

What are the implications for nutrient intakes when modifying the Fruits food group quantities within the Healthy U.S.-Style Dietary Pattern?: Food Pattern Modeling Report

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Overview

Food pattern modeling (FPM) is a methodology used to

- illustrate how hypothetical changes to the amounts or types of foods and beverages in a dietary pattern might affect meeting nutrient needs
- assist in defining quantitative dietary patterns that reflect the evidence for health-promoting diets synthesized from systematic reviews, while meeting energy and nutrient needs

This report describes the results for food pattern modeling (FPM) analyses conducted by the 2025 Dietary Guidelines Advisory Committee, supported by USDA's food pattern modeling team, to answer the following question: What are the implications for nutrient intakes when modifying the Fruit food group and subgroup quantities within the Healthy U.S.-Style (HUSS) Dietary Pattern?

Food Pattern Modeling Analytic Process – In Brief

Below are abbreviated summaries of the methods applied to conduct these FPM analyses. For full details pertaining to how these methods were operationalized, please see the *Should foods and beverages with lower nutrient density (i.e., those with added sugars, saturated fat, and sodium) contribute to item clusters, representative foods, and therefore the nutrient profiles for each food group and subgroup used in modeling the USDA Dietary Patterns? Food Pattern Modeling Report* (which will be referenced as the **Basis Nutrient Profiles FPM Report** throughout the following report).



Before progressing in the following report, it is recommended to review the methods applied in the Basis Nutrient Profiles FPM Report, visit:

<https://www.DietaryGuidelines.gov/2025-advisory-committee-report/food-pattern-modeling>

Step 1: Establish energy levels

Dietary Reference Intakes (DRI) formulas are used to calculate Estimated Energy Requirements (EER) for each age and sex group and for three age groups specific to pregnancy and lactation (14-18 years, 19-30 years and 31-50 years)¹. Each EER calculation is based on sex, age, height, weight, level of physical activity, and life stage and, during pregnancy, gestational weeks. For individuals ages 19 years and older, the established energy levels for FPM analyses utilized the EER calculate on specific to inactive individuals at the median height and a normal weight (BMI 22.5 for males, BMI 21.5 for females) for each age and sex group, rounded to the nearest 200 kcal level. For children and adolescents ages 2-18 years, median height and the 50th percentile BMI-for-age were used, with the EER rounded to the nearest 200 kcal level. For young children ages 12 up to 24 months, EERs from the DRI report using median weight and length were used and rounded to the nearest 100 kcal level. The corresponding calories were then used to evaluate the patterns against nutritional goals.

Step 2: Establish nutritional goals

Specific nutritional goal quantities for a dietary pattern are set according to energy level and based on the DRI specific to the age and sex group(s) for which the pattern is designed. For individual FPM analyses, the assigned energy level for each age and sex group and life stage will be tested against the established nutritional goals (hereafter referred to as 'goals') for that age and sex group or life stage. Dietary patterns are evaluated against goals for total energy, fat, protein, carbohydrates, 3 fatty acids, 12 vitamins, 8 minerals, added sugars and fiber are based on DRI reports released between 1997 and 2023 and on quantitative recommendations in the *Dietary Guidelines for Americans, 2020-2025*.

Step 3: Establish food groupings and amounts

Existing food groups and subgroups in the USDA HUSS Dietary Pattern for age 12 through 23 months and age 2 years and older (published in the *Dietary Guidelines for Americans, 2020-2025*) were used in these analyses. The existing HUSS pattern served two purposes in the following analyses: (1) as a reference and/or (2) as the starting point in analyses that investigate implications to nutritional goals when quantities of food groups and/or subgroups are increased or reduced.

Step 4: Determine the amounts of nutrients that would be obtained by consuming various foods within each food group and subgroup

A composite system is used to calculate the anticipated energy and nutrient content, or nutrient profile, of each food group or subgroup as described below. All foods reported by individuals ages 1 year and older as part of What We Eat in America, National Health and Nutrition Examination Survey 2017-2018 (WWEIA, NHANES 2017-2018) are disaggregated into their ingredients. Some foods and beverages that are lower in nutrient density are excluded from the set of foods used to calculate nutrient profiles. Similar ingredients are aggregated into food item clusters. A nutrient-dense form of the food is selected as the representative food for each item cluster. The proportional intake of each item cluster within each food group or subgroup is calculated and used to compute a weighted average of nutrient-dense forms of foods representing each food item cluster.

Step 5: Evaluate the implications for meeting nutritional goals when modifying the Fruits food group quantities within the Healthy U.S.-Style Dietary Pattern

The Fruits protocol investigated the nutrient contribution of Fruits to the 2020 HUSS pattern, and the implications to nutrient goals when the quantity of Fruits in the pattern is incrementally reduced to 0 cup eq per day. The remaining analyses required the development of two nutrient profiles from the Fruit food group to represent a whole fruit subgroup and a fruit juice subgroup. The whole fruit and fruit juice subgroups were individually increased and decreased to assess the implications of consuming more whole fruit and less fruit juice and vice versa. The Fruit subgroup analyses started with 50 percent of the Fruit food group recommended intake quantity represented by whole fruit and the remaining 50 percent from fruit juice. For young children ages 12 through 23 months and children ages 2 through 8 years, incremental reductions and increases by $\frac{1}{4}$ cup eq per day in Fruit subgroups were modeled. For individuals ages 9 years and older, incremental reductions and increases by $\frac{1}{2}$ cup eq per day in Fruit subgroups were modeled.



For additional details about the Committee’s rationale for these analyses and how they contribute to the synthesis statements, visit:

Fruits FPM Protocol: https://www.dietaryguidelines.gov/sites/default/files/2024-06/2025_DGAC_FPM_Q2_Protocol_Fruit_v2_508c.pdf

Step 6: Iteration and re-evaluation of the patterns to align with current or potential recommendations

The Committee used a stepwise, iterative approach to adjust and re-evaluate the dietary patterns based on findings from systematic reviews, data analysis, or FPM analyses, and to examine flexibilities within the patterns.

After identifying the implications of the defined 2025-2030 nutrient profiles and their comparison to the nutrient profiles calculated with existing methods, the Committee may use a stepwise, iterative approach to make adjustments. This may result in testing a different set of defined population groups and re-evaluation of the resulting nutrient profiles.

Fruits Methods and Results



Fruits

What's included? The Fruits food group in the 2020 USDA Dietary Patterns includes all fresh, frozen, canned, and dried fruits and 100% fruit juices: for example, apples, Asian pears, bananas, berries, citrus fruit, cherries, dates, figs, grapes, guava, jackfruit, lychee, mangoes, melons, nectarines, papaya, peaches, pears, persimmons, pineapple, plums, pomegranates, raisins, rhubarb, sapote, and soursop.

How much? The 2020 USDA Dietary Patterns recommend between $\frac{1}{2}$ to 1 cup equivalents (cup eq) for of Fruits each day for young children ages 12 through 23 months and between 1 to 3 cup eq of Fruits each day for individuals 2 years and older. The Dietary Guidelines for Americans, 2020-2025 recommend that at least half of Total Fruit should be Whole Fruit.

What counts? The Food Pattern Equivalents Database (FPED) converts all foods and beverages in FNDDS into USDA Dietary Pattern components. FPED shows that 1 cup eq of Fruits equates to approximately 1 cup of raw or cooked fruit, 1 cup of fruit juice, and $\frac{1}{2}$ cup of dried fruit.

Question

What are the implications for nutrient intakes when modifying the Fruits food group quantities within the Healthy U.S.-Style Dietary Pattern?

Objectives

The following report contains the FPM objectives, methods, and results for the Fruits analyses. These analyses focused on 3 objectives:

Objective 1: Identify the nutritional composition and contribution of the Fruits food group in current dietary intakes, relative to the 2020 HUSS Dietary Pattern goals for ages 12 through 23 months and ages 2 years and older.

Objective 2: Evaluate nutrient intake implications when the quantity of the Fruits food group in the patterns is reduced by $\frac{1}{4}$ cup equivalents (cup eq) for lower calorie levels in the Dietary Patterns for ages 12 months to 23 months (700, 800, 900, and 1,000 calories) and ages 2 years and older (1,000, 1,200, and 1,400 calories). Increments of $\frac{1}{2}$ cup eq will be used for the higher calorie levels in the Dietary Pattern intended for ages 2 years and older (1,600–3,200 calories).

Objective 3: Evaluate implications on meeting nutritional goals by modifying the proportions of foods (i.e., Whole Fruits and 100% Fruit Juice) by creating and modeling various proportions of draft subgroups within the Fruits food group. The process will model various draft subgroup proportions to represent potential variations of consumption. Models will examine current intake proportions (roughly $\frac{1}{2}$ Whole Fruit; $\frac{1}{2}$ Fruit Juice) and proportions in $\frac{1}{4}$ cup eq increments using draft subgroups.



All data and results presented in this report can be found in the Fruits FPM Analyses at the following link:

<https://www.dietaryguidelines.gov/2025-advisory-committee-report/food-pattern-modeling>

Results reflect the assumptions underlying the nutrient profiles for each food group and subgroup. For consistency, all results are presented to the nearest decimal.

Objective 1

Identify the nutritional composition and contribution of the Vegetables food group and subgroups in the 2020 HUSS pattern, relative to the nutritional goals for ages 12 months and older.

Objective 1: Methods

Using the 2025-2030 nutrient profiles that apply to young children ages 12 to 23 months and the population of individuals ages 2 years and older, the nutrients provided by amounts recommended in the *Dietary Guidelines for Americans, 2020-2025* from each food group (and oils) are compared to the age, sex, and life stage-specific goals (usually at least 90 percent of the RDA or AI).

The percent contribution of a food group to the total amount of a nutrient in the food pattern was calculated using the following equation:

Equation 1: Percent contribution of a food group to the total amount of a nutrient in the food pattern

$$Y_{i,f} = \frac{q_f \times n_{i,f}}{\sum_{k=1}^u q_k \times n_{i,k}} \times 100$$

Where $Y_{i,f}$ is the percent contribution of food group $f \in F$, where F is the set of food groups in the pattern, to the total amount of nutrient $i \in N$, where N is the set of nutrients included in the analyses, q_f is the quantity of food group f in the food pattern (in cup eq, oz eq, or grams), and $n_{i,f}$ is the amount of nutrient i in food group f per cup eq, oz eq, or grams, and where k is the index and u represents the total food groups (or subgroups) in the pattern.

As an example, the total amount of vitamin C from the Fruits food group in the 2,200 calorie pattern (2 cup eq per day of Fruits) provides approximately 71.4 mg. In the 2020 HUSS Dietary Pattern, the pattern (including all food groups and subgroups) provides approximately 149.5 mg of vitamin C. The Fruit food group contributes approximately 47.8 percent of the total vitamin C content in the 2020 HUSS Dietary Pattern for the 2,200 calorie pattern.

Objective 1: Results

Table 1. Percent of total nutrient contribution from the Fruits food group in the 2020 Healthy U.S.-Style (HUSS) dietary pattern as a range of estimates across calorie levels for ages 12 through 23 months and 2 years and older.

Nutrient	Range of contribution (%) in HUSS pattern ages 12-23 months	Range of contribution (%) in HUSS pattern ages 2 years and older
Energy (kcal)	7-11	9-12
Carbohydrate (g)	18-25 [^]	17-23 [^]
Added Sugars (g)	26-32 [^]	19-26 [^]
Fiber (g)	15-21 [^]	14-21 [^]
Protein (g)	≤2	≤2
Fat (g)	≤1	≤1
Saturated Fatty Acids (g)	≤1	≤1
Linoleic acid (18:2) (g)	≤1	≤1
Linolenic acid (18:3) (g)	≤4	≤3
Vitamin A (mcg RAE)	≤4	≤5
Vitamin C (mg)	48-57 [^]	44-57 [^]
Vitamin D (IU)	<1	<1
Vitamin E (mg AT)	5-9	6-8
Vitamin K (mcg)	3-6	3-6
Thiamin (mg)	7-10	6-9
Riboflavin (mg)	4-7	5-8
Niacin (mg)	4-6	≤5
Vitamin B6 (mg)	10-16	11-15
Folate (mcg DFE)	6-10	6-9
Vitamin B12 (mcg)	<1	<1
Choline (mg)	3-6	5-6
Calcium (mg)	≤3	≤4
Copper (mg)	10-15	10-14
Iron (mg)	4-6	4-6
Magnesium (mg)	7-11	8-11
Phosphorus (mg)	≤3	≤3
Potassium (mg)	13-18 [^]	14-18 [^]
Sodium (mg)	≤1	≤1
Zinc (mg)	≤2	≤3

[^] Fruits food group contributes more than 15 percent of the total amount of these nutrients in the 2020 HUSS for at least half of the calorie levels.

Young Children ages 12 through 23 months and Individuals ages 2 years and older

The Fruits food group contributes 15 percent or more of the total nutrient content of the HUSS dietary patterns for ages 2 and older in at least half of the calorie levels from 1,000 kcal to 3,200 kcal (i.e., in at least 8 out of the 15 calorie levels for the following nutrients: carbohydrates, added sugars, fiber, vitamin C, and potassium (**Table 1**)). Fruit has a similar contribution for children ages 12 through 23 months (in at least two of the four calorie levels in the HUSS pattern).

Objective 2

Evaluate nutrient intake implications when the quantity of the Fruits food group in the patterns is reduced by ¼ cup equivalents (cup eq) for lower calorie levels in the Dietary Patterns for ages 12 months to 23 months (700, 800, 900, and 1,000 calories) and ages 2 years and older (1,000, 1,200, and 1,400 calories). Increments of ½ cup eq will be used for the higher calorie levels in the Dietary Pattern intended for ages 2 years and older (1,600–3,200 calories).

Objective 2: Methods

Using the 2025-2030 nutrient profiles that apply to children ages 12 through 23 months and the population 2 years and older (**reference Basis Nutrient Profiles FPM Report**), the nutrients provided by the amounts recommended in the *Dietary Guidelines for Americans, 2020-2025* from each food group (to include oils) are compared to the age, sex, and life stage-specific goals, which are defined as meeting at least 90 percent of the RDA or AI.

Starting with the 2025-2030 HUSS dietary pattern quantities (**reference Basis Nutrient Profiles FPM Report**), incremental reductions to zero by ¼ cup eq were performed to the Fruit food group.

Objective 2: Results

Young Children ages 12 through 23 months

For all calorie levels applied to individuals ages 12 through 23 months, vitamins D and E did not change by >5 percentage points when Fruit was removed from the pattern.

In the 2020 HUSS pattern for **700 calorie level**

- This pattern provides 66.2 g of carbohydrate, which is below goals at 51 percent of the RDA. When the Fruits food group is removed from the pattern, carbohydrate falls to 54 g, which is 42 percent of the RDA.
- This pattern provides 8.1 g of fiber, which is 101 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 0.5 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 6.9 g, which is 86 percent of the fiber goal for fiber.
- This pattern provides 6.2 g of linoleic acid, which is below goals at 89 percent of the AI. When the Fruits food group is removed from the pattern, linoleic acid remains at 88 percent of the AI.
- This pattern provides 147.4 mg of choline, which is below goals at 74 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 142.6 mg, which is 71 percent of the AI.
- This pattern provides 612.4 mg of calcium, which is below goals at 87 percent of the RDA. When the Fruits food group is removed from the pattern, calcium falls to 602 mg, which is 86 percent of the RDA.
- This pattern provides 4.8 mg of iron, which is below goals at 68 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 4.6 mg, which is 66 percent of the RDA.
- This pattern provides 1,178 mg of potassium, which is below goals at 59 percent of the AI. When the Fruits food group is removed from the pattern, potassium falls to 1,029.5 mg, which is 51 percent of the AI.
- This pattern provides 742.2 mg of sodium, which is below goals at 62 percent of the CDRR. When the Fruits food group is removed from the pattern, sodium falls to 739 mg, which is 62 percent of the CDRR.

In the 2020 HUSS pattern for **800 calorie level**

- This pattern provides 82.6 g of carbohydrate, which is below goals at 64 percent of the RDA. When the Fruits food group is removed from the pattern, carbohydrate falls to 64.3 g, which is 49 percent of the RDA.
- The pattern provides 9.5 g of fiber, which is 103 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 0.8 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 7.7 g, which is 84 percent of the fiber goal for fiber.
- The pattern provides 161.9 mg of choline, which is below goals at 81 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 154.7 mg, which is 77 percent of the AI.
- The pattern provides 5.4 mg of iron, which is below goals at 77 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 5.1 mg, which is 73 percent of the RDA.
- The pattern provides 1,347.5 mg of potassium, which is below goals at 67 percent of the AI. When the Fruits food group is removed from the pattern, potassium falls to 1,124.8 mg, which is 56 percent of the AI.
- The pattern provides 814.3 mg of sodium, which is below goals at 68 percent of the CDRR. When the Fruits food group is removed from the pattern, sodium falls to 809.5 mg, which is 67 percent of the CDRR.

In the 2020 HUSS pattern for **900 calorie level**

- This pattern provides 99.4 g of carbohydrate, which is below goals at 76 percent of the RDA. When the Fruits food group is removed from the pattern, carbohydrate falls to 75.1 g, which is 58 percent of the RDA.
- This pattern provides 11.3 g of fiber, which is 109 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 9 g, which is 87 percent of the fiber goal for fiber.
- This pattern provides 169.4 mg of choline, which is below goals at 85 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 159.8 mg, which is 80 percent of the AI.
- This pattern provides 6 mg of iron, which is below goals at 85 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 5.6 mg, which is 80 percent of the RDA.
- This pattern provides 1,617.8 mg of potassium, which is below goals at 81 percent of the AI. When the Fruits food group is removed from the pattern, potassium falls to 1,320.9 mg, which is 66 percent of the AI.
- This pattern provides 919.5 mg of sodium, which is below goals at 77 percent of the CDRR. When the Fruits food group is removed from the pattern, sodium falls to 913.2 mg, which is 76 percent of the CDRR.

In the 2020 HUSS pattern for the **1,000 calorie level**

- This pattern provides 107.1 g of carbohydrate, which is below goals at 82 percent of the RDA. When the Fruits food group is removed from the pattern, carbohydrate falls to 82.8 g, which is 64 percent of the RDA.
- This pattern provides 11.7 g of fiber, which is 102 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.4 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 9.3 g, which is 81 percent of the fiber goal for fiber.
- This pattern provides 173.8 mg of choline, which is below goals at 87 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 164.2 mg, which is 82 percent of the AI.
- This pattern provides 6.5 mg of iron, which is 93 percent of the RDA. The amount of iron falls below goals when the Fruits food group is reduced to less than 0.4 cup eq per day from 1 cup eq per day. When the

Fruits food group is completely removed from the pattern, the pattern provides 6.2 mg, which is 88 percent of the RDA for iron.

- This pattern provides 1,646.1 mg of potassium, which is below goals at 82 percent of the AI. When the Fruits food group is removed from the pattern, potassium falls to 1,349.1 mg, which is 67 percent of the AI.
- This pattern provides 985.7 mg of sodium, which is below goals at 82 percent of the CDRR. When the Fruits food group is removed from the pattern, sodium falls to 979.3 mg, which is 82 percent of the CDRR.

Individuals ages 2 years and older

For all calorie levels applied to individuals ages 12 through 23 months, vitamins D and E did not change by >5 percentage points when Fruit was removed from the pattern.

In the 2020 HUSS pattern for **children ages 2 through 3 years (1,200 calorie level)**

- This pattern provides 135.9 g of carbohydrate, which is 105 percent of the RDA. The amount of carbohydrate falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 111.6 g, which is 86 percent of the RDA for carbohydrate.
- This pattern provides 14.5 g of fiber, which is 105 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 12.1 g, which is 88 percent of the fiber goal for fiber.

In the 2020 HUSS pattern for **children ages 4 through 8 years (1,200 calorie level)**,

- This pattern provides 135.9 g of carbohydrate, which is 105 percent of the RDA. The amount of carbohydrate falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 111.6 g, which is 86 percent of the RDA for carbohydrate.
- This pattern provides 14.5 g of fiber, which is 105 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 12.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 211 mg of choline, which is below goals at 84 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 201.3 mg, which is 81 percent of the AI.
- This pattern provides 2,147.2 mg of potassium, which is 93 percent of the AI. The amount of potassium falls below goals when the Fruits food group is reduced to less than 0.7 cup eq per day from 1 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 1,850.2 mg, which is 80 percent of the AI for potassium.

In the 2020 HUSS pattern for **females ages 9 through 13 years (1,800 calorie level)**

- This pattern provides 319.6 mg of choline, which is below goals at 85 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 305.1 mg, which is 81 percent of the AI.

In the 2020 HUSS pattern for **females ages 14 through 18 years (2,000 calorie level)**

- This pattern provides 24.9 g of fiber, which is 108 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 20.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 338.8 mg of choline, which is below goals at 85 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 319.5 mg, which is 80 percent of the AI.
- This pattern provides 13.7 mg of iron, which is 92 percent of the RDA. The amount of iron falls below goals when the Fruits food group is reduced to less than 1.4 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 13 mg, which is 87 percent of the RDA for iron.
- This pattern provides 360.3 mg of magnesium, which is 100 percent of the RDA. The amount of magnesium falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 321.3 mg, which is 89 percent of the RDA for magnesium.

In the 2020 HUSS pattern for **females ages 19 through 30 years (2,000 calorie level)**

- This pattern provides 24.9 g of fiber, which is 108 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 20.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 137.1 mg of vitamin C, which is 183 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 65.7 mg, which is 88 percent of the RDA for vitamin C.
- This pattern provides 338.8 mg of choline, which is below goals at 80 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 319.5 mg, which is 75 percent of the AI.
- This pattern provides 13.7 mg of iron, which is below goals at 76 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 13 mg, which is 72 percent of the RDA.

In the 2020 HUSS pattern for **females ages 31 through 50 years (1,800 calorie level)**

- This pattern provides 119.2 mg of vitamin C, which is 159 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 1.5 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 65.7 mg, which is 88 percent of the RDA for vitamin C.
- This pattern provides 319.6 mg of choline, which is below goals at 75 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 305.1 mg, which is 72 percent of the AI.

In the 2020 HUSS pattern for **females ages 51 through 70 years (1,600 calorie level)**

- This pattern provides 108 mg of vitamin C, which is 144 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.4 cup eq per day from 1.5 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 54.4 mg, which is 73 percent of the RDA for vitamin C.

- This pattern provides 7.6 mg of vitamin E, which is below goals at 51 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 7.1 mg, which is 48 percent of the RDA.
- This pattern provides 303.2 mg of choline, which is below goals at 71 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 288.7 mg, which is 68 percent of the AI.

In the 2020 HUSS pattern for **males ages 9 through 13 years (2,000 calorie level)**

- This pattern provides 24.9 g of fiber, which is 108 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 20.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 338.8 mg of choline, which is 90 percent of the AI. The amount of choline falls below goals when the Fruits food group is reduced to less than 1.9 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 319.5 mg, which is 85 percent of the AI for choline.

In the 2020 HUSS pattern for **males ages 14 through 18 years (2,600 calorie level)**

- This pattern provides 11.7 mg of vitamin E, which is below goals at 78 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 11.1 mg, which is 74 percent of the RDA.
- This pattern provides 408.9 mg of choline, which is below goals at 74 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 389.5 mg, which is 71 percent of the AI.

In the 2020 HUSS pattern for **males ages 19 through 30 years (2,600 calorie level)**

- This pattern provides 11.7 mg of vitamin E, which is below goals at 78 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 11.1 mg, which is 74 percent of the RDA.
- This pattern provides 408.9 mg of choline, which is below goals at 74 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 389.5 mg, which is 71 percent of the AI.

In the 2020 HUSS pattern for **males ages 31 through 50 years (2,200 calorie level)**

- This pattern provides 149.5 mg of vitamin C, which is 166 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 78.1 mg, which is 87 percent of the RDA for vitamin C.
- This pattern provides 10.1 mg of vitamin E, which is below goals at 68 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 9.5 mg, which is 63 percent of the RDA.
- This pattern provides 371.2 mg of choline, which is below goals at 67 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 351.9 mg, which is 64 percent of the AI.
- This pattern provides 403.1 mg of magnesium, which is 96 percent of the RDA. The amount of magnesium falls below goals when the Fruits food group is reduced to less than 0.7 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 364.1 mg, which is 87 percent of the RDA for magnesium.

In the 2020 HUSS pattern for **males ages 51 through 70 years (1,800 calorie level)**

- This pattern provides 119.2 mg of vitamin C, which is 132 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.4 cup eq per day from 1.5 cup eq per day.

When the Fruits food group is completely removed from the pattern, the pattern provides 65.7 mg, which is 73 percent of the RDA for vitamin C.

- This pattern provides 319.6 mg of choline which is below goals at 58 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 305.1 mg, which is 55 percent of the AI.
- This pattern provides 345.9 mg of magnesium, which is below goals at 82 percent of the RDA. When the Fruits food group is removed from the pattern, magnesium falls to 316.7 mg, which is 75 percent of the RDA.
- This pattern provides 3,244.5 mg of potassium, which is 95 percent of the AI. The amount of potassium falls below goals when the Fruits food group is reduced to less than 0.9 cup eq per day from 1.5 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 2,799 mg, which is 82 percent of the AI for potassium.

In the 2020 HUSS pattern for **pregnant individuals ages 14 through 18 years (2,000 calorie level)**

- This pattern provides 24.9 g of fiber, which is 108 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 20.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 137.1 mg of vitamin C, which is 171 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 65.7 mg, which is 82 percent of the RDA for vitamin C.
- This pattern provides 499.4 mcg of folate, which is below goals at 83 percent of the RDA. When the Fruits food group is removed from the pattern, folate falls to 456.8 mcg, which is 76 percent of the RDA.
- This pattern provides 338.8 mg of choline, which is below goals at 75 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 319.5 mg, which is 71 percent of the AI.
- This pattern provides 13.7 mg of iron, which is below goals at 51 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 13 mg, which is 48 percent of the RDA.
- This pattern provides 360.3 mg of magnesium, which is 90 percent of the RDA. The amount of magnesium falls below goals when the Fruits food group is reduced to less than 2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 321.3 mg, which is 80 percent of the RDA for magnesium.

In the 2020 HUSS pattern for **pregnant individuals ages 19 through 30 years (2,000 calorie level)**

- This pattern provides 24.9 g of fiber, which is 108 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 20.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 137.1 mg of vitamin C, which is 161 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.3 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 65.7 mg, which is 77 percent of the RDA for vitamin C.
- This pattern provides 499.4 mcg of folate, which is below goals at 83 percent of the RDA. When the Fruits food group is removed from the pattern, folate falls to 456.8 mcg, which is 76 percent of the RDA.

- This pattern provides 338.8 mg of choline, which is below goals at 75 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 319.5 mg, which is 71 percent of the AI.
- This pattern provides 13.7 mg of iron, which is below goals at 51 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 13 mg, which is 48 percent of the RDA.

In the 2020 HUSS pattern for **pregnant individuals ages 31 through 50 years (2,000 calorie level)**

- This pattern provides 24.9 g of fiber, which is 108 percent of the fiber goal. The amount of fiber falls below goals when the Fruits food group is reduced to less than 0.2 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 20.1 g, which is 88 percent of the fiber goal for fiber.
- This pattern provides 137.1 mg of vitamin C, which is 161 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.3 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 65.7 mg, which is 77 percent of the RDA for vitamin C.
- This pattern provides 499.4 mcg of folate, which is below goals at 83 percent of the RDA. When the Fruits food group is removed from the pattern, folate falls to 456.8 mcg, which is 76 percent of the RDA.
- This pattern provides 338.8 mg of choline, which is below goals at 75 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 319.5 mg, which is 71 percent of the AI.
- This pattern provides 13.7 mg of iron, which is below goals at 51 percent of the RDA. When the Fruits food group is removed from the pattern, iron falls to 13 mg, which is 48 percent of the RDA.
- This pattern provides 360.3 mg of magnesium, which is 100 percent of the RDA. The amount of magnesium falls below goals when the Fruits food group is reduced to less than 0.1 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 321.3 mg, which is 89 percent of the RDA for magnesium.

In the 2020 HUSS pattern for **lactating individuals ages 14 through 18 years (2,400 calorie level)**

- This pattern provides 967.4 mcg of vitamin A, which is below goals at 81 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin A falls to 929 mcg, which is 77 percent of the RDA.
- This pattern provides 149.9 mg of vitamin C, which is 130 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.7 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 78.5 mg, which is 68 percent of the RDA for vitamin C.
- This pattern provides 10.7 mg of vitamin E, which is below goals at 56 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 10.1 mg, which is 53 percent of the RDA.
- This pattern provides 390.5 mg of choline, which is below goals at 71 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 371.2 mg, which is 67 percent of the AI.

In the 2020 HUSS pattern for **lactating individuals ages 19 through 30 years (2,400 calorie level)**

- This pattern provides 967.4 mcg of vitamin A, which is below goals at 74 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin A falls to 929 mcg, which is 71 percent of the RDA.
- This pattern provides 149.9 mg of vitamin C, which is 125 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.8 cup eq per day from 2 cup eq per day.

When the Fruits food group is completely removed from the pattern, the pattern provides 78.5 mg, which is 65 percent of the RDA for vitamin C.

- This pattern provides 10.7 mg of vitamin E, which is below goals at 56 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 10.1 mg, which is 53 percent of the RDA.
- This pattern provides 390.5 mg of choline, which is below goals at 71 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 371.2 mg, which is 67 percent of the AI.

In the 2020 HUSS pattern for **lactating individuals ages 31 through 50 years (2,200 calorie level)**

- This pattern provides 943.5 mcg of vitamin A, which is below goals at 73 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin A falls to 905 mcg, which is 70 percent of the RDA.
- This pattern provides 149.5 mg of vitamin C, which is 125 percent of the RDA. The amount of vitamin C falls below goals when the Fruits food group is reduced to less than 0.8 cup eq per day from 2 cup eq per day. When the Fruits food group is completely removed from the pattern, the pattern provides 78.1 mg, which is 65 percent of the RDA for vitamin C.
- This pattern provides 10.1 mg of vitamin E, which is below goals at 53 percent of the RDA. When the Fruits food group is removed from the pattern, vitamin E falls to 9.5 mg, which is 50 percent of the RDA.
- This pattern provides 371.2 mg of choline, which is below goals at 67 percent of the AI. When the Fruits food group is removed from the pattern, choline falls to 351.9 mg, which is 64 percent of the AI.

Objective 3

Evaluate implications on meeting nutritional goals by modifying the proportions of whole fruits and 100 percent fruit juice by creating and modeling various proportions of draft subgroups within the Fruits food group. The process will model various draft subgroup proportions to represent potential variations of consumption. Models will examine intake proportions starting with a 50 percent contribution of Fruit from whole fruit and 50 percent from fruit juice. Alterations to the pattern will include increasing one subgroup by $\frac{1}{4}$ cup eq and decreasing the other subgroup by $\frac{1}{4}$ cup eq until one subgroup represents the total Fruit pattern quantity.

Objective 3: Methods

Using the 2025-2030 nutrient profiles that apply to young children less than 2 years and the population 2 years and older, the nutrients provided by amounts recommended in the *Dietary Guidelines for Americans, 2020-2025* from each food group (and oils) are compared to the age, sex, and life stage-specific goals (usually at least 90 percent of the RDA or AI).

For the following analyses, the Fruit nutrient profile was not applied. Instead, nutrient profiles for fruit juice and whole fruit were created and utilized for this objective (**Table 2**). More information about calculating nutrient profiles is described in the **Basis Nutrient Profiles FPM Report**. All other food groups and subgroups from the **Basis Nutrient Profiles FPM Report** were modeled based on the 2020 HUSS dietary pattern quantities.

Objective 3: Results

Table 2. Nutrient Profile for Fruit Juice and Whole Fruit

Nutrients	Fruit Juice	Whole Fruit
Energy (kcal)	117.1	88.9

Carbohydrate (g)	28.6	22.9
Protein (g)	1.1	1.1
Fat (g)	0.3	0.3
Saturated Fatty Acids (g)	0.1	0.1
Linolenic acid (18:3) (g)	0.0	0.0
Linoleic acid (18:2) (g)	0.1	0.1
Vitamin A (mcg RAE)	8.3	23.0
Vitamin C (mg)	69.1	24.1
Vitamin D (IU)	0.0	0.0
Vitamin E (mg AT)	0.4	0.3
Vitamin K (mcg)	1.2	4.5
Thiamin (mg)	0.1	0.1
Riboflavin (mg)	0.1	0.1
Niacin (mg)	0.5	0.5
Vitamin B6 (mg)	0.1	0.2
Folate (mcg DFE)	29.9	18.4
Vitamin B12 (mcg)	0.0	0.0
Choline (mg)	10.5	9.4
Calcium (mg)	28.5	18.0
Copper (mg)	0.1	0.1
Iron (mg)	0.4	0.4
Magnesium (mg)	22.5	18.5
Phosphorus (mg)	32.7	24.9
Potassium (mg)	358.6	275.7
Sodium (mg)	13.0	4.1
Zinc (mg)	0.1	0.2
Added Sugars (g)	1.1	0.5
Fiber (g)	0.7	2.9

Young Children ages 12 through 23 months

Increasing whole fruit and decreasing fruit juice

Overall, for young children ages 12 through 23 months, the scenarios did not change the nutrient content in a manner that would alter a nutrient to shift from meeting the goals to not meeting goals (and vice versa) when simultaneously increasing the quantity of whole fruits and proportionally decreasing the quantity of fruit juice across all four calorie levels. Additionally, nutrients below goals remain below goals in 2020 HUSS pattern for all calorie levels (**reference Basis Nutrient Profiles FPM Report**) and do not change by ≥ 5 percentage points from the starting scenario which models 50 percent whole fruit and 50 percent fruit juice.

Increasing fruit juice and decreasing whole fruit

Overall, for young children ages 12 through 23 months, the scenarios did not change the nutrient content in a manner that would alter a nutrient to shift from meeting the goals to not meeting goals (and vice versa) when simultaneously increasing the quantity of fruit juice and proportionally decreasing the quantity of whole fruits for the 700-calorie and 900-calorie levels. For the 800 and 1,000-calorie patterns for young children ages 12 through 23 months, fiber is the only nutrient that falls below recommendations. In the 800 calorie pattern, when fruit juice is increased to 3/4 cup eq and whole fruit is reduced to zero cup eq, the quantity of fiber in the pattern is reduced from

9.1 g of fiber in the starting scenario (which is 99 percent of the goal for fiber) to 8.2 g, which is less than 90 percent of the goal. In the 1,000 calorie pattern, when fruit juice is increased to 1 cup-eq and whole fruit is reduced to 0 cup eq, the quantity of fiber is reduced from 11.2 g in the starting scenario (which is 97 percent of the goal) to 10.1 g which is 87 percent of the goal. Additionally, nutrients below goals remain below goals in the 2020 HUSS pattern for all calorie levels (**reference Basis Nutrient Profiles FPM Report**) and do not change by ≥ 5 percentage points from the starting scenario.

Individuals ages 2 years and older

Increasing whole fruit and decreasing fruit juice

Overall, with one exception, the scenarios did not change the nutrient content in a manner that would alter a nutrient to shift from meeting the goals to not meeting goals (and vice versa) when simultaneously increasing the quantity of whole fruits and proportionally decreasing the quantity of fruit juice across individuals ages 2 years and older. Additionally, nutrients below goals remain below goals in the pattern for all age, sex, and/or life stage groups (**reference Basis Nutrient Profiles FPM Report**) and do not change by ≥ 5 percentage points from the starting scenario which models 50 percent whole fruit and 50 percent fruit juice.

One exception is for pregnant individuals ages 14 through 18 years. In the starting scenario, the pattern provides 361.8 mg of magnesium, which is 90 percent of the RDA. When whole fruit is increased to 1.5 cup eq of whole fruit and fruit juice is increased to 0.5 cup eq, magnesium falls to 359.8 mg of magnesium which is below 90 percent of the RDA.

Increasing fruit juice and decreasing whole fruit

Overall, the scenarios did not change the nutrient content in a manner that would alter a nutrient to shift from meeting the goals to not meeting goals (and vice versa) when simultaneously increasing fruit juice and proportionally decreasing whole fruits in all age, sex, and/or life stage groups for individuals ages 2 years and older. Additionally, nutrients below goals remain below goals in the 2020 HUSS pattern for all age, sex, and/or life stage groups (**reference Basis Nutrient Profiles FPM Report**) and do not change by ≥ 5 percentage points from the starting scenario which models 50 percent whole fruit and 50 percent fruit juice.

Synthesis Statement

Synthesis Statement 1:

No potential modifications to the HUSS Dietary Pattern.

FPM results support not reducing existing quantities of Fruits in the overall synthesis that integrates the food groups in a healthy dietary pattern.

References

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1. National Academies of Sciences, Engineering, and Medicine. *Dietary Reference Intakes for Energy*. Washington, DC: The National Academies Press; 2023. <https://doi.org/10.17226/26818>

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