



USDA's National Food and Nutrient Analysis Program (NFNAP) produces high-quality data for USDA food composition databases: Two decades of collaboration



David B. Haytowitz*, Pamela R. Pehrsson

USDA-ARS Nutrient Data Laboratory, United States

ARTICLE INFO

Article history:

Received 20 July 2016

Received in revised form 10 November 2016

Accepted 18 November 2016

Available online 19 November 2016

Keywords:

Food composition

Nutrient analysis

Databases

ABSTRACT

For nearly 20 years, the National Food and Nutrient Analysis Program (NFNAP) has expanded and improved the quantity and quality of data in US Department of Agriculture's (USDA) food composition databases (FCDB) through the collection and analysis of nationally representative food samples. NFNAP employs statistically valid sampling plans, the Key Foods approach to identify and prioritize foods and nutrients, comprehensive quality control protocols, and analytical oversight to generate new and updated analytical data for food components. NFNAP has allowed the Nutrient Data Laboratory to keep up with the dynamic US food supply and emerging scientific research. Recently generated results for nationally representative food samples show marked changes compared to previous database values for selected nutrients. Monitoring changes in the composition of foods is critical in keeping FCDB up-to-date, so that they remain a vital tool in assessing the nutrient intake of national populations, as well as for providing dietary advice.

Published by Elsevier Ltd.

1. Introduction

USDA's analytical program for food composition, the National Food and Nutrient Analysis Program (NFNAP) has been underway for nearly 20 years. This program was established in 1997 as a collaboration between USDA's Nutrient Data Laboratory (NDL) and the National Institutes of Health (NIH) to improve the quantity and quality of food composition data in USDA's National Nutrient Database for Standard Reference (SR) and other related databases (Pehrsson, Haytowitz, & Holden, 2003). Through this process, we are able to regularly adjust nutrient values in the USDA National Nutrient Database for Standard Reference to accurately represent the foods currently being consumed by the US population. NDL provides representative nutrient estimates for foods and selected ingredients, increase data acquisition for important foods, add data for selected new components to the database, and validate factors and algorithms for compilation of nutrient data. The primary objective of NFNAP is to provide the best estimates of the nutrient means for the population of each food identified as important in the food supply.

2. Methods and procedures

NFNAP is an integrated system for identifying foods and nutrients, food sampling, food preparation and compositing, sample preparation, chemical analysis, and data dissemination. The design of the original project identified five overarching goals:

1. Prioritize foods and critical nutrients;
2. Evaluate existing data quality;
3. Devise and implement a nationally-based sampling plan;
4. Analyze sampled foods by valid methods; and
5. Compile and disseminate representative estimates.

Foods and nutrients have been prioritized using the Key Foods approach (Haytowitz, 2015). The Key Foods approach utilizes food composition and food consumption data to identify important foods and nutrients and is updated every two years with each release of a new round of consumption data. The most recent Key Foods list utilizes data Release 26 of SR (USDA-ARS, 2013) and the 2011–12 What We Eat in America (WWEIA)/National Health and Nutrition Examination Survey (NHANES) consumption data (CDC, 2014) and contains 576 food items. These are divided into quartiles based on the sum of the percent contribution of each nutrient in each food. The items in the 1st quartile are primarily basic commodities which are highly consumed and often

* Corresponding author.

E-mail address: david.haytowitz@ars.usda.gov (D.B. Haytowitz).

important contributors of multiple nutrients (Table 1). In the early years of NFNAP, two priority lists were developed to account for commodity level foods as single foods and ingredients in multi-ingredient foods. As the project progressed, more commercially processed retail and restaurant foods replaced multi-ingredient foods where the nutrient profiles were often determined by recipe. Since over half of the food consumed by the American public is now prepared by someone else, this was a necessary new direction. A food such as macaroni and cheese once made at home using numerous ingredients and multiple preparation steps is now made from a mix—all one has to do is boil the pasta and add the contents of a cheese sauce packet.

Quality of the existing data in SR at the time of project inception was evaluated using USDA's Data Quality Evaluation System (Holden, Bhagwat, & Patterson, 2002). This evaluation examines sampling plan, number of samples, sample handling, analytical method and analytical quality control to determine the quality of data for each food/nutrient. Since this information was incomplete for nearly all of the foods identified as Key Foods, the decision was made to develop new analytical values for all the foods on the Key Foods list.

Once the foods to be analyzed are determined, a sampling plan to obtain representative samples for analysis is required. NFNAP sampling plans (Pehrsson, Perry, & Daniel, 2013) are based on a stratified three-stage design using the most current population density data from the US Bureau of the Census and food sales data for retail outlets in selected locations and product market shares, using ACNielsen, Inc. data. Selection of locations (population density), retail outlets (sales), and specific brands (market share data) are selected based on probability proportional-to-size, so that any county, store or brand in these three selection levels has a chance of being selected; the greater the proportion to the total, the greater the probability of being selected. Locations selected for the current sampling plan are based on population data from the 2010 US census; the various sampling locations are updated with each new decennial census, though major metropolitan area, i.e. Los Angeles, Chicago and New York City have consistently appeared on the list of sampling locations. Food samples are purchased in the designated retail outlets, either grocery stores or restaurants (fast food or casual dining). For certain foods or food types other locations can be sampled such as food manufacturing plants, ethnic restaurants, Indian reservations, or even individual homes, if needed.

The food samples are shipped to the Food Analysis Laboratory Control Center at Virginia Tech for preparation and compositing. Individual samples, along with quality control materials are shipped to commercial or academic laboratories for analysis. Commercial laboratories have all been accredited and are then qualified by USDA as part of the contract award process. Proposals from each laboratory are reviewed and for those laboratories with acceptable proposals, samples are sent for analysis to assess their performance

on each nutrient. University laboratories within proven expertise are used for specialized nutrients. Once the results of the analyses are received at NDL, they are reviewed by a quality control panel for acceptability. Any questionable data are referred back to the lab for clarification or reanalysis. Acceptable data are then migrated into NDL's Nutrient Databank System where NDL's food specialists move the data through the system, determining means, variance and other statistical parameters. Additional information such as descriptions and household weights are also assembled. The results are then disseminated in the annual releases of SR.

While the NFNAP infrastructure established to accomplish these goals has stayed the same over the length of the project, the nature of the foods chosen for analysis has changed over the course of the project in response to research needs. Initially the primary goal was to sample and analyze as many of the Key Foods as possible, starting with the 1st quartile foods, and working through the list by quartiles until all of the 2nd and 3rd quartile foods and many of the 4th quartile foods were analyzed. However, targeted funding has influenced decisions regarding specific foods selected for analysis. For example, during 2000–01 funding was received from the Produce for Better Health Foundation to analyze various bioactive compounds in fruits, nuts and vegetables. At the same time, NFNAP funds were used to analyze and update the traditional nutrients included in SR for these foods. In 2002, funds were received from the National Institute of Dental and Craniofacial Research to develop a database on the fluoride content of beverages and foods. As a result many beverages, including tap water obtained from 144 individual homes for 2 distinct seasons, were sampled and analyzed. Funding was also received from the Office of Rare Diseases to develop a database on the choline content of foods. More recently, examining foods consumed by minority populations has become an integral part of NFNAP. For several years, starting in 2000, funding from the National Institute on Minority Health and Health Disparities was used to sample and analyze unique foods typically consumed by American Indians and Alaskan Natives such as cloudberries and moose meat. In 2009, foods were sampled from small groceries and restaurants in the Hispanic community and analyzed. Foods consumed by other population subgroups, such as Indians and Southeast Asians were also sampled and analyzed. Moving forward, NDL recognizes that various immigrant populations continue to import foods from their native countries and they need to be considered for analysis.

A major user of SR data is the What We Eat in America survey database (USDA-ARS, 2014) maintained by USDA as part of NHANES. As new foods are reported by survey respondents, NDL provides composition profiles for these foods. The most frequently consumed foods are scheduled for analysis through NFNAP, pending funding.

Both the Institute of Medicine (IOM, 2010) and the World Health Organization (Aburto et al., 2013) have called for individuals

Table 1
First quartile Key Foods, 1994–2012.

Food Description	NHANES 2011–12	NHANES 2009–10	NHANES 2003–04	NHANES 1999–2000	CSFII 1994–96
	Rank				
Eggs, whole, raw, fresh	1	2	2	3	3
Milk, fluid, 2% milk fat	2	1	1	2	2
Cheese, cheddar	3	5	13	12	15
Milk, whole, 3.25% milk fat	4	3	3	1	1
Carrots, raw	5	4	6	11	10
Cheese product, pasteurized process, American	6	10	8	7	9
Rolls, hamburger or hot dog	7	6	7	4	6
Ice cream, vanilla	8	8	10	17	17
Tortillas, flour, refrigerated	9	22	31	44	92
Milk, fluid, 1% milk fat	10	9	20	21	19
Milk, fluid, nonfat	11	7	12	13	14

to reduce their sodium intake. Therefore, NDH has undertaken a project with support from the Centers for Disease Control to monitor changes in the sodium content of food as manufacturers reformulate their products. The strategy to monitor these changes was described by Ahuja et al. (2015), which has influenced the selection of foods sampled and analyzed. In 2015, the U.S. Food and Drug Administration removed partially-hydrogenated oils from the Generally Regarded as Safe (GRAS) list. As this ingredient is removed from the market, there will be a concomitant decrease in the *trans* fatty acid content of some foods, which will influence the foods sampled and analyzed under NFNAP in order to reflect the current composition of foods available in the US market.

3. Impact

3.1. Number and types of foods analyzed

Since its inception, nearly 2500 food items in SR have been added or updated using values generated through NFNAP (Table 2). These foods cover every food group in SR. In addition, many meats were added or updated in SR through large projects funded by the beef, pork and lamb industries. Although they are not included in this list, the projects incorporated many components of the NFNAP infrastructure for sampling and analyzing their respective foods. Other smaller projects have also been funded by various trade groups and thus not included in Table 2 such as eggs, mushrooms, pulses, seafood, and others. These collaborations have resulted in nearly another 1000 food items added or updated in SR using some portion of the NFNAP Infrastructure. In many cases, results from NFNAP also confirmed the existing values for many foods. Archived samples are produced as part of the project and have been provided for other research work, including a project examining radioisotopes in foods. Other potential projects under consideration include collaborations to develop special interest databases on iodine, nitrates and nitrites, and phytosterols.

3.2. Key foods ranking

The position of any one food on the Key Foods lists is dependent on both composition and consumption and for this reason it is

Table 2
Food groups and number of foods added/updated using NFNAP values.

Food Group	Name	Count
01	Dairy and Egg Products	163
02	Spices and Herbs	34
03	Baby Foods	23
04	Fats and Oils	80
05	Poultry Products	176
06	Soups, Sauces, and Gravies	80
07	Sausages and Luncheon Meats	51
08	Breakfast Cereals	68
09	Fruits and Fruit Juices	179
10	Pork Products	22
11	Vegetables and Vegetable Products	283
12	Nut and Seed Products	46
13	Beef Products	7
14	Beverages	99
15	Finfish and Shellfish Products	52
16	Legumes and Legume Products	92
17	Lamb, Veal, and Game Products	7
18	Baked Products	176
19	Sweets	39
20	Cereal Grains and Pasta	86
21	Fast Foods	375
22	Meals, Entrees, and Side Dishes	68
25	Snacks	59
35	American Indian/Alaska Native Foods	67
36	Restaurant Foods	152

difficult to attribute the change to any one factor. Several foods have been in the first quartile of Key Foods since NDH developed the first lists using the 1994–96 Continuing Survey of Food Intakes by Individuals (CSSFII), but the ranking of some of these foods has changed slightly (Table 1). Some of these changes are due to differences in choices made by consumers. For example, tortillas moved from the third quartile in 1994–96 to the first quartile in 2009–10 in part due to the growth in the Hispanic population, which is now the largest minority group in the United States, plus the growing popularity of Mexican and Tex-Mex foods in the general population; these foods make up the largest segment of the ethnic food market (Lee, Hwang, & Mustapha, 2014). Although whole milk remains popular, its consumption has dropped in favor of various reduced-fat milks (containing 2% fat, 1% fat, or no fat).

Other changes in the rankings of the key foods are due to improvements in the SR that USDA's Food Surveys Research Group (FSRG) has adopted over the years in developing the Food and Nutrient Database for Dietary Studies (FNDDS). One example is hamburger rolls. At one time, the nutrient values for hamburger sandwiches served in quick-service restaurants in the FNDDS were based solely on the nutrient values for their parts—a beef patty, roll, cheese, and condiments. More recent releases of SR use values obtained from analyses of hamburger samples from popular hamburger chains and these are used by FSRG in developing the FNDDS. As a result, the rankings of hamburger rolls and pasteurized process cheese have changed slightly. Another possible reason for this change is that starting around 2003–04, consumers began paying more attention to refined carbohydrates in their diet and often chose not to eat foods high in carbohydrates. This resulted in lower consumption of hamburger rolls and the pasteurized process cheese product that frequently accompanied them. All of the foods listed in Table 1 have been analyzed through USDA's NFNAP.

Many foods are consumed in a number of different forms, and each form has a unique nutrient profile in SR. As a result, unique entries for different forms of the same food are lower on the Key Foods list than a composite of all forms of that food would be. For example, the FNDDS contains 13 different forms, e.g. breast, legs and wings and/or cooking methods, e.g. baked, fried or roasted for chicken from SR. Though there are many more chicken items in SR, not all are used in the FNDDS. If the amounts consumed for all the various forms of chicken were combined, they would rank higher on the key foods list.

3.3. Special Interest databases

A number of Special Interest Databases have been developed and released by NDH using data generated in part through NFNAP. The databases on isoflavones, flavonoids and proanthocyanidins also included values collected from the scientific literature. As most of the data available on these compounds are reported on raw fruits and vegetables, additional studies are being conducted in collaboration with the Food Composition and Method Development Laboratory of ARS to develop retention data. This way values can be estimated more accurately for the cooked or processed forms of the food items. Work is underway on developing a Special Interest Database for sulfur-containing compounds.

3.4. Sodium monitoring

As described above, NDH is monitoring the sodium content of foods as manufacturers reformulate their products to reduce the sodium content. As part of this project, ketchup was sampled in 2012 and compared to values obtained in 1983 and 2000. Table 3 shows a significant reduction in sodium content between the two time periods. As part of the sodium monitoring effort, we also analyzed potassium, individual sugars and fatty acids in the food

Table 3
Sodium content (mg/100 g) of ketchup (1983–2000 vs. 2012 sampling).

Year	Mean \pm SD	Median	N	Range
1983–2000	1114 \pm 99 ^a	1115	54	880–1280
2012	904 \pm 38 ^b	908	18	836–967
Brand 1	932 \pm 25 ^b	928	6	907–967
Brand 2	911 \pm 31 ^b	913	6	868–948
Brand 3	868 \pm 31 ^b	858	6	836–912

Pairs with the same letter are not statistically different ($p < 0.05$).

Table 4
First quartile nutrients for sodium, WWEIA/NHANES.¹

Food	2011–12	2001–02	1988–94
Tortillas, flour, refrigerated	1	9	54
Rolls, hamburger or hot dog	2	3	1
Cheese product, pasteurized process, American	3	1	2
Sauce, salsa	4	42	115
Ham, sliced, packaged (96% fat free, water added)	5	4	7
Cheese, cheddar	6	8	19
Turkey breast, sliced, prepackaged	7	80	–
Bread, white	8	3	3
Sauce, pasta, spaghetti/marinara	9	17	230
Water, tap, drinking	10	139	98
Soup, chicken	11	55	48
Pizza, fast-food chain, cheese topping, regular crust	12	–	–
Milk, 2% milk fat	13	11	8
Pizza, fast-food chain, pepperoni topping, regular crust	14	–	–
Ketchup	15	6	4
Egg, whole, raw, fresh	16	25	28
Pork, cured, bacon, pre-sliced, cooked, pan fried	17	44	15

¹ Not including table salt.

samples, as these components may be affected by manufacturer's reformulation made when lowering the sodium content. We noted a change in individual sugars values, though the total sugar values did not change. This situation was due to Brand 1 using high-fructose corn syrup, while Brands 2 and 3 were using cane sugar as a sweetener.

Table 4 shows the foods in the first quartile of the key foods list for sodium—one of the nutrients used to create the Key Foods list. This list is heavily influenced by the popularity of Mexican foods and hamburger sandwiches from quick-service restaurants; most sodium in the U.S. diet comes from processed and restaurant foods (CDC, 2012; Drewnowski & Rehm, 2013). A few foods in the key foods list for sodium—tap water, milk and eggs—contain relatively low amounts of sodium and no added sodium, but are consumed in such large quantities that their naturally-occurring sodium places them high on the list. Sodium (most often as salt) is typically added during processing to the remaining items on the list. For example, as described above, manufacturers have lowered the sodium in ketchup, which resulted in it dropping from 4th on the list in

Table 5
Comparison of selected nutrients in standard and gluten free (GF) crackers, wafers, and cookies.

Food item	Type	Protein (g/100 g)	Total fat (g/100 g)	Saturated fat (g/100 g)	TDF (g/100 g)	Total sugar (g/100 g)	Sodium (mg/100 g)
Crackers	Standard	6.64	26.43	0	2.3	8.18	726
	GF	12.06	15.63	0	16.2	1	587
Sugar wafers	Standard	3.84	23.24	11.899	1.6	42.95	103
	GF	0	24.18	10.501	0	42.31	111
Chocolate sandwich cookies	Standard	5.21	19.14	5.649	2.9	40.67	388
	GF	2.19	17.89	7.905	2.5	49	275

1988–94 to 15th in the 2011–12 list (Table 4). Manufactures have also reduced the salt added to other products on this list, which affected their position on the list. This list does not include table salt (or salt added to recipes) as a separate item, as it would have been the first item on the list; the remainder of the first quartile would have consisted of only the first three items currently in the list.

3.5. Gluten-free products

Gluten-free products have increased in popularity in the last few years. Approximately 0.5–1% of the US population has celiac disease and must avoid gluten-containing foods in their diet. Another 1% of the population consumes gluten-free products regardless of medically-diagnosed disorders. Under NFNAP we analyzed a number of gluten-free crackers, wafers, cookies, white bread, rolls, pancakes and waffles. While white flour is regularly enriched in the United States, we found many of the gluten-free products were not, as regulations do not call for the enrichment of the flour replacements used in these products. The various flour replacements account for the differences in the nutrient content of gluten free products compared to standard products. These result from different formulations required to account for the various functional characteristics and flavor profiles of the flour replacements compared to standard flour. Gluten-free crackers had more protein and dietary fiber but less total fat and total sugar than standard crackers (Table 5). Gluten free sugar wafers had no protein or TDF, but had similar values for total fat, saturated fat, total sugar, and sodium when compared to standard sugar wafers. Gluten free chocolate sandwich cookies had lower protein, total fat and sodium when compared to standard cookies. The gluten free cookies had higher amounts of saturated fat and sugar than standard cookies.

3.6. Trans fatty acids

When FDA required the addition of *trans* fatty acid values to the Nutrition Facts Panel, many restaurants changed their frying oils to eliminate *trans* fatty acids from their products. However, this resulted in other changes to the fatty acids profiles of the products. Table 6 shows the effect of this change on the fatty acid content of French fried potatoes in fast food restaurants, where all the *trans*

Table 6
Comparison of the fatty acids content (g/100 g) of fast food French fried potatoes between 2001–02 and 2012.

Chain	Year	Total Fat	Saturated FA	Mono-unsaturated FA	Poly-unsaturated FA	Trans FA
A	2001–2	19.28	4.33	10.14	3.23	4.53
	2012	15.47	2.27	7.38	4.73	0.06
B	2001–2	16.23	3.20	8.52	3.73	3.56
	2012	14.10	2.79	3.20	7.46	0.06
C	2001–2	17.40	4.37	11.06	1.15	5.12
	2012	12.48	2.14	3.27	5.95	0.05

fatty acids is found in the cooking oil. Suppliers of the cooking oils switched from partially hydrogenated oils high in *trans* fatty acids to other cooking oils containing virtually no *trans* fatty acids. As intended, their *trans* fatty acid content dropped substantially, virtually disappearing. Indeed labeling regulations allow the restaurant to post a zero value when values are below 0.5 g per serving. Concomitantly, polyunsaturated FA increased, while saturated FA, and monounsaturated FA decreased. Interestingly, total fat also declined. Looking at the percent contribution to the diet, in 2001 fast food french-fries contributed 2.76% of the total fat consumption, compared to 1.79% in 2011–12. The total saturated fatty acids contribution also declined from 1.75% to 0.8%. The dietary contribution of total monounsaturated fatty acids declined from 4.28% to 2.08% over the same period, while the dietary contribution of total polyunsaturated fatty acids increased from 2.33% to 2.91%. Some portion of these changes are also attributable to the change in total fat, as well as changes in consumption patterns.

4. Conclusion

In addition to providing updated values when products change, NFNAP also serves to confirm existing values for many foods. New foods are sampled and new nutrients measured to reflect the changing food supply and to support research on the connections between food composition, diet and health outcomes. Monitoring changes in the composition of foods is critical in keeping food composition databases up-to-date, so that they remain a vital tool in assessing the nutrient intake of national populations, as well as providing dietary advice.

NFNAP provides comprehensive valid nutrient analytical data to support the What We Eat in America component of NHANES, as well as providing the essential information for other national and international databases. Values for a number of food items analyzed through NFNAP are also used as ingredients in many recipes and/or formulations to complete the nutrient profiles for those foods. NFNAP data also strongly supports: 1) public health and nutrition policies and programs, such as the development of Dietary Guidelines for Americans and Dietary Reference Intakes; 2) health and nutrition research; 3) food industry activities such as product development, food labeling, and trade; and 4) consumer interest in the nutrient content of the food they eat. The approaches developed for NFNAP are taught in international courses to new composition database developers and provide a

well-tested model for those launching country or region-specific national food sampling and analysis programs

Composition data and related descriptive information produced by NFNAP are released in the USDA National Nutrient Database for Standard Reference and various Special Interest Databases on NDL's web site: www.ars.usda.gov/nutrientdata. An online search program is also available (<http://ndb.nal.usda.gov/>) and was visited in 2015 by 1.1 million unique users in over 2 million sessions.

References

- Aburto, N. J., Ziolkovska, A., Hooper, L., Elliott, P., Cappuccio, F. P., & Meerpohl, J. (2013). Effect of lower sodium intake on health: Systematic review and meta-analyses. *British Medical Journal*, *346*, f1326.
- Ahuja, J. K. C., Pehrsson, P. R., Haytowitz, D. B., Wasswa-Kintu, S., Nickle, M., Showell, B., ... Cogswell, M. (2015). Sodium monitoring in commercially processed and restaurant foods. *American Journal of Clinical Nutrition*, *101*, 622–631.
- Centers for Disease Control and Prevention (2014). *National Health and Nutrition Examination Survey 2011–2012 Dietary Data*. Accessed May 24, 2016. <<http://www.cdc.gov/nchs/nhanes/search/DataPage.aspx?Component=Dietary&CycleBeginYear=2011>>.
- Centers for Disease Control and Prevention (2012). Food categories contributing the most to sodium consumption – United States, 2007–2008. *Morbidity and Mortality Weekly Report*, *61*(5), 92–98.
- Drewnowski, A., & Rehm, C. D. (2013). Sodium intakes of US children and adults from foods and beverages by location of origin and by specific food source. *Nutrients*, *5*, 1840–1855.
- Haytowitz, D. B. (2015). Updating USDA's key foods list for NHANES, what we eat in America 2011–2012, 37th Annual National Nutrient Databank Proceedings. *Procedia Food Science*, *4*, 71–78 <http://www.sciencedirect.com/science/article/pii/S2211601X15000735>.
- Holden, J. M., Bhagwat, S. A., & Patterson, K. Y. (2002). Development of a multi-nutrient data quality evaluation system. *Journal of Food Composition and Analysis*, *15*(4), 339–348.
- Institute of Medicine (2010). *Strategies to reduce sodium intake in the united states*. Washington, DC: The National Academies Press.
- Lee, J. H., Hwang, J., & Mustapha, A. (2014). Popular ethnic foods in the United States: A historical and safety perspective. *Comprehensive Reviews in Food Science and Food Safety*, *13*(1), 2–17.
- Pehrsson, P. R., Haytowitz, D. B., & Holden, J. M. (2003). The USDA's national food and nutrient analysis program: Update 2002. *Journal of Food Composition and Analysis*, *16*(3), 331–341.
- Pehrsson, P. R., Perry, C., & Daniel, M. (2013). ARS, USDA updates food sampling strategies to keep pace with demographic shifts. 36th Annual National Nutrient Databank Proceedings. *Procedia Food Science*, *2*, 52–59.
- U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory (2013). *USDA National Nutrient Database for Standard Reference, release 26*. Beltsville, MD: U.S. Department of Agriculture. Accessed May 23, 2016 at: <<http://www.ars.usda.gov/ba/bhnrc/ndl>>.
- U.S. Department of Agriculture, Agricultural Research Service (2014). *USDA Food and Nutrient Database for Dietary Studies, 2011–2012*. Beltsville, MD: U.S. Department of Agriculture, Agricultural Research Service. Accessed May 23, 2016 at: <http://www.ars.usda.gov/main/site_main.htm?modecode=80-40-05-30>.