

USDA, FDA and ODS-NIH Database for the Iodine Content of Common Foods Release One

Prepared by:

Kristine Y. Patterson¹, Judith H. Spungen², Janet M. Roseland¹, Pamela R. Pehrsson¹, Abby G. Ershow³, and Jaime J. Gahche³

¹ Methods and Application of Food Composition Laboratory
Agricultural Research Service
U.S. Department of Agriculture

² Center for Food Safety and Applied Nutrition
Food and Drug Administration

³ Office of Dietary Supplements
National Institutes of Health

June 2020

U.S. Department of Agriculture
Agricultural Research Service
Beltsville Human Nutrition Research Center
Methods and Application of Food Composition Laboratory (MAFCL)
10300 Baltimore Avenue
Building 005, Room 107, BARC – West
Beltsville, Maryland 20705 Tel. 301-504-0630
MAFCL web site: <http://www.ars.usda.gov/nutrientdata>
FoodData Central database web site: <https://fdc.nal.usda.gov/>

Supported by: National Institutes of Health-Office of Dietary Supplements (NIH-ODS), U.S. Department of Agriculture (USDA), Food and Drug Administration-Center for Food Safety and Nutrition (FDA-CFSAN)

The authors gratefully acknowledge Terry Councell, Dana Hoffman-Pennesi, and Mark Wirtz, of FDA's Center for Food Safety and Applied Nutrition, and the staff of FDA's Kansas City Laboratory for administration of the FDA Total Diet Study (TDS) program, for TDS data management, and for careful review of this document. The authors also acknowledge Juhi Williams, previously at USDA, for assistance with the data and Katherine Phillips, Virginia Tech, for preparation of the USDA samples.

Introduction

Iodine is an essential mineral for human health, functioning as a component of thyroid hormones with important roles in growth and maturation, neurologic development, reproduction, and energy metabolism (Lee et al., 2016a; Rohner et al., 2014). Severe iodine deficiency during pregnancy and early childhood has serious effects on the developing fetus and infant and can cause permanent damage (Swanson et al., 2012). Goiter, enlargement of the thyroid gland, and other disturbances of thyroid function can be seen at all ages in individuals whose diets lack iodine at needed levels.

Adequate dietary iodine intake is crucial, with 150 µg/day as the daily recommended dietary allowance (RDA) for ages 14 years and older, 220 µg/day for pregnant women, and 290 µg/day for lactating women (Institute of Medicine, 2001; Rohner et al., 2014). On the other end of the spectrum, the tolerable upper intake level for iodine is 1100 µg/day for adults (Institute of Medicine, 2001). Excessive intake also can result in adverse health effects such as thyroid dysfunction (e.g., goiter, hyperthyroidism), autoimmune thyroid disease, and cancer (Luo et al., 2014; Ershow et al., 2016).

Overall iodine intake in the U.S. population overall is generally considered sufficient, but subgroups identified as at-risk for iodine insufficiency include women of reproductive age, young adults, and non-Hispanic blacks, with a trend of increasing deficiency over a 12-year period of the National Health and Nutrition Examination Survey (NHANES) from 2001-2012 (Lee et al., 2016a). Iodine insufficiency in the U.S. is a public health concern especially in pregnant women (Pearce, 2015). NHANES 2007-2010 results suggested that 55% of pregnant women and 37% of non-pregnant women of childbearing age had inadequate iodine intakes as measured by urinary iodine (Caldwell et al., 2013).

To assess iodine status, iodine intake must be estimated, which necessitates the availability of data on iodine content and variability for individual foods (Swanson et al., 2012). Workshops that were convened by the Office of Dietary Supplements, National Institutes of Health (NIH) with other scientists in 2011 and 2014, confirmed the need for food composition tables on iodine content (Swanson et al., 2012; Ershow et al., 2018). Thus, the impetus for this project has been the need for updated and expanded data on the iodine content of foods to address continued public health concerns. The database presented here has been developed, through collaboration between the US Department of Agriculture (USDA) Methods and Application of Food Composition Laboratory (MAFCL) in Beltsville, MD, the Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition in College Park, MD and the Office of Dietary Supplements, National Institutes of Health, Bethesda, MD. This initial release includes about 424 foods.

Background

The FDA collects about 270 kinds of food and beverage samples regionally as part of its Total Diet Study (TDS), and analyzes these samples for nutrient elements, including iodine. The underlying TDS iodine data are available upon request from TDS@fda.hhs.gov. These data can be found on-line (FDA, 2020). The TDS program began in 1961, and analysis of TDS samples for iodine began in 1973. The TDS currently monitors levels of over 400 contaminants and nutrients in the average U.S. diet; the number varies slightly from year to year. Juan et al. (2016) used the TDS data and data on iodine concentrations in supplements, water, and salt, along with What We Eat In America (WWEIA), the dietary intake interview portion of

NHANES, to estimate intakes of iodine from foods, water, and supplements for the U.S. population. Abt et al. (2018) used updated TDS iodine concentration data to estimate intakes of iodine from food sources.

More recently the USDA has also been analyzing iodine in foods and dietary supplements obtained nationwide (Pehrsson et al., 2016; Ershow et al., 2016; USDA, 2017). These have included notable dietary food sources of iodine e.g. seaweed, fish and other seafood, dairy foods, iodized salt, eggs, (Rohner et al., 2014; Lee et al., 2016b; Pehrsson et al., 2016) and dietary supplements of vitamins and minerals for adults, children and pregnant women (USDA,2017).

A wide range of iodine concentrations in individual foods and variable use of iodized salt at table and in food preparation make intake assessment especially challenging (Swanson et al., 2012). Varying levels in foods are due to factors such as the amount of iodine in soil where crops are grown, extent of iodine supplementation to animals, use of iodophors as sanitizing agents, and iodine-containing ingredients in processed foods (Ershow et al., 2018). Iodine is present naturally at relatively high levels in seaweed, many saltwater fishes and other seafood, due to the ability to concentrate iodine from their seawater environment (Rohner et al., 2014).

Analytical methodology and quality control

Both the FDA Kansas City Laboratory (Lenexa, KS) and the USDA contract laboratory analyzed the foods for iodine using inductively coupled plasma mass spectrometry (ICP-MS). The USDA samples were solubilized using a strong base, a stabilizer was added followed by dilution and filtration prior to iodine analysis (Sullivan and Zywicki, 2012). The limit of quantitation (LOQ) for the analyses was 10 mcg/100g of iodine for most of the foods and 50 mcg/100g for the salt samples. FDA solubilized TDS samples using tetramethyl-ammonium hydroxide, and a hot block extraction system at 85°C was used to extract the available iodine (Todorov and Gray 2017). FDA's limit of detection (LOD) for iodine ranges from 0.01-0.04 mcg/100g, and the LOQ ranges from 0.1 – 0.5 mcg/100 g.

Quality control materials used for analysis of the USDA samples included certified standard reference materials (SRMs) from the National Institute for Standards and Technology (NIST, Gaithersburg MD 20899): SRM 1548a, SRM 1549, SRM 1849, and SRM 3530. In addition, secondary reference materials from Virginia Tech (Phillips et al., 2006) that have been cross-validated against the SRMs were also used. FDA used SRM 1549a (whole milk powder) as a reference material for quality control of their iodine analyses. All the data, from the reference materials as well as the samples, were examined either by the quality control committee at USDA or by FDA, depending on the source of the data, before acceptance. As a crucial aspect of the data review process, a conservative approach was used; every value that seemed illogical was investigated and was rejected, or retested at the lab if possible, and was accepted only by consensus among the scientific panel after thorough consideration.

Source and handling of samples: USDA

Many of the samples analyzed by USDA came from the National Food and Nutrient Analysis Program (NFNAP), which has been in progress since 1999 (Haytowitz and Pehrsson, 2018). The foods collected under this study, and other related studies, were processed by Virginia Tech, Blacksburg, VA. Foods that required preparation were made using directions on the packages. For most of the foods, other than milk, eggs and salt described below, samples from more than one location were combined.

Where appropriate, the samples were processed with liquid nitrogen, frozen and sent out for analysis with additional aliquots of the food samples stored long-term at -60°C. It was determined that iodine in the samples remains stable under such conditions, by having five samples with different matrices sent for iodine analysis and five years later analyzing aliquots of the same samples. The results did not show any loss of iodine over time, within the limits of analytical uncertainty.

While this program has been running for over 20 years, many if not most of the food samples are more recent. For example, the whole raw fresh eggs were collected and analyzed in 2019, and the other types of eggs, dried and frozen, primarily for commercial use, were collected in 2017. The non-flavored fluid milks were collected and analyzed in 2018-19. Also collected and analyzed in 2018-19 were the salt samples which included iodized table salt and iodized sea salt, as well as non-iodized sea salt.

Along with looking at the uptake of sodium by pasta boiled in salted water, Virginia Tech scientists had the pasta analyzed for iodine uptake since iodized salt was used (Bianchi et al., 2019). Included in the data are replicate samples using the recommended amount of salt in the cooking water based on the label instructions.

Some samples of white bread, whole wheat bread, and hamburger/hot dog rolls that were obtained in 2019 had labels listing potassium iodate or calcium iodate as a dough conditioner. These baked products were analyzed for iodine to provide information on the amount derived from the dough conditioner.

In an earlier study to determine the fluoride content of tap water in the U.S. (Pehrsson et al., 2006), USDA collected tap water samples from 144 locations around the country. A random subset of 40 of these archived water samples was analyzed for iodine by the FDA laboratory.

Source and handling of samples: FDA

TDS data included in this iodine content database were limited to results for samples collected beginning in 2016, because of a change in analytical methodology at that time. Prior to 2016, TDS samples were analyzed for iodine concentrations using ultraviolet-visible (UV-VIS) spectrophotometry through the catalysis of the Cerium +4/Arsenic +3 reaction (adapted from Fischer et al., 1986). The ICP-MS method in use for iodine analysis since 2016 has limits of detection (LODs) and LOQs that are lower (i.e., better) than the older method, and there is less interference from other signals; these factors affect estimates of element concentrations and exposures.

After receipt of samples, FDA prepares foods as for consumption; for example, apples are washed, bananas are peeled, and oatmeal is cooked. Deionized water is used in washing, cooking, and beverage preparation. Non-iodized salt was used in cooking food mixtures (e.g., cornbread, scrambled eggs, tuna casserole), but not in cooking of single items (e.g., cooked cereals, vegetables).

Prior to the 2018 fiscal year (October 2017 – September 2018), TDS foods were obtained in four regional market basket (MB) collections per year. For each regional collection, products purchased in each of the three cities within the region were composited to form single analytical samples. All TDS foods were collected in each MB.

The TDS food list and sampling plan were modified at the beginning of the 2018 fiscal year as part of FDA's modernization of the program. Some TDS foods were dropped, and others were added. TDS foods

were categorized as “regional” foods (possibly varying in nutrient or contaminant concentrations by region or season) or “national” foods (less likely to vary in nutrient and contaminant concentrations by region or season). Under the new sampling plan, regional TDS foods are collected in each of six U.S. regions, in each of two time periods (November – April and May – October), and results are presented as collection #1 (October) through collection #12 (September). For each regional collection, products purchased in each of the three cities within a collection region are composited to form single analytical samples. National foods are collected once per year, in Lenexa, KS and the results are presented as collection #13.

In anticipation of the upcoming major change to the TDS sampling plan, FDA conducted a pilot of the new sampling procedures in the last market basket of 2017 (July). Available data include results for 86 regional foods.

Database format, procedures, and notes

The table provides a description for each food. The Nutrient Data Bank (NDB) numbers familiar to those using USDA’s National Nutrient Database for Standard Reference (SR) file, and the TDS food numbers from FDA, are each shown for reference purposes. Descriptions of foods provided in the table may not exactly match SR or TDS descriptions. Foods listed without an SR or TDS number are foods that have not previously been reported in USDA or TDS composition data tables.

All of the iodine data are expressed per 100g of food, which has been the unit used both in USDA’s previous SR file (Haytowitz and Pehrsson, 2018) and in the current FoodData Central (USDA ARS, 2019). SR did not include data on the iodine content of foods. However, as previously noted, USDA arranged for stored NFNAP samples to be analyzed for iodine, focusing primarily on foods likely to have appreciable amounts of iodine, and the results of those analyses are included in FoodData Central (FDC). FDA posts TDS data on iodine concentrations on its TDS website, along with concentrations of other nutrient elements and contaminants (U.S. FDA, 2019).

When both FDA and USDA data were available for the same food types, the data were combined, as indicated in Source(s) in the table. If only USDA or FDA is indicated, the data are solely from that source.

Footnotes are given where further descriptions or explanations of specific food descriptions are needed. The dataset also provides means, standard deviations, value ranges, sample sizes.

Data discussion

Care should be taken in using data means, especially where the number of analytical samples (n) is very low. As seen in foods having very large numbers (n) of samples analyzed, the variability in the iodine content can be high. However, even where the number of food samples is small, these data provide an estimate of the iodine content and indicate where additional data would be useful, or conversely, where it would not be productive to allocate research resources.

Also affecting the reporting of data on variability is the combining of food samples before analysis. For some foods, both FDA and USDA have homogenized two or more food samples together and then analyzed the composite sample for iodine. The resulting mean values are the best estimates of content, but lack information on variability. For the FDA national samples (n=1) and for the milk, egg and salt data reported by USDA, individual samples were analyzed and not combined with any other samples.

FDA's results for foods below the LOD are shown as zero (0), with values between the LOD and LOQ reported as the detected iodine concentrations. The USDA reports data below their LOQ as simply "<". When the USDA's LOQ is the only information available for a food, "<" along with the LOQ is given, but if FDA had data on the same food type, an estimate of the USDA value was made based on the FDA data and included in the calculations. This impacted only 14 foods and 5 of those had USDA values both above and below the LOQ. Using only the higher data would have biased the values so the values below LOQ were estimated using business rules established for the USDA previous database for foods, SR. For the foods where all values were below LOQ and the FDA data was also low, the business rule applied gave estimates with low but not zero values.

It is clear from the data that when iodate dough conditioner is used in bakery production of breads, iodine content can be far higher than when that conditioner is not used. Therefore, we separated out the data for breads known or suspected to contain iodate conditioners from those that did not and gave them separate entries in the database. These are white bread, whole wheat bread, white bread buns, and one type of fast food sandwich with bun. All of these have descriptions indicating that iodate dough conditioner has been used or is likely to have been used and have an NDB and/or TDS number with an asterisk. While high, none of the iodine values for these breads exceed the regulatory maximum based on the amount of iodate allowed by the FDA (FDA, 2019).

In this database, we have excluded a number of foods with high iodine levels that were likely due to presence of erythrosine (also known as FD&C Red No. 3). Erythrosine is a cherry-colored dye used in foods such as decorating gels, glace cherries and other fruits, some candies, salmon spreads, bakery and snack foods, jellies, ice creams, and popsicles (Gupta et al., 2006; Wenlock and Buss, 1982).¹ Most forms of iodine in food are generally considered very bioavailable (easily absorbed), as high as 99% (Gonzali et al., 2017). The iodine content of erythrosine, however, has been found to have low bioavailability (Jahreis et al., 2001) and thus unlikely to be a significant contributor to internal doses of iodine.

This database contains only analytical data for the iodine content of the foods. In some cases, the food described may not be in the form as consumed, e.g. raw rather than cooked. A direct estimate from raw to prepared is difficult since iodine could, for example, be lost during heating or by moving into cooking water. Estimated prepared values would need to be calculated by the researcher. A retention factor is a way to quantitate the amount of a nutrient remaining in the food after preparation. The principle of using a nutrient retention factor is based on investigations by Reinivuo et al., 2009; Schakel et al., 1997; and Murphy et al., 1975. The appropriate retention factor reflects the effects of food preparation on the food's nutrient content (USDA, 2007). For foods of significant iodine content with only raw data available, additional studies are planned in order to obtain cooked data for future releases of this database as well as to determine retention factors.

Conclusions

The iodine database presented here is a compilation of both USDA and FDA data with a wide variety of foods with about 424 entries. It is anticipated that as more data become available there will be subsequent releases with additional foods. These data are a guide to selecting additional foods for iodine analysis.

¹ Another widely used red food dye, FD&C Red No. 40, contains no iodine.

These data also show where expanding the sample size with more analyses for foods with substantial iodine content would be beneficial.

References:

Abt, E.; Spungen, J.; Pouillot, R.; Gamalo-Siebers, M.; Wirtz M. (2018). Update on dietary intake of perchlorate and iodine from U.S. Food and Drug Administration's total diet study: 2008–2012. *J Expo Sc Env Epi* 28:21-30. [DOI:10.1038/jes.2016.78](https://doi.org/10.1038/jes.2016.78)

Bianchi, L.M.; Phillips, K.M.; McGinty, R.C.; Ahuja, J.K.; Pehrsson, P.R. (2019). Cooking parameters affect the sodium content of prepared pasta. *Food Chem* 271:479-487. [DOI:10.1016/j.foodchem.2018.07.198](https://doi.org/10.1016/j.foodchem.2018.07.198)

Caldwell, K.L.; Pan, Y.; Mortensen, M.E.; Makhmudov, A.; Merrill, L.; Moye, J. (2013). Iodine status in pregnant women in the National Children's Study and in U.S. women (15-44 years), National Health and Nutrition Examination Survey 2005-2010. *Thyroid* 23(8):927-937. DOI:10.1087/thy.2013.0012

Ershow, A.G.; Goodman, G.; Coates, P.M.; Swanson, C. A. (2016). Research needs for assessing iodine intake, iodine status, and the effects of maternal iodine supplementation. *Am J Clin Nutr* 104(Suppl):941S–949S. DOI:10.3945/ajcn.116.134858

Ershow, A.G.; Skeaff, S.A.; Merkel, J.M.; Pehrsson, P.R. (2018). Development of databases on iodine in foods and dietary supplements. *Nutrients* 10, 100:1-20. DOI:10.3390/nu10010100

Fischer, P.W.; L'Abbe, M.R.; Giroux, A. (1986). Colorimetric determination of total iodine in foods by iodide-catalyzed reduction of Ce⁴⁺. *JAOAC Int* 69:687–689.

Gonzali, S.; Kiferle, C.; Perata, P. (2017). Iodine biofortification of crops: agronomic biofortification, metabolic engineering and iodine bioavailability. *Current Opinion in Biotech* 44:16-26. DOI:10.1016/j.copbio.2016.10.004

Gupta, V. K.; Mittal, A.; Kurup, L.; Mittal J. (2006). Adsorption of a hazardous dye, erythrosine, over hen feathers. *J Colloid Interf Sci* 304:52-57. DOI:10.1016/j.jcis.2006.08.032

Haytowitz, D.B.; Pehrsson, P.R. (2018). USDA's National Food and Nutrient Analysis Program (NFNAP) produces high-quality data for USDA food composition databases: Two decades of collaboration, *Food Chem* 238(1): 134-138. DOI:10.1016/j.foodchem.2016.11.082

Institute of Medicine. (2001). Panel on Micronutrients. Dietary Reference Intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. National Academies Press: Washington, DC, USA; <https://www.ncbi.nlm.nih.gov/books/NBK222323>.

Jahreis, G.; Hausmann, W.; Kiessling, G.; Franke, K.; Leiterer, M. (2001). Bioavailability of iodine from normal diets rich in dairy products – results of balance studies in women. *Exp Clin Endocr Diab* 109:163-167. DOI:10.1055/s-2001-14840

Juan, W.Y.; Trumbo, P.R.; Spungen, J.H.; Dwyer, J.T.; Carriquiry, A.L.; Zimmerman, T.P.; Swanson, C.A.; Murphy, S.P. (2016). Comparison of 2 methods for estimating the prevalences of inadequate and excessive iodine intakes. *Am J Clin Nutr* 104(Suppl):888S–897S. DOI: 10.3945/ajcn.115.110346

Lee, K.W.; Shin, D.; Cho, M.S.; Song, W.O. (2016a). Food group intakes as determinants of iodine status among US adult population. *Nutrients* 8:325; DOI:10.3390/nu8060325.

- Lee, K.W.; Cho, M.S.; Shin, D.; Song, W.O. (2016b). Changes in iodine status among US adults, 2001-2012. *Int J Food Sc Nutr* 67(2):184-194; DOI:10.3109/09637486.2016.1144717.
- Luo, Y.; Kawashima, A.; Ishido, Y.; Yoshihara, A.; Oda, K.; Hiroi, N.; Ito, T.; Ishii, N.; Suzuki, K. (2014). Iodine excess as an environmental risk factor for autoimmune thyroid disease. *Int J Mol Sci* 15:12895-12912; DOI:10.3390/ijms150712895
- Murphy, E.W.; Criner, P.E.; Gray, B.C. (1975). Comparison of methods for determining retentions of nutrients in cooked foods. *J Agric Food Chem* 23:1153-1157; DOI:10.1021/jf60202a021
- Pearce, E.N. (2015). Is iodine deficiency reemerging in the United States? *AACE Clinical Case Reports* 1(1): e81-82. DOI:10.4158/EP14472.CO.
- Pehrsson, P.R.; Patterson, K.Y.; Spungen, J.H.; Wirtz, M.S.; Andrews, K.W.; Dwyer, J.T.; Swanson, C.A. (2016). Iodine in food- and dietary supplement–composition databases. *Am J Clin Nutr* 104(Suppl):868S–876S. DOI:10.3945/ajcn.115.110064
- Pehrsson, P.R.; Perry, C.R.; Cutrufelli, R.C.; Patterson, K.Y.; Wilger, J.; Haytowitz, D.B.; Holden, J.M.; Day, C.D.; Himes, J.H.; Harnack, L.; Levy, S.; Wefel, J.; Heilman, J.; Phillips, K.M.; Rasor, A.S. (2006). Sampling and initial findings for a study of fluoride in drinking water in the United States. *J Food Comp Anal* 19(Suppl):S45-S51. DOI:10.1016/j.jfca.2005.11.004
- Phillips, K.M.; Patterson, K.Y.; Rasor, A.S.; Exler, J.; Haytowitz, D.B.; Holden, J.M.; Pehrsson, P.R. (2006). Quality control materials in the USDA National Food and Nutrient Analysis Program (NFNAP). *Anal Bioanal Chem* 384(6):1341-1355. DOI: 10.1007/s00216-005-0294-0
- Reinivuo, H.; Bell, S.; Ovaskainen, M-L. (2009). Harmonisation of recipe calculation procedures in European food composition databases. *J Food Comp Anal* 22:410-413. DOI:10.1016/j.jfca.2009.04.003
- Rohner, F.; Zimmermann, M.; Jooste, P.; Pandav, C.; Caldwell, K.; Raghavan, R.; Raiten, D.J. (2014). Biomarkers of nutrition for development—iodine review. *J Nutr* 144:1322S–1342S. DOI:10.3945/jn.113.181974
- Schakel, S.F.; Buzzard, I.M.; Gebhardt, S.E. (1997). Procedures for estimating nutrient values for food composition databases. *J Food Comp Anal* 10:102-114.
- Sullivan, D.; Zywicki, R. (2012). Determination of total iodine in foods and dietary supplements using inductively coupled plasma-mass spectrometry. *JAOAC Int* 95(1):195-202. DOI:10.5740/jaoacint.11-350
- Swanson, C.A.; Zimmermann, M.B.; Skeaff, S.; Pearce, E.N.; Dwyer, J.T.; Trumbo, P.R.; Zehaluk, C.; Andrews, K.W.; Carriquiry, A.; Caldwell, K.L.; et al.(2012). Summary of an NIH workshop to identify research needs to improve the monitoring of iodine status in the United States and to inform the DRI. *J Nutr* 142(Suppl): 1175S–1185S. DOI:10.3945/jn.111.156448
- Todorov, T.I.; Gray, P.J. (2017). Inductively coupled plasma-mass spectrometric determination of iodine in food using tetramethyl ammonium hydroxide extraction. *Elemental Analysis Manual Method 4.13*. U.S. Food and Drug Administration. Available online: <https://www.fda.gov/media/103112/download> (accessed on 9 December 2019).
- U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS). (2019). FoodData Central. Available online: <https://fdc.nal.usda.gov/> (accessed on 11 June 2019).

U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS). (2007). USDA Table of Nutrient Retention Factors, Release 6. Version current 2007. Available on line: <http://www.ars.usda.gov/Main/docs.htm?docid=9448> (accessed on 28 January 2020).

U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) and U.S. Department of Health and Human Services, National Institutes of Health, Office of Dietary Supplements. (2017) Dietary Supplement Ingredient Database (DSID) release 4.0. Available on-line: <https://dsid.usda.nih.gov> (accessed on 17 May 2020).

U.S. Food and Drug Administration (FDA). 2020. Total Diet Study. Available online: <https://www.fda.gov/food/science-research-food/total-diet-study> (accessed on 13 May 2020).

U.S. Food and Drug Administration (FDA).2019. Code of Federal Regulations, Title 21 CFR136.110. <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=136.110> (accessed on 13 May 2020).

Wenlock, R.W.; Buss, D.H. (1982). Trace nutrients 4*. Iodine in British food. *Br J Nutr* 47:381-390. DOI:10.1079/BJN19820049

USDA, FDA and ODS-NIH Database for the Iodine Content of Common Foods

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
Dairy and Eggs									
91	01001	164	Butter, salted	9	4.7	0.7	3.7	5.9	FDA
359	01192		Cheese product, made with 2% reduced fat milk	1	53.9				USDA
24	01253	10	Cheese, American, processed	27	58.6	19.3	35.3	112.0	FDA/USDA
25	01009	12	Cheese, cheddar (sharp/mild)	23	48.2	15.8	27.6	106.0	FDA/USDA
190	01025	391	Cheese, Monterey Jack	13	46.8	11.9	35.0	76.7	FDA
191	01029	392	Cheese, mozzarella	15	52.6	10.6	27.0	67.2	FDA/USDA
349	01032		Cheese, parmesan, grated	1	78.3				USDA
348	43379		Cheese, processed, Swiss, low fat	1	59.9				USDA
350	01036		Cheese, ricotta, whole milk	1	66.0				USDA
127	01040	236	Cheese, Swiss	20	120	108	33	437	FDA
161	01015	332	Cottage cheese, creamed, reduced fat	9	35.1	6.9	25.1	47.4	FDA/USDA
128	01017	237	Cream cheese	8	39.4	11.2	22.5	55.4	FDA
94	01068	168	Cream substitute, non-dairy, fluid	8	0.7	0.2	0.4	1.0	FDA
351	01053		Cream, heavy whipping, fluid	1	28.0				USDA
93	01049	167	Cream, half & half	21	31.2	5.1	22.1	46.1	FDA/USDA
362	01258		Egg, white, dried, stabilized, glucose reduced	15	34.0	10.5	22.1	59.0	USDA
358	01172		Egg, white, raw, frozen, pasteurized	6	<10				USDA
355	01133		Egg, whole, dried	17	274	52	202	407	USDA
353	01123		Egg, whole, raw, fresh	24	49.2	21.2	27.0	115.0	USDA
357	01171		Egg, whole, raw, frozen, pasteurized	14	61.6	13.9	45.1	80.9	USDA
356	01137		Egg, yolk, dried	17	349	66.0	261.0	437.0	USDA
354	01126		Egg, yolk, raw, frozen, pasteurized	15	177	52.5	75.5	267.0	USDA
34	01129	37	Eggs, hard-boiled	20	51.4	27.3	14.3	117.0	FDA
336	01132	35	Eggs, scrambled with oil	7	42.6	12.6	20.1	56.8	FDA
192	19270	393	Ice cream, chocolate	13	32.2	4.8	23.7	41.9	FDA
341	01243	177	Ice cream, lowfat, vanilla	7	45.2	9.8	27.1	56.3	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
143	19095	286	Ice cream, regular (not lowfat), vanilla	19	39.0	6.3	25.8	52.9	FDA
22	01103	3	Milk, chocolate, lowfat, fluid	22	29.2	8.0	17.3	44.2	FDA/USDA
21	01079	2	Milk, reduced fat (2%), fluid	44	36.5	14.0	19.9	102.7	FDA/USDA
352	01082		Milk, lowfat (1%), fluid	24	36.1	15.0	12.9	85.2	USDA
23	01085	4	Milk, skim, fluid	44	34.6	10.0	15.4	65.1	FDA/USDA
20	01077	1	Milk, whole, fluid	44	34.3	11.6	17.6	83.8	FDA/USDA
154	01056	300	Sour cream	8	30.2	2.4	27.8	34.4	FDA
290		333	Sour cream dip, any flavor	7	25.3	6.1	16.0	31.2	FDA
295	01298	395/409	Yogurt, frozen, vanilla	13	43.4	7.7	25.7	57.7	FDA
361	01256		Yogurt, Greek, plain, nonfat	6	51.2	3.5	45.0	55.6	USDA
363	01284		Yogurt, Greek, strawberry, lowfat	1	41.9				USDA
364	01285		Yogurt, Greek, strawberry, nonfat	2	41.3		39.3	43.3	USDA
365	01286		Yogurt, Greek, vanilla, nonfat	2	50.5		49.3	51.6	USDA
126	01122	235	Yogurt, fruit-flavored, lowfat	9	32.2	6.5	23.9	42.5	FDA/USDA
222	01220	521	Yogurt, vanilla, lowfat	1	34.3				FDA
Spices									
19	02047	909	Salt, table, iodized	25	5070	1120	3410	7430	FDA/USDA
372			Sea salt, iodized	9	4660	1140	2250	6080	USDA
373			Sea salt, non-iodized	27	<50				USDA
Soups, Sauces, Gravies and Condiments									
273		532	Broth, chicken, ready-to-use from carton	1	0.5				FDA
180	06116	374	Brown gravy, canned or bottled	8	1.6	0.2	1.2	2.0	FDA
412	27052		Dip, salsa con queso (salsa with cheese)	6	19.0	14.2	7.4	47.1	USDA
98	11935	173	Ketchup, tomato, bottled	8	1.1	0.4	0.7	1.9	FDA
152	02046	298	Mustard, yellow, plain	8	0.6	0.4	0	1	FDA
177	06164	359	Salsa, tomato, bottled	8	1.7	0.6	1.1	2.9	FDA
203	06150	405	Sauce, barbecue, bottled	12	2.8	1.7	0.9	7.0	FDA
366	06179		Sauce, fish, ready-to-serve	1	20.7				USDA
219	16123/ 16124	518	Sauce, soy	2	1.0	0.7	0.5	1.5	FDA/USDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
12	27050	373	Sauce, sweet & sour, bottled	7	0.7	0.4	0.4	1.5	FDA
221	06931	520	Sauce, tomato pasta, bottled	1	1.3				FDA
5	06404	283	Soup, bean with bacon/pork, canned, condensed, prepared with water	7	0.3	0.1	0.1	0.4	FDA
274		533	Soup, broccoli cheese, canned, ready to eat (RTE)	1	4.8				FDA
246		155	Soup, chicken noodle, canned, RTE	8	1.0	0.3	0.7	1.5	FDA
230	06030	534	Soup, clam chowder, New England, canned, RTE	1	6.5				FDA
319		285	Soup, clam chowder, New England, canned, condensed, prepared with whole milk	7	19.5	5.1	13.2	26.9	FDA
275		535	Soup, cream of mushroom, canned, RTE	1	2.3				FDA
276		536	Soup, cream of potato, canned, RTE	1	3.7				FDA
262		367	Soup, ramen noodles, prepared with water	10	0.4	0.4	0	0.9	FDA/USDA
247		156	Soup, tomato, canned, RTE	8	0.7	0.2	0.5	1.1	FDA
231	06742	537	Soup, vegetable beef, canned, RTE	1	0.8				FDA
312	06471	157	Soup, vegetable beef, canned, condensed, prepared with water	7	1.1	0.4	0.8	2.0	FDA
277		538	Soup, vegetable, canned, RTE	1	0.9				FDA
Baby Foods									
302	03165	730	Baby food, apples with berries	7	0.1	0.1	0.0	0.3	FDA
240	03163	731	Baby food, apples with fruit other than berries	8	0.1	0.1	0.0	0.2	FDA
122	03117	225	Baby food, applesauce	8	0.1	0.1	0.0	0.2	FDA
298	03143	717	Baby food, apricots with mixed fruit	7	0.3	0.1	0.2	0.4	FDA
157	43546	313	Baby food, bananas	8	0.1	0.1	0.0	0.4	FDA
123	03131	226	Baby food, peaches	19	0.2	0.2	0.1	0.9	FDA
124	03133	227	Baby food, pears	8	0.1	0.0	0.1	0.2	FDA
296	03159	713	Baby food, pears and pineapple	7	0.2	0.1	0.0	0.3	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
297	03170	714	Baby food, plums/prunes with apples or pears	7	0.6	0.7	0.0	2.2	FDA
241	03139	736	Baby food, prunes	1	1.5				FDA
125	03166	230	Baby food, juice, apple	8	1.6	1.4	0.2	3.8	FDA
237	44074	712	Baby food, juice, grape	8	1.1	0.6	0.3	1.8	FDA
236	43408	711	Baby food, juice, pear	8	0.5	0.3	0.2	1.1	FDA
117	3100	218	Baby food, carrots	8	0.4	0.2	0.2	0.9	FDA
118	03092	219	Baby food, green beans	8	0.2	0.1	0.1	0.4	FDA
121	03121	223	Baby food, peas	8	0.2	0.1	0.0	0.4	FDA
159	03105	320	Baby food, squash	8	0.2	0.1	0.1	0.3	FDA
120	03109	221	Baby food, sweet potatoes	8	0.3	0.2	0.2	0.8	FDA
119	03279	220	Baby food, vegetables, mixed	8	0.4	0.2	0.2	0.7	FDA
278		701	Baby food, cereal, mixed, prepared with water	8	0.1	0.1	0.0	0.2	FDA
300		725	Baby food, cereal, oatmeal with fruit, prepared with water	7	0.0	0.1	0.0	0.1	FDA
258		323	Baby food, cereal, oatmeal, prepared with water	8	0.1	0.1	0.0	0.4	FDA
259		324	Baby food, cereal, rice, prepared with water	19	0.2	0.2	0.0	0.8	FDA
238	43523	721	Baby food, fruit yogurt dessert	8	19.7	4.7	13.7	28.6	FDA
257		317	Baby food, biscuits, teething	8	14.6	7.0	3.0	23.0	FDA
299	03214	723	Baby food, cookies, arrowroot	8	8.9	2.2	6.1	13.4	FDA/USDA
280		733	Baby food, finger foods, puffed snack	1	1.2				FDA
432	42284		Baby food, finger food , baked product, cereal, fortified	1	<10				USDA
114	03069	214	Baby food, chicken noodle dinner	8	0.9	0.5	0.6	2.0	FDA
301	43008	726	Baby food, chicken with rice	7	0.7	0.5	0.0	1.3	FDA
279		732	Baby food, macaroni and cheese with vegetables	7	5.9	0.8	4.2	6.4	FDA
115	03045	215	Baby food, pasta, tomato and beef	8	1.9	0.3	1.5	2.4	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
242	03046	737	Baby food, ravioli, cheese-filled, with tomato sauce	1	4.7				FDA
111	03002	205	Baby food, beef and broth/gravy	8	1.3	0.8	0.4	3.0	FDA
343	03013	207	Baby food, chicken and broth/gravy	7	27.9	8.2	10.6	35.1	FDA
160	03016	328	Baby food, turkey and broth/gravy	8	1.0	0.2	0.6	1.2	FDA
116	03083	216	Baby food, turkey and rice	8	0.4	0.2	0.0	0.6	FDA
112	03055	211	Baby food, vegetables and beef	8	0.8	0.2	0.5	1.1	FDA
113	03073	212	Baby food, vegetables and chicken	8	0.6	0.2	0.4	0.9	FDA
239	03085	728	Baby food, vegetables and turkey	8	1.2	0.8	0.0	2.6	FDA
249		202/734	Baby food, Infant formula, milk-based, iron fortified, ready-to-feed	8	13.2	1.6	11.6	15.5	FDA
321		309/735	Baby food, Infant formula, soy-based, ready-to-feed	8	11.1	4.4	0.6	15.4	FDA
283		738	Baby food, water, baby, bottled	1	0.1				FDA
Fats and Oils									
90	04691	162	Margarine, salted	8	1.6	1.5	0.5	3.9	FDA
92	04018	166	Mayonnaise, regular, bottled	8	5.9	0.9	5.0	7.6	FDA
182	04053	378	Oil, olive	8	0.3	0.2	0.1	0.5	FDA
183	04044	379	Oil, vegetable	8	0.0	0.0	0.0	0.0	FDA
433	43016		Salad dressing, coleslaw, bottled	1	<10				USDA
329	43215	376	Salad dressing, creamy/buttermilk type, low-calorie, bottled	7	12.7	2.0	9.2	14.7	FDA
328		375	Salad dressing, creamy/buttermilk type, regular, bottled	7	8.4	1.6	7.1	11.9	FDA
181	04114	377	Salad dressing, Italian, regular, bottled	8	0.8	0.4	0.4	1.7	FDA
217	04640	516	Salad dressing, ranch, low-calorie, bottled	1	8.2				FDA
218	04639	517	Salad dressing, ranch, regular, bottled	4	11.6	5.6	7.2	19.0	FDA/USDA
Fruit									
54	09003	78	Apple, red, with peel, raw	20	0.1	0.1	0.0	0.6	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
59	09020	84	Applesauce, bottled	8	0.2	0.1	0.0	0.4	FDA
324	09026	348	Apricots, canned in heavy/light syrup	7	6.2	5.0	1.3	15.4	FDA
67	09037	97	Avocado, raw	20	0.6	0.8	0.0	3.4	FDA
56	09040	80	Banana, raw	20	0.3	0.8	0.0	3.5	FDA
196	09050	398	Blueberries, raw	13	0.3	0.3	0.1	1.1	FDA
64	09181	89	Cantaloupe, raw/frozen	20	0.3	0.2	0.1	0.8	FDA
62	09099	87	Fruit cocktail, canned in light syrup	8	4.9	2.7	0.3	10.3	FDA
65	09111	92	Grapefruit, raw	20	0.2	0.1	0.0	0.3	FDA
63	09132	88	Grapes, seedless, red/green, raw	20	0.4	0.2	0.2	1.1	FDA
153	09193	299	Olives, black, pitted	8	2.6	1.3	1.2	5.2	FDA
55	09200	79	Orange, raw	20	0.2	0.1	0.1	0.5	FDA
345	09239	254	Peach, canned in light/medium syrup	7	6.2	3.6	1.3	10.2	FDA
58	09236	83	Peach, raw/frozen	20	0.3	0.5	0.1	2.6	FDA
346	09256	255	Pear, canned in light syrup	7	0.1	0.0	0.1	0.2	FDA
60	09252	85	Pear, with peel, raw	20	0.1	0.2	0.0	0.7	FDA
309	09354	93	Pineapple, canned in juice	7	1.8	2.3	0.6	7.1	FDA
194	09266	396	Pineapple, raw/frozen	13	0.3	0.2	0.1	0.6	FDA
66	09298	95	Raisins	8	2.3	0.8	0.8	3.5	FDA
61	09316	86	Strawberries, raw/frozen	20	0.4	0.3	0.1	1.6	FDA
57	09326	81	Watermelon, raw/frozen	20	0.2	0.2	0.0	0.8	FDA
Vegetables									
74	11012	115	Asparagus, fresh/frozen, boiled	20	0.8	0.8	0.0	3.9	FDA
340	11084	131	Beets, canned	7	0.4	0.4	0.1	1.2	FDA
72	11742	113	Broccoli, fresh/frozen, boiled	20	0.5	0.6	0.0	2.7	FDA
140	11099	263	Brussels sprouts, fresh/frozen, boiled	20	0.5	0.5	0.0	1.6	FDA
331	11110	110	Cabbage, fresh, boiled	8	0.1	0.1	0.0	0.3	FDA
204	11109	406	Cabbage, raw	12	0.4	0.4	0.0	1.0	FDA
175	11960	356	Carrot, baby, raw	20	1.4	1.0	0.0	3.5	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
313	11125	259	Carrot, fresh, peeled, boiled	7	0.5	0.6	0.0	1.6	FDA
75	11136	116	Cauliflower, fresh/frozen, boiled	20	0.6	0.8	0.0	3.0	FDA
73	11143	114	Celery, raw	20	1.6	2.2	0.0	8.9	FDA
70	11162	108	Collards, fresh/frozen, boiled	20	1.4	1.4	0.0	6.3	FDA
45	11172	55	Corn, canned	8	0.5	0.3	0.1	0.9	FDA
44	11179	54	Corn, frozen, boiled	20	0.4	0.4	0.0	1.4	FDA
79	11206	123	Cucumber, peeled, raw	20	0.6	0.5	0.1	2.1	FDA
315	11210	265	Eggplant, fresh, without peel, boiled	14	0.2	0.2	0.0	1	FDA
250		410	Eggplant, with peel, baked	12	0.4	0.5	0.0	1.4	FDA
78	11729	122	Green beans, canned, drained solids	8	0.4	0.5	0.0	1.2	FDA
77	11061	121	Green beans, fresh/frozen, boiled	20	0.6	0.8	0.0	2.6	FDA
71	11252	109	Lettuce, iceberg, raw	20	0.3	0.5	0.0	1.8	FDA
176	11253	357	Lettuce, leaf, raw	20	1.2	1.8	0.1	8.0	FDA
36	11032	42	Lima beans, immature, frozen, boiled	8	0.3	0.4	0.0	0.9	FDA
142	11584	268	Mixed vegetables, frozen, boiled	8	0.4	0.3	0.0	0.9	FDA
141	11260	264	Mushrooms, raw	20	0.3	0.1	0.1	0.6	FDA
434			Nori, seaweed, dried	3	2320	618	1640	2850	USDA
317	11279	267	Okra, fresh/frozen, boiled	7	1.0	0.6	0.3	1.8	FDA
82	11282	128	Onion, mature, raw	20	0.4	0.4	0.0	1.6	FDA
37	11313	46	Peas, green, fresh/frozen, boiled	8	0.2	0.4	0.0	1.0	FDA
80	11333	125	Pepper, bell, green, raw	20	0.4	0.6	0.1	2.7	FDA
89	11937	161	Pickles, dill, cucumber	8	0.7	0.6	0.3	1.7	FDA
83	11367	136	Potato, peeled, boiled	20	0.3	0.4	0.0	1.2	FDA
84	11674	137	Potato, with peel, baked	20	1.0	1.5	0.0	7.0	FDA
293	11371	354	Potatoes, mashed, prepared from fresh	7	6.2	3.6	3.8	14.2	FDA
220	11549	119/519	Sauce, tomato, canned/bottled	8	1.0	0.5	0.0	1.5	FDA
1	11458	107	Spinach, fresh/frozen, boiled	8	3.9	2.9	1.0	8.1	FDA
206	11457	408	Spinach, raw	12	6.0	3.0	2.1	10.8	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
332	11468	124	Squash, summer, fresh/frozen, boiled	8	0.3	0.1	0.1	0.5	FDA
205	11478	407	Squash, summer, zucchini, fresh/frozen, boiled	12	0.4	0.3	0.1	1.0	FDA
81	11644	126	Squash, winter (Hubbard or acorn), fresh/frozen, boiled	8	0.2	0.4	0.0	0.9	FDA
195	11508	397	Sweet potato, baked, peel removed	13	1.3	1.0	0.0	3.0	FDA
325	11514	358	Sweet potato, canned	7	0.7	0.8	0.0	2.3	FDA
76	11529	117	Tomato, raw	20	0.3	0.2	0.0	0.8	FDA
316	11567	266	Turnip, fresh/frozen, boiled	7	0.3	0.2	0.0	0.5	FDA
Legumes									
270		527	Beans, black, canned, drained	1	1.0				FDA
271		528	Beans, kidney, canned, drained	1	1.1				FDA
228	16146	529	Beans, pinto, canned, drained	1	1.2				FDA
304	16043	38	Beans, pinto, from dry, boiled	7	0.0	0.1	0.0	0.2	FDA
167	16103	341	Beans, refried, canned	8	0.8	0.5	0.0	1.4	FDA
272		530	Beans, white, canned, drained	1	0.8				FDA
323	16050	342	Beans, white, from dry, boiled	7	0.1	0.2	0.0	0.4	FDA
35	16009	39	Beans, with pork, canned	8	0.3	0.2	0.0	0.5	FDA
38	16167	47	Peanut butter, smooth/creamy	8	0.7	0.4	0.0	1.3	FDA
39	16090	48	Peanuts, dry roasted, salted	8	0.7	0.4	0.0	1.1	FDA
18	43137	544	Veggie burger, soy based, baked	1	9.7				FDA
Nuts and Seeds									
227	12061	526	Almonds, shelled	1	1.0				FDA
168	12537	343	Seeds, sunflower, shelled, salted, roasted	8	0.3	0.4	0.0	0.9	FDA
201	12155	403	Walnuts, shelled	13	0.6	0.5	0.0	1.7	FDA
Beverages including Juices									
110	14003	198	Alcohol, beer	8	0.9	0.6	0.2	2.1	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
207	14051	500	Alcohol, distilled, vodka	1	0.1				FDA
248		200	Alcohol, distilled, whiskey/scotch	1	0.1				FDA
342	14084	199/501/502	Alcohol, wine, red/white	9	1.6	0.8	0.9	3.3	FDA
210	14091	503	Beverage, almond	1	0.9				FDA
211	14090	504	Beverage, coconut water	1	0.5				FDA
212	14060	505	Beverage, energy	1	0.2				FDA
213	16222	506	Beverage, soy	1	2.9				FDA
264		507	Beverage, sports	1	0.0				FDA
374	14164		Beverage, chocolate malt powder, prepared with 1% milk, fortified	1	28.1				USDA
108	14416	194	Carbonated beverage, cola, low-calorie	8	0.3	0.2	0.0	0.6	FDA
106	14148	191	Carbonated beverage, cola, regular	8	0.2	0.2	0.0	0.5	FDA
320	14144	306/508	Carbonated beverage, fruit-flavored	8	0.1	0.2	0.0	0.5	FDA
155	14209	305	Coffee, brewed from ground	8	0.2	0.1	0.1	0.3	FDA
13	14201	381	Coffee, decaffeinated, from ground	7	0.2	0.1	0.1	0.4	FDA
173	14242	351	Cranberry juice cocktail, canned/bottled	8	0.2	0.3	0.0	0.8	FDA
156	14651	307	Fruit drink (5% - 25% juice), canned/bottled	8	0.6	0.2	0.3	0.9	FDA
107	14541	193	Fruit drink from powder, reconstituted	8	0.1	0.2	0.0	0.5	FDA
68	09400	99	Juice, apple, bottled	8	0.5	0.6	0.0	1.9	FDA
172	09444	350	Juice, fruit blend (100% juice), canned/bottled	8	0.7	0.3	0.4	1.2	FDA
138	09130	257	Juice, grape, bottled	8	0.3	0.2	0.1	0.8	FDA
69	09123	100	Juice, grapefruit, bottle/carton	8	0.6	0.3	0.3	1.2	FDA
225	09152	524	Juice, lemon, bottled	1	3.2				FDA
174	09207	352	Juice, orange, bottle/carton	8	10.1	8.2	1.7	24.2	FDA
338	09209	98	Juice, orange, from frozen concentrate, reconstituted	7	0.4	0.2	0.2	0.7	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
137	09409	256	Juice, pineapple, canned	8	0.3	0.2	0.0	0.6	FDA
339	09294	103	Juice, prune, bottled	7	1.3	1.3	0.4	3.2	FDA
314	11886	261	Juice, tomato, bottled	7	1.1	0.3	0.7	1.4	FDA
226	11578	525	Juice, tomato-vegetable, bottled	1	0.4				FDA
310	14293	105	Lemonade, from frozen concentrate, reconstituted	7	0.1	0.1	0.0	0.2	FDA
322		331	Meal replacement, liquid, ready to drink (RTD), assorted flavors	7	47.4	47.3	19.5	142.7	FDA
265		509	Meal replacement, liquid, RTD, vanilla	1	18.2				FDA
215	14066	510	Powder, protein	1	75.8				FDA
109	14355	197	Tea, brewed from tea bag	8	0.1	0.1	0.0	0.4	FDA
14	14352	382	Tea, decaffeinated, brewed from tea bag	7	0.1	0.1	0.0	0.2	FDA
184	14555	380	Water, mineral/spring, bottled	20	0.3	0.2	0.0	0.7	FDA
439	14411		Water, tap, drinking ¹	40	1.1	2.0	0.0	10.9	USDA
Seafood									
389	15141		Crustaceans, crab, blue, canned	3	37.8	12.4	27.3	51.5	USDA
390	15148		Crustaceans, lobster, northern, cooked, moist heat	3	185	44	139	226	USDA
391	15149		Crustaceans, shrimp, mixed species, raw	9	14.7	10.7	7.4	38.5	USDA
132	15151	244	Crustaceans, shrimp, precooked, shell removed, no tail	24	15.4	11.6	3.4	54.8	FDA/USDA
33	15027	34	Fish sticks or patty, frozen, oven-cooked	12	68.7	29.5	25.2	134.0	FDA/USDA
165	15235	339	Fish, catfish, pan-cooked with oil	20	4.2	1.9	1.4	8.1	FDA
186	15192	387	Fish, cod, baked	13	186	70	95	327	FDA
375	15019		Fish, cod, Pacific, raw	7	131	68	51	241	USDA
376	15028		Fish, flatfish (flounder and sole species), raw	4	14.3	3.9	10.8	19.9	USDA
377	15033		Fish, haddock, raw	3	227	88	138	314	USDA
378	15036		Fish, halibut, Atlantic and Pacific, raw	5	8.0	1.3	7.4	10.3	USDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
379	15057		Fish, ocean perch, Atlantic, raw	4	9.3	2.2	7.4	11.5	USDA
396	15266		Fish, pollock, Alaska, raw	3	43.5	8.7	37.4	53.5	USDA
380	15070		Fish, rockfish, Pacific, mixed species, raw	3	14.0	4.8	10.7	19.5	USDA
421	35171		Fish, salmon, chum, dried (Alaska Native)	1	38.4				USDA
395	15260		Fish, salmon, pink, canned, drained solids	2	15.3	7.4	10.0	20.5	USDA
381	15083		Fish, salmon, pink, raw	5	26.2	15.7	11.8	49.7	USDA
384	15087		Fish, salmon, sockeye, canned, drained solids	1	22.0				USDA
382	15085		Fish, salmon, sockeye, raw	2	14.3	3.8	11.6	17.0	USDA
158	15237	318	Fish, salmon, steaks/fillets, baked	10	16.5	8.6	3.8	27.8	FDA/USDA
422	35184		Fish, smelt, dried (Alaska Native)	1	216				USDA
371			Fish, swai, cooked	2	<10				USDA
385	15110		Fish, swordfish, raw	4	19.5	3.8	16.4	24.9	USDA
187	15262	388	Fish, tilapia, baked	13	4.6	1.5	2.5	8.7	FDA
386	15115		Fish, trout, rainbow, wild, raw	1	<10				USDA
166	15121	340	Fish, tuna, canned in water, drained	13	8.5	1.8	6.6	11.9	FDA/USDA
388	15118		Fish, tuna, fresh, bluefin, cooked, dry heat	4	23.0	4.4	17.5	28.1	USDA
387	15117		Fish, tuna, fresh, bluefin, raw	4	17.6	5.9	11.5	25.5	USDA
420	35091		Fish, whitefish, broad, including head, eyes, cheeks and soft bones (Alaska Native), raw	1	33.6				USDA
392	15160		Mollusks, clam, mixed species, canned, drained solids	4	66.5	9.1	57.9	78.0	USDA
393	15169		Mollusks, oyster, eastern, wild, cooked, moist heat	3	109.1	25.6	81.4	132.0	USDA
394	15172		Mollusks, scallop, mixed species, raw	4	<10				USDA
Grains²									
16	20081	900	Flour, white, all-purpose	1	2.4				FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
53	20110	69	Noodles, egg, enriched, boiled	8	3.5	1.2	1.7	4.9	FDA
347	20321		Pasta, enriched, boiled in water with iodized salt using amount per pasta label	2	28.9	0.0	27.7	30.1	USDA
232	20134	539	Pasta, rice noodles, cooked	1	1.5				FDA
171	20121	347	Pasta, spaghetti, enriched, boiled	8	0.1	0.2	0.0	0.4	FDA
233	20125	540	Pasta, whole wheat, cooked	1	0.6				FDA
223	20137	522	Quinoa, cooked	1	1.1				FDA
200	20041	402	Rice, brown, cooked	13	0.6	0.4	0.0	1.6	FDA
40	20051	50	Rice, white, enriched, cooked	19	0.5	0.3	0.0	1.1	FDA
Cereals									
254		74	Cereal, bran with raisins	8	1.0	0.4	0.6	1.7	FDA
253		71	Cereal, corn flakes	8	0.2	0.4	0.0	1.2	FDA
43	08091	53	Cereal, corn/hominy grits, enriched, cooked	8	0.0	0.1	0.0	0.2	FDA
42	08169	52	Cereal, cream of wheat (farina), enriched, cooked	8	0.2	0.5	0.0	1.3	FDA
255		75	Cereal, crisped rice	8	0.4	0.3	0.0	0.8	FDA
306		72	Cereal, fruit-flavored, sweetened ³	7	0.7	0.5	0.2	1.5	FDA/USDA
266		512	Cereal, granola	1	10.8				FDA
308		76	Cereal, granola with raisins	7	14.2	4.0	9.4	20.2	FDA
256		77	Cereal, oat ring	8	0.9	0.3	0.4	1.2	FDA
267		513	Cereal, oat ring, honey	1	1.5				FDA
41	08121	51	Cereal, oatmeal, plain, cooked	8	0.3	0.4	0.0	1.1	FDA
307		73	Cereal, shredded wheat	7	0.1	0.2	0.0	0.6	FDA
268		514	Cereal, shredded wheat, frosted	1	0.9				FDA
269		515	Cereal, whole wheat, cooked	1	0.5				FDA
Baked Products									
133	18001	249	Bagel, plain, toasted	21	1.5	2.0	0.0	9.3	FDA/USDA
305	18015	61	Biscuits, refrigerated-type, baked	8	3.2	2.3	0.7	7.4	FDA/USDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
344	28397	248	Bread, multigrain ⁴	4	1.8	2.0	0.0	4.4	FDA
337	18060	64	Bread, rye	7	0.6	0.3	0.0	0.9	FDA
199	18350	401	Bread, white roll/bun (hamburger/hotdog) ⁵	8	2.2	3.0	0.0	9.5	FDA/USDA
442	18350*	401*	Bread, white roll/bun (hamburger/hotdog), with iodate dough conditioner	11	1196	292	828	1730	FDA/USDA
46	18069	58	Bread, white, enriched, pre-sliced ⁶	12	1.9	2.5	0.0	9.5	FDA/USDA
440	18069*	58*	Bread, white, enriched, pre-sliced, with iodate dough conditioner	13	639	210	388	1180	FDA/USDA
48	18075	62	Bread, whole-wheat, commercially prepared ⁷	13	2.8	2.3	0.7	9.5	FDA
441	18075*	62*	Bread, whole-wheat, commercially prepared, with iodate dough conditioner	5	618	244	357	1010	FDA/USDA
15	18079	903	Breadcrumbs	1	180				FDA
170	18362	345	Breakfast tart/toaster pastry ⁸	7	3.0	2.0	0.0	5.4	FDA
146	18151	291	Brownie, commercially prepared	8	10.5	13.4	0.9	42.2	FDA
99	18096	178	Cake, chocolate with chocolate icing, commercially prepared ⁹	19	7.6	2.0	4.1	10.9	FDA
263		369	Cake, white with white icing, commercially prepared ¹⁰	18	17.4	19.0	4.6	72.1	FDA
399	18140		Cake, yellow with chocolate frosting, commercially prepared	3	8.3	1.5	7.4	10.0	USDA
185	18964	386	Cinnamon roll, from package, iced	15	5.1	2.9	1.3	11.6	FDA
100	18160	183	Cookies, from package, chocolate chip	9	1.4	0.9	0.2	2.7	FDA/USDA
101	18166	184	Cookies, from package, sandwich with crème filling	8	0.5	0.4	0.0	1.1	FDA
147	18204	292	Cookies, from package, sugar ¹¹	6	5.6	2.3	2.5	8.9	FDA
47	18024	60	Cornbread, homemade	8	21.5	6.4	12.3	31.0	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
398	18023		Cornbread, from dry mix, prepared with 2% milk, margarine, and eggs	1	16.7				USDA
136	18229	252	Crackers, butter-type	8	0.6	0.7	0.0	2.0	FDA
229	18214	531	Crackers, cheese, regular	2	14.3		10.3	18.3	FDA/USDA
135	18173	251	Crackers, graham	8	0.9	0.5	0.3	1.5	FDA
51	18228	66	Crackers, saltine	8	0.5	0.3	0.0	0.8	FDA
145	18248	290	Doughnut, cake-type, plain, commercially prepared	8	17.4	16.0	5.1	41.2	FDA
134	18437	250	English muffin, plain, toasted	20	2.4	3.3	0.0	15.4	FDA
50	18274	65	Muffin, blueberry, commercially prepared	20	12.9	5.8	8.0	34.5	FDA
169	18936	344	Pancakes, frozen, heated	10	6.8	1.9	3.2	10.4	FDA/USDA
234	18335	541	Pie crust, commercially prepared	1	1.3				FDA
102	18443	185	Pie, apple, fresh/frozen, commercially prepared	8	0.6	0.5	0.0	1.2	FDA
103	18326	186	Pie, pumpkin, fresh/frozen, commercially prepared	8	22.2	3.8	17.5	29.5	FDA
3	18244	182	Sweet roll/Danish pastry	4	6.0	1.4	4.4	7.7	FDA
198	18363	400	Tortilla, corn	1	1.0				FDA
49	18970	63	Tortilla, flour	19	1.1	0.9	0.0	3.5	FDA
Sweets and Snacks									
216	19919	511	Candy, fruit snacks	1	0.4				FDA
178	19155	371	Candy bar (chocolate, nougat, and nuts)	8	17.1	3.1	13.5	21.8	FDA
104	19120	187	Candy bar, milk chocolate, plain	8	46.8	4.9	36.8	54.1	FDA
148	19107	293	Candy, hard, assorted flavors	8	9.6	13.6	0.2	35.4	FDA
85	19411	138	Chips, potato	8	3.0	3.7	0.6	9.1	FDA
402	19412		Chips, potato, made from dried potatoes, cheese-flavor	1	1.5				USDA
52	25028	67	Chips, corn/tortilla	8	1.4	1.6	0.1	4.5	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
105	19173	190	Gelatin dessert, assorted flavors, prepared	8	0.5	0.4	0.1	1.4	FDA
224	19015	523	Granola bar	1	2.6				FDA
327		370	Granola bar, with raisins	7	2.0	1.6	0.6	4.6	FDA
97	19296	172	Honey	8	0.6	0.2	0.4	1.1	FDA
151	19300	296	Jelly, assorted flavors	8	0.9	0.7	0.2	2.1	FDA
144	19283	288	Popsicle, fruit-flavored ¹²	2	1.5		0.4	2.5	FDA
179	25026	372	Popcorn, microwave, butter-flavored	8	0.2	0.2	0.0	0.5	FDA
149	19047	294	Pretzels, hard, salted	8	0.7	0.4	0.3	1.2	FDA
235	19183	542	Pudding, ready-to-eat, chocolate	1	13.3				FDA
326		368	Pudding, ready-to-eat, assorted flavors other than chocolate	7	4.7	1.9	3.0	7.6	FDA
401	19193		Pudding, rice, ready-to-eat	1	27.5				USDA
289	19097	287	Sherbet, fruit-flavored ¹³	3	14.5	0.7	13.7	15.1	FDA
330		385	Sorbet, fruit-flavored	4	1.1	0.6	0.3	1.8	FDA
95	19335	169	Sugar, white, granulated	8	0.1	0.2	0.0	0.4	FDA
150	19348	295	Syrup, chocolate	8	0.7	0.6	0.3	2.0	FDA
96	19129	170	Syrup, pancake	8	0.2	0.1	0.1	0.4	FDA
Mixed Dishes									
284		269	Beef stroganoff with noodles, homemade	7	6.2	1.0	5.3	8.1	FDA
88	22906	152	Chicken potpie, frozen, heated	8	3.1	1.0	1.9	4.7	FDA
86	22904	145	Chili con carne with beans, canned	8	2.1	0.6	1.3	2.8	FDA
294	21127	355	Coleslaw, mayonnaise-type, from grocery/deli	7	1.8	0.8	1.0	2.8	FDA
411	22973		Corn dogs, frozen, prepared	1	23.7				USDA
6	22977	361	Lasagna with meat, frozen, heated	7	8.4	1.1	7.0	9.8	FDA
418	32019		Lasagna, cheese, frozen, unprepared	5	10.7	3.4	7.4	15.0	USDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
87	22960	146	Macaroni and cheese, prepared from box mix	15	19.4	4.4	11.2	28.7	FDA/USDA
291		346	Macaroni salad, from grocery/deli	7	3.2	1.2	1.9	5.3	FDA
245		148	Meatloaf, beef, homemade	7	15.5	10.7	8.1	34.4	FDA
416	32008		Pasta mix, classic cheeseburger macaroni, unprepared	1	<10				USDA
417	32010		Pasta mix, Italian lasagna, unprepared	2	11.3	5.4	7.4	15.1	USDA
409	21505		Pizza, cheese topping, thin crust, frozen, baked	7	23.3	5.0	16.2	29.3	USDA
410	22971		Potato salad with egg	5	<10				USDA
292	21140	353	Potato salad, mayonnaise-type, from grocery/deli	7	2.6	1.7	0.0	5.0	FDA
244		142	Spaghetti with meat sauce, homemade	7	1.8	0.6	1.0	2.6	FDA
438			Sushi, California roll	3	31.0	9.5	20.0	36.6	USDA
415	32007		Taquitos, frozen, beef and cheese, oven-heated	1	<10				USDA
414	32006		Taquitos, frozen, chicken and cheese, oven-heated	1	<10				USDA
285		272	Tuna noodle casserole, homemade	7	16.1	9.3	10.5	36.1	FDA
419	32037		Turnover, pepperoni pizza	1	20.9				USDA
Fast Foods									
197	21142	399	Biscuits, fast food	5	10.5	3.9	6.7	16.5	FDA/USDA
10	21064	365	Burrito with beef, beans and cheese, from Mexican carry-out	7	5.4	2.2	2.7	9.8	FDA
162	21469	336	Chicken breast, fried, with skin, fast food ¹⁴	18	4.0	1.5	2.1	6.7	FDA
164	21470	338	Chicken leg, fried, with skin, fast food	20	2.4	0.7	1.0	3.8	FDA
131	21229	241	Chicken nuggets, fast food	20	1.9	1.4	0.5	7.3	FDA
303	01110	7	Milk shake, chocolate, fast food	7	35.3	9.4	22.6	45.4	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
193	01111	394	Milk shake, vanilla, fast food	13	35.9	6.8	21.7	45.3	FDA
318	21302	281	Pizza, cheese and pepperoni, regular crust, from pizza carry-out	11	11.7	4.4	7.1	19.6	FDA/USDA
202	21299	404	Pizza, cheese, fast food	15	12.6	2.9	7.3	17.3	FDA/USDA
435			Pizza, crust only, fast food	9	<10				USDA
408	21484		Pizza, with sausage topping, regular crust, fast food	1	13.2				USDA
139	21138	258	Potatoes, French fries, fast food	20	2.2	2.2	0.0	10.2	FDA
2	21112	147	Sandwich, hamburger, single, large patty, fast food	7	3.3	1.4	2.0	5.9	FDA
406	21092		Sandwich, cheeseburger, double, regular patty, plain, fast food	8	11.1	2.7	7.4	14.6	USDA
443	21092*		Sandwich, cheeseburger, double, regular patty, fast food (bun w iodate dough conditioner)	4	278	96	164	392	USDA
286	21096	275	Sandwich, cheeseburger, single, large patty, fast food	9	10.3	2.2	7.4	14.5	FDA/USDA
11	21490	366	Sandwich, chicken filet (broiled) sandwich, fast food	7	1.8	1.6	0.4	4.5	FDA
288	21021	278	Sandwich, egg, cheese, and ham on English muffin, fast food	8	24.5	5.9	16.1	31.8	FDA/USDA
287	21105	276	Sandwich, fish, fast food	10	36.2	12.3	22.9	56.9	FDA/USDA
405	21059		Shrimp, breaded and fried, fast food	2	<10				USDA
4	21486	279	Taco/tostada with beef and cheese, from Mexican carry-out	7	7.0	2.7	4.4	11.9	FDA
Restaurant Foods (excluding Fast Food Restaurants)									
7	36603	362	Beef with vegetables in sauce, restaurant, Chinese	7	4.3	5.2	0.6	15.6	FDA
428	36050		Cheese enchilada, restaurant, Mexican	1	16.1				USDA
429	36052		Cheese quesadilla, restaurant, Mexican	1	23.1				USDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
430	36055		Cheese ravioli with marinara sauce, restaurant, Italian	1	21.5				USDA
8	36626	363	Chicken with vegetables in sauce, restaurant, Chinese	7	3.8	4.6	0.8	12.6	FDA
444	36033		Fish fillet, parmesan crusted tilapia, restaurant, family style	1	13.1				USDA
436			Fish, salmon, grilled, restaurant	1	<10				USDA
423	36012		Fried mozzarella sticks, restaurant, family style	3	38.1	4.1	34.2	42.3	USDA
9	36602	364	Fried rice, meatless, restaurant, Chinese	7	5.5	5.6	1.2	16.9	FDA
427	36041		Lasagna with meat, restaurant, Italian	1	27.5				USDA
425	36017		Macaroni & cheese, from kids' menu, restaurant, family style	10	22.4	7.4	12.9	32.3	USDA
431	36620		Shrimp and vegetables, restaurant, Chinese	1	<10				USDA
Sausage and Luncheon Meats									
32	07959	29	Bologna (beef/pork)	8	26.8	9.7	15.1	43.5	FDA
31	07949	28	Frankfurter, beef/pork, boiled	7	4.1	1.4	2.8	7.0	FDA
369	07945		Frankfurter, beef, heated	2	<10				USDA
261	07081	335/543	Luncheon meat (chicken/turkey)	8	3.7	1.1	1.8	5.1	FDA
129	07028	239	Luncheon meat, ham	8	1.4	0.6	0.8	2.4	FDA
188	07072	389	Salami, dry/hard	18	13.3	11.1	4.2	47.7	FDA/USDA
243		30	Salami, luncheon-meat type (not hard)	7	12.3	8.0	3.5	23.2	FDA
367	07019		Sausage, pork, chorizo, raw	1	29.8				USDA
28	07953	19	Sausage, pork, oven-cooked	20	4.0	2.5	1.2	10.7	FDA
Meats									
130	05064	240	Chicken breast, oven-roasted (skin removed)	20	2.0	1.8	0.2	8.1	FDA

DB_ID	NDB No.	TDS No.	Description	n	Iodine mcg/100g	SD	Min	Max	Source(s)
163	05098	337	Chicken thigh, oven-roasted (skin removed)	20	1.3	0.5	0.3	2.5	FDA
30	05192	26	Turkey breast, oven-roasted ¹⁵	19	2.1	1.3	0.0	4.9	FDA
189	05306	390	Turkey, ground, pan-cooked	13	5.5	4.3	0.8	16.9	FDA
26	10136	17	Ham, cured (not canned), baked	20	1.5	1.5	0.0	5.9	FDA
29	10860	20	Pork bacon, oven-cooked	20	1.9	0.8	0.8	3.9	FDA
27	10179	18	Pork chop, pan-cooked with oil	20	1.0	0.8	0.0	3.4	FDA
333		21	Pork roast, loin, oven-roasted	7	0.4	0.3	0.0	0.9	FDA
335	17204	27	Beef/calf, liver, pan-cooked with oil	7	16.4	5.0	7.7	21.6	FDA
251		13	Beef, ground, pan-cooked	20	8.0	3.4	3.8	18.9	FDA
334		14	Beef roast, chuck, oven-roasted	8	3.8	2.2	1.8	8.2	FDA
260		334	Beef steak, loin/sirloin, broiled	19	4.7	1.3	2.9	8.1	FDA
252		22	Lamb chop, pan-cooked with oil	20	3.0	2.5	0.8	12.3	FDA

*TDS and/or NDB identifiers with asterisks indicate products that differ from the generic product in that they contain iodate dough conditioners

¹USDA water samples analyzed by FDA

²Grain products prepared without salt unless otherwise noted

³Omitted sample with 386 mcg I/100g, value probably from FD&C Red No. 3 food coloring

⁴Omitted 3 samples with values from 72 – 224 mcg I/100g – probably mixture of breads with and without iodate dough conditioners

⁵Omitted 4 samples with values from 130 - 416 mcg I/100g – probably mixture of breads with and without iodate dough conditioners

⁶Omitted 6 samples with values from 53 - 290 mcg I/100g – probably mixture of breads with and without iodate dough conditioners

⁷Omitted 6 samples with values from 194 - 290 mcg I/100g – probably mixture of breads with and without iodate dough conditioners

⁸Omitted sample with 92.4 mcg I/100g, value probably from FD&C Red No. 3 food coloring

⁹Omitted sample with 120 mcg I/100g, value probably from FD&C Red No. 3 food coloring

¹⁰Omitted 2 samples with 312 and 335 mcg I/100g, values probably from FD&C Red No. 3 food coloring

¹¹Omitted 2 samples with 42 and 973 mcg I/100g, values probably from FD&C Red No. 3 food coloring

¹²Omitted 6 samples from 123 to 621 mcg I/100g, values probably from FD&C Red No. 3 food coloring

¹³Omitted sample with 545 mcg I/100g, value probably from FD&C Red No. 3 food coloring

¹⁴Omitted samples with values of 38 and 42 mcg I/100g, values may reflect the use of disinfectant during poultry cleaning but we were unable to confirm this use

¹⁵Omitted sample with value of 61 mcg I /100g as an outlier, although value was confirmed by the lab