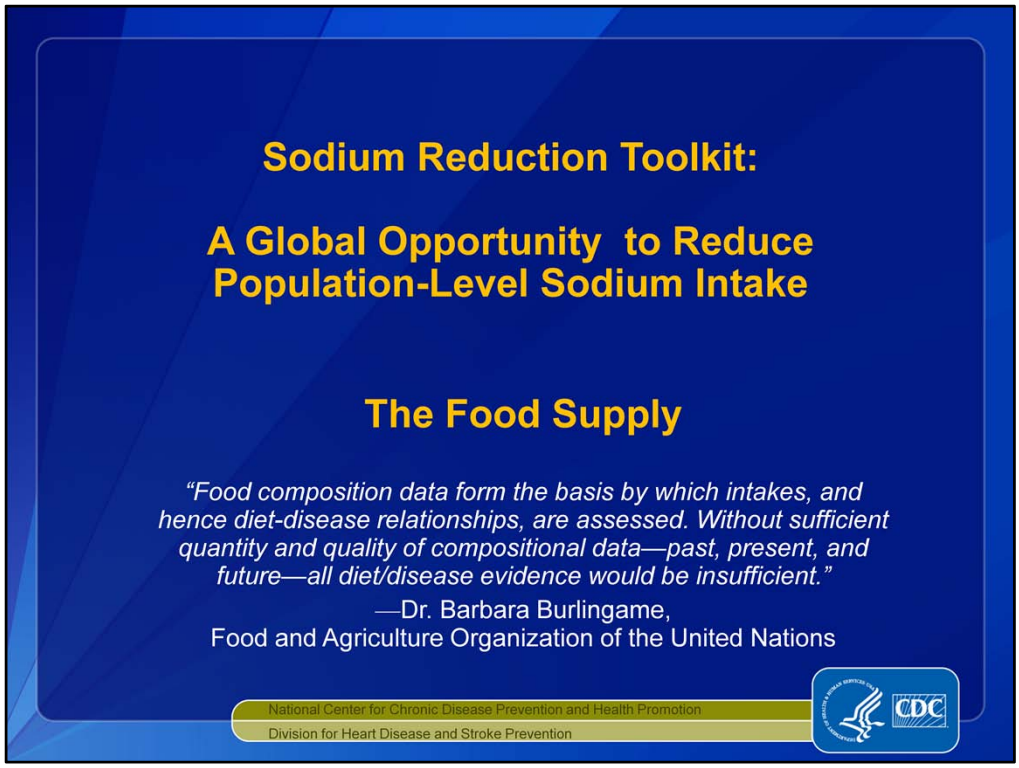
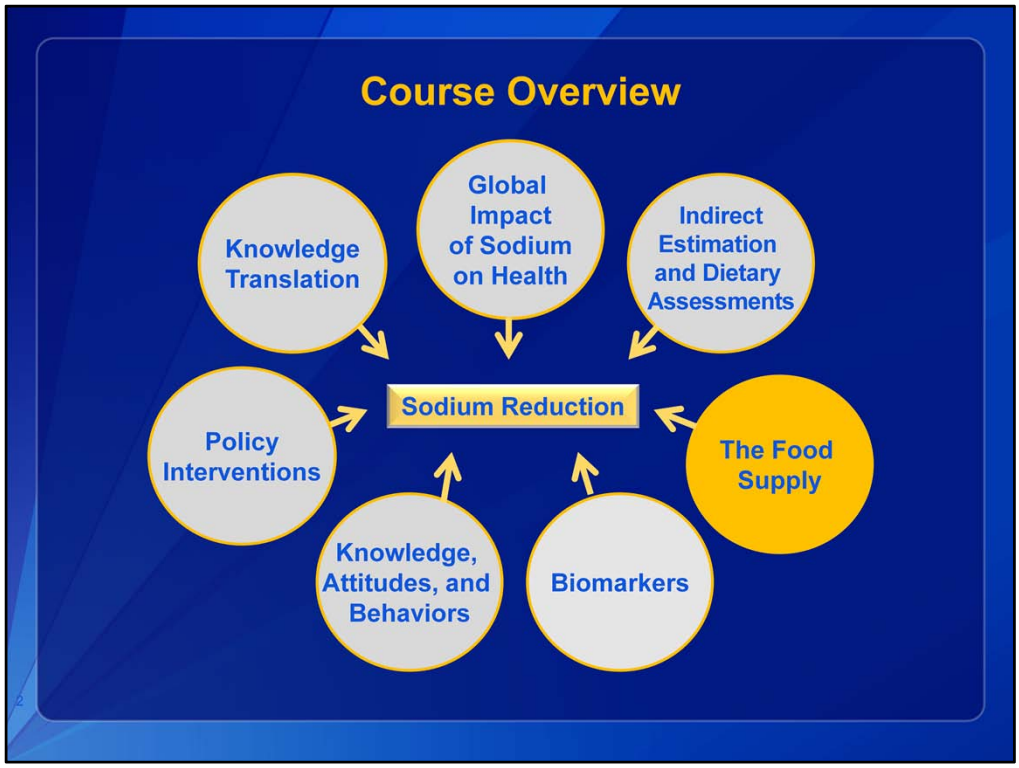


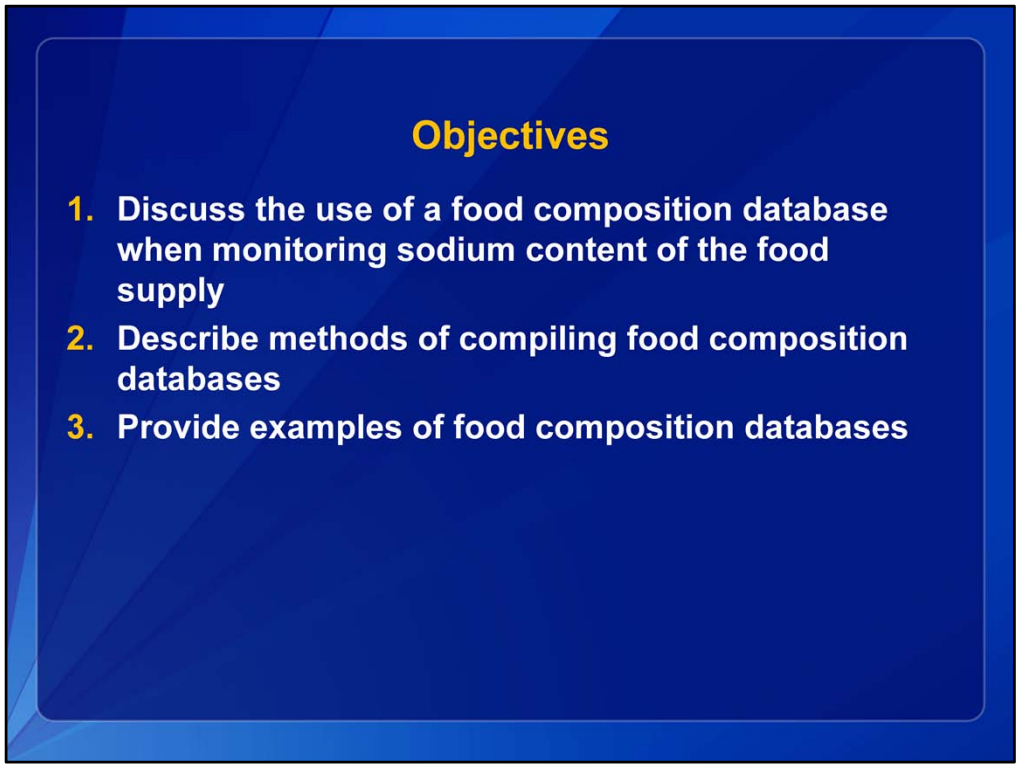
This module is part of the Centers for Disease Control and Prevention's Sodium Reduction Toolkit: A Global Opportunity to Reduce Population-Level Sodium Intake. The toolkit is designed to provide government agencies, international organizations, and other stakeholders with a brief overview, tools, and information necessary to inform strategies to reduce population-level sodium intake.

"Food composition data form the basis by which intakes, and hence diet-disease relationships, are assessed. Without sufficient quantity and quality of compositional data—past, present, and future—all diet/disease evidence would be insufficient."
–Dr. Barbara Burlingame, Food and Agriculture Organization of the United Nations[1]



This module in the Sodium Reduction Toolkit covers the food supply as it relates to sodium. Other modules in the toolkit provide information about the global impact of sodium on health; methods to evaluate sodium intake through biomarkers, indirect estimation, and dietary assessments; knowledge, attitudes, and behaviors related to sodium intake and health; strategies for using sodium-reduction policy interventions to reduce sodium intake; and the process of translating and sharing evidence-based research. Each module also includes examples and a list of top 10 resources.

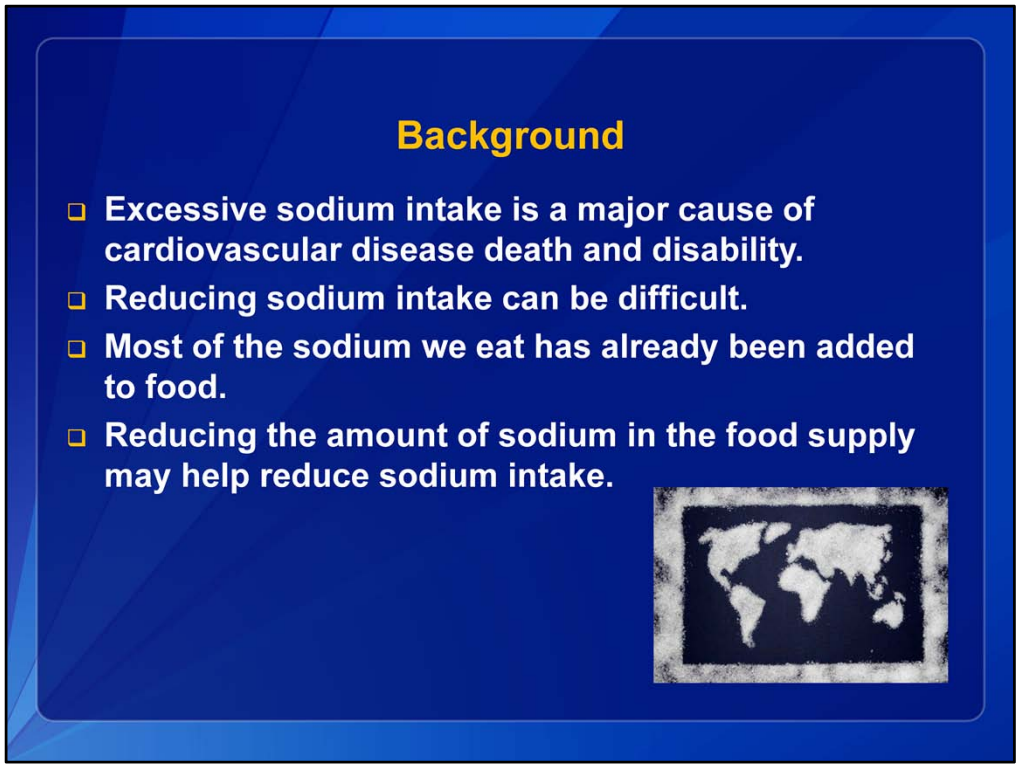
Please note that throughout this module, the term “salt,” also known as sodium chloride, is not synonymous with the term “sodium.” Modules in this series use the term “salt” when referring to sodium chloride and sodium when referring to dietary sodium. A list of conversions for salt and sodium is available on the toolkit web page.



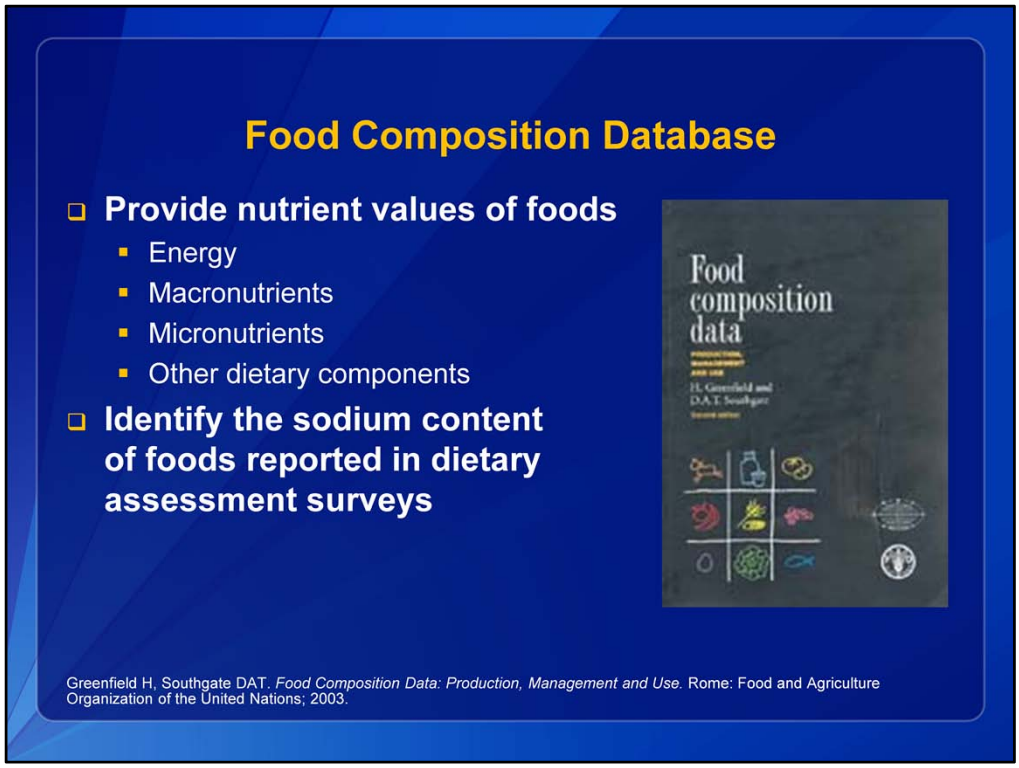
The objectives of the Food Supply module are to:

1. Discuss the use of a food composition database when monitoring sodium content of the food supply.
2. Describe methods of compiling food composition databases.
3. Provide examples of food composition databases.

Please note that the examples and recommendations provided should be used for training purposes only and do not necessarily imply that they are appropriate for use in your country.



Excessive sodium intake, through high blood pressure, is a major cause of cardiovascular disease–related death and disability worldwide. In countries where consumption of packaged and restaurant foods is high, reducing average sodium intake can be difficult because most of the sodium a person consumes has already been added before the time of purchase. However, outside the United States, the main sources of sodium are sauces, marinades, and added salt during cooking or at the table. Identifying the main sources of sodium in the food supply of your country can help inform strategies to reduce sodium intake.



Food composition databases or tables provide nutrient values of foods, including but not limited to energy, macronutrients, minerals such as sodium, vitamins, fiber, fatty acids, amino acids, and other dietary components such as caffeine and carotenoids.[2,3] The number of food categories and types vary and can include packaged and processed foods, restaurant menu items, and recipes.[2,3]

Composition databases are becoming increasingly important for identifying the sodium content of foods that individuals report consuming in dietary assessment surveys. For more information about monitoring sodium intake through dietary assessments, please see the Indirect Estimation and Dietary Assessment module. We now will move on to the uses of food composition data.

Food composition data have various uses. In general, food composition data can be used to estimate the nutrient content of foods; compare different foods for their nutrient composition; and assess nutrient intakes at the individual, group, and population levels. For example, a food composition database can be used to convert food intake data from dietary assessment surveys into nutrient intake data.

Food composition data also can be used as reference points for desirable nutrient levels in new and reformulated foods. For example, some food manufacturers are reducing the sodium content of their food products, and food composition data can show the size of the reduction.

In addition to their general uses, food composition data also can be merged with market share data, which can help identify the top-selling individual food products that contribute the most to sodium intake.[2,4,5] Market share data provide details for when, at what dollar price, and how much of a specific product is sold.[6]

Next we will review methods of compiling food composition data.

Methods of Compiling Nutrient Data

- Direct laboratory analysis
- Indirect data sources
- Combination method

There are three methods used to compile nutrient data: direct laboratory analysis, indirect data sources, and the combination method. Direct laboratory analysis involves analyzing nutrient values of foods in a laboratory. Indirect data sources typically are data from published and unpublished reports, journals, and other sources. The combination method uses direct and indirect approaches to compile data.[2,4,7] These methods are described next.

Direct Laboratory Analysis

- Analyze nutrient values of foods in a laboratory
- Conducted by government, through contracts with universities, and by the food industry
- Can provide reliable data
- Can be costly and time consuming

Direct laboratory analysis involves analyzing nutrient values of foods in a laboratory.[2] This method is often conducted by governments, through contracts with universities, and by the food industry, including manufacturers and retailers.[7] Although this method can provide reliable data, it can be costly and time consuming.[8]

Indirect data sources may be used when analytical resources are limited or when certain foods are imported from other countries where current and reliable nutrient composition data are available.[2] Indirect data sources include, but are not limited to, scientific journals, existing food composition databases, and food labels and other data provided by industry.

Scientific journals, such as *Food Chemistry* and the *Journal of Food Composition Analysis,* are often the timeliest sources of nutrient data emerging from analytical laboratories.[7,9] However, because these sources can be costly, it is important to evaluate the relevance of the data before deciding whether to use them.

You can also compile nutrient data from existing food composition databases. Numerous food composition databases have been created and are publically available on the Internet. For example, the International Food Composition Tables Directory, which is maintained by the United Nations International Network of Food Data Systems,[10] and the International Nutrient Databank Directory[11] each provide detailed lists of international, national, regional, and local food composition data.

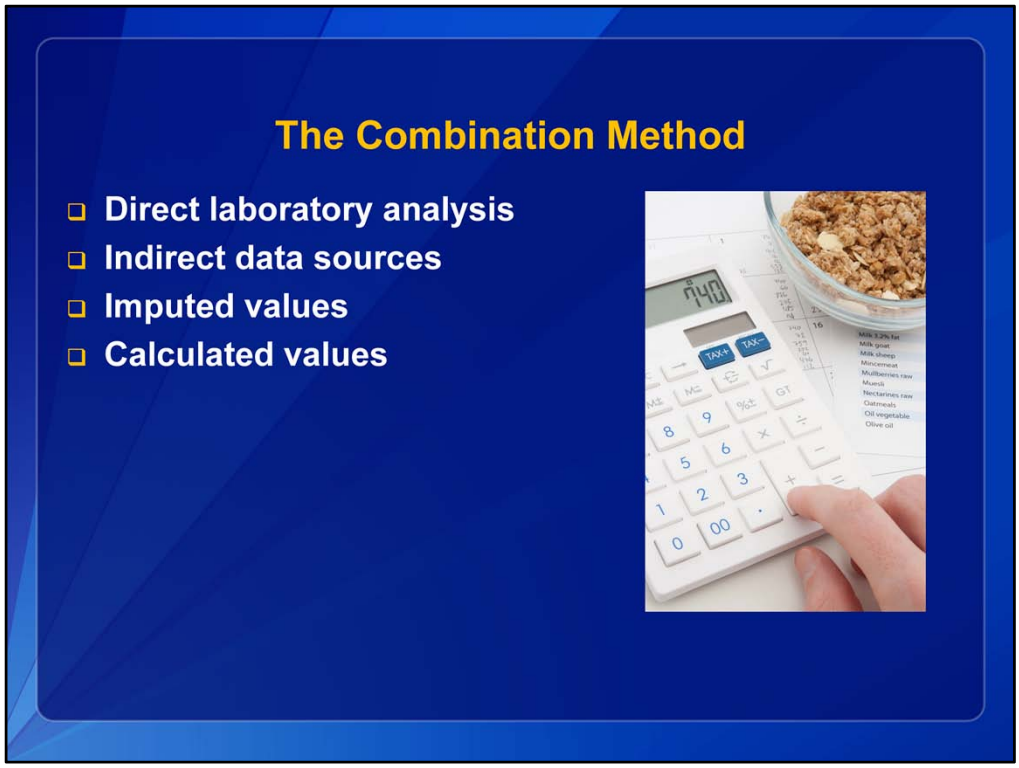
Although using data from another country may save resources, it is important to recognize that sodium and other nutrient levels may differ between countries. This variation is due in part to differences in geographic locations, national regulations on fortification and enrichment levels, and processing practices. For example, the same individual brand food product available worldwide may contain more or less sodium depending on the country or region in which it is sold.

Nutrient data also can be compiled from food labels and other industry-provided data. One advantage of using food labels is that you can link label information about sodium content to market share data using the Universal Product Code, or UPC. A UPC, as shown on this slide, is a series of vertical black bars on processed and packaged food products. However, because food labeling regulations vary by country, nutrient values for individual brand products may be limited or unavailable.[12]

Furthermore, some values on the product label may differ from the amount determined through laboratory analysis. For example, the United States has a 20 percent labeling allowance between the nutrition label value and the actual analytic value. This allowance means that the amount determined through laboratory analysis cannot be more than 20 percent above the value declared on the product label on the Nutrition Facts Panel.

For example, if a laboratory analysis found 420 milligrams of sodium per serving in a product that stated 320 milligrams of sodium per serving on the label, the ratio between the laboratory value and the label value would be 420 over 320, or 31 percent higher. The product label would be considered out of compliance.[13]

Lastly, nutrient data also can be compiled from food industry websites, at food industry trade shows and conferences, or from food industry representatives. Because data from indirect sources may be considered more as rough estimates than actual values, the combination method can be used to provide both analytic and estimated values.[2,4]

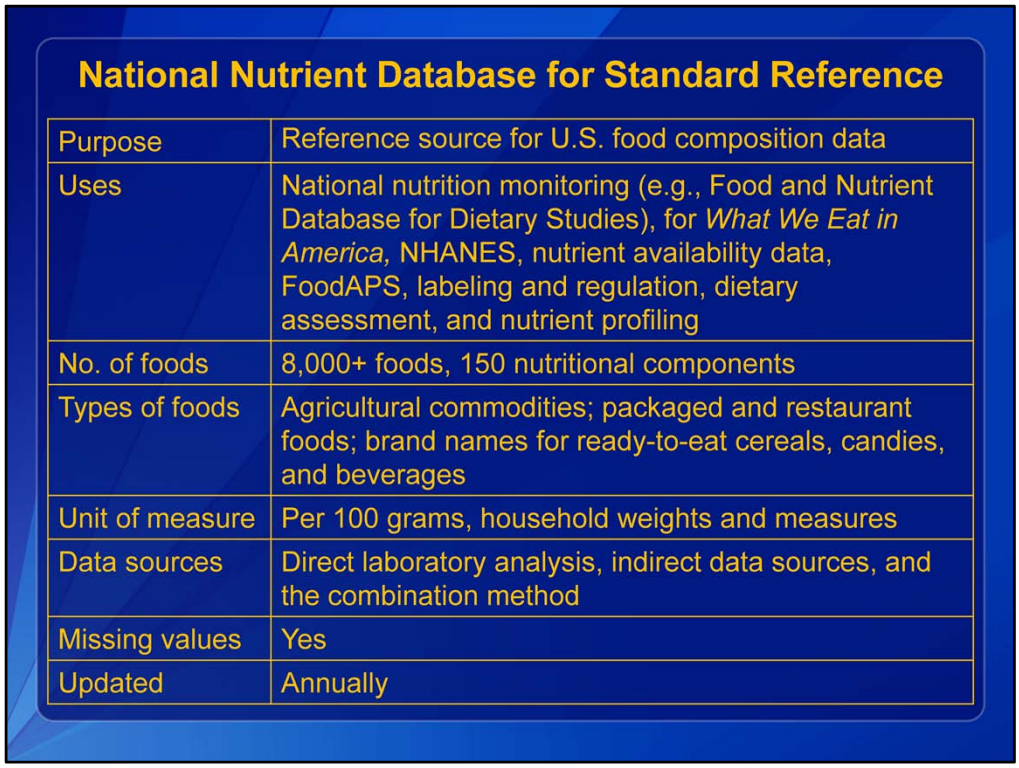


Many food composition databases contain nutrient values derived from a combination of direct and indirect methods.[2,14] In other words, a food composition database may contain analytical values, imputed and calculated values, as well as values taken from existing databases, scientific literature, and food labels.

Imputed values are derived from analytic values obtained from a similar food. For example, the nutrient value of bread can be used as an imputed value for a roll. You can also obtain imputed values by using another form of the same food. For example, nutrient values for steaming may be used if nutrient data for boiling are unavailable. However, these values need to be considered as rough estimates due to the nutrient changes from different preparation techniques.

When analytical data for cooked foods are unavailable, nutrient values can be calculated from uncooked food by applying cooking yields or nutrient retention factors.[15,16] Cooking yields describe changes in food weight due to moisture loss such as evaporation, water absorption such as boiling, or fat loss or gain during food preparation and cooking.[15] The U.S. Department of Agriculture defines retention as "the measure of the proportion of the nutrient remaining in the cooked food in relation to the nutrient originally present in the raw food."[16,17] Many public and private-sector databases, such as the Department of Agriculture's Nutrient Data Laboratory website, apply cooking yields or retention factors to food formulations and recipes as a way to convert nutrient values for uncooked foods or ingredients into values for cooked foods.[15,16]

There are different types of food composition databases, including national, regional, and packaged and restaurant food databases. The following slides provide examples of each type of database. We will begin at the national level.



The Department of Agriculture National Nutrient Database for Standard Reference, also known as "SR," is the primary reference source for food composition data in the United States.[3] SR also provides the foundation for most other databases, both clinical and research-related.

In addition, SR is used in national nutrition monitoring. For example, researchers used it to develop the Food and Nutrient Database for Dietary Studies. It also plays a part in food labeling and regulations and dietary assessment and nutrient profiling.

SR currently contains nutrient values for more than 8,000 food items, including agricultural commodities; packaged and restaurant foods; and brand names for ready-to-eat cereals, candies, and beverages. Nutrient values are compiled from analytic data; through contracts with universities; from the food industry, including food manufacturers, retailers, and restaurants; and from scientific journals and other data sources.

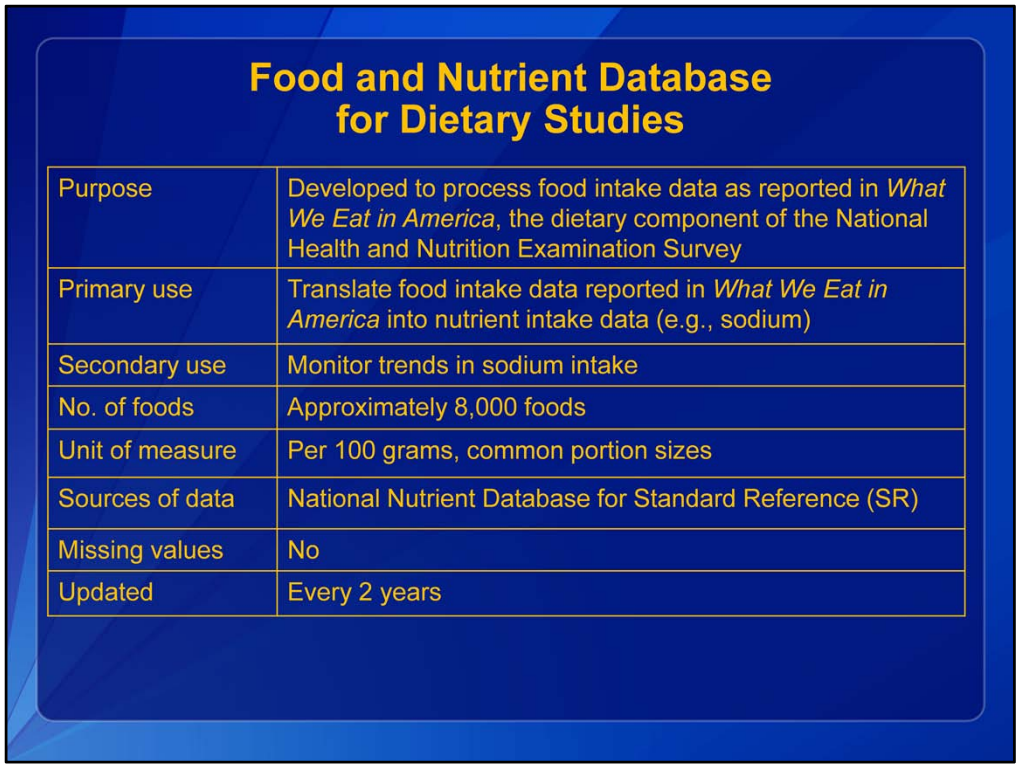
Due to changes in food reformulations, SR has limited or missing nutrient values for some foods. SR is available to search or download from the National Agricultural Library website.

National Nutrient Database for Standard Reference

Biscuit, plain or buttermilk, frozen, baked			
Nutrient	Unit	Per 100 grams	Small (35 grams)
Energy	kcal	365	128
Total fat	g	16.50	5.78
Carbohydrate	g	48.50	16.98
Protein	g	6.20	2.17
Sodium	mg	942	330

This table provides select nutrient values for a biscuit using SR. Values apply to a plain, buttermilk, frozen, or baked biscuit. According to these data, the biscuit contains approximately 365 kilocalories, 16.5 grams of fat, and 942 milligrams of sodium per 100 grams.

Data are also presented by serving size. A small biscuit weighs 35 grams and contains 330 milligrams of sodium. Thus, if an individual reported consuming a small biscuit, he or she consumed approximately 128 kilocalories and 330 milligrams of sodium.

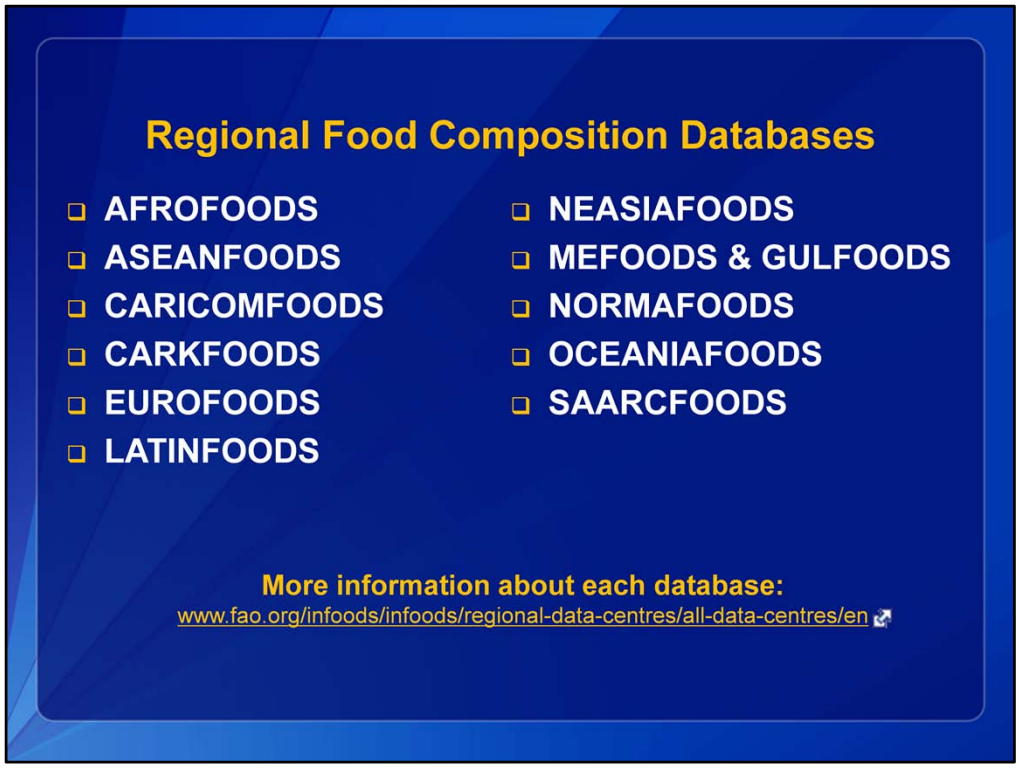


The purpose of the Food and Nutrient Database for Dietary Studies is to provide nutrient and other values for foods reported from 24-hour dietary recalls by participants in the What We Eat in America survey, the dietary intake component of the National Health and Nutrition Examination Survey.[3]

To estimate the nutrient value of each reported food, portion size and food descriptions from the 24-hour dietary recall are assigned unique codes. Each food code is assigned a nutrient value in one of two ways: matched directly to a food in the most recent version of SR—for example, a small biscuit—or estimated from nutrient values of several food codes in SR, such as mixed foods like beef goulash.

About 3,000 food codes in SR are used to establish nutrient values in database. Internet resources, direct contact with manufacturers, and market checks also can be used to help determine the composition of new foods not previously reported in dietary recalls.

Sodium intake for each participant from a 24-hour dietary recall is estimated by adding the sodium values from each reported food and beverage consumed. The database is updated every two years to correspond with the latest survey cycle. In 2005, data were used to create an online tool that provides nutrient values for approximately 13,000 foods and typical portion sizes.



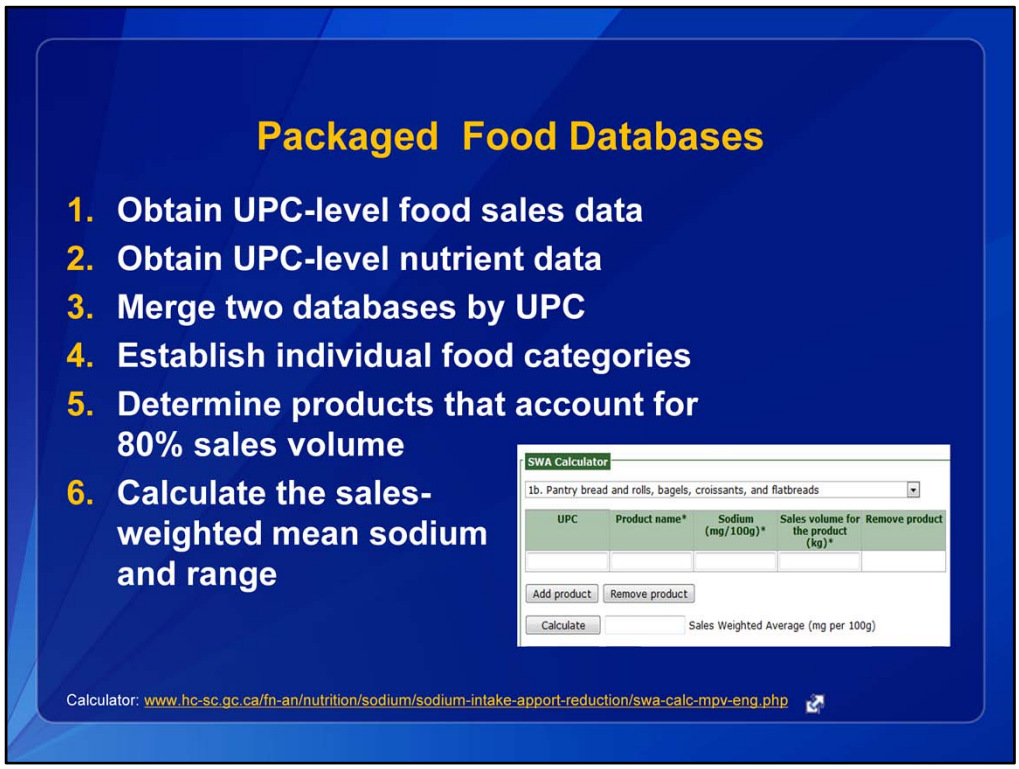
Regional food composition databases can be helpful, particularly for low- and middle-income countries that may lack the resources to develop their own national databases. Many of these databases are co-sponsored by the Food and Agriculture Organization of the United Nations and the University of the United Nations through a project called the international network of food data systems, or INFOODS. The INFOODS website provides additional information about regional food composition databases.

The LATINFOODS database is described next.

LATINFOODS is the regional Latin American network of INFOODS.[10] The database includes more than 6,100 foods specific to Latin America.[18]

In support of the Pan American Health Organization's Salt Reduction Initiative to control noncommunicable diseases, for which knowledge of food composition is essential, members of LATINFOODS have declared international policies on sodium reduction and completed a regional survey on sodium content in 14 processed and prepared food categories from Latin America. Although some information on sodium content was available in each category, members indicated that they needed more current and reliable data, particularly for convenience foods, snacks, and cereals. Members also indicated that they needed resources to purchase laboratory supplies and materials as well as technical training to conduct sodium analysis.[18,19]

Next, we will review how compositional data from food labels can be merged with market share data to identify the relative proportions of food products contributing to sodium intake.



In addition to using more standard food composition databases to monitor sodium, several groups have developed packaged food databases to allow for monitoring products at the individual-brand level, informed by sales volume.[20] These databases are typically created by merging market share data with nutrient data. Using the UPC as the merge point, these data can show the top-selling products by unit sales volume that contribute the most to sodium intake.

Several countries, including but not limited to the United Kingdom,[21] Canada,[22] and Australia[23] as well as New York City[24] have developed a database to monitor sodium in these foods. The methods for developing a database to monitor sodium content of these foods can vary depending on purpose, but in general, the following steps can be taken:

First, obtain UPC food sales data from a market research company or from a source that provides aggregated packaged food sales data from major retailers. Next, obtain UPC-level nutrient data, found on the nutrition label of packaged foods. Some companies provide aggregated data across multiple brands.

Merge the sales data with the nutrient data by UPC code. Next, establish individual food categories, such as bread; cheese; meats; cereals and other grain products; soups; and sauces, dips, gravies, and condiments.

Within food categories, determine the products that account for 80 percent or more of the market sales volume, and fill in missing nutrient data based on manufacturers' websites or other data sources.

Lastly, to assess individual food categories that account for differences in individual product sales as well as differences in contribution to population sodium intake, the sales-weighted mean and range of sodium are determined. The sales-weighted mean is often based on select food products with available nutrition information in the top 80 percent of sales in each food category.[20] This value is helpful because some products sell much more than others, and reducing sodium in popular selling items may contribute more to sodium reduction than in products with lower sales.

A sales-weighted mean can be determined by taking the sodium levels of the individual brand food products within a food category weighted by their sales volume market share in milligrams per 100 grams.[20]

Some countries have used the sales-weighted mean and range of sodium to establish sodium reduction targets and benchmarks for these foods.[21–24] Canada developed an online calculator to find the sales-weighted mean sodium of individual food products.[22]

Packaged Food Database: Australia

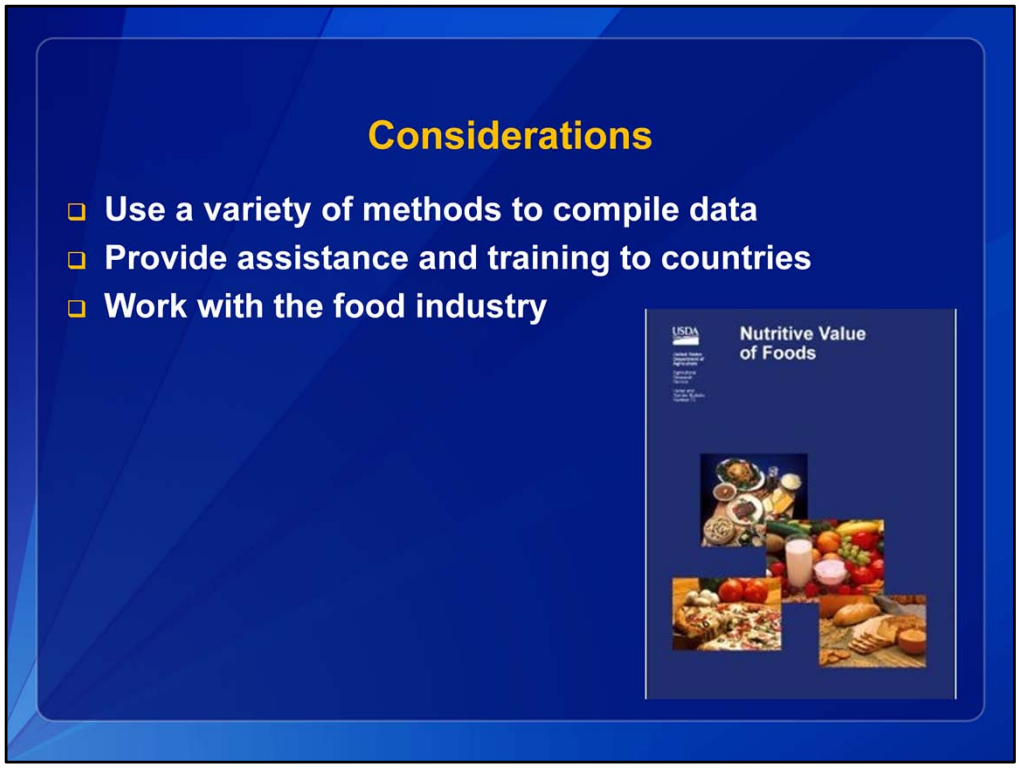
Sales-weighted mean and range of sodium

	No. of products	Market share covered (%)	Range (mg/100 g)	Mean (mg/100 g)
Food group: Bread and bakery products	—	—	0–2,900	467
Food category: Biscuit	—	—	0–1,770	477
Food subcategory:				
Sweet filled	89	> 70	70–258	194
Sweet, unfilled	209	> 70	11–640	285
Plain dry	118	> 80	0–1,310	562
Savory	187	> 80	120–1,770	771

Webster JL, Dunford E K, Neal BC. A systematic survey of the sodium contents of processed foods. Am J Clin Nutr. 2010;91:413–20.

In Australia, researchers estimated the sales-weighted mean and range of sodium for more than 7,000 products in 10 major food groups. The data revealed that bread and bakery products were among the food groups with the highest sales-weighted mean and range of sodium. However, the table shows a variation in the mean and range within and among food products that indicates product reformulations for lower sodium are not only feasible but are already an established practice.[23]

For more information about packaged food databases, please see the References document available for download.



A food composition database is a valuable tool for monitoring the sodium content in the food supply as well as for estimating intakes of nutrients and other dietary components. Countries can:

- Use a variety of methods to develop their own national food composition databases,
- Provide assistance and training to countries who may lack resources, and
- Work with the food industry to set sodium reduction targets for key foods that contribute the most to sodium intake.

The resources included here provide additional background about the food supply and sodium.

Top 10 Resources

6. Schakel SF, Buzzard IM, Gebhardt SE. Procedures for estimating nutrient values for food composition databases. J Food Comp Anal. 1998;10:102–14. www.nal.usda.gov/fnic/foodcomp/Data/Other/jfca10_102-114.pdf. Accessed February 4, 2013.
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8. World Health Organization and Pan American Health Organization. *A Review of Methods Used to Determine the Main Sources of Salt in the Diet.* Pan American Health Organization Web site. http://new.paho.org/hq/index.php?option=com_content&task=view&id=3072&Itemid=2376. Accessed February 4, 2013.
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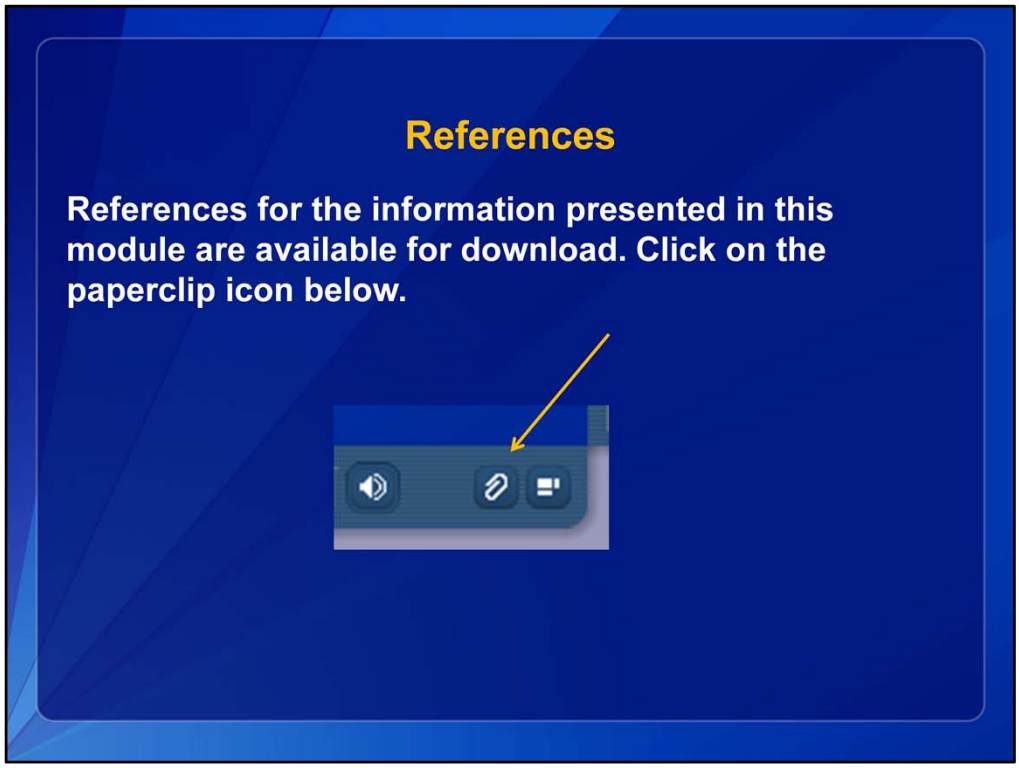
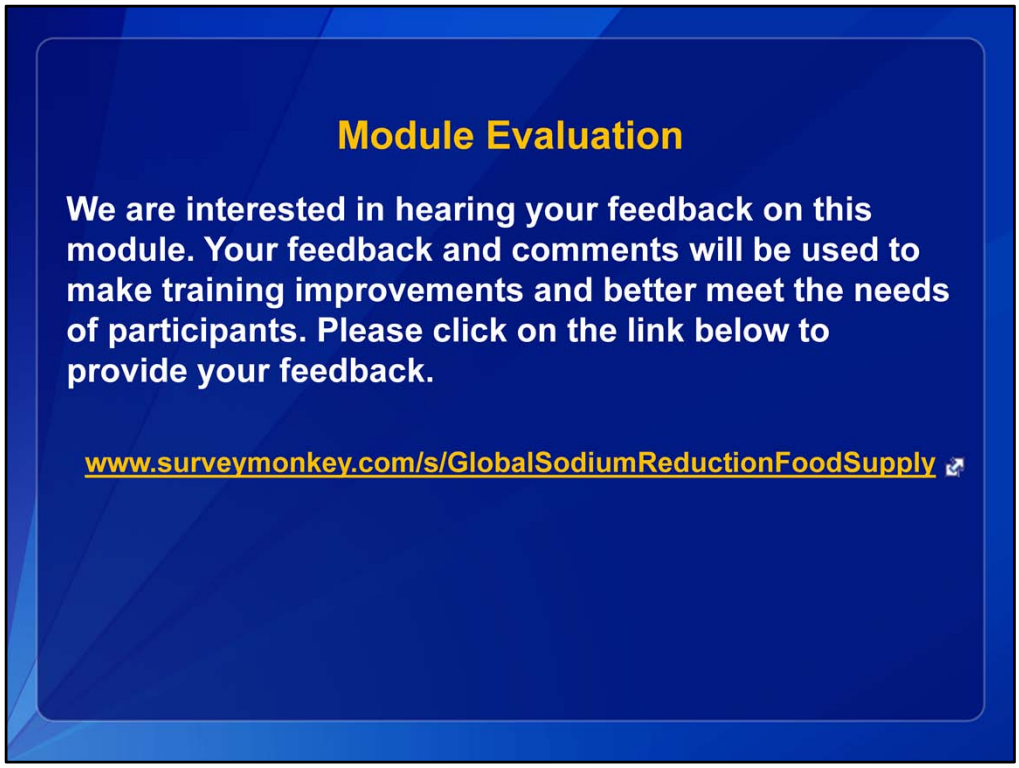


References for the information presented in this module are available for download. Click on the paperclip icon below.



This concludes the Food Supply module. Please review the other modules to learn more about strategies for reducing sodium intake in your country.

We are interested in hearing your feedback on this module. Your feedback and comments will be used to make training improvements and better meet the needs of participants. Please click on the link below to provide your feedback.

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