEIGHT	13199
Footnote	FOOTNOTE	425
Support files		
Food Group Description	FD_GROUP	25
LanguaL Factor	LANGUAL	40494
LanguaL Factors Description	LANGDESC	775
Nutrient Definition	NUTR_DEF	146
Source Code	SRC_CD	10
Data Derivation Description	DERIV_CD	54
Sources of Data	DATA_SRC	561
Sources of Data Link	DATSRCLN	165042

The relational files are provided in both ASCII format and a Microsoft Access 2003 database. Tables 4 through 13 describe the formats of these files. Information on the relationships that can be made among these files is also given. Fields that always contain data and fields that can be left blank or null are identified in the "blank" column; N indicates a field that is always filled; Y indicates a field that may be left blank (null) (Tables 4–13). An asterisk (*) indicates primary key(s) for the file. Though keys are not identified for the ASCII files, the file descriptions show where keys are used to sort and manage records within the NDBS. When importing these files into a database management system, if keys are to be identified for the files, it is important to use the keys listed here, particularly with the Nutrient Data file, which uses two.

ASCII files are delimited. All fields are separated by carets (^) and text fields are surrounded by tildes (~). A double caret (^^) or two carets and two tildes (~~) appear when a field is null or blank. Format descriptions include the name of each field, its type [N = numeric with width and number of decimals (w.d) or A = alphanumeric], and maximum record length. The actual length in the data files may be less and most likely will change in later releases. Values will be padded with trailing zeroes when imported into various software packages, depending on the formats used.

Figure 1. Relationships among files in the USDA National Nutrient Database for Standard Reference *



* Underlined items denote key fields.

Food Description File (file name = FOOD_DES). This file (Table 4) contains long and short descriptions and food group designators for 7,636 food items, along with common names, manufacturer name, scientific name, percentage and description of refuse, and factors used for calculating protein and kilocalories, if applicable. Items used in the FNDDS are also identified by value of "Y" in the Survey field.

- Links to the Food Group Description file by the FdGrp_Cd field
- Links to the Nutrient Data file by the NDB_No field
- Links to the Weight file by the NDB_No field
- Links to the Footnote file by the NDB_No field
- Links to the LanguaL Factor file by the NDB_No field

Table 4.—Food Description File Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Databank number that uniquely identifies a food item. If this field is defined as numeric, the leading zero will be lost.
FdGrp_Cd	A 4	N	4-digit code indicating food group to which a food item belongs.
Long_Desc	A 200	N	200-character description of food item.
Shrt_Desc	A 60	N	60-character abbreviated description of food item. Generated from the 200-character description using abbreviations in Appendix A. If short description is longer than 60 characters, additional abbreviations are made.
ComName	A 100	Y	Other names commonly used to describe a food, including local or regional names for various foods, for example, "soda" or "pop" for "carbonated beverages."
ManufacName	A 65	Y	Indicates the company that manufactured the product, when appropriate.
Survey	A 1	Y	Indicates if the food item is used in the USDA Food and Nutrient Database for Dietary Studies (FNDDS) and thus has a complete nutrient profile for the 65 FNDDS nutrients.
Ref_desc	A 135	Y	Description of inedible parts of a food item (refuse), such as seeds or bone.
Refuse	N 2	Y	Percentage of refuse.
SciName	A 65	Y	Scientific name of the food item. Given for the least processed form of the food (usually raw), if applicable.
N_Factor	N 4.2	Y	Factor for converting nitrogen to protein (see p. 10).
Pro_Factor	N 4.2	Y	Factor for calculating calories from protein (see p. 11).
Fat_Factor	N 4.2	Y	Factor for calculating calories from fat (see p. 11).
CHO_Factor	N 4.2	Y	Factor for calculating calories from carbohydrate (see p. 11).

* Primary key for the Food Description file.

Food Group Description File (file name = FD_GROUP). This file (Table 5) is a support file to the Food Description file and contains a list of food groups used in SR23 and their descriptions.

- Links to the Food Description file by FdGrp_Cd

Table 5.—Food Group Description File Format

Field name	Type	Blank	Description
FdGrp_Cd	A 4*	N	4-digit code identifying a food group. Only the first 2 digits are currently assigned. In the future, the last 2 digits may be used. Codes may not be consecutive.
FdGrp_Desc	A 60	N	Name of food group.

* Primary key for the Food Group Description file.

LanguaL Factor File (File name = LANGUAL). This file (Table 6) is a support file to the Food Description file and contains the factors from the LanguaL Thesaurus used to code a particular food.

- Links to the Food Description file by the NDB_No field
- Links to LanguaL Factors Description file by the factor field

Table 6.—LanguaL Factor File Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Databank number that uniquely identifies a food item. If this field is defined as numeric, the leading zero will be lost.
Factor_Code	A 5	N	The LanguaL factor from the Thesaurus

* Primary key for the LanguaL Factor file.

LanguaL Factors Description File (File name = LANGDESC). This file (Table 7) is a support file to the LanguaL Factor file and contains the descriptions for only those factors used in coding the selected food items codes in this release of SR.

- Links to the LanguaL Factor File by the Factor field

Table 7.—LanguaL Factors Description File Format

Field name	Type	Blank	Description
Factor_Code	A 5*	N	The LanguaL factor from the Thesaurus. Only those codes used to factor the foods contained in the LanguaL Factor file are included in this file
Description	A 140	N	The description of the LanguaL Factor Code from the thesaurus

* Primary key for the LanguaL Factor Description file.

Nutrient Data File (file name = NUT_DATA)**.** This file (Table 8) contains the nutrient values and information about the values, including expanded statistical information.

- Links to the Food Description file by NDB_No.
- Links to the Weight file by NDB_No.
- Links to the Footnote file by NDB_No and when applicable, Nutr_No.
- Links to the Nutrient Definition file by Nutr_No.
- Links to the Source Code file by Src_Cd
- Links to the Derivation Code file by Deriv_Cd

Table 8.—Nutrient Data File Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Databank number.
Nutr_No	A 3*	N	Unique 3-digit identifier code for a nutrient .
Nutr_Val	N 10.3	N	Amount in 100 grams, edible portion †.
Num_Data_Pts	N 5.0	N	Number of data points (previously called Sample_Ct) is the number of analyses used to calculate the nutrient value. If the number of data points is 0, the value was calculated or imputed.
Std_Error	N 8.3	Y	Standard error of the mean. Null if cannot be calculated. The standard error is also not given if the number of data points is less than three.
Src_Cd	A 2	N	Code indicating type of data.
Deriv_Cd	A 4	Y	Data Derivation Code giving specific information on how the value is determined
Ref_NDB_No	A 5	Y	NDB number of the item used to impute a missing value. Populated only for items added or updated starting with SR14.

Field name	Type	Blank	Description
Add_Nutr_Mark	A 1	Y	Indicates a vitamin or mineral added for fortification or enrichment. This field is populated for ready-to-eat breakfast cereals and many brand-name hot cereals in food group 8.
Num_Studies	N 2	Y	Number of studies.
Min	N 10.3	Y	Minimum value.
Max	N 10.3	Y	Maximum value.
DF	N 2	Y	Degrees of freedom.
Low_EB	N 10.3	Y	Lower 95% error bound.
Up_EB	N 10.3	Y	Upper 95% error bound.
Stat_cmt	A 10	Y	Statistical comments. See definitions below.
CC	A 1	Y	Confidence Code indicating data quality, based on evaluation of sample plan, sample handling, analytical method, analytical quality control, and number of samples analyzed. Not included in this release, but is planned for future releases.

* Primary keys for the Nutrient Data file.
† Nutrient values have been rounded to a specified number of decimal places for each nutrient. Number of decimal places is listed in the Nutrient Definition file.

Definitions of each statistical comment included in the Nutrient Data table follow:

1. The displayed summary statistics were computed from data containing some less-than values. Less-than, trace, and not-detected values were calculated.
2. The displayed degrees of freedom were computed using Satterthwaite's approximation (Korz and Johnson, 1988).
3. The procedure used to estimate the reliability of the generic mean requires that the data associated with each study be a simple random sample from all the products associated with the given data source (for example, manufacturer, variety, cultivar, and species).
4. For this nutrient, one or more data sources had only one observation. Therefore, the standard errors, degrees of freedom, and error bounds were computed from the between-group standard deviation of the weighted groups having only one observation.

Nutrient Definition File (file name = NUTR_DEF). This file (Table 9) is a support file to the Nutrient Data file. It provides the 3-digit nutrient code, unit of measure, INFOODS tagname, and description.

- Links to the Nutrient Data file by Nutr_No.

Table 9.—Nutrient Definition File Format

Field name	Type	Blank	Description
Nutr_No	A 3*	N	Unique 3-digit identifier code for a nutrient.
Units	A 7	N	Units of measure (mg, g, µg, and so on).
Tagname	A 20	Y	International Network of Food Data Systems (INFOODS) Tagnames.† A unique abbreviation for a nutrient/food component developed by INFOODS to aid in the interchange of data.
NutrDesc	A 60	N	Name of nutrient/food component.
Num_Dec	A 1	N	Number of decimal places to which a nutrient value is rounded.
SR_Order	N 6	N	Used to sort nutrient records in the same order as various reports produced from SR.

* Primary key for the Nutrient Definition file.
† INFOODS, 2009.

Source Code File (file name = SRC_CD). This file (Table 10) contains codes indicating the type of data (analytical, calculated, assumed zero, and so on) in the Nutrient Data file. To improve the usability of the database and to provide values for the FNDDS, NDL staff imputed nutrient values for a number of proximate components, total dietary fiber, total sugar, and vitamin and mineral values.

- Links to the Nutrient Data file by Src_Cd

Table 10.—Source Code File Format

Field name	Type	Blank	Description
Src_Cd	A 2*	N	2-digit code.
SrcCd_Desc	A 60	N	Description of source code that identifies the type of nutrient data.

* Primary key for the Source Code file.

Data Derivation Code Description File (file name = DERIV_CD). This file (Table 11) provides information on how the nutrient values were determined. The file contains the derivation codes and their descriptions.

- Links to the Nutrient Data file by Deriv_Cd

Table 11.—Data Derivation Code File Format

Field name	Type	Blank	Description
Deriv_Cd	A 4*	N	Derivation Code.
Deriv_Desc	A 120	N	Description of derivation code giving specific information on how the value was determined.

* Primary key for the Data Derivation Code file.

For example, the data derivation code that indicates how α-tocopherol (Nutrient No. 323) in Emu, fan fillet, raw (NDB. No. 05623) was calculated is BFSN. The breakdown of the code is as follows:

B = based on another form of the food or a similar food;
F = concentration adjustment used;
S = solids, the specific concentration adjustment used; and
N = retention factors not used

The Ref_NDB_No is 05621 Emu, ground, raw. This means that the analytical α-tocopherol value in the total solids of emu, ground, raw is used to calculate the α-tocopherol in the total solids of emu, fan fillet, raw.

$N_t = (N_s * S_s)/S_t$

where

N_t = the nutrient content of the target item,
N_s = the nutrient content of the source item,
For NDB No. 05621, α-tocopherol = 0.24 mg/100 g
S_s = the total solids content of the source item, and
For NDB No. 05621, solids = 27.13 g/100 g
S_t = the total solids content of the target item.
For NDB No. 05623, solids = 2538 g/100 g

So, using this formula for the above example:

$N_t = (0.24 \times 25.38)/27.13 = 0.22$ mg/100 g α-tocopherol in Emu, fan fillet, raw

Only items that were imputed starting with SR14 (2001) will have both derivation codes and reference NDB numbers. Other items that have been imputed outside the NDBS will have data derivation codes, but the Ref_NDB_No field will be blank.

Weight File (file name = WEIGHT). This file (Table 12) contains the weight in grams of a number of common measures for each food item.

- Links to Food Description file by NDB_No.
- Links to Nutrient Data file by NDB_No.

Table 12.— Weight File Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Databank number.
Seq	A 2*	N	Sequence number.
Amount	N 5.3	N	Unit modifier (for example, 1 in "1 cup").
Msre_Desc	A 80	N	Description (for example, cup, diced, and 1-inch pieces).
Gm_Wgt	N 7.1	N	Gram weight.
Num_Data_Pts	N 3	Y	Number of data points.
Std_Dev	N 7.3	Y	Standard deviation.

* Primary key for the Weight file.

Footnote File (file name = FOOTNOTE)**.** This file (Table 13) contains additional information about the food item, household weight, and nutrient value.

- Links to the Food Description file by NDB_No.
- Links to the Nutrient Data file by NDB_No and Nutr_No.

Table 13.—Footnote File Format

Field name	Type	Blank	Description
NDB_No	A 5	N	5-digit Nutrient Databank number.
Footnt_No	A 4	N	Sequence number. If a given footnote applies to more than one nutrient number, the same footnote number is used. As a result, this file cannot be indexed.
Footnt_Typ	A 1	N	Type of footnote: D = footnote adding information to the food description; M = footnote adding information to measure description; N = footnote providing additional information on a nutrient value. If the Footnt_typ = N, the Nutr_No will also be filled in.
Nutr_No	A 3	Y	Unique 3-digit identifier code for a nutrient to which footnote applies.
Footnt_Txt	A 200	N	Footnote text.

Sources of Data Link File (file name = DATSRCLN). This file (Table 14) is used to link the Nutrient Data file with the Sources of Data table. It is needed to resolve the many-to-many relationship between the two tables.

- Links to the Nutrient Data file by NDB No. and Nutr_No.

- Links to the Sources of Data file by DataSrc_ID.

Table 14.—Sources of Data Link File Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Databank number.
Nutr_No	A 3*	N	Unique 3-digit identifier code for a nutrient.
DataSrc_ID	A 6*	N	Unique ID identifying the reference/source.

* Primary key for the Sources of Data Link file.

Sources of Data File (file name = DATA_SRC). This file (Table 15) provides a citation to the DataSrc_ID in the Sources of Data Link file.

- Links to Nutrient Data file by NDB No. through the Sources of Data Link file

Table 15.—Sources of Data File Format

Field name	Type	Blank	Description
DataSrc_ID	A 6*	N	Unique number identifying the reference/source.
Authors	A 255	Y	List of authors for a journal article or name of sponsoring organization for other documents.
Title	A 255	N	Title of article or name of document, such as a report from a company or trade association.
Year	A 4	Y	Year article or document was published.
Journal	A 135	Y	Name of the journal in which the article was published.
Vol_City	A 16	Y	Volume number for journal articles, books, or reports; city where sponsoring organization is located.
Issue_State	A 5	Y	Issue number for journal article; State where the sponsoring organization is located.
Start_Page	A 5	Y	Starting page number of article/document.
End_Page	A 5	Y	Ending page number of article/document.

* Primary key for the Sources of Data file.

Abbreviated File

The Abbreviated file **(**file name = ABBREV) is available in ASCII format and as a Microsoft Excel spreadsheet. It contains all the food items found in the relational database, but with fewer nutrients and other related information. The abbreviated file does not include values for starch, fluoride, betaine, vitamin D_2 and D_3, added vitamin E, added vitamin B_{12}, alcohol, caffeine, theobromine, phytosterols, individual amino acids, individual fatty acids, or sugars. Table 16 lists all the nutrients included in the abbreviated file. Starting with SR22 (2009), Vitamin D in µg and IU was added to the Abbreviated file. The ASCII file (Table 16) is in delimited format. Fields are separated by a caret (^) and text fields are surrounded by tildes (~). Data refer to 100 g of the edible portion of the food item. Decimal points are included in the fields. Missing values are denoted by the null value of two consecutive carets (^^) or two carets and two tildes (~~). The file is sorted in ascending order by the NDB number. Two common measures are provided, which are the first two common measures in the Weight file for each NDB number. To obtain values per one of the common measures, multiply the value in the desired nutrient field by the value in the desired common measure field and divided by 100. For example, to calculate the amount of fat in 1 tablespoon of butter (NDB No. 01001),

$$V_H=(N*CM)/100$$

where:

Vh = the nutrient content per the desired common measure
N = the nutrient content per 100 g
For NDB No. 01001, fat = 81.11 g/100 g
CM = grams of the common measure
For NDB No. 01001, 1 tablespoon = 14.2 g

So using this formula for the above example:

Vh = (81.11*14.2)/100 = 11.52 g fat in 1 tablespoon of butter

This file is a flat file and is provided for those users who do not need a relational database. It contains the information in one record per food item and is suitable for importing into a spreadsheet. The data file has been imported into a Microsoft Excel 2003 spreadsheet for users of that application. Users of other software applications can import either the Microsoft Excel 2003 spreadsheet or the ASCII files. If additional information is needed, this file can be linked to the other SR files by the NDB number.

Table 16.—Abbreviated File Format

Field name	Type	Description
NDB_No.	A 5*	5-digit Nutrient Databank number.
Shrt_Desc	A 60	60-character abbreviated description of food item.†
Water	N 10.2	Water (g/100 g)
Energ_Kcal	N 10	Food energy (kcal/100 g)

Field name	Type	Description
Protein	N 10.2	Protein (g/100 g)
Lipid_Tot	N 10.2	Total lipid (fat)(g/100 g)
Ash	N 10.2	Ash (g/100 g)
Carbohydrt	N 10.2	Carbohydrate, by difference (g/100 g)
Fiber_TD	N 10.1	Total dietary fiber (g/100 g)
Sugar_Tot	N 10.2	Total sugars (g/100 g)
Calcium	N 10	Calcium (mg/100 g)
Iron	N 10.2	Iron (mg/100 g)
Magnesium	N 10	Magnesium (mg/100 g)
Phosphorus	N 10	Phosphorus (mg/100 g)
Potassium	N 10	Potassium (mg/100 g)
Sodium	N 10	Sodium (mg/100 g)
Zinc	N 10.2	Zinc (mg/100 g)
Copper	N 10.3	Copper (mg/100 g)
Manganese	N 10.3	Manganese (mg/100 g)
Selenium	N 10.1	Selenium (µg/100 g)
Vit_C	N 10.1	Vitamin C (mg/100 g)
Thiamin	N 10.3	Thiamin (mg/100 g)
Riboflavin	N 10.3	Riboflavin (mg/100 g)
Niacin	N 10.3	Niacin (mg/100 g)
Panto_acid	N 10.3	Pantothenic acid (mg/100 g)
Vit_B6	N 10.3	Vitamin B_6 (mg/100 g)
Folate_Tot	N 10	Folate, total (µg/100 g)
Folic_acid	N 10	Folic acid (µg/100 g)
Food_Folate	N 10	Food folate (µg/100 g)
Folate_DFE	N 10	Folate (µg dietary folate equivalents/100 g)
Choline_Tot	N 10	Choline, total (mg/100 g)
Vit_B12	N 10.2	Vitamin B_{12} (µg/100 g)
Vit_A_IU	N 10	Vitamin A (IU/100 g)
Vit_A_RAE	N 10	Vitamin A (µg retinol activity equivalents/100g)
Retinol	N 10	Retinol (µg/100 g)
Alpha_Carot	N 10	Alpha-carotene (µg/100 g)

Field name	Type	Description
Beta_Carot	N 10	Beta-carotene (µg/100 g)
Beta_Crypt	N 10	Beta-cryptoxanthin (µg/100 g)
Lycopene	N 10	Lycopene (µg/100 g)
Lut+Zea	N 10	Lutein+zeazanthin (µg/100 g)
Vit_E	N 10.2	Vitamin E (alpha-tocopherol) (mg/100 g)
Vit_D_mcg	N 10.1	Vitamin D (µg/100 g))
Vit_D_IU	N 10	Vitamin D (IU/100 g))
Vit_K	N 10.1	Vitamin K (phylloquinone) (µg/100 g)
FA_Sat	N 10.3	Saturated fatty acid (g/100 g)
FA_Mono	N 10.3	Monounsaturated fatty acids (g/100 g)
FA_Poly	N 10.3	Polyunsaturated fatty acids (g/100 g)
Cholestrl	N 10.3	Cholesterol (mg/100 g)
GmWt_1	N 9.2	First household weight for this item from the Weight file.‡
GmWt_Desc1	A 120	Description of household weight number 1.
GmWt_2	N 9.2	Second household weight for this item from the Weight file.‡
GmWt_Desc2	A 120	Description of household weight number 2.
Refuse_Pct	N 2	Percent refuse.§

* Primary key for the Abbreviated file.
† For a 200-character description and other descriptive information, link to the Food Description file.
‡ For the complete list and description of the measure, link to the Weight file.
§ For a description of refuse, link to the Food Description file.

Update Files

The update files contain changes made between SR22 (2009) and SR23 (2010). Update files in ASCII are provided for those users who reformatted previous releases for their systems and wish to do their own updates. If a release earlier than SR22 is used, it is necessary to first obtain the update files for that release through SR22, update the database to SR22, and then use the update files provided with SR23. The earlier update files are available on NDL's web site: http://www.ars.usda.gov/nutrientdata.

New data added to SR23 are given in the following files:

- ADD_FOOD for descriptions of the new items,

- ADD_NUTR for added nutrient data,
- ADD_WGT for added weight and measure data,
- ADD_FTNT for added footnotes,
- ADD_NDEF for added nutrient definitions.

These files are in the same formats as the Food Description file, the Nutrient Data file, the Weight file, the Footnote file, the Nutrient Definition file and the Food Group Description file.

Five files contain changes made since SR22 (2009):
- CHG_FOOD contains records with changes in the descriptive information for a food item.
- CHG_NUTR contains changes to the following fields: nutrient values, standard errors, number of data points, source code, and data derivation code.
- CHG_WGT contains records with changes to the gram weights or measure information.
- CHG_FTNT contains records with changes to footnotes.
- CHG_NDEF contains records with changes to the nutrient definitions.

If the values in any fields have changed, the entire record is included for that file. These files are in the same format as the Food Description, Nutrient Data, Weight, and Nutrient Definition files.

Four files contain records that were deleted since SR22 (2009):
- DEL_FOOD file (Table 17) lists those food items that were deleted from the database.
- DEL_NUTR file (Table 18) lists those nutrient values that were removed from the database.
- DEL_WGT contains any gram weights that were removed. These records are in the same format as the Weight file (Table 12).
- DEL_FTNT contains any footnotes that were removed from the database (Table 19). Starting with SR19, if a given footnote applied to more than one nutrient number, the same footnote number can be used. When these footnote numbers are updated, the extra footnotes are deleted.

Table 17.—Foods Deleted Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	Unique 5-digit number identifying deleted item.
Shrt_Desc	A 60	N	60-character abbreviated description of food item.

* Primary key for Foods Deleted file.

Table 18. —Nutrients Deleted Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	Unique 5-digit number identifying the item that contains the deleted nutrient record.
Nutr_No	A 3	N	Nutrient number of deleted record.

* Primary key for Nutrients Deleted file.

Table 19.—Footnotes Deleted Format

Field name	Type	Blank	Description
NDB_No	A 5*	N	Unique 5-digit number identifying the item that contains the deleted nutrient record.
Footnt_No	A 4	N	Sequence number.
Footnt_Typ	A 1	N	Type of footnote of deleted record.

* Primary key for Footnotes Deleted file.

Update files in ASCII are also provided for the Abbreviated file:

- CHG_ABBR file contains records for food items where a food description, household weight, refuse value, or nutrient value have been added, changed, or deleted since SR22. This file is in the same format as the Abbreviated file (Table 16).
- DEL_ABBR contains food items that have been removed from the database; it is in the same format as DEL_FOOD.
- ADD_ABBR contains food items added since SR22; it is also in the same format as the Abbreviated file.

Summary

A number of food items have been added to the database using new data from NFNAP, the food industry, and other sources. Other foods have had nutrient values updates. In particular, the sodium content of those foods which are major contributors of sodium to the diet—primarily processed foods— has been reviewed using data from company web sites and package labels. Where the difference from previously published values is greater than or equal to 10% per 100g, the sodium value has been updated. A number of food items, no longer on the market, such as certain processed foods, have been removed. These are described in "Specific Changes for SR23" (p. 1). The next release, SR24, available during summer 2011, will contain additional items and updates.

References Cited in the Documentation

Adams, C.F. 1975. Nutritive Value of American Foods in Common Units. U.S. Department of Agriculture, Agricultural Handbook 456.

Association of Official Analytical Chemists. 2003. Official Methods of Analysis, 17th ed., 2nd revision. AOAC International, Gaithersburg, MD.

Booth, S.L., K.W. Davidson, and J.A. Sadowski. 1994. Evaluation of an HPLC method for the determination of phylloquinone (vitamin K_1) in various food matrices. Journal of Agricultural and Food Chemistry 42:295-300.

Byrdwell, W. C., J. Devries, J. Exler, J.M. Harnly, J.M. Holden, M.F. Holick, B.W. Hollis, R.L. Horst, M. Lada, L.E. Lemar, K.Y. Patterson, K.M. Philips, M.T. Tarrago-Trani, W.R. Wolf. 2008. Analyzing vitamin D in foods and supplements: methodologic challenges. American Journal of Clinical Nutrition. 88(2):554S-557S.

Chun, J., Martin, J.A., Chen, L., Lee, J., Ye, L., Eitenmiller, R. 2004. A differential assay of folic acid and total folate in foods containing enriched cereal-grain products to calculate μg dietary folate equivalents (μg DFE). Journal of Food Composition and Analysis 19(2-3):182-187.

Dietary Guidelines Advisory Committee (DGAC). 2004. The Report of the Dietary Guidelines Advisory Committee on Dietary Guidelines for Americans, 2005. Available from http://www.health.gov/dietaryguidelines/dga2005/report/default.htm (accessed 06/19/2009).

Fulton, L., E. Matthews, and C. Davis. 1977. Average Weight of a Measured Cup of Various Foods. U.S. Department of Agriculture, Home Economics Research Report 41.

Gebhardt, S.E., and R.G. Thomas. 2002. Nutritive Value of Foods. U.S. Department of Agriculture, Home and Garden Bulletin 72.*

Haytowitz, D.B., P.R. Pehrsson, and J.M Holden. 2008. The national food and nutrient analysis program: a decade of progress. Journal of Food Composition and Analysis 21(Supp. 1):S94-S102.*

Holden, J.M., S.A. Bhagwat, and K.Y. Patterson. 2002. Development of a multi-nutrient data quality evaluation system. Journal of Food Composition and Analysis 15(4):339–348.*

Holden, J.M., A.L. Eldridge, G.R. Beecher, et al. 1999. Carotenoid content of U.S. foods: An update of the database. Journal of Food Composition and Analysis 12:169–196.*

INFOODS. 2009. Tagnames for Food Components. INFOODS web site. http://www.fao.org/infoods/tagnames_en.stm. (Accessed 7/1/2010).

Institute of Medicine. 1998. Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B_6, folate, vitamin B_{12}, pantothenic acid, biotin, and choline. National Academy Press, Washington, DC.

Institute of Medicine. 2000. Dietary reference intakes for vitamin C, vitamin E, selenium, and carotenoids. National Academy Press, Washington, DC.

Institute of Medicine. 2001. Dietary reference intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. National Academy Press, Washington, DC.

Jones, D.B. 1941. Factors for Converting Percentages of Nitrogen in Foods and Feeds into Percentages of Protein. U.S. Department of Agriculture, Circular 83, slight revision.*

Koc, H., Mar, M. H., Ranasinghe, A., Swenberg, J. A., and Zeisel, S. H. 2002. Quantitation of choline and its metabolites in tissues and foods by liquid chromatography/electrospray ionization-isotope dilution mass spectrometry. Analytical Chemistry 74:4734-4740.

Korz, S., and N.L. Johnson. 1988. Encyclopedia of Statistical Sciences. Vol. 8, pp. 261–262, John Wiley and Son, New York, NY.

Kubota, J., and W.H. Allaway. 1972. Geographic distribution of trace element problems. *In* J.J. Mortvedt, ed., Micronutrients in Agriculture: Proceedings of Symposium held at Muscle Shoals, Alabama, pp. 525–554. Soil Science Society of America, Madison, WI.

Lee, J., Suknark, K., Kluvitse, Y., Philips, R.D, Eitenmiller, R.R. 1999. Rapid liquid chromatographic assay of vitamin E and retinyl palmitate in extruded weaning foods. Journal of Food Science 64:968-972.

Leonard, S.W., C.K. Good, E.T. Gugger, and M.G. Traber. 2004. Vitamin E bioavailability from fortified breakfast cereal is greater than that from encapsulated supplements. American Journal of Clinical Nutrition 79:86–92.

Liem, I.I.H., K.H. Steinkraus, and J.C. Cronk. 1977. Production of vitamin B_{12} in tempeh: A fermented soybean food. Applied Environmental Microbiology 34:773–776.

Livesay, G., and E. Marinos. 1988. Estimation of energy expenditure, net carbohydrate utilization, and net fat oxidation and synthesis by indirect calorimetry: Evaluation of errors with special reference to the detailed composition of fuels. American Journal of Clinical Nutrition 47:608–628.

Mangels, A.R., J.M. Holden, G.R. Beecher, et al. 1993. Carotenoid content of fruits and vegetables: An evaluation of analytic data. Journal of the American Dietetic Association 93:284–296.

Martin, J.I., W.O. Landen, A.M. Soliman, and R.R. Eitenmiller. 1990. Application of a tri-enzyme extraction for total folate determination in foods. Journal of the Association of Analytical Chemistry 73:805–808.

Matthews, R.H., and Y.J. Garrison. 1975. Food Yields Summarized by Different Stages of Ppreparation. U.S. Department of Agriculture, Agriculture Handbook 102.*

Merrill, A.L., and B.K. Watt. 1973. Energy Value of Foods: Basis and Derivation, revised. U.S. Department of Agriculture, Agriculture Handbook 74.*

Møller A., and Ireland J. 2009. LanguaL 2009 – The LanguaL thesaurus. EuroFIR Technical Report D1.8.43. Danish Food Information. LanguaL Web site: http://www.langual.org/langual_literature.asp (Accessed 6/25/2010)

Murphy, E.W., P.E. Criner, and B.C. Gray. 1975. Comparison of methods for determining retentions of nutrients in cooked foods. Journal of Agriculture and Food Chemistry 23:1153.*

National Research Council. 1989. Recommended dietary allowances, 10th ed. National Academy Press, Washington, DC.

Phillips K.M., W.C. Byrdwell, J. Exler, J.M. Harnly, J.M. Holden, M.F. Holick, B.W. Hollis, R.L. Horst, L.E. Lemar, K.Y. Patterson, M.T.Tarrago-Trani, and W.R. Wolf. 2008. Development and validation of control materials for the measurement of vitamin D_3 in selected US foods. Journal of Food Composition and Analysis 21:527-534.

Reamer, D.C., and C. Veillon. 1981. Determination of selenium in biological materials by stable isotope dilution gas chromatography-mass spectrometry. Analytical Chemistry 53(14):2166–2169.

Schakel, S.F., I.M. Buzzard, and S.E. Gebhardt. 1997. Procedures for estimating nutrient values in food composition databases. Journal of Food Composition and Analysis 10:102–114.*

Sheppard, A.J. 1992. Lipid Manual: Methodology Suitable for Fatty acid-Cholesterol Analysis. William C. Brown Publishers, Dubuque, IA.

U.S. Department of Agriculture, Agricultural Research Service. 1976. Composition of Foods: Dairy and Egg products; raw, processed, prepared. Agriculture Handbook 8–1.

U.S. Department of Agriculture, Agricultural Research Service. 1977. Composition of Foods: Spices and herbs; raw, processed, prepared. Agriculture Handbook 8–2.

U.S. Department of Agriculture, Agricultural Research Service. 1978. Composition of Foods: Baby foods; raw, processed, prepared. Agriculture Handbook 8–3.

U.S. Department of Agriculture, Agricultural Research Service. 1979. Composition of Foods: Fats and oils; raw, processed, prepared. Agriculture Handbook 8–4.

U.S. Department of Agriculture, Agricultural Research Service. 1979. Composition of Foods: Poultry products; raw, processed, prepared. Agriculture Handbook 8–5.

U.S Department of Agriculture, Agricultural Research Service. 1980. Composition of Foods Soups, sauces, and gravies; raw, processed, prepared. Agriculture Handbook 8–6.

U.S. Department of Agriculture, Agricultural Research Service. 1980. Composition of Foods Sausages and luncheon meats; raw, processed, prepared. Agriculture Handbook 8–7.

U.S. Department of Agriculture, Agricultural Research Service. 1982. Composition of Foods Breakfast cereals; raw, processed, prepared. Agriculture Handbook 8–8.

U.S. Department of Agriculture, Agricultural Research Service. 1982. Composition of Foods Fruits and fruit juices; raw, processed, prepared. Agriculture Handbook 8–9.

U.S. Department of Agriculture, Agricultural Research Service. 1992. Composition of Foods Pork products; raw, processed, prepared. Agriculture Handbook 8–10.

U.S. Department of Agriculture, Agricultural Research Service. 1984. Composition of Foods Vegetables and vegetable products; raw, processed, prepared. Agriculture Handbook 8–11.

U.S. Department of Agriculture, Agricultural Research Service. 1984. Composition of Foods Nut and seed products; raw, processed, prepared. Agriculture Handbook 8–12.

U.S. Department of Agriculture, Agricultural Research Service. 1990. Composition of Foods Beef products; raw, processed, prepared. Agriculture Handbook 8–13.

U.S. Department of Agriculture, Agricultural Research Service. 1986. Composition of Foods Beverages; raw, processed, prepared. Agriculture Handbook 8–14.

U.S. Department of Agriculture, Agricultural Research Service. 1987. Composition of Foods Finfish and shellfish products; raw, processed, prepared. Agriculture Handbook 8–15.

U.S. Department of Agriculture, Agricultural Research Service. 1986. Composition of Foods Legumes and legume products; raw, processed, prepared. Agriculture Handbook 8–16.

U.S. Department of Agriculture, Agricultural Research Service. 1989. Composition of Foods Lamb, veal, and game products; raw, processed, prepared. Agriculture Handbook 8–17.

U.S. Department of Agriculture, Agricultural Research Service. 1992. Composition of Foods Baked products; raw, processed, prepared. Agriculture Handbook 8–18.

U.S. Department of Agriculture, Agricultural Research Service. 1991. Composition of Foods Snacks and sweets; raw, processed, prepared. Agriculture Handbook 8–19.

U.S. Department of Agriculture, Agricultural Research Service. 1989. Composition of Foods Cereal grains and pasta; raw, processed, prepared. Agriculture Handbook 8–20.

U.S. Department of Agriculture, Agricultural Research Service. 1988. Composition of Foods Fast foods; raw, processed, prepared. Agriculture Handbook 8–21.

U.S. Department of Agriculture, Agricultural Research Service. 1990. Composition of Foods Raw, processed, prepared. Agriculture Handbook 8, 1989 Supplement.

U.S. Department of Agriculture, Agricultural Research Service. 1991. Composition of Foods Raw, processed, prepared. Agriculture Handbook 8, 1990 Supplement.

U.S. Department of Agriculture, Agricultural Research Service. 1992. Composition of Foods Raw, processed, prepared. Agriculture Handbook 8, 1991 Supplement.

U.S. Department of Agriculture, Agricultural Research Service. 1993. Composition of Foods Raw, processed, prepared. Agriculture Handbook 8, 1992 Supplement.

U.S. Department of Agriculture, Agricultural Research Service. 1992. Provisional Table on the Selenium Content of Foods. USDA, HNIS, PT–109.

U.S. Department of Agriculture. 2007. USDA Table of Nutrient Retention Factors, Release 6. Nutrient Data Laboratory Home Page at http://www.ars.usda.gov/nutrientdata. (Accessed 7/1/2010)*

U.S. Department of Agriculture, Agricultural Research Service. 2004. USDA Database for the Choline Content of Common Foods. Nutrient Data Laboratory web site: http://www.ars.usda.gov/nutrientdata/choline. (Accessed 7/1/2010) *

U.S. Department of Agriculture, Agricultural Research Service. 2005. USDA National Fluoride Database of Selected Beverages and Foods - Release 2. Nutrient Data Laboratory web site: http://www.ars.usda.gov/nutrientdata/fluoride. (Accessed 7/1/2010)*

U.S. Department of Agriculture, Agricultural Research Service. 2010. USDA Food and Nutrient Database for Dietary Studies (release 40) [database]. Food Surveys Research Group web site: http://www.ars.usda.gov/ba/bhnrc/fsrg (Accessed ??).

U.S. Food and Drug Administration, Department of Health and Human Services. 2008. Food Labeling. Code of Federal Regulations, Title 21, Pt. 101. U.S. Government Printing Office web site: http://www.gpoaccess.gov/cfr/index.html (Accessed 6/19/2009).

Van Winkle S, Levy S.M., Kiritsy M.C., Heilman J.R., Wefel J.S., Marshall T. 1995. Water and formula fluoride concentrations: Significance for infants fed formula. Pediatric Dentistry. 17(4):305-310.

Watt, B.K., and A.L. Merrill. 1963. Composition of Foods Raw, Processed, Prepared. U.S. Department of Agriculture, Agriculture Handbook 8.

Weihrauch, J.L., and A.S. Chatra. 1994. Provisional Table on the Vitamin K Content of Foods, Revised. USDA, HNIS, PT–104.*

Weihrauch, J.L., L.P. Posati, B.A. Anderson, and J. Exler. 1977. Lipid conversion factors for calculating fatty acid content of foods. Journal of the American Oil Chemists Society 54:36–40.

Weihrauch, J.L., and J. Tamaki. 1991. Provisional Table on the Vitamin D Content of Foods. USDA, HNIS, PT–108.*

Williams, J., Patterson, K., Howe, J. (Retired), Snyder, C., Boillot, K., Lofgren, P., Thompson, L., Luna, A., Nalawade, A., Douglass, L., Holden, J. 2009. Nutrient Composition in Ground Pork using Regression Techniques (Poster). Institute of Food Technologists Annual Meeting + Food Expo. Anaheim, CA. June 6-9, 2009, http://www.ars.usda.gov/SP2UserFiles/Place/12354500/Articles/IFT09_GrdPork.pdf (Accessed 7/1/2010) *

Zeisel, S. H., and Blusztajn, J. K. 1994. Choline and human nutrition. Annual Reviews of Nutrition. 14:269-296

Zeisel, S.H., Mar, M.H., Howe, J. C., Holden, J. M 2003. Concentrations of choline – containing compounds and betaine in common foods. Journal of Nutrition 133:1302-1307; Erratum. 2003. Journal of Nutrition. 133:2918-2919

* Available on NDL's web site: http://www.ars.usda.gov/nutrientdata

Notes on Foods

In the printed sections of Agriculture Handbook No. 8, Notes on Foods provided additional information about the items in the food group. In SR23, NDL has begun to include this information for several food groups. Notes on Foods are provided for Beef Products (Food Group 13), whole eggs in Dairy and Egg Products (Food Group 1), and Pork Products (Food Group 10).

Beef Products (Food Group 13)

Introduction

Data for beef products are presented in the USDA National Nutrient Database for Standard Reference. For most retail cuts, nutrient values are presented for cuts trimmed to 1/8-inch and 0-inch fat and for Choice or Select quality grades. Nutrient values reported as "All Grades" were estimated by combining the nutrient values for Choice and Select grades, weighted by their market proportions. A few Prime cuts trimmed at 1/8 inch external fat are also included.

The data in SR represent the amount of each constituent in 100 grams of edible portion. The edible portion in beef may be represented as "separable lean and fat" or as "separable lean only". In both cases, bone and connective tissue are removed from the cut and reported as refuse. In the case of "separable lean and fat", it is assumed that all fat present is consumed. For items described as "separable lean only", all external trim fat and seam fat are removed from the cut, weighed, and included in the reported refuse. Weights are determined for the whole retail cut as purchased, and for each component (e.g., separable lean, separable fat, refuse, etc.). Nutrient analyses are conducted on the separable lean and the separable fat. The external trim fat and the seam fat are combined for analyses and reported as separable fat. The nutrient values for separable lean and separable fat are weighted for their respective contributions to the whole retail cut and reported as "separable lean and fat". For cooked beef cuts, the cuts are cooked with the separable fat intact. Nutrient data for separable fat, separable lean only, and separable lean and fat of cooked cuts are analyzed or calculated as described above.

The analytical nutrient data include the mean nutrient value, the standard error given to three decimal places, and the number of observations on which the values are based. For many food items, mean values are given without an accompanying standard error and number of samples. These values are either calculated by pooling data by or by weighting means (e.g. All Grades), by applying cooking yields or nutrient retention factors, or by imputation from a different, closely related food. For raw beef items and unheated cured items, nutrient values are estimated on the known content of that nutrient in the lipid (fatty acids), total solids (cholesterol), moisture-free, fat-free solids (minerals), or protein (water-soluble vitamins) fraction of a similar food.

Nutrients

Nutrient information for SR can be found under "File Content" in the documentation. However,

some nutrient information specific to beef products are included here. Nutrient data are obtained for moisture, protein, ash and total fat. The values for protein are calculated from the content of total nitrogen (N) in the food using the conversion factor recommended by Jones (Jones, D.B., 1941). The specific factor applied to beef items is 6.25. The carbohydrate content of uncured products (except some organ meats) consisting entirely of beef is negligible. For such foods, the carbohydrate content is assigned a zero value. The sum of the percentages of water, protein, total lipid, and ash may not necessarily equal 100 percent for those foods showing zero carbohydrate because the amounts of each of these constituents are determined independently.

For heart, liver, kidney, tongue, and cured products (foods expected to contain carbohydrate), the carbohydrate value is calculated as the difference between 100 and the sum of the percentages of water, protein, total lipid, and ash. If the total of these constituents for any item is more than 100 due to analytical variation, the carbohydrate content is assigned a zero value.

Food energy is expressed in terms of both kilocalories and kilojoules. (One kilocalorie equals 4.184 kilojoules.) The data are for physiologic energy values remaining after losses due to digestion and metabolism have been deducted. Further discussions on energy and caloric factors used in SR can be found in the "Food Description File" of the general documentation.

The specific calorie factors used for calculating energy values in beef products are:

	Kcal/g
Protein	4.27
Fat	9.02
Carbohydrate	3.87

The carbohydrate factor of 3.87 is used for some organ meats and some cured products. The factor of 4.11 is used for tongue. The factors are based on the Atwater system for determining energy values. Details of the derivation of these factors are outlined in Agriculture Handbook No. 74 (Merrill, A.L. and Watt, B.K., 1973). Because the level of carbohydrate in separable lean and separable fat is insignificant, no carbohydrate factor is needed for most beef products.

Description of Projects

The studies documented in these notes on beef represent only data collected since 1998.

Selected cuts, 1/8 inch external trim fat.

A collaborative study was funded by the Beef Checkoff Program and conducted by USDA, America's Beef Producers, and Texas A&M University to determine the food and nutrient composition of 13 raw and cooked retail cuts for inclusion in the USDA National Nutrient Database for Standard Reference.

Sampling and fabrication. Carcasses (n=20) were selected from two packing plants, one in the Texas Panhandle and the other in Nebraska. Ten USDA Choice and ten USDA Select carcasses (yield grade 2 and 3) were selected for the study. These carcasses represented the approximate

distribution found in the US beef supply according to the National Quality Beef Audit – 1998 (Boleman, S.L. et al., 1998). All carcasses were shipped to Texas A&M University for fabrication of the following retail cuts: arm roast, bottom round roast, bottom round steak, brisket – flat half, eye of round roast, flank steak, round tip roast, small-end rib steak, tenderloin steak, tri-tip (bottom sirloin butt) roast (boneless and defatted), top loin steak, top round steak, and top sirloin steak. Cuts were assigned randomly to the following external fat trim levels: 0.0 cm (0 inch trim), 0.3 cm (1/8 inch trim), or 0.6 cm (1/4 inch trim). External fat was measured at five points, the points connected, and with a scalpel, the fat was removed half the thickness of the cut. This procedure was repeated on the other side, thus removing the excess fat completely. One additional steak was assigned to a raw treatment and trimmed to 0.3 cm. Three of the cuts (flank steak, round tip roast, and tri-tip roast) had no external fat and were therefore assigned to the 0.0 cm group for both preparations (raw and cooked). Dried surfaces, extending chine bones, minor muscles, and muscle pieces were trimmed from all cuts. All cuts were vacuum packed individually, labeled, and frozen at -23°C for further dissection and cooking. Additional details on fabrication have been previously published (Wahrmund-Wyle, J.L. et al., 2000).

Cooking procedures. (Wahrmund-Wyle, J.L. et al., 2000). Retail cuts destined for cooking were thawed overnight in a cooler at 5°C, weighed, and cooked as follows: arm roast, bottom round steak, and brisket were braised; bottom round roast, eye of round roast, round tip roast, and tri-tip roast were roasted; and flank steak, small-end rib steak, tenderloin steak, top loin steak, top round steak, and top sirloin steak were broiled.

For braising, cuts were browned for 4-8 min (time being size-dependent) in a preheated Farberware Dutch Oven placed on top of a conventional range. After browning, the cuts were covered with 90-180ml distilled water, placed in a preheated conventional gas oven at 325°F (163°C) and simmered in a covered vessel to an internal temperature of 185°F (85°C).

Cuts for roasting were placed on wire racks with the fat side up, when possible, and cooked in a conventional gas oven (preheated to 325°F (163°C) to an internal temperature of 140°F (60°C). For broiling, cuts were cooked on electric Farberware Open-Hearth Broilers (model 350A) to an internal temperature of 149°F (65°C). The internal temperature of each retail cut was monitored by inserting copper constantan thermocouples into the geometric center of the cut and recording the data on Honeywell recorders. After cooking, cuts were wrapped in plastic wrap and chilled (2-3°C) overnight (Jones, D.K. et al., 1992). Each cut was weighed prior to and after cooking for calculation of cooking yield.

Sample preparation. Individual samples from all cuts, both raw and cooked, were carefully dissected to separate and weigh the various cut components. These components included separable lean, external fat, seam fat, and waste such as bone and heavy (non-edible) connective tissue. The separable lean included muscle, intramuscular fat, and connective tissue that would be considered edible. External fat is the fat on the outside of the cut. Seam fat included intermuscular fat depots within the cut. Separable fat from all cuts was pooled to form raw and cooked composites. Separable fat included both external and seam fat in these composites. Separable lean was placed in a Cuisinart® food processor and homogenized for 35 seconds. Sample aliquots were frozen at -10°C until analysis.

Sample analyses. Proximate nutrients (moisture, total fat, ash, and protein) were determined on individual samples and composites of the separable fat. Raw and cooked samples of separable fat and the separable lean from the arm roast, bottom round steak, and top loin steak, trimmed to 1/8 inch external fat, were also analyzed for minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, selenium, sodium, and, zinc) and vitamins (niacin, thiamin, riboflavin, vitamins B_6, and B_{12}). Samples from the raw and cooked arm roast and separable fat were analyzed for vitamins A and E, total folate, and pantothenic acid. Raw samples from the arm roast were analyzed for amino acids. Data were released in SR16 (2003).

Grass-fed Beef

A collaborative study (Leheska, J.M. et al., 2008) was funded by the Beef Checkoff Program and conducted by America's Beef Producers, Texas Tech University, and USDA to determine the nutrient composition of grass-fed beef in the United States for inclusion in SR. The demand for grass-fed products has increased in recent years due to increased public interest in grass-fed production practices and nutrition. Crop variety, season, and geographic location can have an affect on the nutrient content of feedstuffs. In turn, the different types of feed given to cattle can affect weight gain, carcass characteristics, and nutrient content.

Sampling. Ground beef and strip steaks were collected on 3 separate occasions from 15 producers of grass-fed beef, representing 13 different states (Alabama, Arkansas, California, Colorado, Georgia, Idaho, Kentucky, Minnesota, Missouri, Montana, New Mexico, Texas, and Virginia). The sample collection protocol required that 2 steaks from 3 different animals be collected by each producer on each of the 3 separate occasions. The steaks were cut 2.54 cm thick from the 13th rib position of the strip loin. Similarly, 454 g of ground beef targeting 85% lean and 15% fat was collected by each producer from 3 different carcasses on each of 3 different occasions. When the specified lean to fat ratio (85/15) was not available they were asked to provide the next leanest ground beef (e.g., 88/12). The samples were then packaged appropriately and shipped frozen to Texas Tech University.

Sample preparations, grass-fed ground beef samples. After the ground beef samples had thawed properly they were frozen in liquid nitrogen and homogenized. Once homogeneity was reached aliquots of the samples were double bagged in labeled Whirl-Pak bags and stored at -80°C until subsequent analysis.

Sample preparations grass-fed strip steak samples: After proper thawing, the strip steak samples were weighed and dissected. The lean, fat, and refuse (connective tissue and scrap) of each steak was separated and weighed individually. Samples of cubed strip steak were frozen in liquid nitrogen and homogenized using the same protocol as ground beef samples. Aliquots of the homogenized samples were double bagged in labeled Whirl-Pak bags and stored at -80°C until subsequent analyses.

Chemical Analysis. Analyses of proximate nutrients were performed at Texas Tech University. Following ether extraction, fat was determined in each sample using the Soxhlet method according to Official Method 991.36. Percent protein was determined by combustion using a

LECO FP 2000 following AOAC Official Method 992.15. Percent moisture of the samples was analyzed by oven drying according to AOAC Official Method 8.2.1.1 and percent ash was determined by difference. Fatty acid analysis and cholesterol content was performed by a commercial laboratory using gas chromatography according to AOAC Official Methods 963.22 and 994.15. The University of North Carolina analyzed the grass-fed beef samples for choline by extracting choline compounds and quantifying by liquid chromatography-electrospray ionization-isotope dilution mass spectrometry. Total choline content of the samples was calculated as the sum of choline-contributing metabolites. Total fat, thiamin, vitamin B_{12}, and minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, selenium, sodium, and, zinc) were analyzed by a commercial laboratory using AOAC Official Methods. To validate all analytical procedures, quality control was monitored by insertion of certified reference materials and blind duplicates into the sampling course. Data on Grass-fed beef was released with SR21 (2008).

Ground Beef Products.

The USDA, in collaboration with America's Beef Producers and the University of Wisconsin, undertook a study funded by the Beef Checkoff Program to update the nutrient composition data for ground beef products in SR. None of the ground beef products contained extenders. According to Federal regulations, ground beef has no added water, phosphates, binders, or extenders, and shall not contain more than 30 percent fat (USDA, FSIS, Code of Federal Regulations). Ground beef is a unique meat product in that a wide range of formulations for this product are available in most US retail stores. In order to provide consumers and industry with the nutrient composition information for this variable product, the study was designed to establish the mathematical relationship between the various nutrients and the total fat content of raw ground beef through regression techniques. The ultimate aim was to use these relationships for predicting the nutrient composition for raw and prepared ground beef.

Sampling. Ground beef samples for each of three fat categories (label declarations of <12% fat, 12-22% fat, or >22% fat) were purchased from 24 retail outlets nationwide. In this sampling plan developed for the NFNAP (Pehrsson, P.R. et al., 2000), the country was divided into 4 regions, with 3 consolidated metropolitan statistical areas (CMSA) within each region; 2 retail stores were selected within each CMSA.

Sample preparation. Ground beef products were analyzed in raw and cooked form. To achieve uniform sizing for broiled and pan-broiled patties, 112 g of ground beef were pressed into a patty mold. Patties were broiled in a preheated conventional oven for 8.7 min (final internal temperature of 160°F (71°C). Pan-broiled patties were broiled in a pre-heated Westbend electric skillet for 11.75 min (final internal temperature of 160°F (71°C). Patties were cut in half to evaluate degree of doneness based on color. Ground beef crumbles were cooked in a pre-heated Westbend electric skillet for 5.3 min (final internal temperature of 160°F (71°C)), and drained in a colander. The loaf was baked in a conventional oven at 325°F (163°C) for 41 min (final internal temperature of 160°F (71°C)). No fat was added during cooking. After cooking, all samples were stored at –24°C in sealed vacuum bags until homogenization and analysis.

Sample analyses. Raw samples and broiled patties from each location and for each fat level

(n=72) were analyzed for moisture, nitrogen, total fat, ash, and selenium. Samples were pooled based on CMSA (n=36) for analyses of minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium, and, zinc), niacin, thiamin, riboflavin, vitamins B_6 and B_{12} and cholesterol; twelve samples (pooled by region) were analyzed for total choline, vitamin K, amino acids (raw samples only), and fatty acids (C8 - C22); composites of 12 locations (n=6) were analyzed for folate, pantothenic acid, retinol, and vitamin E. Proximate components for pan-broiled patties and pan-browned crumbles were analyzed on the samples pooled by CMSA; minerals, including selenium, niacin, thiamin, riboflavin, vitamins B_6 and $B_{12,}$ and cholesterol were analyzed in samples pooled by region; fatty acids, folate, pantothenic acid, retinol, and vitamin E and were analyzed on the 6 composites of 12 locations each. For the baked loaf samples, proximate components, minerals, including selenium, niacin, thiamin, riboflavin, vitamins B_6 and $B_{12,}$ and cholesterol were analyzed on regional composites; fatty acids, folate, pantothenic acid, retinol, and vitamin E were analyzed on the 6 composites of 12 locations each.

Nutrient analyses were conducted at either University laboratories or at a commercial testing laboratory using AOAC methods. Quality control measures included duplicate sampling, and the use of control composites and NIST certified reference materials (SRM 1546: Meat Homogenate).

Statistics. Data were analyzed using mixed model regression analysis to obtain a regression equation for each nutrient and preparation method (SAS, 2004).

Nutrient values were released in SR15 (2002) for ground beef products containing 5%, 10%, 15%, 20%, 25%, and 30% fat. The prepared ground beef values included raw samples, broiled patties, pan-broiled patties, pan-browned crumbles, and baked loaf. The ground beef calculator, released on the NDL web site in 2006, computes the nutrient profile for raw and prepared ground beef products of intermediate fat content.

Beef Value Cuts

A new line of single–muscle roasts and steaks, fabricated from the outside round, the knuckle, and the chuck shoulder clod, were introduced to the retail market in 2001-2002. These cuts, the top blade steak (Infraspinatus), shoulder top and center steaks (Triceps brachii), shoulder tender (Teres major), tip center (Rectus femoris), tip side (Vastus lateralis), and bottom round (Biceps femoris), were tested for palatability and functionality. Furthermore, five of the six major cuts met the USDA definition of lean or extra-lean. USDA, in collaboration with America's Beef Producers and the University of Wisconsin, conducted a study funded by the Beef Checkoff Program to determine the nutrient profile of the Beef Value Cuts for inclusion in SR.

Sampling. Animal products were obtained from an IBP (Tyson) plant near Sioux City, Iowa. This plant draws cattle from a large number of feedlots and has nationwide product distribution. Twelve carcasses were identified by quality grade (high choice, average choice, and select) with yield grades of 2 or 3. Two carcasses were used for reserves and for training the meat cutting staff. There was sufficient product from 1 knuckle, 1 outside round, and 1 chuck clod to sample, prepare, and analyze five of the cuts. The Teres major is a very small muscle (~8 oz from 1 side) and would not provide a sufficient amount for all analyses. Therefore, one 15 pound box of

choice (quality grade unknown) and one box of select Teres major muscles were purchased from the same plant. Removed beef value muscles were trimmed free of all external fat and heavy connective tissue. The denuded muscles were vacuum packaged and stored at -20°F until steak preparation.

Sample Preparation. Muscles were cut into 1-inch thick steaks and weighed. Steaks were removed in pairs, one steak for raw analyses, the other to be cooked and analyzed in the cooked state. Steaks were cooked by grilling over a preheated portable gas grill. Steaks were turned when the internal temperature reached the midway point between the starting temperature and the final internal temperature (including post-cooking temperature rise) of 160°F (71°C) (medium degree of doneness). Steaks were placed on a wire rack for 3 min and then weighed to obtain the cooked weight. Raw and cooked steaks were stored at -20°F (-29°C) until time for nutrient analyses.

Sample analyses. Proximate nutrients (moisture, total fat, ash, and protein) and cholesterol were determined on individual muscle samples from the chuck clod, bottom round, and the knuckle, both raw and cooked. Composites of three samples from each of these muscle groups were pooled into composites and analyzed for fatty acid content. Individual samples from the knuckle muscles were also analyzed for of minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, selenium, sodium, and, zinc) and vitamins (niacin, riboflavin, thiamin, vitamins B_6 and B_{12}). Samples from the raw and cooked knuckle muscles were also analyzed for vitamins A and E. No vitamins or minerals were analyzed on samples from the chuck clod or bottom round; NDL imputed these values based on nutrient values from the arm roast and bottom round. Cooking yields calculations were based on initial (raw) and final cooked weights from all samples. These data were disseminated in SR18 (2005).

References for Notes on Foods – Beef Products

Boleman, S.L., S.J. Boleman, W.W. S.J., Morgan, D.S. W.W., Hale, D.B. D.S., Griffin, J.W. D.B., Savell, R.P. J.W., Ames, M.T. R.P., Smith, J.D. M.T., Tatum, T.G. J.D., Field, G.C. T.G., Smith, B.A. G.C., Gardener, J.B. B.A., Morgan, S.L. J.B., Northcutt, H.G. S.L., Dolezal, D.R. H.G., Gill, D.R., and F.K. Ray., F.K. 1998 National Beef Quality Audit- 1995: Survey of producer-related defects and carcass quality and quality attributes. J. Anim. Sci. 76:96-103.

Code of Federal Regulations. Animals and Animal Products; Food Safety and Inspection Service, Meat and Poultry Inspection, U.S. Department of Agriculture; Definitions and Standards of Identity. 9 CFR 319.

Jones, D.B. 1941. Factors for Converting Percentages of Nitrogen in Foods and Feeds into Percentages of Protein. Rev. U.S. Dept. of Agric., Circ. 183, 22 pp.

Jones, D.K., J.W. Savell, J.W., and H.R. Cross., H.R. 1992. Effects of fat trim on the composition of beef retail cuts – 1. Separate tissue components. J. Muscle Foods 3: 45-56.

Leheska, J.M., L.D. Thompson, J.C. L.D., Howe, E. J.C., Hentges, J. E., Boyce, J.C. J., Brooks, B. J.C., Shriver, L. B., Hoover, L., and M.F. Miller., M.F. 2008. Effects of conventional and grass feeding systems on the nutrient composition of beef. J Animal Sci

Merrill, A.L., and B.K. Watt. 1973. Energy Value of Foods—Basis and Derivation. Rev. U.S. Dept. of Agric., Agric. Handb. No. 74, 105 pp.

Pehrsson, P. R., D.B. Haytowitz, J.M. D.B., Holden, C.R. J.M., Perry, C.R. and D.G. Beckler., D.G. 2000. USDA's National Food and Nutrient Analysis Program: food sampling. Journal of Food Composition and Analysis 13:379-389.

SAS, 2004 - SAS Institute Inc. 2004**.** SAS OnlineDoc® 9.1.2. Cary, NC: SAS Institute Inc.

Wahrmund-Wyle, J.L., K.B. Harris, K.B., and J.W. Savell., J.W. 2000. Beef Retail Cut Composition: 1. Separable Tissue Components. J. Food Comp. and Anal. :13:, 233-242.

Eggs (Food Group 01)

Recently, NDL arranged to have regular large, whole eggs picked up in a nationwide sampling as part of NFNAP. Notes on other food items in this food group will be included at a later time.

Sampling and analysis. Whole egg samples of regular large eggs were picked up in March/April 2010 at the 12 NFNAP sampling locations. The sample units were sent to the Food Analysis Laboratory Control Center (FALCC) at Virginia Tech for preparation of analytical samples to be sent to the qualified analytical laboratories. Individual samples from each of the 12 locations were prepared for the determination of proximates (moisture, protein and fat), fatty acids, and cholesterol. Samples units from the 12 locations were paired, using randomization, to create six city-pair analytical composites for analysis of vitamins, minerals, and sugars. FALCC also sent quality control (QC) samples to the analytical laboratories to monitor accuracy and precision of measurements.

Results. The analytical and QC data received from the analytical laboratories were reviewed. The QC results were found to be acceptable, and the analytical data for most nutrients were comparable to the current data in the National Nutrient Database for Standard Reference, Release 22 (SR22). Values for cholesterol, vitamin D, and vitamin B_{12} were significantly different from the older values which were based on analyses from eggs sampled in 2002.

Cholesterol was determined by gas chromatography; the new value for cholesterol is 372 mg/100g compared to the SR22 value of 423 mg/100g. This estimate was based on the analysis of the 12 individual samples by each of three independent qualified laboratories. The results for QC materials from all three laboratories were also acceptable.

Vitamin D was determined by HPLC-UV for the six city-pair composites. The results for the QC material were within the acceptable range. Two of the city-pair composites were analyzed by another lab using HPLC-MS/MS to double check the data. The inter-lab results were in good agreement.

Values for four of the six city-pair composites for Vitamin D averaged 1.2 µg (49.2 IU)/100g (with a range of 1 µg (39 IU) – 1.8 µg (71 IU)/100g), compared to the SR22 value of 1.2 µg (49.6 IU)/100g. However, the values for the other two city-pairs were 3.8 µg (150 IU)/100g and 8.7 µg (348 IU)/100g. Each city-pair with a higher vitamin D value contained samples of eggs for a specific brand picked up in two non-contiguous states from the same grocery store chain, and those cartons were labeled as follows: 5X MORE VITAMIN D PER EGG.

Reserve samples for the four individual cities that were part of the two city-pairs with higher vitamin D were sent to the laboratory to be analyzed for vitamin D. One of the city values was within the expected range (1 µg (39 IU) – 1.8 µg (71 IU)/100g) of the data for the current estimate. The other three city values were much higher and fell between 7.1 µg (284 IU)/100g and 12.1 µg (483 IU)/100g. Two of these three samples were from the same store brand, and their respective cartons were labeled as indicated above, and thus higher in vitamin D. The third

of the three was obtained from a store brand that had no vitamin D statement on the carton. Additional samples of that brand were sampled, analyzed, and confirmed.

To calculate the final estimate of vitamin D in large, whole eggs, all values from samples which had no vitamin D claims were averaged together to yield a value of 2.0 µg (82 IU)/100g with a range of 1.0 µg (39 IU)/100g to 9.2 µg (368 IU)/100g. The new value is 64% higher than the SR22 value of 1.2 µg (50 IU)/100g.

The values for the store brand which contained a vitamin D claim were not used. NDL staff decided that the presence of a claim could influence the selection of that brand by the consumer and may bias the representativeness of the sample set. However, it is clear that some eggs in the marketplace now contain higher levels of vitamin D. It is likely that this change is due to the fortification of specific feeds given to the laying hens. More research will be needed to assess the impact on vitamin D levels in eggs nationwide.

The new value for vitamin B_{12} (0.89 µg/100g) is 31% lower than the value in SR22 (1.29 µg/100g). The values for the QC samples were satisfactory.

Impact. All SR23 egg products that contain egg yolk, where the fat soluble cholesterol and vitamin D are found, were updated to reflect the change in values. NDL food specialists, who use whole eggs and other egg products as ingredients in formulations and recipes, will use the SR23 cholesterol and vitamin D values to calculate the composition of those food items. NDL plans to follow up on the sampling and analysis of whole eggs in one to two years to monitor levels of vitamin D in samples nationwide.

Pork Products (Food Group 10)

Introduction

Nutrient and food composition data for pork products are presented in the USDA National Nutrient Database for Standard Reference (SR). The data in SR represent the amount of each constituent in 100 grams of edible portion. The edible portion of pork may be represented as "separable lean and fat" or as "separable lean only". In each case, bone and connective tissue are removed from the cut and reported as refuse. In the case of "separable lean and fat", it is assumed that all fat present is consumed. For items described as "separable lean only", all external trim fat as well as trimmable seam fat are removed from the cut, and included in the reported refuse. Weights are determined for the whole retail cut as purchased, and for each component (e.g. refuse, separable lean, etc). The external trim fat and the seam fat are combined for analyses, weighed, and reported as separable fat. Nutrient analyses are conducted on the separable lean and the separable fat. The nutrient values for separable lean and separable fat are combined and weighted for their respective contributions to the whole retail cut; the resulting food items are reported as "separable lean and fat". For cooked pork cuts, the cuts are cooked with the separable fat intact. Nutrient data for separable fat, separable lean only, and separable lean and fat of cooked cuts are analyzed or calculated as described above.

The analytical nutrient data includes the mean nutrient value, the standard error given to three decimal places, and the number of observations on which the values are based. For many food items, mean values are given without an accompanying standard error and number of samples. These values are either calculated by pooling data or by weighting means, by applying cooking yields or nutrient retention factors to derive values for some cooked foods, or by imputation from a different, closely related food. For raw pork items and unheated cured items, nutrient values were calculated based on known content of the nutrient in the lipid (fatty acids), total solids (cholesterol), moisture-free, fat-free solids (minerals), or protein (water-soluble vitamins) fractions.

Nutrients

Nutrient information for SR can be found under "File Content" in the documentation. However, some nutrient information specific to pork products are included here. Nutrient values are obtained for moisture, protein, ash, and total fat. The values for protein are calculated from the content of total nitrogen (N) in the food using the conversion factor recommended by Jones (1941). The specific factor for protein applied to pork items is 6.25. The carbohydrate content of uncured products (except for some organ meats) consisting entirely of pork is negligible, and the carbohydrate content is thus assigned a zero value. The sum of the percentages of water, protein, total lipid, and ash do not necessarily equal 100 percent for those foods showing zero carbohydrate because the amounts of each of these constituents were determined independently.

Food energy is expressed in terms of both kilocalories and kilojoules and represents the physiological energy value remaining after losses in digestion and metabolism have been deducted. (One kilocalorie equals 4.184 kilojoules). A broader discussion on energy and calorie factors used in SR can be found under "Food Description" file in the documentation. The

specific calorie factors used for calculating energy values in pork products are:

	kcal/g
Protein	4.27
Fat	9.02
Carbohydrate	3.87

The carbohydrate factor of 3.87 is used for estimating energy values for some organ meats and some cured products. The factors are based on the Atwater system for determining energy values. Details of the derivation of these factors are outlined in Agriculture Handbook No. 74 (1973). Because the level of carbohydrate in separable lean and separable fat is insignificant, no carbohydrate factor is needed for these products.

Description of Projects

A series of projects have been conducted to update the pork cuts in the USDA National Nutrient Database for Standard Reference (SR). The studies documented in these notes on pork represent only data collected since 2005. These projects are described in detail below:

Natural Fresh Pork cuts

Nutrient composition data for fresh pork products in the SR had not been updated since 1991. Since that time, changes in animal husbandry practices and industry procedures led to the availability of leaner cuts. In order to provide up-to-date nutrient information on fresh pork products in SR, the NDL, in collaboration with scientists at the University of Wisconsin and the National Pork Board, conducted a study to determine the nutrient composition of nine (9) fresh pork cuts. This study was funded in part by the National Pork Board. The cuts chosen for evaluation were bone-in shoulder blade steak, boneless tenderloin roast, boneless top loin chop, boneless top loin roast, bone-in sirloin roast, bone-in center loin chop, bone-in center rib chop, bone-in country-style ribs, and bone-in spare ribs. Data from this project were disseminated in a separate report on the NDL web site titled "The Revised USDA Nutrient Data for Fresh Pork" in 2006 and were later incorporated in SR20 (2007).

Sampling: Nine fresh pork cuts were pre-ordered and purchased from 12 retail outlets using the nationwide sampling plan developed for NFNAP (Perry et al., 2003) and shipped frozen to the University of Wisconsin for trimming and preparation. Products from each location were assigned randomly to either raw or cooked preparation. For roasts and spare ribs, each roast or rack of ribs was randomly assigned to either raw or cooked preparation.

Preparation - Cooking procedures:

Broiling (Center Loin Chops, Center Rib Chops, Top Loin Chops). Chops were grilled on a pre-heated George Foreman™ Indoor/Outdoor Electric Barbeque Grill for 10 minutes, setting "4". External fat thickness and chop thickness were measured prior to cooking; weights of raw cuts were obtained. Two (2) thermocouples were placed into one (1) or two (2) chops, as needed. Chops were turned over when the internal temperature reached 100°-105°F (38°-41°C). Chops

were removed from the grill to attain a final internal temperature of 160°F/71°C (chops were taken off the grill at approximately 155°F/68°C internal temperature). Chops were cooled on a wire rack for 5 minutes and the highest internal temperature attained during the standing period was recorded. After standing for 5 minutes, chops were re-weighed.

Roasting (Top Loin, Tenderloin, and Sirloin Roasts). Oven was pre-heated to 325°F/163°C (425°F/218°C for tenderloin roast). Top loin, tenderloin, and sirloin roasts were weighed raw, and placed on a rack in a pan for cooking. Top loin roasts (boneless) were roasted as "single" loin roasts (one loin muscle only). If the purchased product was "double top loin roast (boneless)", i.e. two single top loin roasts backed and tied together, the strings were removed, and each half of the double top loin roast was processed as a single top loin roast. Roasts were cooked uncovered. An oven-durable meat thermometer was placed into the geometric center of the roast. Roasts were removed when they achieved an internal temperature of ~150°F/65°C; the target final internal temperature was approximately 160°F/71°C. Roasts were allowed to stand 15 minutes; the final internal temperature was determined during this period. The cooked weight of the roast was obtained and the cooking yield calculated.

Roasting (Spareribs). The oven was pre-heated to 325°F/163°C. No external fat measurements were collected, but any gross physical fat (loosely attached) from the raw ribs were removed before cooking. The raw weight of the spareribs was obtained. The number of ribs in the product being cooked was recorded. Spareribs were placed on a rack in a pan, but were not covered during cooking. Ribs were roasted for 1 hour and 45 minutes. Ribs were then removed from the oven; the temperature in the intercostal muscles was immediately taken. Ribs were cooled for 10 minutes, and then re-weighed. When cool enough to process, edible lean was separated from bone/cartilage. Trimmable fat and connective tissue are not an issue in cooked ribs, since it is assumed that, with this product, all soft tissues are consumed.

Braising (Shoulder Blade Steaks and Country-Style Ribs). Oven was pre-heated to 325°F/163°C. The raw blade steaks and/or country-style ribs were weighed. The thickness of the external fat around the outer surface of the cuts was measured. Blade steaks or country-style ribs were placed on a rack in a roasting pan. Distilled water (100 ml) was added to the roasting pan, which was covered tightly and placed in the center of the oven. Cooking time was determined from initial trials. Initial cooking time estimates were: 45 minutes for blade steaks; 1 hour and 15 minutes for country-style ribs. The internal temperature was determined with an electronic digital thermometer. Steaks and/or ribs were allowed to cool for 5 minutes and then re-weighed and the weight was recorded.

Sample preparation - raw and cooked products:

Measurement of external trim (separable) fat. For all chops, blade steaks, and country-style ribs, external fat at the **¼, ½**, and **¾** points along the external fat surface of the product were measured in millimeters. External fat thickness was measured at each of these points. For top loin and sirloin roasts, fat thickness measurements were taken over the center of the exposed fat at the **¼, ½,** and **¾** points along the length of the roast. External fat measurements were not determined on tenderloin roast or spareribs.

Separation of lean meat, separable fat, connective tissue, and bone. Dissection of pork cuts was performed from the perspective of a "careful consumer", who conscientiously separates these tissues. The most difficult separation is between the trimmable (separable) fat and connective tissue, which lies in the "seams" between muscles. The separation was accomplished by "scraping" the co-mingled tissues with a knife blade, such that the soft fat was separated from the tougher, stringy connective tissue. Separable lean tissue should be relatively free of trimmable fat, while the trimmable fat should be reasonably free of connective tissue.

Separable lean meat, separable fat, and connective tissue were removed from bones as cleanly as possible. Separable fat (i.e., external trim fat and seam fat), bone, and connective tissue were removed from raw and cooked products and weighed to determine the relative amounts of separable fat and separable lean meat. Component weights (i.e., weights of separable lean, separable fat, bone, and connective tissue) were reported in SR; weights of connective tissue and bone were combined and reported as "refuse". For food items listed "lean only", the separable fat associated with that cut is considered "refuse"; for food items listed "lean and fat", the separable fat is considered edible and contributes to the nutrient profile.

Sample composites and nutrient analyses:

Shoulder blade steak, tenderloin roast, and top loin chops. Shoulder blade steak, tenderloin roast, and top loin chops represent different areas of the pig and are most commonly cooked by grilling, roasting, and braising, respectively. For purposes of this study, these were referred to as the primary cuts since complete nutrient profiles were obtained for both the raw and cooked preparations of these cuts. For each cut, the lean tissue cuts purchased from an individual location were combined into individual composites for homogenization and nutrient analysis; for some nutrients (proximates, minerals, cholesterol, thiamin, niacin, and riboflavin), the number of observations (n) = 12. For pantothenic acid, vitamin B_6, and vitamin B_{12}, samples from the three locations were combined to form regional composites (n = 4). One of these composites was randomly chosen and analyzed for retinol (Vitamin A); n = 1. Separable fat from all cuts were combined to form raw and cooked composites. Complete nutrient profiles were determined for each of these composites (raw and cooked).

Top loin roasts, sirloin roasts, center loin chops, center rib chops, country-style ribs, and spare ribs. Proximate nutrients and minerals were analyzed from individual composites for both the raw and cooked preparations of top loin roasts, sirloin roasts, center loin chops, center rib chops, country-style ribs, and spare ribs. For these cuts, cholesterol, thiamin, niacin, and riboflavin were determined from the regional composites of the cooked samples. For some nutrients, values were imputed using established NDL procedures described above. Nutrient values for pantothenic acid, vitamin B_6, and vitamin B_{12} for these cooked cuts were imputed from the primary cuts prepared (cooked) in the same manner. Nutrient values (cholesterol, thiamin, niacin, and riboflavin, pantothenic acid, vitamin B_6 and vitamin B_{12}) for the raw preparations were imputed from their cooked counterparts. A commercial laboratory, whose analytical procedures were evaluated through the NFNAP process and found to be acceptable, performed tissue homogenization and nutrient analyses.

Enhanced Pork Cuts

Enhanced pork is the process of adding non-meat ingredients to fresh pork to improve the eating quality of the final product where eating quality is defined as the juiciness, tenderness, and flavor of pork (National Pork Board, 1998). As meat producers increasingly raise leaner animals that contain significantly less fat, alternative processes are being developed to replace the flavor loss due to fat reduction and reduce moisture loss resulting from cooking. Enhancing the meat is one such process. It is estimated that 45% of fresh pork cuts are enhanced. Since SR did not provide data for the nutrient content of enhanced meat, a collaborative study was conducted by scientists at USDA, the University of Wisconsin, and the National Pork Board to determine the nutrient profile of the following enhanced products: shoulder blade steak, tenderloin, and top loin chops. This project was funded in part by the National Pork Board.

Sampling. Three fresh, enhanced pork cuts were pre-ordered and purchased from 12 retail outlets using the nationwide sampling plan developed for NFNAP (Perry et al., 2003) and shipped frozen to the University of Wisconsin for trimming and preparation.

Preparation and analysis. Preparation, compositing, and nutrient analyses for enhanced versions of the shoulder blade steak, tenderloin, and top loin chops were similar to those described for natural fresh pork cuts (see above). Data for enhanced pork cuts were disseminated in SR20 (2007).

Pork Value Cuts

USDA, in collaboration with the National Pork Board and University of Wisconsin, conducted a study to determine the nutrient profile of four new pork value cuts. This project was funded in part by the National Pork Board. These cuts were introduced to the retail market in 2008-2009. Pork value cuts are individual muscles chosen from the shoulder and the leg. These cuts were selected for their strong marketability, consistency in flavor and tenderness, availability, and economic feasibility for food chains and consumers. The common names of the four new cuts selected, the scientific name for the muscle, and the part of the carcass from which they originate are as follows:

- Pork Shoulder Breast Boneless (Pectoralis profundi) – shoulder
- Pork Shoulder Petite Tender Boneless (Teres major) - shoulder
- Pork Leg Cap Steak Boneless (Gracilis) – leg
- Pork Leg Sirloin Tip Roast Boneless (Vastus lateralis and Rectus femoris) – knuckle and leg.

The nutrient profiles of these four new cuts were released in SR21 (2008).

Sampling. A total of 14 paired cuts for each pork value cut were obtained from pork production plants in North Carolina and Iowa. At each plant, both shoulder and hams from 7 randomly selected pork carcasses were obtained. Carcasses were of average weight or slightly heavier to ensure an adequate amount of sample. Proper cut identification of each ham and shoulder from each plant was maintained throughout the fabrication process. Each muscle was denuded, trimmed free of all external fat and connective tissue, and frozen prior to shipment to the University of Wisconsin.

Sample Preparation. Among the 7 paired products from each of the two locations, 6 pairs were randomly selected for use in the study. One member of each pair was prepared as raw and the other was cooked either by broiling or braising to a desired internal temperature or time end-point. After a designated cooling period, the cooked product was cubed, hand mixed, and divided into individual carcass samples, and composites of two or three carcasses.
The designated cooking method for each pork value cut were:

- Pectoralis profundi – broiled
- Teres major – broiled
- Gracilis – broiled
- Rectus femoris – braised

Cooking methods, broiling. Cuts were grilled on a pre-heated George Foreman™ Indoor/Outdoor Electric Barbeque Grill for 10 minutes on setting "4". Raw cuts were weighed prior to cooking. Internal cooking temperatures were determined by insertion of thermocouples. Cuts were turned-over when the internal temperature reached 100°-105°F (71°-41°C). Cuts were removed from the grill to attain a final internal temperature of 160°F/71°C (cuts were taken off the grill at approximately 155°F/68°C internal temperature). After standing 5 minutes, cuts were re-weighed and the highest internal temperature was attained during the standing period and recorded.

Cooking methods, braising. Oven was pre-heated to 325°F/163°C. Temperature was monitored with an oven thermometer. The cuts were weighed prior to cooking and then placed on a rack in a roasting pan. Distilled water (100 ml) was added to the roasting pan, which was covered tightly and placed in the center of the oven. Cuts were braised until reasonably tender. Cooking time was determined from initial trials. Initial cooking time estimates were: 45 minutes for blade steaks; 1 hour and 15 minutes for country-style ribs. Immediately after removal from the oven, the product was placed on a wire rack. The internal temperature was determined with an electronic digital thermometer. Cuts were allowed to cool for 5 minutes and then weighed.

Sample analyses. Proximate nutrients (moisture, total fat, ash, and protein) and cholesterol were determined on individual muscle samples from the shoulder, leg and knuckle, both raw and cooked. For each cut, three samples were pooled into composites and analyzed for fatty acids. Vitamins and minerals were analyzed on samples from the two-carcass composites. Choline and folate analyses were done on the three-carcass composites, raw and cooked. Amino acids were also analyzed on the three-sample composites - raw samples only.

Cured Hams

A new study on cured ham products was conducted by the NDL in collaboration with the University of Wisconsin to update the nutrient profile of various cured ham products in the SR. The word Ham refers to pork meat from the hind leg of a hog. Ham products were available in bone-in or boneless forms.

Cured hams are classified into four categories (USDA-FSIS, 2007):

- Ham - at least 20.5% protein in the lean area with no water added;
- Ham with Natural Juices (HNJ) - at least 18.5% protein with a small addition of water when cured;
- Ham - Water added (HWA) - at least 17% protein with no more than 10% added solution;
- Ham and Water Product (HWP) - less than 17% protein and contains any amount of water but labeling must indicate percentage of "added ingredients".

"Added ingredients" may vary for each ham product. These solutions, flavorings or "added ingredients" may include water, sugar, salt, sodium erythrobate, sodium nitrite, potassium, and magnesium leading to flavor enhancement. Binders such as soy or milk proteins may also be added to help hold water in the ham. These additions of water and flavor enhancers in ham affect its taste and texture.

Sampling. The sampling plan used for the study was developed for NFNAP (Pehrsson et al., 2000). The country was divided into four regions, with three consolidated metropolitan statistical areas (CMSA) within each region; two retail stores were selected within each CMSA. Eight different types of ham products were picked up from 12 retail outlets nationwide: 1) ham, bone-in whole; 2) ham, bone-in, shank half; 3) ham with natural juices, bone-in rump; 4) ham with natural juices, bone-in butt half; 5) ham with natural juices, bone-in spiral sliced; 6) ham, water added, bone-in, slice; 7) boneless hams (many shapes and sizes); and 8) ham and water product, boneless slices, any type, and/or glazed with sugar, honey, and other ingredients. The sampling procedure for each category of bone-in hams was to select two half-hams. One of those was a shank-half portion and the other a rump-half portion. It was preferable that the two halves should come from the same manufacturer and from the same category. Pairs of selected, branded, bone-in hams (Maple, Haen, and Brandon) were picked-up for retention studies. All products were vacuum packaged, individually labeled, and sent frozen to University of Wisconsin for further cooking and dissection.

Sample preparation. All hams (bone-in and boneless; heated and unheated) were weighed, measured for thickness, and dissected to separate external fat and seam fat. Bone-in hams were further dissected for removal of bone and connective tissue prior to nutrient analyses. Branded hams or paired bone-in whole hams were cut into shank, butt, and slices. One portion from each pair (rumps and shanks) was analyzed "as purchased" and the other roasted to an internal temperature >160°F (71°C). Slices were weighed and measured for thickness prior to being pan-fried to an internal temperature of 64-82°F (18°-28°C). All other types of bone-in and boneless hams were either roasted in a 325°F (163°C) convection oven or pan-broiled to the internal temperature

specified on the label. No fat was added during any cooking preparation.

Sample analyses. Proximate nutrients (moisture, total fat, ash, and protein) cholesterol, vitamins, and minerals were determined on all categories of bone-in and boneless hams, both heated and unheated. Total sugars and fatty acids were analyzed on all bone-in and boneless forms of "Ham", "Ham with natural juices" and "Ham and water product". Two pairs of "Ham" types, heated and unheated, were analyzed for vitamin K, retinol, choline, and amino acids (unheated only).

References for Notes on Foods – Pork Products

Jones, D.B. 1941. Factors for Converting Percentages of Nitrogen in Foods and Feeds into Percentages of Protein. Rev. U.S. Dept. of Agric., Circ. 183, 22 pp.

Merrill, A.L. and B.K. Watt. 1973. Energy Value of Foods—Basis and Derivation. Rev. U.S. Dept. of Agric., Agric. Handb. No. 74, 105 pp.

National Pork Board. 1998. Functionality Of Non-Meat Ingredients Used In Enhanced Pork. National Pork Board Web site: http://www.pork.org/filelibrary/Factsheets/PorkScience/functionalitynonmeat04527.pdf (Accessed 8/9/10)

Perry C.R., P.R. Pehrsson, and J. Holden 2003. A Revised Sampling Plan for Obtaining Food Products for Nutrient Analysis for the USDA National Nutrient Database 2003. Proceedings of the American Statistical Association, Section on Survey Research Methods [CD-ROM], Alexandria, VA: American Statistical Association, San Francisco

Pehrsson, P. R., D.B. Haytowitz, J.M. Holden, C.R. Perry, and D.G. Beckler, 2000. USDA's National Food and Nutrient Analysis Program: food sampling. Journal of Food Composition and Analysis 13:379-389.

U.S. Department of Agriculture, Food Safety and Inspection Service. 2007. Ham Glossary – Ham and food safety fact sheet: 2007. Home page: http://www.fsis.usda.gov/factsheets/ham/ (Accessed 8/9/2010)

Appendix A. Abbreviations Used in Short Descriptions

All purpose	ALLPURP
Aluminum	AL
And	&
Apple	APPL
Apples	APPLS
Applesauce	APPLSAUC
Approximate	APPROX
Approximately	APPROX
Arm and blade	ARM&BLD
Artificial	ART
Ascorbic acid	VIT C
Aspartame	ASPRT
Aspartame-sweetened	ASPRT-SWTND
Baby food	BABYFD
Baked	BKD
Barbequed	BBQ
Based	BSD
Beans	BNS
Beef	BF
Beverage	BEV
Boiled	BLD
Boneless	BNLESS
Bottled	BTLD
Bottom	BTTM
Braised	BRSD
Breakfast	BRKFST
Broiled	BRLD
Buttermilk	BTTRMLK
Calcium	CA
Calorie, calories	CAL
Canned	CND
Carbonated	CARB
Center	CNTR
Cereal	CRL
Cheese	CHS
Chicken	CHICK
Chocolate	CHOC
Choice	CHOIC
Cholesterol	CHOL
Cholesterol-free	CHOL-FREE
Chopped	CHOPD
Cinnamon	CINN

Coated	COATD
Coconut	COCNT
Commercial	COMM
Commercially	COMMLY
Commodity	CMDTY
Composite	COMP
Concentrate	CONC
Concentrated	CONCD
Condensed	COND
Condiment, condiments	CONDMNT
Cooked	CKD
Cottonseed	CTTNSD
Cream	CRM
Creamed	CRMD
Dark	DK
Decorticated	DECORT
Dehydrated	DEHYD
Dessert, desserts	DSSRT
Diluted	DIL
Domestic	DOM
Drained	DRND
Dressing	DRSNG
Drink	DRK
Drumstick	DRUMSTK
English	ENG
Enriched	ENR
Equal	EQ
Evaporated	EVAP
Except	XCPT
Extra	EX
Flank steak	FLANKSTK
Flavored	FLAV
Flour	FLR
Food	FD
Fortified	FORT
French fried	FRENCH FR
French fries	FRENCH FR
Fresh	FRSH
Frosted	FRSTD
Frosting	FRSTNG
Frozen	FRZ
Grades	GRDS
Gram	GM
Green	GRN
Greens	GRNS
Heated	HTD

Heavy	HVY
Hi-meat	HI-MT
High	HI
Hour	HR
Hydrogenated	HYDR
Imitation	IMITN
Immature	IMMAT
Imported	IMP
Include, includes	INCL
Including	INCL
Infant formula	INF FORMULA
Ingredient	ING
Instant	INST
Juice	JUC
Junior	JR
Kernels	KRNLS
Large	LRG
Lean	LN
Lean only	LN
Leavened	LVND
Light	LT
Liquid	LIQ
Low	LO
Low fat	LOFAT
Marshmallow	MARSHMLLW
Mashed	MSHD
Mayonnaise	MAYO
Medium	MED
Mesquite	MESQ
Minutes	MIN
Mixed	MXD
Moisture	MOIST
Natural	NAT
New Zealand	NZ
Noncarbonated	NONCARB
Nonfat dry milk	NFDM
Nonfat dry milk solids	NFDMS
Nonfat milk solids	NFMS
Not Further Specified	NFS
Nutrients	NUTR
Nutrition	NUTR
Ounce	OZ
Pack	PK
Par fried	PAR FR
Parboiled	PARBLD
Partial	PART

Partially	PART
Partially fried	PAR FR
Pasteurized	PAST
Peanut	PNUT
Peanuts	PNUTS
Phosphate	PO4
Phosphorus	P
Pineapple	PNAPPL
Plain	PLN
Porterhouse	PRTRHS
Potassium	K
Powder	PDR
Powdered	PDR
Precooked	PRECKD
Preheated	PREHTD
Prepared	PREP
Processed	PROC
Product code	PROD CD
Propionate	PROP
Protein	PROT
Pudding, puddings	PUDD
Ready-to-bake	RTB
Ready-to-cook	RTC
Ready-to-drink	RTD
Ready-to-eat	RTE
Ready-to-feed	RTF
Ready-to-heat	RTH
Ready-to-serve	RTS
Ready-to-use	RTU
Reconstituted	RECON
Reduced	RED
Reduced-calorie	RED-CAL
Refrigerated	REFR
Regular	REG
Reheated	REHTD
Replacement	REPLCMNT
Restaurant-prepared	REST-PREP
Retail	RTL
Roast	RST
Roasted	RSTD
Round	RND
Sandwich	SNDWCH
Sauce	SAU
Scalloped	SCALLPD
Scrambled	SCRMBLD
Seed	SD

Select	SEL
Separable[1]	
Shank and sirloin	SHK&SIRL
Short	SHRT
Shoulder	SHLDR
Simmered	SIMMRD
Skin	SKN
Small	SML
Sodium	NA
Solids	SOL
Solution	SOLN
Soybean	SOYBN
Special	SPL
Species	SP
Spread	SPRD
Standard	STD
Steamed	STMD
Stewed	STWD
Stick	STK
Sticks	STKS
Strained	STR
Substitute	SUB
Summer	SMMR
Supplement	SUPP
Sweet	SWT
Sweetened	SWTND
Sweetener	SWTNR
Teaspoon	TSP
Thousand	1000
Toasted	TSTD
Toddler	TODD
Trimmed[1]	
Trimmed to[1]	
Uncooked	UNCKD
Uncreamed	UNCRMD
Undiluted	UNDIL
Unenriched	UNENR
Unheated	UNHTD
Unprepared	UNPREP
Unspecified	UNSPEC
Unsweetened	UNSWTND
Variety, varieties	VAR
Vegetable, vegetables	VEG
Vitamin A	VIT A
Vitamin C	VIT C
Water	H20

Whitener	WHTNR
Whole	WHL
Winter	WNTR
With	W/
Without	WO/
Yellow	YEL

[1] Removed in short description

Appendix B. Other Abbreviations

ap	as purchased
ARS	Agricultural Research Service
DFE	Dietary Folate Equivalent
dia	diameter
DRI	Dietary Reference Intakes
fl oz	fluid ounce
FNDDS	USDA Food and Nutrient Database for Dietary Studies
g	gram
INFOODS	International Network of Food Data Systems
IU	International Unit
kcal	kilocalorie
kJ	kilojoule
lb	pound
mg	milligram
µg, mcg	microgram
ml	milliliter
NDB	Nutrient Databank
NDBS	Nutrient Databank System
NDL	Nutrient Data Laboratory
NFNAP	National Food and Nutrient Analysis Program
NLEA	Nutrition Labeling and Education Act
oz	ounce
RAE	Retinol Activity Equivalent
RE	Retinol Equivalents
RDA	Recommended Dietary Allowances, a Dietary Reference Intake
SR	USDA National Nutrient Database for Standard Reference
UL	Tolerable Upper Intake Level, a Dietary Reference Intake