

HOW MUCH ADDED SUGARS CAN BE ACCOMMODATED IN A HEALTHY DIET WHILE STILL MEETING FOOD GROUP AND NUTRIENT NEEDS?

This document describes the protocol used to answer the following question: How much added sugars can be accommodated in a healthy diet while still meeting food group and nutrient needs?

The 2020 Dietary Guidelines Advisory Committee, Data Analysis and Food Pattern Modeling Cross-Cutting Working Group, answered this question with support from the federal food pattern modeling specialists of the data analysis team.

This document includes details about the methodology, as it was applied to the food pattern modeling as follows:

- The [analytic framework](#) (p. 1) describes the overall scope of the question and approach used to describe how much added sugars can be accommodated in a healthy diet while still meeting food group and nutrient needs.
- The [analytic plan](#) (p. 3) details the data and methods for the described food pattern modeling exercises
- The [results](#) (p. 4) explains how to access summarized and full documentation of the food pattern modeling analyses described in this protocol.

More information about food pattern modeling methods, which were used in implementing this food pattern modeling protocol, is available on the Dietary Guidelines for Americans website:

<https://www.dietaryguidelines.gov/2020-advisory-committee-report/food-pattern-modeling>

ANALYTIC FRAMEWORK

The analytic framework describes the overall scope of the food pattern modeling, including the population and type of analyses and data sources identified to answer the question. It also includes the definitions of key terms.

Question: How much added sugar can be accommodated in a healthy diet while still meeting food group and nutrient needs?

Food pattern modeling methodology for answering this question involves:

- Exercise 1. Estimating the number of the calories in the USDA Food Patterns that could be used for added sugars.
 - Exercise 2. Redistributing calories from top reported sources of added sugars to foods and beverages that achieve food group and nutrient goals.
 - Exercise 3. Estimating excess calories from added sugars when USDA Food Patterns are met with typical vs nutrient dense choices.
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Population:

The patterns tested in these food pattern modeling exercises are intended to apply to the U.S. population ages 2 years and older including women who are pregnant or lactating. Exceptions will be noted.

Data Sources:

FNDDS 2015-2016: U.S. Department of Agriculture, Agricultural Research Service. 2018. USDA Food and Nutrient Database for Dietary Studies 2015-2016. Food Surveys Research Group Home Page, <http://www.ars.usda.gov/nea/bhnrc/fsrg>

FPED 2015-2016: Bowman SA, Clemens JC, Shimizu M, Friday JE, and Moshfegh AJ. 2018. Food Patterns Equivalents Database 2015-2016: Methodology and User Guide [Online]. Food Surveys Research Group, Beltsville Human Nutrition Research Center, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland. September 2018. Available at: <http://www.ars.usda.gov/nea/bhnrc/fsrg>

SR 28: US Department of Agriculture, Agricultural Research Service. 2016. Nutrient Data Laboratory. USDA National Nutrient Database for Standard Reference, Release 28 (Slightly revised). Version Current: May 2016. <http://www.ars.usda.gov/nea/bhnrc/mafcl>

Key Definitions:

Food Groups and Subgroups - USDA Food Patterns provide amounts of five major food groups and subgroups including:

- Fruits
- Vegetables: Dark-green, red/orange, beans and peas, starchy, and other
- Dairy, including calcium fortified soy beverage
- Grains: Whole grains and refined grains
- Protein Foods: Meats, poultry, and eggs; seafood; nuts, seeds, and soy products*

*For the purpose of this exercise beans and peas will only be modeled in the vegetable group.

Nutrient Profiles - the anticipated nutrient content for each food group and subgroup that could be obtained by eating a variety of foods in each food group in nutrient dense forms. The nutrient profiles are based on a weighted average of nutrient dense forms of foods. The weighted average calculation considers a range of American food choices, but in nutrient dense forms and results in a food pattern that can be adapted to fit an individual's preferences.

Nutrient Dense Representative Foods - for the purpose of USDA's food pattern modeling, nutrient dense representative foods are those within each item cluster in forms with the least amounts of added sugars, sodium, and solid fats.

Typical Choice Representative Foods - for the purpose of USDA's food pattern modeling, typical choice representative foods are most frequently consumed within an item cluster of

foods and inclusive of any added sugars, solid fats, and/or sodium.

Added sugars – Added sugars that are either added during the processing of foods, or are packaged as such (e.g., a bag of sugar). Added sugars include sugars (free, mono- and disaccharides), sugars from syrups and honey, and sugars from concentrated fruit or vegetable juices that are in excess of what would be expected from the same volume of 100 percent fruit or vegetable juice of the same type (FDA, 2016). Naturally occurring sugars, such as those in fruit or milk, are not added sugars. Specific examples of added sugars that can be listed as an ingredient include brown sugar, corn sweetener, corn syrup, dextrose, fructose, glucose, high-fructose corn syrup, honey, invert sugar, lactose, malt syrup, maltose, molasses, raw sugar, sucrose, trehalose, and turbinado sugar.

ANALYTIC PLAN

Exercise 1. Estimating the number of calories in the USDA Food Patterns that could be used for intakes of added sugars

The base pattern was developed as described in the FPM protocol for testing updated and variations of the patterns for ages 2 and older. The overall food pattern modeling methodology described in that protocol included: (1) identifying appropriate energy levels for the patterns, (2) identifying nutritional goals for the patterns, (3) establishing food groupings, (4) determining the amounts of nutrients that would be obtained by consuming various foods within each group, and (5) evaluating nutrient levels in each pattern against nutritional goals.

Calories from all food groups and oils, termed “essential calories,” were then summed and the remaining calories were considered calories for other uses including additional nutrient dense foods from a food group, solid fats, added sugars, or alcohol. This amount of remaining calories aided in describing a limit for calories from solid fats and added sugars.

The calories from solid fats and added sugars were assigned based on the proportional intakes of solid fats and added sugars in the population, using the NCI analysis of usual intakes for WWEIA, NHANES 2013-16. This partitioning allowed for calculation of the amounts and proportions of fatty acids and carbohydrates in the overall patterns, and suggested limits for solid fats and added sugars intakes. The assigned calories for added sugars for each of the 12 patterns were reported using Nutrient Profiles for ages 2+, and for each life stage.

Exercise 2: Redistributing calories from top reported sources of added sugars to foods and beverages that achieve food group and nutrient goals

Reducing added sugar intake from current levels of consumption could provide an opportunity to increase intake of more nutrient dense foods that help meet the USDA Food Patterns as well as specific nutrient goals, especially in specific populations.

For this exercise, we demonstrated how a portion of calories from added sugars (approximately 70% of current calories from added sugars consumed) could be applied towards meeting food group recommendations and underconsumed nutrients.

- The following process was applied to each age-sex group:

Step 1. estimate the calories coming from the top sources of added sugars

Step 2. use current mean intakes of food groups to quantify the amount of each food group that is needed to meet the recommendations

Step 3. use the nutrient profiles for each food group to estimate how many calories would be needed to reach the food group or subgroup goal

Step 4. compare the estimated calories needed to meet food group goals to the estimated calories from added sugars obtained from the top sources

Step 5. identify food group and nutrient gaps that could be addressed by redistributing calories from sources of added sugars to food groups for each age-sex group.

EXERCISE 3: Estimating excess calories from added sugars when USDA Food Patterns met with typical vs nutrient dense choices

Reducing calories from added sugars helps to achieve energy balance while meeting food group and nutrient goals.

For this exercise, we estimated the additional calories from added sugars as well as solid fats that would be present if the USDA Food Patterns were met with typical vs nutrient dense foods. This demonstrated that if typical choices are made across food groups and subgroups, energy balance is no longer achieved.

The overall food pattern modeling methodology outlined in the protocol that described food pattern modeling for ages 2 and older included the following steps: (1) identifying appropriate energy levels for the patterns, (2) identifying nutritional goals for the patterns, (3) establishing food groupings, (4) determining the amounts of nutrients that would be obtained by consuming various foods within each group, and (5) evaluating nutrient levels in each pattern against nutritional goals.

This exercise modified step 4 in which the Nutrient Profile was developed. The anticipated nutrient content, or Nutrient Profile, of each food group was calculated using a *typical* rather than a *nutrient dense* representative food for each item cluster.

The total calories, calories from added sugars, and calories from solid fats between the nutrient dense and typical choice food group and subgroup nutrient profiles were compared.

RESULTS

The Advisory Committee's findings are summarized within Part D, Chapter 12 of the Scientific Report of the 2020 Dietary Guidelines Advisory Committee:

<https://www.dietaryguidelines.gov/2020-advisory-committee-report>

In addition, online-only supplements were prepared by the food pattern modeling team for the 2020 Dietary Guidelines Advisory Committee to support its review of the scientific evidence:

<https://www.dietaryguidelines.gov/2020-advisory-committee-report/food-pattern-modeling>