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Added sugars: Definition and estimation in the USDA Food Patterns Equivalents Databases[☆]

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ABSTRACT

The objective of this article is to define added sugars and to describe the methodology used to estimate the added sugars present in the foods and beverages found in What We Eat in America, National Health and Nutrition Examination Survey (WWEIA, NHANES), Food and Nutrient Database for Dietary Studies (FNDDS). The Food Patterns Equivalent Database (FPED) converts FNDDS foods and beverages to respective amounts of 37 USDA food patterns groups, of which added sugars is one. Added sugars are defined as caloric sweeteners that are added to foods as ingredients during food processing, during food preparation, or at the Table Sugars naturally present in milk and fruit are not added sugars, by definition. Added sugars are measured in teaspoon equivalents defined as 4.2 g of total sugars. The FNDDS SR Links file and food label information were used to identify and estimate amounts of added sugars. The FPED provide added sugars amounts per 100 g of each FNDDS foods and beverages. The FPED plays a vital role in nutrition monitoring and evaluating the American diet with respect to the Dietary Guidelines recommendations. Added sugars data can be used for nutrition education and food policy.

1. Introduction

Added sugars play an important role in the American diet. They are present in many beverages, bakery foods, dairy desserts, and candies, to name a few. On average, Americans, 2 years and over, consume 18.4 teaspoon equivalents (tsp. eq.) or 77.3 g of added sugars from foods and beverages each day (USDA-ARS, 2014a) as documented in the What We Eat in America, National Health and Nutrition Examination Survey (WWEIA, NHANES) 2011–12 (USDA and USDHHS, 2014). However, the mean intake reported above is a significant decrease from the 21.0 tsp. eq. reported in 2003–04 WWEIA, NHANES. Similarly, substantial and significant reductions were noted among adults 20+ years and children ages 2–5, 6–11, and 12–19 years from 2003 to 04 to 2011–12 (Bowman et al., 2016).

Added sugars are a source of energy, but limited in beneficial nutrients (USDHHS and USDA, 2015). Because of the high prevalence of overweight and obesity among persons of all ages and ethnicity, it is recommended individuals limit intakes of foods and beverages that are sources of calories, but provide little or no additional nutritional benefits. The Dietary Guidelines for Americans (DGA) 2005 (USDA and USDHHS, 2005) provided the first recommendation for added sugars by stating that Americans should choose and prepare foods and beverages with little added sugars or caloric sweeteners. The DGA 2010 (USDA

and USDHHS, 2010) recommended that Americans reduce their intake of calories from added sugars. For the first time, the DGA 2015–2020 (USDHHS and USDA, 2015) placed a quantitative recommendation on added sugar intake suggesting it not exceed 10% of total energy intake.

To control added sugar intake, it is important to know the foods and beverages that are appreciable sources of added sugars and how much added sugars are present in these foods and beverages. The Food Patterns Equivalents Database (FPED) have been developed for the WWEIA, NHANES foods and beverages and include data on 37 food patterns groups including added sugars (Bowman et al., 2013a, 2013b, 2014a, 2014b). The FPED data are based on per 100 g of each FNDDS food.

The FPED can be used to monitor and to identify foods and beverages that are sources of added sugars in American diet. The purpose of this article is to describe the methodology used in the estimation of added sugars in the FPED.

2. Materials and methods

2.1. Materials

The Food and Nutrition Database for Dietary Studies (FNDDS) used for WWEIA, NHANES 2011–12 includes ingredients, energy, and

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nutrient data for each of the 8000+ survey foods (USDA-ARS, 2014b). The FNDDS-SR Links file and total sugar values are used to identify and estimate added sugars in foods. Where details on the ingredients are not available in the FNDDS, food labels and restaurant websites are used to identify ingredients of the FNDDS foods.

2.2. Definition of added sugars

Added sugars are defined as sugars, syrups, or caloric sweeteners that are added to foods during food processing or food manufacturing: food preparation at home, restaurants or other food places: or added at the table (e.g., adding sugar to coffee or tea). Examples of foods that are defined as added sugars include all types of syrups, brown sugar, cane sugar, corn sweetener, dextrose, fructose, glucose, granulated sugar, high-fructose corn syrup, honey, invert sugar, lactose, malt syrup, maltose, molasses, raw sugar, sucrose, trehalose, and turbinado sugar. Additionally, fruit juice concentrates used in foods without further dilution are also considered as added sugars in the FPED. The foods that are defined as added sugars in the FPED are the same as those identified as added sugars by the U.S. Food and Drug Administration (USFDA, 2016).

There is also a definition for sugars that are not added sugars. These are sugars naturally present in dairy and fruit. Examples include lactose present in milk and fructose present in fruit and fruit juice. In FPED, these two sugars are not included in added sugars.

2.3. Unit of measurement

Added sugars are measured in teaspoon equivalents (tsp. eq.) One teaspoon equivalent of added sugars is defined as 4.2 g of sugar, the amount of total sugars present in one teaspoon of granulated sugar.

2.4. Estimation of added sugars per 100 g of food

The estimation of added sugars in the FPED is a two-step process: (1) Identification of ingredients that are defined as added sugars and (2) Computation of the amount of added sugars present per 100 g of foods (includes beverages).

In the first step, each ingredient of a food or beverage is classified as either (a) added sugars or (b) not added sugars, using the definition above. For example, the ingredients of a strawberry smoothie are listed below, and the classification of each ingredient into one of the two groups is shown.

Strawberries	– total sugars are naturally present sugars and not added sugars
Yogurt	– total sugars are naturally present sugars and not added sugars
Honey	– total sugars present are added sugars
Brown sugar	– total sugars present are added sugars
Ice cubes	– no total sugars and not added sugars

As seen above only honey and brown sugar are identified as added sugars and the sugars naturally present in strawberries and yogurt are not added sugars.

The FNDDS nutrient values are per 100 g of FNDDS foods (includes beverages). The total sugars values of FNDDS foods are used to compute the amount of added sugars present in foods. The gram amount of total sugars present 100 g of an added sugars ingredient is divided by 4.2 to convert it to tsp. eq. of added sugars per 100 g of food.

2.4.1. Where total sugars equal added sugars in a food or beverage

In some foods, all of the total sugars present are solely from ingredients that are defined as added sugars. Such foods and beverages can contain either single or multi ingredients. In such case, the percent

Table 1

Selected list of foods where the only ingredient present is defined as added sugars.

Food	Percent total sugars	Added sugars (tsp.eq.)
Granulated sugar	99.8	23.8
Honey	82.1	19.5
Maple syrup	60.5	14.4

Table 2

Selected multi-ingredient foods where total sugars come only from ingredients that are added sugars.

Beverage	Percent total sugars	Added sugars (tsp.eq.)
Sweetened green tea	5.5	1.3
Carbonated root beer	10.6	2.5
Soft drink, cola type	9.0	2.1
Stinger	22.7	5.4

total sugars value of the food or beverages is divided by 4.2 to convert it to number of tsp. eq. (Tables 1 and 2)

2.4.2. Where total sugars are composed of added sugars and sugars naturally present in foods

Many multi-ingredient foods such as muffins, cakes, cookies, fruit smoothies, pies, ice cream, and ready-to-eat cereals may contain ingredients that are added sugars in addition to fruit, fruit, juice, and dairy that contain naturally present sugars. Here, food recipes are used to compute the amount of added sugars present in 100 g of food. Computation of added sugars present in carrot muffin is shown in Table 3.

2.4.3. Where unsweetened version of the same food is available

Fruits canned in light or heavy syrups contain both added sugars and natural sugars. The added sugars come from the syrup and the natural sugars come from the fruit. To estimate the added sugars portion, total sugars value of the same fruit canned in water is needed, because this canned fruit contains only naturally present sugars and no added sugars. The added sugar from the syrup are computed by subtracting total sugars values of fruit canned in water from that canned in different types of syrup (Table 4). The same principle is used to compute added sugars in honey roasted peanuts by subtracting the total sugars value of plain dry roasted peanuts (Table 5).

2.4.4. Assumptions made in fruit nectars and fruit juice drinks

Due to a wide variability in the amount of fruit pulp present in fruit nectars, the fruit nectars are assumed to contain 40% fruit juice. The added sugars present in fruit nectars are computed by subtracting the amounts of sugars naturally present in the unsweetened fruit pulp from the total sugars values of fruit nectars.

Table 3

Added sugars estimation in carrot muffin.^a

Ingredient	Amount need to prepare 100 g of muffin (g)	Total sugars from ingredient (g)	Added sugars (tsp.eq.)
Wheat flour	25	0.0	0
Vegetable oil	11	0.0	0
Carrots	22	1.0 ^b	0
Milk	25	1.2 ^b	0
Brown sugar	15	14.3	3.4
Granulated sugars	6.7	6.7	1.6

^a Selected ingredients are listed. Amounts rounded. 14% moisture lost in cooking. Total added sugars = 5.0 tsp. eq.

^b Not added sugars.

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