



# 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 Protocol

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## Rationale

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

The Fruit food group includes whole fruits, which includes fresh, canned, frozen, and dried forms, and 100% fruit juice. The 2020 Healthy U.S.-Style (HUSS) Dietary Pattern intended for those ages 2 years and older includes a daily quantity of Fruits ranging from ranging from 1 cup eq at the 1000 calorie pattern to 2 ½ cup eq at the 3200 calorie level per day. The Dietary Guidelines also recommend that at least half of the recommended amount of fruit should come from whole fruit.<sup>1</sup> Recommended quantities of Fruits are less for children ages 12 through 23 months, who have lower energy needs. From 12 through 23 months, fruit juice is not necessary, and most fruit intake should come from eating whole fruits. If 100% fruit juice is provided, up to 4 ounces per day can fit in a healthy dietary pattern. Before the age of 12 months, 100% fruit (or vegetable) juice should not be provided.

Fruits are sources of many nutrients, two of which (i.e., potassium and dietary fiber) have been identified as dietary components of public health concern. For most individuals ages 2 years and older, intakes of fruit are generally below the daily quantitative recommendations in the *Dietary Guidelines for Americans, 2020-2025*, with average consumption of less than one cup eq per day of total fruit.<sup>1,2</sup> Approximately two-thirds of total fruit consumption is as whole fruit and approximately one-third of fruit consumption is as 100% fruit juice.<sup>3</sup>

The rationale for evaluating hypothetical reductions and/or modifications to this food group is to fully understand and document the implications on nutrient intake if quantities of Fruits or proportions of whole vs 100% juice in the Patterns are modified. The following food pattern modeling analyses are proposed to examine hypothetical modifications and implications for meeting nutrient goals using the HUSS Dietary Pattern when: 1) quantities of Fruits are modified from a range of 0 to the current quantities recommended in the HUSS Dietary Pattern (which ranges from ½ to 2 ½ cup eq per day), and 2) proportions of whole fruit and 100% fruit juice are modified within the recommended total amount. The nutrient intake implications of these modifications will be examined across age groups and life stages. Separate protocols propose food group and subgroup modifications within the other food groups and will address any unmet nutritional goals identified in the Fruits analyses. Results from each of these analyses will be synthesized with the results from all other FPM analyses of the Committee, along with related data analysis findings and systematic review evidence, before determining if the final advice to the Departments will include suggested changes to the USDA Dietary Patterns or if new dietary patterns are recommended.

## Introduction

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To prepare for the development of the *Dietary Guidelines for Americans, 2025-2030*, the U.S. Departments of Health and Human Services (HHS) and Agriculture (USDA) identified a proposed list of scientific questions based on relevance, importance, potential impact to federal programs, and avoiding duplication, which were posted for public comment.<sup>1,4</sup> The Departments appointed the 2025 Dietary Guidelines Advisory Committee (Committee) in January 2023 to review evidence on the scientific questions. Their review forms the basis of their independent, science-based advice and recommendations to HHS and USDA, which is considered as the Departments develop the next edition of the *Dietary Guidelines*. These questions were refined and prioritized by the Committee for consideration in their review of the evidence.

The Committee will be asked to answer the following question using Food Pattern Modeling (FPM) analyses:

**Considering each life stage, should changes be made to the USDA Dietary Patterns (Healthy U.S.-Style, Healthy Mediterranean-Style, and/or Healthy Vegetarian); should additional Dietary Patterns be developed/proposed based on:**

- **Findings from systematic reviews, data analysis, and/or FPM analyses; and**
- **Population norms (e.g., starchy vegetables are often consumed interchangeably with grains), preferences (e.g., emphasis on one staple grain versus another), or needs (e.g., lactose intolerance) of the diverse communities and cultural foodways within the U.S. population?**

Changes to Dietary Patterns may include modification to the amounts of food groups/subgroups and/or recategorization of food groups/subgroups, as well as subsequent changes to energy available for other uses, including for added sugars.

As part of that process and to address the overarching FPM question, the following questions for analysis have been identified:

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

The Committee will use FPM analyses to address these questions, with support from USDA's FPM methods team. This protocol will establish the methods to model hypothetical modifications of the Fruits group within the current HUSS Dietary Pattern and implications on meeting nutritional goals.

## Historical perspectives

The 2020 USDA Dietary Patterns are designed to reflect health promoting dietary patterns and meet the known nutrient needs of the age-sex groups for which they are targeted, within calorie constraints. The Dietary Patterns include recommended amounts to eat from five major food groups, one of which is Fruits. For individuals ages 2 years and older, the 2020 HUSS Dietary Pattern recommends 1 to 2 ½ cup eq of Fruits per day, with at least half of intake coming from whole fruits.<sup>1</sup> For individuals ages 12 to 23 months, the recommendation is ½ to 1 cup eq per day from mostly whole fruit. 100% fruit juice is not needed during this stage of life, but up to 4 ounces can be incorporated into a healthy dietary pattern. For infants under 12 months of age, 100% fruit juice is not recommended.

The analyses in this protocol expand upon the FPM work of the 2010 Committee: *Appendix E-3.1: Adequacy of USDA Food Patterns: Food Pattern Modeling Analysis*, and the 2015 Committee: *Appendix E-3: USDA Food Patterns for Special Analyses*, which explored questions related to this protocol.<sup>5,6</sup> These Committees explored questions on the contribution of fruits and 100% juice, along with other food groups, to total dietary fiber intake and total nutrient intake in the USDA Food Patterns. They also explored the contribution of Fruits to nutrient intake. These analyses found that at recommended levels of intake, Fruits contributed over 15% of dietary fiber and potassium in the Dietary Patterns.

Past Committees examining the relationship between dietary patterns and health outcomes across the lifespan found consistent evidence that dietary patterns associated with beneficial outcomes include higher intakes of vegetables, **fruits**, legumes, whole grains, low- or non-fat dairy, lean meat and poultry, seafood, nuts, and unsaturated vegetable oils and lower intakes of red and processed meats, sugar-sweetened foods and drinks, and refined grains.<sup>2,7</sup> In addition, the previous Committee also examined consumption of 100% fruit juice, and found limited evidence to suggest that 100% fruit juice is not associated with adiposity in children or adults.<sup>8</sup>

The *Dietary Guidelines for Americans, 2020-2025*, highlighted the concern around the underconsumption of the Fruits food group, noting that about 80% of individuals in the U.S. did not meet recommendations.<sup>1</sup> Furthermore, while fruit is often consumed in nutrient-dense forms such as fresh whole fruit or canned fruit with

no added sugars, some fruit is consumed in forms with added sugars such as canned fruit in syrup, sweetened cooked fruits used in desserts (e.g., pies), or in sugar sweetened drinks that include a small portion of 100% juice. Data analysis used to support the development of the 2020-2025 Dietary Guidelines showed average intakes of Fruit was just under 1 cup eq across age-sex groups for those 1 year and older, though there were some differences between age and race and/or ethnic groups.<sup>2</sup>

## Current perspectives

Fruits have consistently been identified as a food group in dietary patterns associated with positive health outcomes in systematic reviews. The role of Fruits in healthy dietary patterns and the contribution to intakes of dietary components of public health concern (i.e., dietary fiber and potassium) emphasize the need to further understand their contribution in food pattern modeling analyses. This protocol describes a multi-phased approach to understand the implications on nutrient goals if different amounts of the Fruits group are consumed compared to the quantities currently recommended.

Thorough understanding of the implications for achieving nutritional goals when quantities of Fruits and proportions of whole fruit to 100% juice will contribute to answering the overarching question: What are the implications for nutrient intakes when modifying the Fruit food group quantities within the Healthy U.S.-Style Dietary Pattern (HUSS)?

One of the analyses prioritized in this protocol will assess the impact on nutrient goals using the HUSS Dietary Pattern if the quantitative recommendations for the Fruits group are incrementally reduced or if no foods and beverages are consumed from this food group and a second analyses will evaluate implication on nutrition goals when proportions of whole fruit and 100% juice are modified—especially for nutrients/dietary components of public health concern, such as dietary fiber. Although similar analyses were conducted by the 2010 and 2015 Committees, there is support for updating these analyses with updates to food composition data and revisions to the Dietary Reference Intakes in 2019 for sodium and potassium and 2023 for energy.

The 2025 Committee is continuing to examine dietary patterns and 100% fruit juice consumption and health outcomes across the lifespan and will also be examining fruit consumption during the complementary feeding period from birth to 24 months of age.<sup>9</sup> These systematic review results will be considered when the Committee synthesizes the full body of evidence to determine their overall advice on potential dietary pattern changes and/or newly recommended dietary patterns.

Results from these analyses will be collectively synthesized by the Committee along with all other FPM analyses, including those modeling modifications of other food group and subgroup quantities to address intake variability at the food group and subgroup levels. As part of a separate protocol following these analyses, diet simulations will be used to examine intake variability at the individual food level. As part of the iterative FPM process, findings from these and other analyses may prompt the development of subsequent protocols to address any identified nutrient inadequacies and answer the overarching FPM question. The conclusions drawn by the Committee will inform their recommendations for the 2025 USDA Dietary Patterns in their scientific report to the Secretaries of HHS and USDA.

## Methods

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This section presents an overview of the methods, or the process, that will be used by the Committee to answer the questions:

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

### Develop a protocol

A FPM protocol is the plan for how USDA's FPM methodology will be used to conduct specific FPM analyses. The protocol is established by the Committee before the analysis is conducted. The protocol describes the components of the FPM process, including the analytic framework, analytic plan, analysis synthesis, conclusion development, and future research recommendations. It is developed through Committee discussion of the strengths and limitations for various analysis types and exercises to identify the most appropriate and relevant methods to answer each FPM question. FPM is an iterative process; thus, results from initial analyses may inform refinement of this protocol or subsequent protocols for other research questions.

When reviewing questions or topics addressed by prior Committees, the Committee uses the previous analytic framework, plan, and protocol to inform and refine their current approaches. Any changes to this protocol will be described in **Table 5. Protocol amendments**.

### Develop an analytic framework

An analytic framework represents the overall scope of the FPM analyses, including the population, type of analyses, and data sources identified to answer the question. It also includes the definitions of key terms.

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#### Questions:

**What are the implications for nutrient intakes when modifying the Fruit food group quantities within the Healthy U.S.-Style (HUSS) Dietary Pattern?**

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#### Population:

The nutrient profiles modeled in these FPM analyses are based on dietary intake data among the U.S. population ages 12 months and older. The contribution of complementary foods and beverages consumed by infants less than 12 months will not be included in the calculation of nutrient profiles.

The nutrient profiles examined in these FPM analyses will be applied to the 2020 HUSS Dietary Patterns published for ages 12 through 23 months who are no longer consuming human milk or infant formula, and for ages 2 and older.<sup>1</sup> Around 12 months, a dietary pattern that no longer includes infant formula or human milk may be established; however, consumption of human milk in the second year of life is common and recommended by the American Academy of Pediatrics and the World Health Organization. The HUSS Dietary Pattern was tailored for children ages 12 through 23 months who are no longer receiving infant or toddler formula or human milk.

#### Types of analyses:

The overall FPM methodology used to develop and update the USDA Dietary Patterns includes six steps: **(1)** identifying appropriate energy levels for the patterns; **(2)** identifying nutritional goals for the patterns; **(3)** establishing food groupings and food group amounts; **(4)** determining the amounts of energy and nutrients that would be provided by consuming various foods within each food group or subgroup; and **(5)** evaluating nutrient levels in each pattern against nutritional goals. Finally, **(6)** adjust and re-evaluate the patterns to align with current or potential recommendations.

**These analysis questions will focus on step 3 (establishing food groupings and food group amounts) and assess the implications of changes to step 3 throughout subsequent steps 4, 5, and 6.** Initial analyses will use existing food groups and subgroups identified in the 2020 HUSS Dietary Pattern published in the *Dietary Guidelines for Americans, 2020-2025*.<sup>1</sup> Nutrient profiles that underlie those patterns will be updated based on the 2025 Dietary Guidelines Advisory Committee's analyses in answering the question: “*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?*” View the protocol developed by the 2025 Committee to answer that question.

Subsequent analyses will model the implications of modifications to the Fruits food group. Specifically, analyses will examine reduction and elimination of quantitative recommendations for the food group, changes to the proportion of foods included that determine the composite nutrient profile, and the implications of potential pattern modifications in meeting nutrient goals.

FPM analyses planned to answer these questions include:

- Identifying the nutritional composition and contribution of the Fruits group in current dietary intakes, relative to the 2020 HUSS Dietary Pattern goals.
- Evaluating nutrient intake implications when the quantity of the Fruits food group in the patterns are 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), starting with the current maximum quantity in each calorie level in the HUSS Dietary Pattern and reducing to 0. 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). The nutritional composition and contributions of the Fruits food group in the Dietary Pattern will be examined.
- Evaluate implications on meeting nutritional goals by creating and modeling various proportions of draft subgroups (Whole Fruits, 100% Fruit Juice) within the Fruits food group.
- Identifying and documenting potential implications on the nutritional composition and contributions of the above analyses.

Results from these analyses will contribute to the evidence that will be used to answer the overarching FPM question: 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?

This process will include:

- Synthesizing the above analyses with all other food group and subgroup modification analyses to determine if changes should be made to the USDA Dietary Patterns or if additional Dietary Patterns should be proposed based on population norms, preferences, and needs.
- Examining modified or new dietary patterns for meeting nutritional goals compared to the DRIs, current *Dietary Guidelines for Americans, 2020-2025* recommendations, potential recommendations of the 2025 Committee, and simulated diet analyses.
- Developing conclusion statements based on all FPM analyses informing the overarching FPM question and in consideration of related systematic review conclusions and data analysis findings.
- Making research recommendations to inform future work on this topic.

## Data Sources:

- What We Eat in America, NHANES 2017-2018, individuals 1 years and over, days 1 and 2, weighted to produce nationally representative estimates. Available: [ars.usda.gov/nea/bhnrc/fsrg](https://ars.usda.gov/nea/bhnrc/fsrg)



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## Key definitions:

Note: Key definitions in this protocol include existing definitions used by the 2020 Dietary Guidelines Advisory Committee and/or published in the *Dietary Guidelines for Americans, 2020-2025*, such as definitions operationalized in the HUSS Dietary Pattern.<sup>1,2</sup> The 2025 Dietary Guidelines Advisory Committee will continue to consider terminology and implications of terms related to representation of population groups and/or communication to the public. Future revisions to existing definitions and new working definitions for 2025 will be noted.

**Food Groups and Subgroups in the HUSS Dietary Pattern:** USDA’s HUSS Dietary Pattern for ages 2 years and older provides amounts of five major food groups and *subgroups* including:

- Fruits

- Whole fruit
  - Includes fruits from fresh, canned, frozen, and dried forms.
- Fruit juice
  - Includes beverages as 100% fruit juices without added sugars.
- Vegetables:
  - *Dark-Green; Red and Orange; Beans, Peas, and Lentils<sup>a</sup>; Starchy; and Other*
    - <sup>a</sup>. Beans, Peas, and Lentils are typically modeled as Vegetables in the HUSS Dietary Pattern but can also be counted toward the Protein Foods group. For the analyses in this protocol using the HUSS Dietary Pattern, Beans, Peas, and Lentils will only be modeled in the Vegetables food group.
- Dairy and Fortified Soy Alternatives
- Grains:
  - *Whole Grains and Refined Grains*
- Protein Foods:
  - *Meats, Poultry, and Eggs<sup>b</sup>; Seafood; Nuts, Seeds, and Soy Products*
    - <sup>b</sup>. For the HUSS Dietary Pattern for ages 12 through 23 months, there are separate subgroups for 1) Meats and Poultry and 2) Eggs.

**Oils:** Oils are sources of essential fatty acids and include canola, corn, olive, peanut, safflower, soybean, and sunflower oils. Oils also are naturally present in nuts, seeds, seafood, olives, and avocados. The fat in some tropical plants, such as coconut oil, palm kernel oil, and palm oil, are not included in the oils category because they contain a higher percentage of saturated fat than do other oils.

**Added sugars:** Added sugars are either added during the processing of foods or are packaged as sweeteners (e.g., a bag of table 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.<sup>10</sup> Naturally occurring sugars, such as those in fruit or milk, are not defined as 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.

**Limits on calories for other uses (as defined in the HUSS Pattern):**<sup>1, 2</sup> Foods are assumed to be in nutrient-dense forms, which are lean or low-fat and prepared with minimal added saturated fat, added sugars, refined starches, or sodium. If all food choices to meet food group recommendations are in nutrient-dense forms, a small number of calories remain within the overall limit of the pattern (i.e., limit on calories for other uses). The amount of calories depends on the total calorie level of the pattern and the amounts of food from each food group required to meet nutritional goals. Calories up to the specified limit can be used for added sugars, refined starches, saturated fat, and/or alcohol (for nonpregnant adults of legal drinking age only), or to eat more than the recommended amount of food in a food group.

**Item Clusters:** Identified groupings of the same or similar foods or beverages that make up each food group and subgroup. Item clusters are used to calculate the weighted average consumption for use in calculating a nutrient profile for each food group and subgroup used in USDA FPM.

**Nutrient-Dense Representative Foods:** For the purpose of USDA's FPM, each item cluster is assigned a nutrient-dense representative food which are those foods or beverages that represent the forms with the least amounts of added sugars, sodium, and saturated fats. The nutrient composition of the nutrient-dense representative food is used to represent the nutrient composition of the entire item cluster when calculating the nutrient profile for a food group or subgroup.

**Nutrient Profiles:** The proportional nutrient composition from the item clusters that represent each food group and subgroup from the variety of foods in each food group in their nutrient-dense forms. The nutrient profiles are based on a weighted average of nutrient-dense forms of foods (i.e., a composite of nutrient-dense forms of foods and beverages within a food group or subgroup). The weighted average calculation considers a range of food choices in the United States, but in nutrient-dense forms and results in a food pattern that can be adapted to fit an individual's preferences.

## Develop an analytic plan

### Establish energy levels:

Dietary Reference Intakes (DRI) formulas are used to calculate Estimated Energy Requirements (EER) for each age-sex group and for three age groups specific to pregnancy and lactation (14-18 years, 19-30 years and 31-50 years).<sup>11</sup> (See **Table 1.**) EER is based on sex, age, height, weight, level of physical activity, and life stage and, during pregnancy, gestational weeks. The EERs for pregnancy account for the energy cost of tissue accretion and deposition based on pre-pregnancy BMI category and IOM recommended rates of gestational weight gain. The EERs for lactation account for the energy cost of human milk production and mobilization of postpartum tissue stores for gradual weight loss.<sup>1</sup>

Computed weight for a body mass index (BMI) of 22.5 kg/m<sup>2</sup> for adult males and 21.5 kg/m<sup>2</sup> for adult females (ages 19+ years) and median height are used to calculate reference energy levels for each age-sex group.<sup>1</sup> The computed weight based on the corresponding BMI is obtained using the following equation.

$$\text{BMI } 22.5 \text{ or } 21.5 \times (\text{median height in m})^2 = \text{computed weight in kg}$$

These BMIs correspond to the 50<sup>th</sup> percentile (median) for reference weight among 19-year old males and females based on the 2005 DRI for energy and the 2000 CDC Growth Charts.<sup>12, 13</sup> The EER calculations for adults follow the 2020 Committee's approach to base reference weight on a BMI of 18.5 to <25 kg/m<sup>2</sup> but are enhanced to incorporate median heights for each age-sex group using updated NHANES data instead of using one median height for all adult males and one median height for all adult females.<sup>14, 15</sup> For children and adolescents ages 2-18 years, median height and the 50<sup>th</sup> percentile BMI-for-age are obtained using NHANES anthropometric data and the CDC Growth Charts.<sup>15, 16</sup> For young children ages 12 through 23 months, EERs from the DRI report using NHANES median weight and length are used, as these result in similar calorie levels as WHO Growth Chart data.<sup>11, 17</sup> These weight, height/length, and BMI assumptions for estimating energy levels in FPM align with those being used in the Committee's data analysis work. The use of median height/length also aligns with the DRI for energy report.<sup>11</sup>

A lower energy level (for inactive individuals) rounded to the nearest 200 calorie level and its associated pattern are determined for each age-sex group and used in evaluating the patterns against nutritional goals. (See step 2: **Establish nutritional goals.**) The 2020 USDA Dietary Patterns for ages 12 through 23 months are established to meet the EER for those ages. For ages 2 years and older, the 2020 Dietary Patterns generally are not age- or sex- specific. However, the 2020 Dietary Patterns at 1,000, 1,200, and 1,400 calorie levels are designed to meet the nutritional needs of children ages 2 through 8 years. Patterns from 1,600 to 3,200 calories are designed to meet the nutritional needs of children 9 years and older and adults. The 1,000 and 1,200 calorie level patterns are not intended for children 9 years and older or adults, and the 1,400-calorie level is not intended for children ages 10 years and older or adults. Individuals may require a calorie level that is higher or lower than the calorie level associated with each population-level age-sex group.

**Table 1. Age-sex groups for which nutritional goals are examined in analyses**

Children (Male/Female)	Males	Females	Pregnancy (Per 1 <sup>st</sup> , 2 <sup>nd</sup> , and 3 <sup>rd</sup> Trimesters)	Lactation (Per 0-6 and 7-12 months postpartum)
1-3 years				
	4-8 years	4-8 years		
	9-13 years	9-13 years		
	14-18 years	14-18 years	14-18 years	14-18 years
	19-30 years	19-30 years	19-30 years	19-30 years
	31-50 years	31-50 years	31-50 years	31-50 years
	51+ years	51+ years		

### Establish nutritional goals:

Specific nutritional goal quantities for a dietary intake pattern are set according to energy intake level and based on the DRI age-sex group(s) for which the pattern is designed. 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 current *Dietary Guidelines for Americans, 2020-2025* (DGA).<sup>1, 11, 18-21</sup> The macronutrients, fatty acids, vitamins, and minerals that are considered nutritional goals for these analyses are specified in **Table 2**. Because the dietary patterns are designed as a framework for achieving a healthy dietary pattern, the goals are the Recommended Dietary Allowance (RDA) amounts for nutrients having an RDA. The Adequate Intake (AI) is used as the nutrient goal when an RDA is not established.

**Table 2. Nutritional goals for analyses**

Food Component	Specific Nutrients (and Source of Goal <sup>a</sup> )
Energy	Energy (EER)
Macronutrients	Carbohydrate (AMDR/RDA), Protein (AMDR/RDA), Total Fat (AMDR)
Fatty acids	Saturated Fatty Acids (DGA 2020-2025, <10% of total energy), 18:2 Linoleic Acid (AI), 18:3 Linolenic Acid (AI)
Vitamins	Vitamin A (RDA), Vitamin C (RDA), Vitamin D (RDA), Vitamin E (RDA), Vitamin K (AI), Thiamin (RDA), Riboflavin (RDA), Niacin (RDA), Vitamin B6 (RDA), Folate (RDA), Vitamin B12 (RDA), Choline (AI)
Minerals	Calcium (RDA), Copper (RDA), Iron (RDA), Magnesium (RDA), Phosphorus (RDA), Potassium (AI), Sodium (CDRR), Zinc (RDA)
Added Sugars	Added Sugars (DGA 2020-2025, <10% of energy)
Fiber	Total Dietary Fiber (AI, 14g/1,000 calories)

<sup>a</sup> AI = Adequate Intake, AMDR = Acceptable Macronutrient Distribution Range, CDRR = Chronic Disease Risk Reduction Level, DGA 2020-2025 = *Dietary Guidelines for Americans, 2020-2025*, RDA = Recommended Dietary Allowance

## Establish food groupings and amounts:

Food groups and subgroups in the USDA HUSS Dietary Patterns for ages 12 through 23 months and ages 2 years and older (published in the *Dietary Guidelines for Americans, 2020-2025*) will be used in these analyses, along with the Fruits modifications outlined below, to examine their impacts on nutritional composition and contribution within the Fruits group and meeting nutritional goals across the HUSS Dietary Patterns.<sup>1</sup>

### Analysis on the nutritional contribution of the food group:

- 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 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).

**Table 3. Cup equivalents (cup eq) per day of Fruits to be modeled with incremental reductions within the 2,000-calorie level of the 2020 Healthy U.S.-Style (HUSS) Dietary Pattern<sup>a</sup>**

Scenario	Fruits (cup eq)
Current Pattern (Reference)	2
Fruit-1	1.5
Fruit-2	1
Fruit-3	0.5
Fruit-4	0

<sup>a</sup> This table shows just one example of several scenarios that will be modeled.

**Table 4. Cup equivalents (cup eq) per day of Fruits to be modeled with incremental reductions within the 800-calorie level of the 2020 Healthy U.S.-Style (HUSS) Dietary Pattern for ages 12 through 23 months**

Scenario	Fruits (cup eq)
Current Pattern (Reference)	0.75
Fruit-1	0.5
Fruit-2	0.25
Fruit-3	0

<sup>a</sup> This table shows just one example of several scenarios that will be modeled.

### Analyses modifying food group quantities and proportions:

- 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 2/3 Whole Fruit; ½ Fruit Juice) and proportions in ¼ cup eq increments using draft subgroups, as outlined in Tables 5 and 6.

**Table 5. Cup equivalents (cup eq) per day of Fruits to be modeled with incremental reductions of the draft subgroup 100% Fruit Juice (FJ) within the 2,000-calorie level of the 2020 Healthy U.S.-Style (HUSS) Dietary Pattern<sup>a</sup>**

Scenario	Total Fruits (cup eq)	<Whole> Fruits (cup eq)	<Whole> Fruits (% of Total Fruits)	100% Fruit Juice (cup eq)	100% Fruit Juice (% of Total Fruits)
<b>Key Recommendation (Reference)<sup>b</sup></b>	2	1	50%	1	50%
FJ-1/WF+1	2	1.25	63%	0.75	38%
FJ-2/WF+2	2	1.5	75%	0.5	25%
FJ-3/WF+3	2	1.75	88%	0.25	13%
FJ-4/WF+4	2	2	100%	0	0%

- <sup>a</sup> This table shows just one example of several scenarios that will be modeled.
- <sup>b</sup> The Dietary Guidelines recommend that at least half of the recommended amount of fruit should come from whole fruit, rather than 100% juice.

**Table 6. Cup equivalents (cup eq) per day of Fruits to be modeled with incremental reductions of the draft subgroup Whole Fruit (WF) within the 2,000-calorie level of the 2020 Healthy U.S.-Style (HUSS) Dietary Pattern<sup>a</sup>**

Scenario	Total Fruits (cup eq)	<Whole> Fruits (cup eq)	<Whole> Fruits (% of Total Fruits)	100% Fruit Juice (cup eq)	100% Fruit Juice (% of Total Fruits)
<b>Current Pattern (Reference)</b>	2	1	50%	1	50%
FJ+1/WF-1	2	0.75	38%	1.25	63%
FJ+2/WF-2	2	0.5	25%	1.5	75%
FJ+3/WF-3	2	0.25	13%	1.75	88%
FJ+4/WF-4	2	0	0%	2	100%

<sup>a</sup> This table shows just one example of several scenarios that will be modeled.

Determine the amounts of nutrients that would be obtained by consuming various foods within each group:

The anticipated energy and nutrient content, or nutrient profile of each food group and subgroup will be determined based on the synthesis of results of the planned 2025 analyses to answer the question:

*“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?”*

The results of those analyses will determine if a “composite” system will be used to determine the nutrient profiles, or if a revised approach will be used which removes foods and beverages lower in nutrient density from contributing to the development of healthy dietary patterns.

For more information on the work planned for this question, view the protocol developed by the 2025 Committee and posted on [DietaryGuidelines.gov](https://www.dietaryguidelines.gov).<sup>22</sup>

Evaluate nutrient level in each pattern against nutritional goals:

Using the revised 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% of the RDA or AI).

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

Any nutrient goals that were not feasible to meet within the structure of the dietary patterns will be identified and potential health impacts will be considered by the Committee. Food group amounts and modifications will be based on expert judgement of which food groups could most reasonably provide the nutrients when goals were not met. New food groups and subgroups may be modeled to aim towards achieving a potential recommendation reflected in the systematic reviews. All modifications to food groups or subgroups will be balanced within energy constraints. To reduce possible bias in modifying food group amounts, food group and subgroup amounts in the patterns will be evaluated against usual intake distributions between median and 95th percentiles of usual intakes, or in the case of overconsumed components, between the median and the 5th percentiles of usual intake. Calories from all food groups, subgroups, and oils, termed “essential calories,” will then be summed and the remaining calories up to the calorie limit for the pattern will be used to set limits on calories for other uses.

## Conduct analyses

The USDA FPM methods team, in collaboration with the Committee, will use the analytic framework and analytic plan as a guide for conducting analyses and preparing tables and reports describing the analytic results for each analysis.

The first level of analysis will be by population with results described for each age-sex groups and life stage (e.g., pregnancy and lactation). Depending on the available data, subsequent analyses may be based on population groups, race and/or ethnicity, and/or socioeconomic position.

## Synthesize analyses

The Committee will describe, compare, and combine the evidence from all FPM analyses conducted to answer these FPM questions. Synthesis of the analyses will involve summarizing results with particular emphasis on implications for each life stage: children, adolescents, adults, older adults, and individuals who are pregnant or lactating. Implications for each of the existing USDA Dietary Patterns or rationale for new pattern development, including energy levels, will also be included.

The analyses related to each individual protocol, along with the results of simulated diet analyses, related systematic review evidence, and related data analysis findings will be considered together in answering the primary question.

## Develop conclusion

The Committee will review and discuss the synthesis of the analyses to develop conclusion statements for each FPM question. Conclusions from this protocol will be used along with conclusions from all other food pattern modeling protocols, the graded conclusions of any related systematic review, and related data analysis findings to collectively inform the Committee’s advice on the development or refinement of healthy dietary patterns.

## Recommend future research

The Committee will identify and document research gaps and methodological limitations throughout the FPM process. These gaps and limitations will be used to develop research recommendations that describe the research, data, and methodological advances that are needed to strengthen the process to test and develop healthy dietary patterns. Rationales for the necessity of additional or stronger research may also be provided with the research recommendations.

## Protocol amendments

The first version of this protocol was published in February 2024. This revised version was published in June 2024. Amendments listing protocol changes are documented below in **Table 7**.

**Table 7. Protocol amendments**

Date	Protocol change	Description
June 2024	Analytic Framework	Updated the language about population groups based on available data from What We Eat in America.
June 2024	Analytic Plan	The analytic plan was revised to indicate that food group and subgroup quantities in the patterns will be evaluated against but will not be constrained by usual intake distributions.
June 2024	Editorial	Population subgroups was changed to population groups.

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The Committee members are involved in: establishing all aspects of the protocol, which presents the plan for how they are planning to examine the scientific evidence, including the development of an analytic framework and analytic plan; synthesizing analysis results; and writing conclusion statements. The analytic framework and plan provide details about the types of analyses that will be conducted, synthesized, and from which conclusions will be drawn to inform subsequent FPM questions and the Committee’s advice on the development or refinement of healthy dietary patterns. The FPM Methods Team, with assistance from Federal Liaisons and Project Leadership, supports the Committee by facilitating, executing, and documenting the work necessary.

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