Composition of Foods
Raw, Processed, Prepared
USDA National Nutrient Database for Standard Reference, Release 18

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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 18 (SR18), contains data on 7,146 food items and up to 136 food components. It replaces SR17 issued in October 2004.

SR18 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8" (U.S. Department of Agriculture 1976–92), and its four supplements (U.S. Department of Agriculture 1990–93), which superseded the 1963 edition (Watt and Merrill 1963). Since 1992, updated data have been published electronically on the USDA Nutrient Data Laboratory (NDL) website. SR18 supersedes all previous releases, including the printed versions, in the event of any differences.

With the first release of data from our new Nutrient Databank System (NDBS) in July 2001, we changed some formats and added fields 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 have not been updated or processed through the complete system. Therefore, many of these new fields contain data for only a limited number of items and it will take a number of years before they are populated for most food items in the database.

We compiled data from published and unpublished sources. Published sources include the scientific and technical literature. Unpublished data include those obtained from the food industry, other government agencies, and research conducted under contracts initiated by USDA Agricultural Research Service (ARS). These analyses are currently conducted under the National Food and Nutrient Analysis Program (NFNAP), which began in 1997, in cooperation with the National Heart Lung and Blood Institute and 16 other offices and institutes of the National Institutes of Health (Pehrsson et al. 2000). 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 may contain a complete nutrient profile.

Specific Changes for SR18

We have made several major changes to the database since the last release, as listed below:

- Included nutrient values for added vitamin E and vitamin B_{12} for all foods used in the Food and Nutrition Database for Dietary Studies (FNDDS) (U.S. Department of Agriculture—Agricultural Research Service 2004).

- Added 72 new food items representing 12 new beef cuts recently introduced to the retail market.

- Added data for USDA commodity ready-to-eat breakfast cereals to expand the available data on USDA commodities. These foods are used in USDA nutrition assistance programs, such as the National School Lunch Program and the Food Distribution Program on Indian Reservations.

- Updated values generated from formulations, when appropriate, to use new data on industrial fats and oils, replacing data on retail fats and oils previously used for these products.

- Updated and expanded data for a variety of food items, including different types of french-fried potatoes, several types of mushrooms, bagels, English muffins, frozen pancakes, frozen waffles, industrial wheat flours, vinegars, flaxseed, baby foods and infant formulas, frozen novelties, sweeteners, bottled, noncarbonated waters, brand name sports drinks and fitness waters, energy drinks, cranberry juice drinks, and wine and beer.

- Expanded brand name fast food data, including 28 brand-name thick, thin, and regular crust pizza items.

Data Files

The data files for SR18 are in ASCII format. A description of each field in these files and the relationships between each begins on p. 18. We have also made a Microsoft Access 2000 database available. This database contains all the SR18 files and relationships, with a few sample queries and reports. We have also included an abbreviated file (p. 27), with fewer nutrients but all the food items. A Microsoft Excel 2000 spreadsheet of this file is also provided.

Reports

The data in SR18 are also available as reports in two different presentations. The first presents items in SR18 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 SR18. These reports are sorted either 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).

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

File Content

As mentioned earlier, the database consists of several separate data files. 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).

The four principal 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.

Food Description File

This file includes descriptive information about the food items. For more details on the Food Description file, see "Food Description File Formats" (p. 20). A full description and a short description (containing abbreviations) are provided. Abbreviations used in creating short descriptions are given in appendix A. In creating the short description, we did not abbreviate the first word in the long description. In addition, if the long description was 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, amounts of refuse, and refuse descriptions are provided where appropriate. The factors used to calculate protein from nitrogen are included, as well as those used to calculate calories. There are no factors for items prepared using the recipe program of the NDBS or for items where the manufacturer calculates protein and calories.

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 and 456 (Adams 1975, Matthews and Garrison 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 intramuscular fat. Separable lean refers to muscle tissue that can be readily separated from the intact cut; it includes any fat striations (marbling) within the muscle. For boneless cuts, the refuse values apply 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 from formula

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

where

Y = nutrient value per 1 pound as purchased, and

W_c = weight of cooked, edible meat.

Nutrients

The Nutrient file contains nutrient values per 100 g, edible portion, along with fields to further describe the mean value. Nutrient values have been rounded to the number of decimal places for each nutrient as specified in the Nutrient Definition file (p. 23). In addition to the mean value, number of samples, and standard deviation, we provide a number of statistical attributes to better describe the mean. These include the following:

- Number of studies—the number of analytical studies used to generate a mean. A study is a discrete research project on the analysis of foods. 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 a range of values.
- Maximum value—the largest observed value in a range of values.
- Degrees of freedom—the number of values that are free to vary after we have placed certain restrictions on the data; used in probability calculations.
- Lower- and upper-error bounds—represent a range of values within which the mean is expected to fall, given a pre-specified confidence level. For SR18 and related releases, the confidence level is 95 percent.
- Statistical comments—give additional details about certain assumptions made during statistical calculations. The definition of each comment is given in the discussion of the Nutrient Value file under “File Formats.”

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

- Derivation code—gives more information about how a value was calculated or imputed. Procedures for imputing nutrient values were 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 added or updated since SR14.
- 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 8. In future releases, this field will be populated for other food groups.
- 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 new NDBS (Holden et al. 2002). This field is not included in this release but is planned for future releases.

For more details on the Nutrient Data file, see “Nutrient Data File Formats” (p. 21). Nutrient values give the total amount of the nutrient present in the edible portion of the food, including any nutrients added in processing. The values do not necessarily give the nutrient amounts available to the body. Table 1 gives an idea of the comprehensiveness of the database by listing for each nutrient the number of items that contain data.

Table 1.—Number of foods in database (*n* = 7,146)

Nutr. No.	Nutrient	Number of foods	Nutr. No.	Nutrient	Number of foods
255	Water* †	7142	334	β-cryptoxanthin* †	3841
208	Energy* †	7146	337	Lycopene* †	3807
203	Protein* †	7146	338	Lutein+zeaxanthin* †	3767
204	Total lipid (fat)* †	7146	324	Vitamin D	477
207	Ash* †	7138	430	Vitamin K* †	3644
205	Carbohydrate, by difference* †	7146	323	α-tocopherol (vitamin E)* †	3995
291	Total dietary fiber* †	6387	573	Added vitamin E*	3086
209	Starch	384	341	β-tocopherol	857
269	Total sugars* †	4533	342	γ-tocopherol	868
210	Sucrose	677	343	δ-tocopherol	861
211	Glucose	683	401	Vitamin C, total ascorbic acid* †	6812
212	Fructose	676	404	Thiamin* †	6700
213	Lactose	633	405	Riboflavin* †	6702
214	Maltose	624	406	Niacin* †	6697
287	Galactose	512	410	Pantothenic acid†	5907
301	Calcium* †	6983	415	Vitamin B_6* †	6464
303	Iron* †	7016	417	Folate, total* †	6447
304	Magnesium* †	6632	431	Folic acid* †	6166
305	Phosphorus* †	6733	432	Food folate* †	6306
306	Potassium* †	6788	435	Folate (DFE)* †	6161
307	Sodium* †	7063	418	Vitamin B_{12}* †	6435
309	Zinc* †	6607	578	Added vitamin B_{12}*	3119
312	Copper*	6545	601	Cholesterol* †	6902
315	Manganese†	5732	636	Phytosterols	589
317	Selenium* †	5882	641	β-Sitosterol	65
318	Vitamin A (IU)* †	6871	638	Stigmasterol	63
320	Vitamin A (RAE)* †	6196	639	Campesterol	64
319	Retinol* †	6133	221	Alcohol*	4134
321	β-carotene* †	3994	262	Caffeine*	3792
322	α-carotene* †	3857	263	Theobromine*	3779

Table 1.—Number of foods in database (*n* = 7,146)—(continued)

Nutr. No.	Nutrient	Number of foods	Nutr. No.	Nutrient	Number of foods
606	Total saturated fatty acids* †	6852	851	18:3 n-3 c,c,c	355
607	4:0*	4268	685	18:3 n-6 c,c,c	348
608	6:0*	4296	856	18:3 i	32
609	8:0*	4526	627	18:4*	4230
610	10:0*	5211	672	20:2 n-6 c,c	588
611	12:0*	5536	689	20:3 undifferentiated	629
696	13:0	173	853	20:3 n-6	6
612	14:0*	5959	620	20:4 undifferentiated*	5222
652	15:0	810	855	20:4 n-6	5
613	16:0*	6189	629	20:5 n-3*	4413
653	17:0	835	857	21:5	16
614	18:0*	6175	858	22:4	16
615	20:0	949	631	22:5 n-3*	4358
624	22:0	785	621	22:6 n-3*	4413
654	24:0	381	605	Fatty acids, total *trans*	480
645	Total monounsaturated fatty acids* †	6623	693	Fatty acids, total *trans*-monoenoic	180
625	14:1	893	695	Fatty acids, total *trans*-polyenoic	147
697	15:1	526			
626	16:1 undifferentiated*	5919	501	Tryptophan	4548
673	16:1 c	66	502	Threonine	4593
662	16:1 t	21	503	Isoleucine	4596
687	17:1	564	504	Leucine	4597
617	18:1 undifferentiated*	6212	505	Lysine	4612
674	18:1 c	195	506	Methionine	4608
663	18:1 t	213	507	Cystine	4537
628	20:1*	5205	508	Phenylalanine	4594
630	22:1 undifferentiated*	4439	509	Tyrosine	4562
676	22:1 c	7	510	Valine	4596
664	22:1 t	1	511	Arginine	4583
671	24:1 c	132	512	Histidine	4588
646	Total polyunsaturated fatty acids* †	6630	513	Alanine	4535
618	18:2 undifferentiated*	6229	514	Aspartic acid	4538
675	18:2 n-6 c,c	190	515	Glutamic acid	4539
666	18:2 i	61	516	Glycine	4536
669	18:2 t,t	95	517	Proline	4524
665	18:2 t not further defined	6	518	Serine	4534
670	18:2 CLAs	11	521	Hydroxyproline	631
619	18:3 undifferentiated*	6111			

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

† Nutrients included in the Abbreviated file (p. 27)

When nutrient data for prepared or cooked products were unavailable or incomplete, nutrient values were calculated from comparable raw items or by recipe. When values are calculated in a recipe or from the raw item, appropriate nutrient retention (U.S. Department of Agriculture 2003) and yield factors (Matthews and Garrison 1975) are applied. 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, when appropriate, adjustments are made for fat and moisture gains and losses.

Nutrient retention factors are based on data from USDA research contracts, recent 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 of solids from foods that occurs during preparation and cooking.

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

where

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.

In general, levels of fortified nutrients are the values calculated by the manufacturer or NDL food specialists, 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 one can expect in the product. If analytical values were available to estimate levels of added nutrients, a number is present in the sample count field for these nutrients.

Proximates. The term proximate components refers to those macronutrients that include water (moisture), protein, total lipid (fat), total carbohydrate, and ash.

Protein. The values for protein were calculated from the level of total nitrogen (N) in the food, using the conversion factors recommended by Jones (1941). 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. There is no factor for items prepared using the recipe program of the NDBS or for items where the manufacturer calculates protein.

Protein values for chocolate, cocoa, coffee, mushrooms, and yeast were adjusted for nonprotein nitrogenous material. 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 were ingredients, 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 SR18; 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. The item calculated using the 6.25 factor is identified as "crude protein basis."

Total Lipid. The total lipid (fat) content of most foods was 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 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. The term "NLEA fat" is commonly referred to as "total fatty acids expressed as triglycerides."

Carbohydrate. Carbohydrate, when present, was 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, as determined by the methods of the Association of Official Analytical Chemists (AOAC 2003), was 979.06 (27.1.21) and 985.10 (28.1.18), respectively. Total dietary fiber content was 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 were determined using AOAC methods (2003), either high-performance liquid chromatography (HPLC) or gas-liquid chromatography (GLC). When analytical data for total sugars were unavailable for items in the USDA Food and Nutrient Database for Dietary Studies (FNDDS), values were imputed or obtained from manufacturers and trade associations. Starch was analyzed using the AOAC method 966.11 (2003). Because the analyses of total dietary fiber, total sugars, and starch are performed separately, the sum of these carbohydrate fractions may not add up to 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 are for physiological energy, which is the energy value remaining after losses from digestion and metabolism are deducted from gross energy. Calorie 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 outlined in "Agriculture Handbook 74" (Merrill and Watt 1973). For multi-ingredient processed foods, calorie values (source codes 8 or 9; for more information on source codes, see p. 23) generally reflect industry practices (as permitted by NLEA) of calculating calories from 4-4-9 calories per gram of protein, carbohydrate, and fat, respectively, or from 4-4-9 calories 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, we used a factor of 6.93 to calculate calories per gram of alcohol. No calorie factors are given for items prepared using the recipe program of the NDBS. Instead, total calories for these items equal the sums of the calories contributed by each ingredient after adjustment for changes in yield, as appropriate. For multi-ingredient processed foods, if the calories calculated by the manufacturer are reported, no calorie factors are given.

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

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

Analytical data for selenium were published earlier by USDA (1992) and were determined by the modified selenium hydride and fluorometric methods. Selenium values from the NFNAP were determined by either the modified selenium hydride 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.

Vitamins. Vitamins included in the database are ascorbic acid (vitamin C), thiamin, riboflavin, niacin, pantothenic acid, vitamin B_6, vitamin B_{12}, folate, 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), but may be a mixture of total and reduced forms. Reduced ascorbic acid was determined by the dichloroindophenol method and total ascorbic acid by the fluorometric method.

Thiamin, Riboflavin, and Niacin. Thiamin was determined chemically by the thiochrome procedure or by microbiological methods. Fluorometric or microbiological methods were used to measure riboflavin. Niacin was determined by microbiological methods. 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. In estimating the amounts of niacin available from foods, the mean value of 60 mg tryptophan is considered equivalent to 1 mg niacin (NAS/IOM 1998).

Pantothenic acid, Vitamins B_6, and B_{12}. Pantothenic acid was determined microbiologically. Vitamins B_6 and B_{12} were determined by microbiological or chromatographic methods. Vitamin B_{12} is found in foods of animal origin or those containing some ingredient of animal origin, for example, 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 (beer, 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).

The Dietary Reference Intakes (DRI) for vitamin B_{12} recommend 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 (NAS/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 230 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} was 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 would contain intrinsic vitamin B_{12}. However, infants are not the population of concern for intake of fortified vitamin B_{12}. Plant-based meat substitutes would not contain intrinsic vitamin B_{12}.

Folate. Values are reported for folic acid, food folate, and total folate reported as µg of dietary folate equivalents (DFEs). These varied forms are included in response to the DRIs for folate issued by the National Academy of Sciences, Institute of Medicine (NAS/IOM 1998). DRIs 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, it is necessary to have separate values for naturally occurring food folate and added synthetic folic acid.

$$\mu g\ DFE = \mu g\ food\ folate + (1.7 * \mu g\ folic\ acid)$$

In SR12 (1998), the folate values in the database were updated to reflect regulations requiring the addition of folic acid to enriched cereal grain products subject to standards of identity (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. At that time, values for the database were based on enrichment levels specified in the regulations, since analytical values were not yet available. Beginning with SR16, analytical folate values from NFNAP and the scientific literature have been used for wheat flour, cornmeal and grits, farina, macaroni and noodles, bread, rolls and a few types of crackers. For many baked products containing enriched flour and cornmeal as ingredients, folate values have been calculated by recipe using the revised folate values for the ingredients.

For unenriched foods, the total folate value consists of only food folate. Therefore, the value for total folate with its number of data points and standard error, if present, was also used for food folate. The folic acid value was assumed to be zero.

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 databank 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 reported in SR13 (1999).

Folate values for foods analyzed through NFNAP are generated using the trienzyme microbiological procedure (Martin et al. 1990). Microbiological methods measure total folate; for enriched foods, folic acid and food folate are not distinguished from each other. Therefore, to be able to calculate DFE, enriched foods are also analyzed by a microbiological procedure without enzymes to estimate the amount of added folic acid. Food folate is then calculated by difference.

Vitamin A. Beginning with SR15 (2002), in addition to the international units (IUs) that have been reported in the past, we reported values for vitamin A in µg of retinol activity equivalents (RAEs) and µg of retinol. Values in µg of retinol equivalents (REs) were dropped from the database.

This change responds to new DRIs for vitamin A issued by the National Academy of Sciences, Institute of Medicine (NAS/IOM 2001). Along with the new DRIs, the panel 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 recent studies that show that the conversion of provitamin A carotenoids to retinol is only half as great as previously thought.

Vitamin A in IU will continue to be reported because that is the unit used for nutrition labeling. One IU is equivalent to 0.3 µg retinol, 0.6 µg beta-carotene, or 1.2 µg other provitamin-A carotenoids (NAS/NRC 1989).

Individual carotenoids, β-carotene, α-carotene, β-cryptoxanthin, lycopene, and lutein+zeaxanthin are reported. The analytical data are from NFNAP, generated using HPLC methodology, 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 values in IU and RAE were calculated from the individual carotenoids (β-carotene, α-carotene, and β-cryptoxanthin) using the appropriate factors. For food items used in the FNDDS, carotenoid values were imputed if analytical data were not available. For many of these items data were only available for vitamin A in IU. However, the variability in carotenoid levels due to cultivar, season, growing area, etc., increases the difficulty in imputing individual carotenoids to match existing IU values. The vitamin A IU value should agree with the IU value calculated from individual carotenoids ±15 IU.

When individual carotenoids are not reported for plant foods (such as fruits, vegetables, legumes, nuts, cereal grains, and spices and herbs), µg RAE were 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, when analytical data was not available, µg RAE and µg of retinol were calculated by dividing the IU value by 3.33.

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

Vitamin E. Vitamin E activity as defined by the DRI report (NAS/IOM 2000) is now limited to the naturally occurring form and three synthetic forms of α-tocopherol. For this reason, α-tocopherol equivalents, which included vitamin E activity from α-, β-, γ-, and δ-tocopherols and α-, β-, and γ-tocotrienols, were dropped from the database in SR16. Tocopherols were determined by gas-liquid chromatography (GLC) or high-performance liquid chromatography (HPLC). For those items in FNDDS, values are presented for α-tocopherol. If analytical data were unavailable, values for α-tocopherol were imputed. When available, values are also presented for the other tocopherols.

In the new Dietary Reference Intakes for Vitamin E, different factors were used to calculate the milligram amount of α-tocopherol from IU of vitamin E (NAS/IOM 2000). The factors vary depending upon the chemical form of α-tocopherol used to fortify the food where

mg of α-tocopherol in food, fortified food, or multivitamin

= IU of the RRR-α-tocopherol compound × 0.67 and

= IU of the *all rac*-α-tocopherol compound × 0.45.

Before SR16-1, the conversion factor for RRR-α-tocopherol was used for all vitamin E fortified foods. New α-tocopherol values have been calculated for breakfast cereals, most infant formulas and a few other foods that are fortified with vitamin E, where we have confirmed that all rac-α-tocopherol was the form added. For more information about vitamin E in breakfast cereals, see the article in the January 2004 issue of the *American Journal of Clinical Nutrition* by Leonard et al. (2004).

"All forms of supplemental alpha-tocopherol are used as the basis of establishing the Tolerable Upper Intake Level (UL) for vitamin E (NAS/IOM 2000)." A new nutrient number (#573) has been added to identify quantities of "added vitamin E." In this release, there are 100 food items that have values for added vitamin E greater than 0. For the majority of these food items the form added is synthetic vitamin E (all rac-α-tocopherol). To relate intakes of supplemental α-tocopherol to the UL, values for "added vitamin E" should be multiplied by 2 when the added form is synthetic vitamin E. Although the 2S-stereoisomers do not contribute to vitamin E activity for the RDA, they do contribute to the UL. Items that are fortified with RRR-α-tocopherol (natural vitamin E) are identified by a footnote and the added vitamin E can be used directly for contribution to the UL. The majority of foods that are fortified with vitamin E are infant formulas and breakfast cereals. For these foods, the value for total vitamin E was used for "added vitamin E"; the small amount of intrinsic vitamin E was not considered. In fortified peanut butter, the intrinsic vitamin E was calculated since it is a substantial amount.

Vitamin K. Much of the data for vitamin K were generated under NFNAP and supersede the values in the 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 internal standard (Booth et al. 1994).

Vitamin D. Much of the data for vitamin D were published earlier (Weihrauch and Tamaki 1991). Values for breakfast cereals were updated based on data received from the food industry; values for other food items were updated using data generated under NFNAP. These new values supersede those in the Provisional Table (PT-108).

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. 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 references. 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 lipid conversion factor for that food item. No statistics of variability are reported for normalized 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 and omega-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 new nutrient numbers have been assigned, include 18:2 c,t, 18:2 t,c, and 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.

Fatty acid totals: Only a small portion of the fatty acid data received for release in SR18 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. Thus, mean values for the specific isomers of 18:2 would be 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 may be relatively small.

For multi-ingredient processed brand name foods, industry data were often available for fatty acid classes (SFA, MUFA, and PUFA) but were lacking for individual fatty acids. In these cases, individual fatty acids were calculated from the fatty acids of the individually listed ingredients and normalized to the total fat level. A best-fit approximation was made to fatty acid classes, but unavoidably, calculated sums of individual fatty acid totals did 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 were converted to g fatty acids per 100 g of food, values of less than 0.0005 were rounded to 0.

Table 2 is provided for the convenience of users in attaching common names or systematic names to fatty acids in our 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. 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 c			673*
16:1 t			662
17:1	heptadecenoic		687
18:1 undifferentiated	octadecenoic	oleic	617
18:1 c			674*
18:1 t			663
20:1	eicosenoic	gadoleic	628
22:1 undifferentiated	docosenoic	erucic	630
22:1 c			676*
24:1 c	cis-tetracosenoic	nervonic	671

Table 2.—Systematic and common names for fatty acids—(continued)

Fatty acid	Systematic name	Common name of most typical isomer	Nutrient number
Polyunsaturated fatty acids			
18:2 undifferentiated	octadecadienoic	linoleic	618
18:2 n-6 c,c			675*
18:2 i			666
18:2 t,t			669
18:2 t not further defined			665
18:3	octadecatrienoic	linolenic	619
18:3 n-3 c,c,c		alpha-linolenic	851*
18:3 n-6 c,c,c		gamma-linolenic	685
18:4 undifferentiated	octadecatetraenoic	parinaric	627
20:2 n-6 c,c	eicosadienoic		672
20:3 undifferentiated	eicosatrienoic		689
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.

Cholesterol. Cholesterol values were generated primarily by GLC procedures. 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 have been 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) were obtained by colorimetric or gas-chromatographic procedures 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. Data to develop amino acid patterns for simple foods were obtained primarily by ion-exchange chromatography. Amino acids are extracted in three groups—tryptophan, sulfur-containing amino acids (methionine and cystine), and all others. The amino acid patterns and the total nitrogen content were 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.

In the past, the number of data points appeared only on 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. For foods processed in the new NDBS, 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.

If amino acid values are presented for an item with more than one protein-containing ingredient, the values may have been 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 were calculated as the sum of the amino acids in each protein-containing ingredient multiplied by total nitrogen in the item.

Weights and Measures

Information is provided on household measures for food items (for example, 1 cup, 1 tablespoon, 1 fruit, and 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 were 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 (2004). Though we made special efforts 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. 25.

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. Many of the footnotes published in "Agriculture Handbook 8" are no longer needed because the information has been moved to other fields and tables. For example, details about the measure description, once contained in footnotes, are now part of the measure description in the Weight file. Values for additional nutrients once included in footnotes were given nutrient numbers, when appropriate, and included in the Nutrient Data file. The database also incorporates data that cover enrichment or fortification or cases where nutrient content is affected by plant part or color (for example, yellow and white corn). The format of this file is described on p. 25.

Sources of Data
We first added this file (previously called References) with SR14 (2001). We have changed the name and some of the fields to reflect the fact that not all sources are journals or books, 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 many of the data in this release were carried forward from SR13 (1999), nutrient-specific source documentation was 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. 26.

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. The format of this file is described on p. 27.

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 other related information. The abbreviated file does not include values for alcohol, caffeine, phytosterols, starch, theobromine, vitamin D, or individual amino acids, fatty acids, and sugars.

Relational Files
The four principal and six support files of the relational database can be linked together in a variety of combinations to produce queries and generate reports (figure 1). Table 3 shows the number of records in each file. The relational files are in both ASCII format and a Microsoft Access 2000 database. Tables 4−13 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 that this is an index field for the file. Though the ASCII files are not indexed, the file descriptions show where indexes were used to sort and manage records within the NDBS. When importing these files into a database management system, if files are to be indexed, it is

important to use the indexes 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) and A = alphanumeric], and maximum length. The actual length in the data files may be less and most likely will change in later releases. Values will be padded with 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

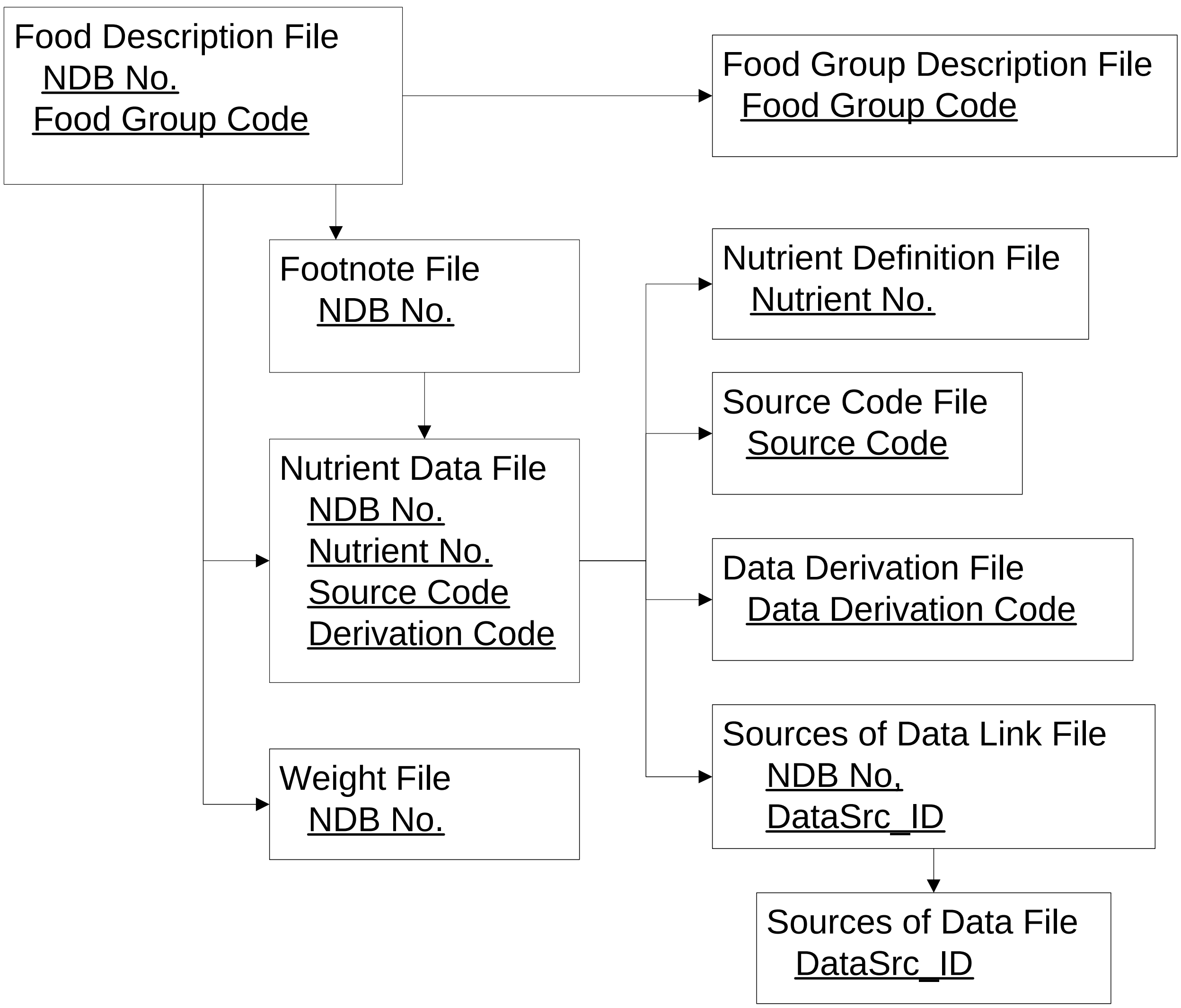

Table 3.—Number of records in principal and support files

File name	Table name	Number of records
Principal files		
Food Description	FOOD_DES	7,146
Nutrient Data	NUT_DATA	488,327
Weight	WEIGHT	13,009
Footnote	FOOTNOTE	212
Support files		
Food Group Description	FD_GROUP	24
Nutrient Definition	NUTR_DEF	136
Source Code	SRC_CD	10
Data Derivation Description	DERIV_CD	54
Sources of Data	DATA_SRC	366
Sources of Data Link	DATSRCLN	95,325

Food Description File (file name = FOOD_DES). The Food Description file (table 4) contains a long and short description and food group for 7,146 food items, along with common names, manufacturer name, scientific name, percentage and description of refuse, and factors used for calculating protein and calories, if applicable. Items used in the FNDDS are also identified.

- 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 Sources of Data file by the NDB_No field through the Sources of Data Link file

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
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 was longer than 60 characters, additional abbreviations were 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 50	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 has a complete nutrient profile for a specified set of nutrients
Ref_desc	A 60	Y	Description of inedible parts of a food item (refuse), such as seeds or bone
Refuse	N 2	Y	Percentage of refuse
SciName	A 60	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. 7)
Pro_Factor	N 4.2	Y	Factor for calculating calories from protein (see p. 8)
Fat_Factor	N 4.2	Y	Factor for calculating calories from fat (see p. 8)
CHO_Factor	N 4.2	Y	Factor for calculating calories from carbohydrate (see p. 8)

* Index field 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 SR18 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

* Index field for the Food Group Description file.

Nutrient Data File (file name = NUT_DATA)**.** The Nutrient Data file (table 6) 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 6.—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)
Std_Error	N 8.3	Y	Standard error of the mean. Null if could not be calculated
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 was 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
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.

* Index field 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). The Nutrient Definition file (table 7) is the 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 7.—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 that a nutrient value is rounded to
SR_Order	N 6	N	Used to sort nutrient records in the same order as various reports produced from SR

* Index field for the Nutrient Definition file.
† INFOODS 2005.

Source Code File (file name = SRC_CD). The Source Code file (table 8) 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 8.—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

* Index field for the Source Code file.

Data Derivation Code Description File (file name = DERIV_CD). This file (table 9) is a support file for the Nutrient Data file and contains 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 9.—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

* Index field 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 = 25.38 g/100 g
S_t = the total solids content of the target item.
For NDB No. 05623, solids = 27.13 g/100 g

So, using this formula for the above example:

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

Only items that were imputed starting with SR14 (2001) will have both derivation codes and reference NDB numbers. Other items that were 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 10) 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 10.— 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

* Index field for the Weight file.

Footnote File (file name = FOOTNOTE**).** This file (table 11) 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 11.—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

* Index field for the Footnote file.

Sources of Data File (file name = DATA_SRC). This file (table 12) 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 12.—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 10	Y	Volume number for journal articles or books; 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

* Index field for the Sources of Data file.

Sources of Data Link File (file name = DATSRCLN). This file (table 13) 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 13.—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

* Index field for the Sources of Data Link file.

Abbreviated File (file name = ABBREV). The Abbreviated file is available in ASCII format and is also provided in a Microsoft Excel spreadsheet. It contains all the food items, but fewer nutrients and other related information. The abbreviated file does not include values for alcohol, caffeine, phytosterols, starch, theobromine, vitamin D, or individual amino acids, fatty acids, and sugars. Table 14 lists all the nutrients included in the abbreviated file. Starting with SR16 (2003), we have added total sugars, folic acid, food folate, folate DFE, retinol, α-tocopherol, vitamin K, and individual carotenoids (α-carotene, β-carotene, β-cryptoxanthin, lycopene, and lutein+zeaxanthin) to the Abbreviated file. The ASCII file (table 14) is in delimited format. Fields are separated by a caret (^). Text fields are surrounded by a tilde (~). 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.

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. We have imported the data file into a Microsoft Excel 2000 spreadsheet for users of that application. Users of other software applications can import either the Microsoft Excel 2000 spreadsheet or the ASCII files. It contains all the food items, but less descriptive information and fewer nutrients and weights than the larger relational files. If additional information is needed, this file can be linked to the other files by the NDB number.

Table 14.—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)
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)
Vit_B12	N 10.2	Vitamin B_{12} (µg/100 g)

Field name	Type	Description
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)
Vit_E	N 10.2	Vitamin E (alpha-tocopherol) (mg/100 g)
Vit_K	N 10.1	Vitamin K (phylloquinone) (µg/100 g)
Alpha_Carot	N 10	Alpha-carotene (µg/100 g)
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)
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§

* Index field 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. These update files provide changes made between SR17 (2004) and SR18 (2005). Update files in ASCII are provided for those users who reformatted previous releases for their systems and wish to do their own updates. If you are using an earlier release, you will need to first obtain the update files for that release through SR17, update your database to SR17, then use the update files for SR18. These updates are available on NDL's website: http://www.ars.usda.gov/ba/bhnrc/ndl. Added items are given in five 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, Weight file, Footnote file, Nutrient Definition file, and the Data Derivation Code Description file.

Three files contain changes made since SR17 (2004):

- 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.

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, Nutrient Definition, and Weight files. The update files are provided in ASCII format.

Four files contain records that were deleted since SR17 (2004):

- DEL_FOOD file (table 15) lists those food items that were deleted from the database.
- DEL_NUTR file (table 16) 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 10).
- DEL_FTNT contains any footnotes that were removed from the database (table 17). Starting with SR18, 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 15.—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

* Index field for Foods Deleted file.

Table 16. —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

*Index field for Nutrients Deleted file.

Table 17.—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
Nutr_No	A 3	N	Nutrient number of deleted record
Footnt_Typ	A 1	N	Type of footnote of deleted record

* Index field 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 was added, changed, or deleted since SR17. This file is in the same format as the Abbreviated file (table 14).
- DEL_ABBR contains food items that were removed from the database; it is in the same format as DEL_FOOD.
- ADD_ABBR contains food items added since SR17; it is also in the same format as the Abbreviated file.

Summary

Values for added vitamin B_{12} and added vitamin E have been incorporated into the database for all food items in the FNDDS. Other food items and nutrients/food component values have been updated and expanded as described in "Specific Changes for SR18" (p. 1). SR19, which will be released in about a year, will contain additional items and updates.

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* Available on NDL’s website: http://www.ars.usda.gov/ba/bhnrc/ndl

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
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
RDA	Recommended Dietary Allowances
SR	USDA National Nutrient Database for Standard Reference