

# Part D. Chapter 5: Complementary Feeding and Feeding Styles and Practices During Childhood

## Introduction

Childhood represents a critical window during which nutrition has a profound influence on cognitive and physical development, and it is also a focal period for development and socialization of eating behaviors. Complementary feeding is a period of rapid nutritional transition when children exposed to a single food since birth—human milk and/or infant formula—are introduced to a variety of foods and eating routines that reflect the diets of their family, culture, and environment. These dietary shifts are accompanied by physical, cognitive, emotional, and social development that enables children to take a more active role in feeding and communicating their needs and preferences to others. This development continues into the preschool years, when children have increasing autonomy in making choices about whether, what, and how much to eat. The family is a first and fundamental context in which the development of eating behaviors occurs. Considering the types, amounts, and timing of foods fed to children during complementary feeding along with caregiver feeding styles and practices during early childhood allows for a holistic approach to feeding future generations.

This chapter provides a brief background on complementary feeding and caregiver feeding styles and practices and summarizes findings from systematic reviews on relationships between the timing and types of foods and beverages introduced during the complementary feeding period and growth, body composition, and risk of obesity during infancy and childhood; associations of caregiver feeding styles and practices with child food acceptance, dietary intake, and outcomes related to growth; and repeated exposure and food acceptance among children. The chapter also discusses the results of the systematic reviews and provides the Dietary Guidelines Advisory Committee's (Committee) advice to the Departments, based on its review of the science, for developing the *Dietary Guidelines for Americans, 2025-2030*.

## Complementary Feeding

Complementary feeding, which begins around age 6 months and extends to 24 months, is a period during which complementary foods and beverages (CFB) take on an increasingly important role in sustaining adequate growth and development.<sup>1,2</sup> In addition to the timing of introduction, the types and amounts of CFB are important factors that may influence dietary intake, nutritional status, growth and body composition, and future health outcomes.

Current nationally representative data indicate that for a majority of young children ages 12 to 24 months, intakes of the following food groups and subgroups are generally below *Dietary Guidelines* recommendations: Total Vegetables (including Dark-Green Vegetables; Other Vegetables; and Beans, Peas, and Lentils); Whole Grains; and Seafood. Conversely, for a majority of young children ages 12 to 24

months, intakes of the following food groups and subgroups are generally at or above recommendations: Total Fruits; Red and Orange Vegetables; Starchy Vegetables; Total Grains; Refined Grains; Total Protein Foods; Meat, Poultry, and Eggs; Nuts, Seeds, and Soy Products; Dairy and Fortified Soy Alternatives; and Oils.<sup>3</sup> Additionally, most young children ages 12 to 24 months exceed the recommended limits for added sugars and sodium.<sup>4</sup> The relationships between intake of food groups and health outcomes are important to explore because complementary feeding provides nutrients that are essential for physical and cognitive development. For example, brain development—which includes language, sensory and higher cognitive functions—peaks during the first 2 years of life, a period during which nutrient deficiencies can have long-term impact. Excessive intake of calories and other nutrients and food components such as sodium, added sugars, and saturated fat should be avoided during this critical window of development.<sup>1,5,6</sup> As such, introduction to CFB during this period of rapid growth and development is key to meeting energy and nutrient needs of children and to promoting an adequate rate of growth while preventing excessive weight gain.

## Caregiver Feeding Styles and Practices

While orientation to basic tastes, such as preferences for sweetness and rejection of bitterness are innate, food acceptance and preferences are largely learned through experiences around eating that are inherently social in nature.<sup>7</sup> Similarly, children’s self-regulation of appetite is believed to have biological and learned underpinnings. As such, *how* children are fed may be as important as *what* children are fed.<sup>8</sup> Caregivers have fundamental roles in socializing children’s eating behaviors by providing foods that become familiar and accepted, by acting as role models, and by using feeding styles and practices to guide and socialize children’s eating behaviors (see [Box D.5.1](#) and [Figures D.5.1](#) and [D.5.2](#) for more information about feeding styles and practices).<sup>8,9</sup>

Providing children with repeated exposure to new foods is a specific type of structured feeding practice that is thought to have fundamental influence on children’s acceptance of healthy foods. Multiple lines of research provide evidence of prenatal and postnatal flavor learning in early development, where flavors of the maternal diet are transferred to the fetus and infant, respectively, through amniotic fluid during pregnancy and through human milk during lactation.<sup>10</sup> These early flavor exposures shape infant acceptance of these flavors in foods during complementary feeding and are thought to act as a “flavor bridge” to prepare children to learn to accept foods eaten within the family and local environments. In turn, providing repeated exposure to healthy foods during complementary feeding has been shown to promote children’s liking and intake of those foods, collectively referred to as food acceptance.<sup>11</sup>



## Box D.5.1: Key Terms

**Caregiver:** A parent or guardian who provides most of the direct care to a child in the home setting (e.g., mother, father, grandparent, guardian).

**Complementary feeding:** The process that starts when human milk or infant formula is complemented by other foods and beverages. The complementary feeding period typically continues to age 24 months as the young child transitions to family foods.

**Complementary foods and beverages (CFB):** Foods and beverages (liquids, semisolids, and solids) other than human milk or infant formula provided to an infant or young child to provide nutrients and energy.

**Feeding styles:** The broad or general approach that caregivers take to feeding children as well as the emotional climate in which feeding occurs. Feeding styles reflect caregiver demands on or expectations for the child's behavior during eating, as well as responsiveness to the child's individual eating needs (**Figure D.5.1**).

**Feeding practices (also referred to as food parenting practices):** Specific goal-oriented actions or behaviors used by caregivers to shape children's eating attitudes, beliefs, and behaviors (**Figure D.5.2**).

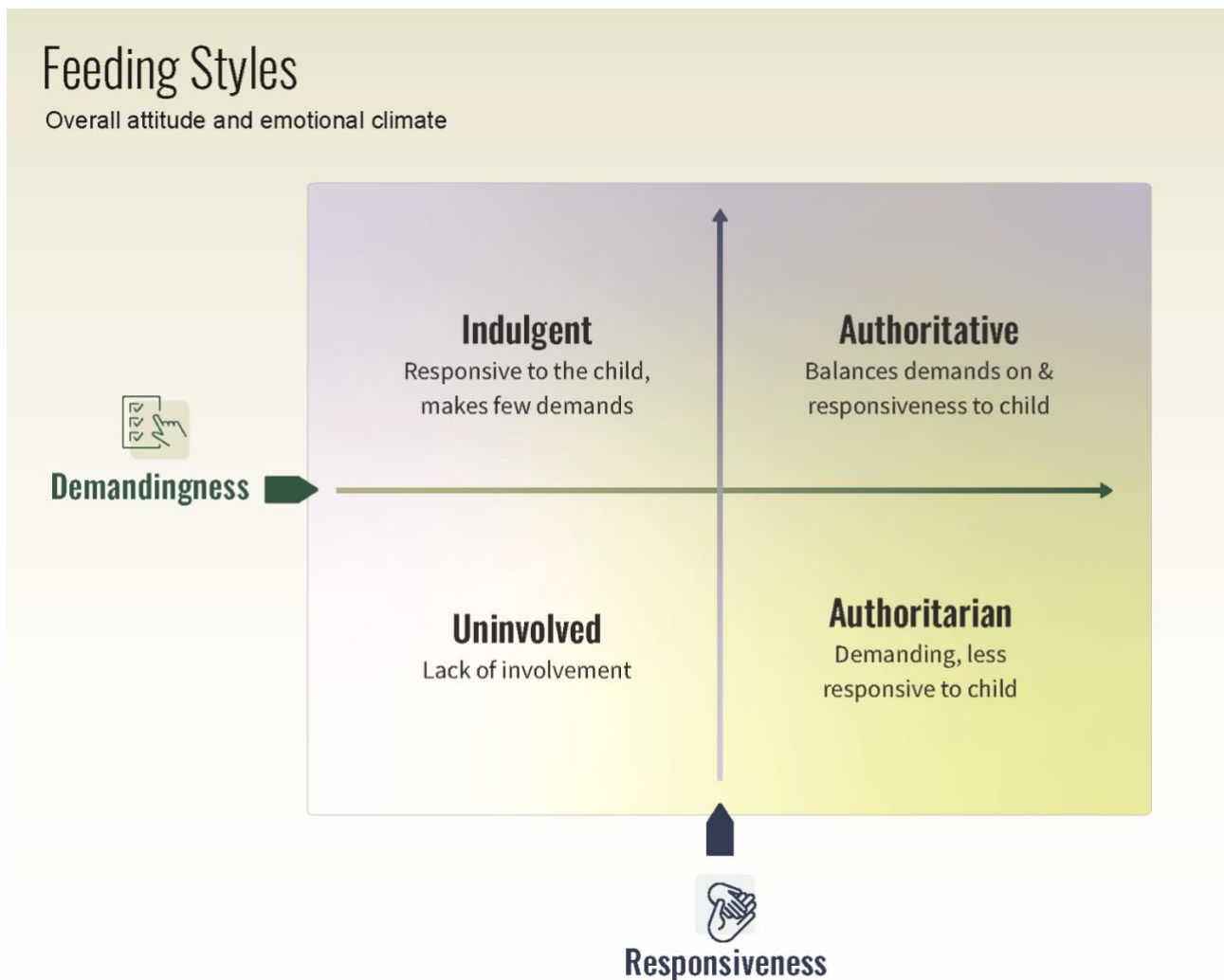
- *Structured feeding practices* organize physical and social aspects of children's eating environments to facilitate children's competence and promote positive behaviors; such practices may include the availability, accessibility, and portion sizes of foods and beverages in the home as well as role modeling, limit setting, and having routines for meals and snacks.
- *Autonomy support feeding practices* encourage developmentally appropriate independence and provide scaffolding for children's self-feeding skills, eating choices, and appetite self-regulation; such practices may include responsiveness to feeding cues, nutrition education, child involvement, encouragement, praise, reasoning, and negotiation.
- *Controlling feeding practices* reflect caregiver-centered control of and dominance over children's eating; such practices may include use of restriction, pressure to eat, threats, bribes, and using food to control negative emotions.

**Food acceptance:** Reflection of children's liking and intake of foods; studies of infants and young children typically measure food acceptance based on the child's willingness to try or taste the food, the child's facial responses during feeding, the caregiver's perception of the child's enjoyment, the child's verbal indication of liking the foods, the rate and duration of feeding, and the amount consumed.

**Repeated exposure to foods:** Providing a specific food (typically a new food) on multiple occasions during the course of food acceptance.

- *Taste exposure* occurs when a child is provided the opportunity to taste and/or consume the food.
- *Non-taste exposure* occurs when a child is provided sensory exposure to a food that does not involve tasting, such as smell, tactile, and visual exposure (e.g., looking at food or a picture of food).

**FIGURE D.5.1**  
CAREGIVER FEEDING STYLES



Adapted from Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite*. Feb 2005;44(1):83-92. <https://doi.org/10.1016/j.appet.2004.08.007><sup>12</sup>

## Expansion of Previous Reviews

With regard to complementary feeding, prior systematic reviews were conducted as part of the Pregnancy and Birth to 24 Months Project (P/B-24 Project) by groups of external experts in collaboration with USDA's Nutrition Evidence Systematic Review (NESR) team.<sup>13</sup> These reviews explored the introduction of CFB (including timing of introduction and specific types of foods and beverages) in relation to growth, size, body composition, and risk of obesity; developmental milestones; micronutrient status; bone health; and food allergy, atopic dermatitis/eczema, asthma, and allergic rhinitis.<sup>14-19</sup> These systematic reviews were used by the 2020 Committee to address a number of scientific questions in its Scientific Report. The authors of those reviews and the 2020 Committee pointed to the need for additional research to address evidence gaps and limitations around the timing of introduction and specific types of foods and beverages introduced before age 4 months and after age 7 months for those outcomes. Therefore, this

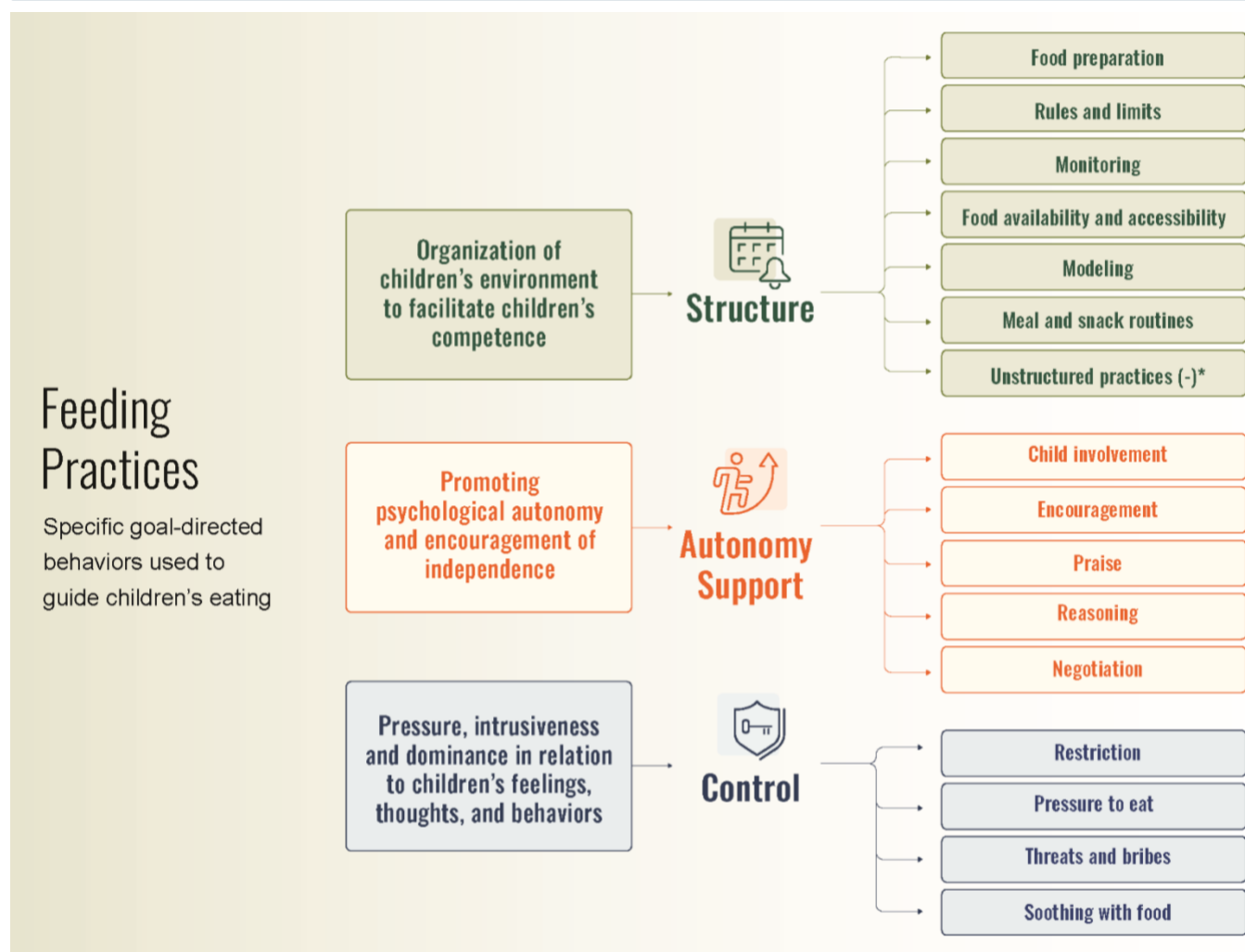
Committee updated the work of the P/B-24 Project by examining relationships between the types and the timing of introduction of specific types of CFB and growth, body composition, and risk of obesity.

With regard to repeated exposure, a systematic review conducted as part of the P/B-24 Project found moderate evidence for children ages 4 to 24 months that tasting a vegetable or fruit once per day for 8 to 10 or more days is likely to increase acceptability of the item.<sup>20</sup> Given evidence of fundamental effects on food acceptance during early childhood, this Committee updated the P/B-24 Project review of repeated exposure among children from birth to age 24 months and extended the review of evidence to studies of children ages 2 to 6 years. The Committee's review considered studies of taste exposure as well as evidence on other types of sensory exposure to foods. The Committee prioritized a comprehensive review of evidence on strategies for promoting food acceptance among younger children, given that this age group's current intakes of foods such as vegetables, whole grains, and seafood are below recommended amounts.

With regard to caregiver feeding practices, a systematic review on this topic was conducted as part of the P/B-24 Project, focused solely on children from birth to age 24 months.<sup>21</sup> Following recommendations of the 2020 Committee, the 2025 Committee comprehensively reviewed the scientific evidence on how to feed younger children. A new systematic review was conducted to evaluate associations of feeding practices used by caregivers of children ages 2 to 6 years with child dietary intakes aligned with the *Dietary Guidelines*. Dietary outcomes of interest were diet quality, and consumption of underconsumed and overconsumed food groups, specifically fruits and vegetables, whole grains, and sugar-sweetened beverages. A separate review evaluated associations of feeding practices used by caregivers of children ages 2 to 6 years with child growth, body composition, and risk of obesity outcomes, expanding the scope of the P/B-24 Project review on this topic.

These reviews of caregiver feeding practices differ from previous narrative and systematic reviews in 2 important ways. Previous reviews have tended to evaluate associations of individual feeding practices with child dietary intake and weight outcomes.<sup>22,23</sup> In contrast, the Committee used a conceptual framework developed by Vaughn and colleagues to organize and evaluate the evidence on individual practices within 3 higher-order dimensions of control, structure, and autonomy support ([Figure D.5.2](#)). This approach provided the opportunity to integrate a diverse body of literature along broad parenting dimensions that have clear public health relevance. Importantly, both reviews focused on randomized controlled trials and prospective cohort studies that provide the opportunity to evaluate directionality in the evidence, namely the extent to which associations reflect influences of the feeding practice on the child, or alternatively, reflect influences of the child on the practices used by caregivers.

**FIGURE D.5.2**  
CAREGIVER FEEDING PRACTICES



\*Note: Unstructured practices that set few boundaries, such as allowing children to graze, short-order cooking, and catering to the child's likes/dislikes, are inversely associated with structure.

Adapted from Vaughn AE, Ward DS, Fisher JO, et al. Fundamental constructs in food parenting practices: a content map to guide future research. *Nutr Rev*. Feb 2016;74(2):98-117. doi: <https://doi.org/10.1093/nutrit/nuv061><sup>24</sup>

## List of Questions

1. What is the relationship between complementary feeding and growth, body composition, and risk of obesity?<sup>25</sup>
2. What is the relationship between repeated exposure to foods and food acceptance?<sup>26</sup>
3. What is the relationship between parental and caregiver feeding styles and practices during childhood and adolescence and consuming a dietary pattern that is more aligned with the *Dietary Guidelines for Americans*?<sup>27</sup>
4. What is the relationship between parental and caregiver feeding styles and practices during childhood and adolescence and growth, body composition, and risk of obesity?<sup>25</sup>

## Conclusion Statements

Question 1. What is the relationship between complementary feeding and growth, body composition, and risk of obesity?

### Approach to Answering Question: Systematic Review

#### Timing of Introduction of Specific Types of Complementary Foods and Beverages

##### Fruit

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to fruit and outcomes related to growth patterns, body composition, and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

##### 100% Juice

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to 100% juice and outcomes related to growth patterns, body composition, and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

##### Vegetables

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to vegetables and outcomes related to growth patterns, body composition, and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

##### Grains

Introducing grains at or before age 4 months is associated with higher BMI z-score during childhood. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to grains and body composition and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

##### Protein Foods

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to foods from the protein foods group and outcomes related to growth patterns, body composition, and risk of obesity during childhood because of substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)

##### Dairy and Fortified Soy Alternatives

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to the dairy food group and outcomes related to growth

patterns, body composition, and risk of obesity during childhood because there is not enough evidence available, and the evidence that is available has substantial concerns with consistency. (Grade: Grade Not Assignable)

#### Sugar-Sweetened Beverages

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to sugar-sweetened beverages and outcomes related to growth patterns, body composition, and risk of obesity during childhood because of substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)

#### Food Sources of Added Sugars

A conclusion statement cannot be drawn about the relationship between the age when infants and young children, up to age 24 months, are introduced to food sources of added sugars and outcomes related to growth patterns, body composition, and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

### **Types and Amounts of Complementary Foods and Beverages**

#### Fruit

Fruit consumption by infants and young children, up to age 24 months, is not associated with unfavorable outcomes related to growth patterns during childhood. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

A conclusion statement cannot be drawn about the relationship between fruit consumption by infants and young children, up to age 24 months, and body composition and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

#### 100% Juice

A conclusion statement cannot be drawn about the relationship between 100% juice consumption by infants and young children, up to age 24 months, and outcomes related to growth patterns, body composition, and risk of obesity during childhood because of substantial concerns with consistency and precision in the body of evidence. (Grade: Grade Not Assignable)

#### Vegetables

Vegetable consumption by infants and young children, up to age 24 months, is not associated with unfavorable outcomes related to growth patterns during childhood. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

A conclusion statement cannot be drawn about the relationship between vegetable consumption by infants and young children, up to age 24 months, and body composition and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)



### Grains

Grains consumption by infants and young children, from ages 6 months up to age 24 months, is not associated with unfavorable outcomes related to growth patterns and risk of obesity during childhood. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

A conclusion statement cannot be drawn about the relationship between grains consumption by infants and young children, from ages 6 months up to age 24 months, and outcomes related to body composition during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)

### Protein Foods

A conclusion statement cannot be drawn about the relationship between consumption of protein foods as a food group by infants and young children, up to age 24 months, and outcomes related to growth patterns, body composition, and risk of obesity during childhood because of substantial concerns with consistency and directness in the body of evidence. (Grade: Grade Not Assignable)

### Dairy and Fortified Soy Alternatives

A conclusion statement cannot be drawn about the relationship between dairy consumption by infants and young children, up to age 24 months, and outcomes related to growth patterns, body composition, and risk of obesity during childhood because of substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)

### Sugar-Sweetened Beverages

Sugar-sweetened beverage consumption by infants, children, and adolescents is associated with unfavorable growth patterns and body composition, and higher risk of obesity in childhood up to early adulthood. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)<sup>a</sup>

### Food Sources of Added Sugars

A conclusion statement cannot be drawn about the relationship between consumption of food sources of added sugars by infants and young children, up to age 24 months, and outcomes related to growth patterns, body composition, and risk of obesity during childhood because there is not enough evidence available. (Grade: Grade Not Assignable)



View the full systematic review, including details on the methodology and the evidence underlying these conclusion statements, at [https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/complementary-foods-beverages\\_growth-obesity](https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/complementary-foods-beverages_growth-obesity)

<sup>a</sup>This conclusion statement was developed as part of the Committee's systematic review with meta-analysis on sugar-sweetened beverages and growth, body composition, and risk of obesity across the lifespan. The conclusion statement relevant to infants and young children is presented here for reference. For more detail, see **Part D. Chapter 3: Beverages**.

## Question 2. What is the relationship between repeated exposure to foods and food acceptance?

### Approach to Answering Question: Systematic Review

#### Infants and Young Children (Birth to 24 Months)

##### Taste Exposure

Repeated taste exposure to a single or multiple novel or familiar vegetable(s) is likely to increase acceptance of the target vegetable(s) by infants and young children ages 4 to 24 months. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)

Repeated taste exposure to a single fruit is likely to increase acceptance of the target fruit by infants and young children ages 4 to 24 months. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)

Repeated taste exposure to a vegetable is likely to increase acceptance of a different vegetable, but not a fruit, by infants and young children ages 4 to 24 months. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)

Repeated taste exposure to a fruit may increase acceptance of a different fruit, but not a vegetable, by infants and young children ages 4 to 24 months. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

##### Non-Taste Exposure

A conclusion statement cannot be drawn about the effect of repeated non-taste exposure, either alone or together with taste exposure, on food acceptance by infants and young children ages 4 to 24 months because there are substantial concerns with consistency and directness in the body of evidence. (Grade: Grade Not Assignable)

#### Children Ages 2 to 6 Years

##### Taste Exposure

Repeated taste exposure to a single or multiple novel or familiar vegetable(s) is likely to increase acceptance of the target vegetable(s) by children ages 2 to 6 years. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)

A conclusion statement cannot be drawn about the effect of repeated taste exposure to fruit(s) on acceptance of target fruit(s) by children ages 2 to 6 years because there is no evidence available. (Grade: Grade Not Assignable)

Repeated taste exposure to a target vegetable may increase acceptance of a different vegetable by children ages 2 to 6 years. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

A conclusion statement cannot be drawn about the effect of repeated taste exposure to a target fruit on acceptance of a different fruit by children ages 2 to 6 years because there is no evidence available. (Grade: Grade Not Assignable)

## Non-Taste Exposure

Repeated non-taste exposure alone or together with taste exposure to a target fruit or vegetable increases acceptance, specifically willingness to try, of the target fruit or vegetable by children ages 2 to 6 years. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)



View the full systematic review, including details on the methodology and the evidence underlying these conclusion statements, at <https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/repeated-exposure-acceptance>

Question 3. What is the relationship between parental and caregiver feeding styles and practices during childhood and adolescence and consuming a dietary pattern that is more aligned with the *Dietary Guidelines for Americans*?

### Approach to Answering Question: Systematic Review

#### Structured Feeding Practices

Food parenting practices by caregivers of children ages 2 to 6 years that structure children’s physical and social eating environments (e.g., availability and accessibility of healthy foods, monitoring children’s eating, modeling of healthy eating behaviors, meal routines such as eating together as a family) are associated with higher intake of fruits and vegetables. This conclusion statement is based on evidence graded as moderate. (Grade: Moderate)

#### Controlling Feeding Practices

A conclusion statement cannot be drawn about the relationship between controlling food parenting practices (e.g., pressure to eat, overt limits on consumption of certain foods) by caregivers of children ages 2 to 6 years and outcomes related to consuming a dietary pattern aligned with the *Dietary Guidelines for Americans* because there are substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)

#### Autonomy Supportive Feeding Practices

A conclusion statement cannot be drawn about the relationship between food parenting practices by caregivers of children ages 2 to 6 years that provide developmentally appropriate support for children’s autonomy (e.g., responsive feeding, praise, child involvement in food and eating activities) and outcomes related to consuming a dietary pattern aligned with the *Dietary Guidelines for Americans* because there is not enough evidence available. (Grade: Grade Not Assignable)

#### Feeding Styles

A conclusion statement cannot be drawn about the relationship between feeding styles by caregivers of children ages 2 to 6 years and outcomes related to consuming a dietary pattern aligned with the *Dietary Guidelines for Americans* because there is not enough evidence available. (Grade: Grade Not Assignable)



View the full systematic review, including details on the methodology and the evidence underlying these conclusion statements, at [https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/caregiver-feeding-practices\\_diet-quality](https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/caregiver-feeding-practices_diet-quality)

Question 4. What is the relationship between parental and caregiver feeding styles and practices during childhood and adolescence and growth, body composition, and risk of obesity?

### Approach to Answering Question: Systematic Review

#### Structured Feeding Practices

Food parenting practices involving monitoring of children's eating by caregivers of children ages 2 to 6 years is not associated with outcomes related to growth. This conclusion statement is based on evidence graded as limited. (Grade: Limited)

A conclusion statement cannot be drawn about the relationship between food parenting practices by caregivers of children ages 2 to 6 years that structure children's physical and social eating environments (e.g., availability of healthy foods, modeling of healthy eating behaviors, meal routines such as eating together as a family), and outcomes related to growth, body composition, and risk of obesity because there was not enough evidence available. (Grade: Grade Not Assignable)

#### Controlling Feeding Practices

A conclusion statement cannot be drawn about the relationship between controlling feeding practices by caregivers of children ages 2 to 6 years and outcomes related to growth, body composition, and risk of obesity because there are substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)

#### Autonomy Supportive Feeding Practices

A conclusion statement cannot be drawn about the relationship between food parenting practices by caregivers of children ages 2 to 6 years that provide developmentally appropriate support for children's autonomy (e.g., responsive feeding, praise, child involvement in food and eating activities) and outcomes related to growth, body composition, and risk of obesity because there are few studies and substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)

#### Feeding Styles

A conclusion statement cannot be drawn about the relationship between feeding styles by caregivers of children ages 2 to 6 years and outcomes related to growth, body composition, and risk of obesity because there are substantial concerns with consistency in the body of evidence. (Grade: Grade Not Assignable)



View the full systematic review, including details on the methodology and the evidence underlying these conclusion statements, at [https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/caregiver-feeding-practices\\_growth-obesity](https://nesr.usda.gov/2025-dietary-guidelines-advisory-committee-systematic-reviews/caregiver-feeding-practices_growth-obesity)

## Integration

In this section the Committee integrates evidence across conclusion statements by summarizing favorable, unfavorable, and null relationships between exposures/interventions and outcomes of interest.

### **Favorable Relationships Between Feeding Styles and Practices and Repeated Exposures to Healthy Foods and Food Acceptance, Dietary Intake, and Growth, Body Composition, and Risk of Obesity**

The Committee drew 8 conclusion statements about the influence of caregiver feeding styles and practices on child food acceptance, dietary intake, and growth, body composition, and risk of obesity outcomes. One of those conclusions outlined favorable influences of structured caregiver feeding practices on dietary intake among children ages 2 to 6 years. Based on moderate evidence from prospective cohort studies and randomized controlled trials, the Committee concluded that feeding practices that provide structure for children's eating are associated with higher intakes of fruits and vegetables among children ages 2 to 6 years. Structured feeding practices organize children's eating environments, as well as their eating behaviors, by shaping physical and social aspects of those environments. Structured practices may take many forms, including making healthy foods available in the home and accessible to the child (e.g., keeping ready-to-eat fruits in a reachable location), modeling healthy eating behaviors, setting limits and providing guided choices (e.g., offering the option of 2 different fruits as a snack choice), and following routines for snacks and meals, including eating together (i.e., family meals). Thus, the Committee's conclusion supports the use of feeding practices that structure physical and social aspects of children's eating environments to increase consumption of fruits, vegetables, and other healthy foods aligned with the *Dietary Guidelines*.

Providing children with repeated exposure to healthy foods was a feeding practice of particular interest to the Committee within the broader category of structure in feeding practices. Seven conclusion statements were developed to characterize favorable effects of repeated exposure on fruit and vegetable acceptance among children. Five of those conclusions were supported by moderate evidence, highlighting the robust nature of the evidence. Collectively, these 7 conclusions identify repeated exposure as a key strategy for promoting acceptance of healthy foods among children up to age 6 years. Four of the 7 conclusions focused on children ages 4 to 24 months and the other 3 conclusions focused on children ages 2 to 6 years.

Among children ages 4 to 24 months, repeated exposure was found to promote acceptance of the specific fruit or vegetable to which children were exposed and to increase acceptance of other non-

exposed foods within the same category, such as exposure to fruits increasing acceptance of other fruits or exposure to vegetables increasing acceptance of other vegetables. The effects of repeated exposure appear to generalize to other foods in the same category, suggesting that repeated exposure may not only promote acceptance of specific foods, but also encourage children's acceptance of a variety of healthy foods during complementary feeding when children are introduced to new foods that lay the foundation of early dietary patterns.

Among children ages 2 to 6 years, favorable effects of repeated exposure on acceptance were seen for novel, familiar, and previously disliked vegetables. This conclusion suggests that repeated exposure may have favorable effects on children's acceptance of vegetables with which they may or may not be familiar as well as for vegetables that they may or may not initially like. The Committee also concluded that providing other types of sensory exposure to fruits and vegetables outside of tasting (e.g., touching and smelling foods, listening to stories about food) also benefits acceptance among children ages 2 to 6 years, specifically children's willingness to try new foods. This conclusion suggests that providing children with diverse types of positive experiences with new foods may increase the effectiveness of repeated exposure by increasing children's willingness to try (i.e., taste) those foods.

## **No Unfavorable Relationships Between Complementary Feeding and Growth, Body Composition, and Risk of Obesity**

The Committee drew 3 conclusion statements regarding consumption of specific food groups that did not have unfavorable associations with 1 or several outcomes related to growth, body composition, and risk of obesity. The conclusion statements highlighted that fruit and vegetable consumption is not unfavorably associated with growth patterns in childhood, and that grain consumption from ages 6 to 24 months is not unfavorably associated with growth and risk of obesity in childhood. These statements support consumption of fruits, vegetables, and grains after age 6 months.

## **No Relationships Between Feeding Styles and Practices and Growth, Body Composition, and Risk of Obesity**

One conclusion found no association of caregiver monitoring of children's eating with child growth, body composition, and risk of obesity outcomes, suggesting that monitoring children's eating does not have consequences for weight-related outcomes. The lack of association, however, between any single feeding practice and weight-related outcomes should be interpreted with caution, given evidence that from day to day, most parents use a wide range of different types of feeding practices across the broad domains considered by the Committee.

## **Unfavorable Relationships Between Complementary Feeding and Growth, Body Composition, and Risk of Obesity**

The Committee identified that introduction of grains at or before age 4 months is associated with higher BMI z-scores in childhood. This conclusion reinforces that complementary feeding should not begin before age 4 months, which aligns with the *Dietary Guidelines for Americans, 2020-2025* recommendation to introduce complementary feeding around age 6 months. No other conclusion statements identified unfavorable associations between complementary feeding and feeding styles and practices on outcomes related to growth, body composition, and obesity.

## **Conclusions Could Not be Drawn about Relationships Between Complementary Feeding, Feeding Styles and Practices, and Dietary Intake, Food Acceptance, and Growth, Body Composition, and Risk of Obesity**

A total of 25 conclusion statements could not be drawn about associations between complementary feeding and growth, body composition, and risk of obesity (15 conclusion statements) and feeding styles and practices and dietary intake, food acceptance, and growth, body composition, and risk of obesity (10 conclusion statements).

## **Complementary Feeding**

The Committee was unable to draw conclusion statements for 9 areas related to complementary feeding and growth, body composition, and risk of obesity outcomes during childhood due to lack of evidence. Four conclusion statements about timing of complementary feeding indicated that conclusions could not be drawn regarding associations between age of introduction to 100% juice, fruits, vegetables, or food sources of added sugars up to age 24 months and growth, body composition, and risk of obesity outcomes during childhood due to a lack of studies. Similarly, although a conclusion statement was drawn regarding age of introduction to grains and growth outcomes, a conclusion statement could not be drawn regarding age of introduction to grains and body composition and risk of obesity during childhood due to a lack of evidence. Three conclusion statements on the types and amounts of foods and beverages during the complementary feeding period indicated that conclusions could not be drawn about the associations of fruit, vegetable, or grain consumption up to age 24 months with body composition in childhood (all) as well as risk of obesity (fruit or vegetable only) because of a lack of evidence. Additionally, a conclusion statement could not be drawn about associations between intake of added sugars from food sources up to age 24 months and growth, body composition, and risk of obesity outcomes during childhood due to a lack of evidence.

The Committee was unable to draw conclusion statements for 6 areas related to complementary feeding and growth, body composition, and risk of obesity outcomes during childhood due to concerns regarding consistency, precision, and/or directness in the bodies of evidence. Two statements indicated

that conclusions could not be drawn regarding associations between the age of introduction of protein foods and sugar-sweetened beverages and growth, body composition, and risk of obesity outcomes during childhood because of concerns about consistency in the body of evidence. Further, a conclusion could not be drawn regarding associations between the age of introduction of dairy and growth, body composition, and risk of obesity outcomes during childhood due to concerns about consistency in the body of evidence, in addition to noting the minimal evidence available for certain exposures and outcomes. Concerns about consistency in the body of evidence were also noted for the association between consumption of dairy and growth, body composition, and risk of obesity outcomes during childhood. Finally, a conclusion statement could not be drawn regarding consumption of 100% juice up to age 24 months and growth, body composition, and risk of obesity during childhood because of concerns about consistency and precision, while a conclusion statement could not be drawn regarding consumption of protein foods up to age 24 months and growth, body composition, and risk of obesity outcomes during childhood because of concerns about consistency and directness.

## Caregiver Feeding Styles and Practices

Five conclusion statements regarding caregiver feeding styles and practices indicated that conclusions could not be drawn due to a lack of studies. Specifically, associations could not be evaluated between caregiver feeding styles or autonomy support practices and dietary intake, or between structured feeding practices and growth, body composition, and risk of obesity outcomes among children ages 2 to 6 years. Additionally, associations could not be evaluated between repeated exposure and acceptance of a target or of different fruits among children ages 2 to 6 years.

Five conclusion statements regarding caregiver feeding styles and practices indicated that conclusions could not be drawn due to concerns about consistency and/or directness in the body of evidence. Conclusions could not be drawn for associations of controlling caregiver feeding practices with dietary intake and growth, body composition, and risk of obesity outcomes, or for autonomy support practices and feeding styles with growth, body composition, and risk of obesity outcomes among children ages 2 to 6 years, because of lack of consistency in direction of association as well as variation in the measured exposures. In addition, conclusions could not be drawn regarding the association of non-taste exposure with acceptance among children ages 4 to 24 months due to study designs that combined non-taste and taste exposure.

## Summary

Taken together, the conclusion statements on timing of complementary feeding and amounts and types of CFB suggest that consumption of fruits, vegetables, and grains (around age 6 months) have no unfavorable associations with 1 or several outcomes related to growth, body composition, and risk of obesity, whereas grain consumption before age 4 months is associated with higher BMI z-score in childhood. It is notable that 15 conclusion statements about complementary feeding could not be drawn due to either lack of evidence or concerns regarding consistency, precision, and/or directness in the bodies



of evidence, highlighting the need for future, rigorous research. Specifically, a need exists for prospective cohort studies and controlled trials that consider timing of introduction of different food groups and amounts of those food groups consumed during the complementary feeding period. Given these evidence gaps, conclusions for food groups beyond fruits, vegetables, and grains cannot be made at this time.

The 8 conclusion statements about feeding styles and practices, when examined collectively, highlight the potentially supportive role of structured feeding practices in promoting younger children's acceptance and consumption of healthy foods aligned with the *Dietary Guidelines*. The findings provide evidence that caregiver use of structured feeding practices may play an important role in encouraging intake of fruits and vegetables among children ages 2 to 6 years. Repeated exposure is a structured feeding practice that shows robust evidence of promoting children's acceptance of fruits and vegetables during the first 6 years of life. While health promotion efforts for healthy eating often group together fruits and vegetables, these foods are distinct in terms of taste and preference perspectives among younger children. Fruits are among the most preferred foods by younger children, due in part to their inherent sweetness, whereas vegetables are among the least preferred foods by younger children and often contain bitter flavor notes. Structured feeding practices, including repeated exposure, may support children's intakes of both fruits and vegetables by organizing children's physical and social eating environments: making readily accepted foods generally available to children (e.g., fruits) and including vegetables in eating routines (e.g., providing vegetables at snacks), providing guided choices that include vegetables, and modeling enjoyment of eating vegetables.

The lack of findings regarding other types of feeding practices as well as other aspects of dietary intake and growth, body composition, and risk of obesity outcomes among children ages 2 to 6 years highlights notable scientific gaps for promoting healthy dietary patterns aligned with the *Dietary Guidelines* and preventing diet-related chronic disease. Specifically, the inability to draw conclusions in 20 instances highlights the need for rigorous prospective and controlled trials on approaches to feeding younger children. Growth, body composition, and risk of obesity outcomes are fairly distal to the goal-oriented nature of specific child feeding practices, which are aimed at shaping children's eating behaviors and dietary intakes. As such, research evaluating outcomes related to eating behaviors and dietary intakes should be a priority for identifying approaches to feeding children that promote intakes aligned with the *Dietary Guidelines*.

## Discussion

### **Comparison to the Pregnancy and Birth to 24 Months Project Systematic Reviews that Informed the *Dietary Guidelines for Americans, 2020-2025*** **Complementary Feeding**

This Committee noted several differences when comparing its conclusion statements about complementary feeding to those of the P/B-24 Project. This Committee focused solely on evaluating

consumption of and timing of introduction to specific types of complementary foods and beverages—rather than the first introduction of any complementary food or beverage—in relation to growth, body composition, and risk of obesity. The Committee’s updated review led to several new conclusion statements and identification of gaps in the literature.

When this Committee assessed the timing of introduction to specific complementary foods and beverages, it found that introducing grains at or before age 4 months was associated with higher BMI z-scores in childhood (supported by evidence graded as limited). However, a conclusion statement could not be drawn regarding the age at which grains were introduced (up to age 24 months) and other growth, body composition, and risk of obesity outcomes including body composition and risk of obesity in childhood because of a lack of evidence. The systematic review conducted as part of the P/B-24 Project found that first introduction of *any* complementary food or beverage before age 4 months may be associated with higher odds of overweight or obesity (supported by evidence graded as limited), whereas first introduction of *any* complementary food or beverage between ages 4 and 5 months compared to 6 months was not associated with growth, size, body composition, and risk of overweight and obesity in generally healthy, full-term infants (supported by evidence graded as moderate). This Committee had concerns about the consistency of evidence for the age of introduction of protein foods, dairy, and sugar-sweetened beverages (up to age 24 months) and growth, body composition, and risk of obesity in childhood, therefore conclusion statements could not be drawn. Similarly, not enough evidence was available to evaluate the age of introduction of 100% juice, fruit, vegetable, and food sources of added sugars in relation to growth, body composition, and risk of obesity in childhood.

When this Committee assessed consumption of specific types of complementary foods, it found no unfavorable associations between grains consumption (between ages 6 and 24 months) and growth and risk of obesity in childhood (supported by evidence graded as limited). These findings are in line with the P/B-24 Project systematic review on types and amounts of complementary foods or beverages, which identified that the type or amount of cereal did not favorably or unfavorably influence growth, size, body composition, and risk of overweight and obesity (supported by evidence graded as limited). This Committee had concerns about the consistency, directness, and precision of evidence for consumption of protein foods, dairy, and 100% juice (up to age 24 months) and growth, body composition, and risk of obesity in childhood, therefore conclusion statements could not be drawn. The P/B-24 Project systematic review identified that higher vs. lower meat intake or meat vs. iron-fortified cereal intake over a short duration (about 3 months) during the complementary feeding period does not favorably or unfavorably influence growth, size, body composition, and risk of overweight and obesity (supported by evidence graded as moderate); however evidence was insufficient to determine a relationship between meat intake and prevalence/incidence of overweight or obesity. Finally, the P/B-24 Project systematic review reported a positive association between juice intake and infant weight-for-length and child BMI z-score (supported by evidence graded as limited). An important note is that identification of 100% juice vs. “juice”—which can include sugar-sweetened beverages—was not consistent between systematic reviews. This Committee found no unfavorable association between fruits or vegetable consumption (up to age 24 months) and

outcomes related to growth patterns in childhood (supported by evidence graded as limited). Not enough evidence was available, however, for outcomes related to body composition and risk of obesity. Similarly, not enough evidence was available for consumption of food sources of added sugars (up to age 24 months) and outcomes related to growth, body composition, and risk of obesity. These conclusions statements add to those of the P/B-24 Project work that identified that no conclusion could be made about the relationship between other complementary foods (vegetables, fruit, dairy products and/or cow milk, cereal-based products, milk-cereal drink, and/or categories such as “ready-made foods”) and growth, size, body composition, and risk of overweight and obesity in childhood.

Details regarding consumption of sugar-sweetened beverages and 100% juice on growth, body composition, and risk of obesity are integrated in the systematic review and meta-analysis across the lifespan—which the 2020 Committee recommended conducting—and are presented in **Part D. Chapter 3. Beverages**.<sup>28,29</sup> The 2020 Committee also recommended that the 2025 Committee review evidence on *how* to feed infants and toddlers to complement reviews about *what* to feed infants and young children. This information is presented in the following section.

## Feeding Styles and Practices

This Committee was the first to evaluate evidence examining associations of caregiver feeding styles and practices with dietary intake and growth, body composition, and risk of obesity outcomes among children ages 2 to 6 years. This work complemented and extended the P/B-24 Project work that focused more narrowly on associations of caregiver feeding practices and growth, body composition, and risk of obesity among children ages 4 to 24 months.<sup>21</sup> The P/B-24 Project did not review evidence on feeding styles or on influences of caregiver feeding practices on dietary outcomes.

This Committee identified favorable associations between structured feeding practices and fruit and vegetable intake among children ages 2 to 6 years. Conclusions could not be drawn, however, about the association of practices reflecting control or autonomy support with child dietary outcomes. Further, the Committee drew few conclusions regarding the influence of caregiver feeding styles and practices on child growth, body composition, and risk of obesity outcomes among children ages 2 to 6 years, largely because of a lack of rigorous studies. The exception was the conclusion that monitoring (a dimension of structure) was not associated with growth, body composition, and risk of obesity outcomes among children. In contrast, the conclusions drawn by the P/B-24 Project among children ages 4 to 24 months identified associations of feeding practices with weight-related outcomes among children.<sup>21</sup> A systematic review conducted as part of the P/B-24 Project found moderate evidence from randomized controlled trials to suggest that providing mothers with feeding guidance to recognize and respond appropriately to a child’s hunger and satiety cues can contribute to normal weight gain and/or weight status in children ages 2 years and younger. Further, the P/B-24 review concluded that greater use of restrictive feeding practices during the period of birth to 24 months was associated with increased weight gain and higher weight status, whereas greater use of pressuring children to eat was associated with decreased weight gain and lower weight status. The P/B-24 work qualified that conclusion by noting that the direction of association between

controlling feeding practices and child weight status has not been clearly established by prospective studies.

This Committee found favorable effects of repeated exposure on food acceptance, particularly vegetables, among children ages 4 to 24 months and ages 2 to 6 years. Among young children ages 4 to 24 months, the effects appeared to generalize to foods within the same category. Among children ages 2 to 6 years, increases in acceptance were observed for novel as well as previously disliked vegetables. Further, the Committee concluded that other types of sensory exposure outside of tasting may encourage children to try (i.e., taste) new foods. Collectively, these findings update and extend those of a systematic review on repeated exposure and vegetable intake among children from birth to 24 months that was conducted as part of the P/B-24 Project.<sup>20</sup> That review found moderate evidence that providing repeated exposure to a fruit or vegetable once a day for 8 to 10 or more days is likely to increase its acceptance and to generalize to foods in the same category. In acknowledgement of the findings of the P/B-24 reviews, the 2020 Committee subsequently recommended repeated offerings of foods such as fruits and vegetables to increase acceptance and encourage consumption of a variety of healthy foods. This Committee's findings strengthen the scientific basis for such recommendations, suggesting that repeated exposure is an effective strategy for promoting acceptance of healthy foods, particularly vegetables, during the first 6 years of life. Providing taste as well as other types of sensory exposure to healthy foods promotes their acceptance among children and has important implications for settings inside and outside the home, including federal programs that serve children and their families.

## Comparisons to Other Systematic Reviews and Meta-Analyses

### Complementary Feeding

Several other published systematic reviews on complementary feeding are important to highlight. For context, it is notable that Dietary Reference Intakes for specific nutrients during the complementary feeding period have not been established, which makes intake recommendations challenging. In prior systematic reviews led by the World Health Organization (WHO), several major evidence gaps were identified for ages 6 to 24 months with regard to relationships between consumption of animal food sources, or of fruits, vegetables, nuts, and pulses and dietary and health outcomes later in life.<sup>30</sup> These gaps have been partially addressed with this Committee's conclusion statements for the consumption of grains, fruit, and vegetables in relation to growth, body composition, and risk of obesity. Another systematic review led by the WHO suggested that early introduction of complementary foods (between 3 and 6 months) for normal-term infants might be associated with overweight, obesity, and blood pressure in observational studies (supported by limited evidence with low certainty).<sup>31</sup> This Committee refined the analysis to specific food groups and found that early introduction of grains was associated with higher BMI z-score in childhood (supported by evidence graded as limited).

Building on the knowledge that dietary intakes of infants are significantly associated with dietary intake of caregivers, understanding the drivers of food preferences and dietary intakes during childhood is critical.

In prior systematic reviews conducted as part of the P/B-24 Project, flavor transfer from maternal diet to the amniotic fluid and human milk was supported by evidence graded as limited and moderate, respectively.<sup>32</sup> Importantly, infants were found to detect diet-transmitted flavors in mother's milk (supported by evidence graded as moderate), suggesting that flavor transfer, and therefore maternal diet quality and diversity, may facilitate complementary feeding by increasing food acceptance. Such findings suggest that caregiver diet may be a promising focus for interventions aiming to shape infant food preferences and dietary intakes.

In addition, another systematic review found that socioeconomic factors, family and cultural aspects, guidance from health professionals, and factors inherent to the baby (such as the acceptance or rejection of new foods) influence caregiver selection of complementary foods.<sup>33</sup> More studies are needed to evaluate how food and nutrition security, individual and community resources, and cultural meaning of food choices and values may impact complementary feeding choices.<sup>34</sup> Parental education on readiness for complementary feeding and choice of foods should be prioritized with attention to vulnerable groups of parents such as teenagers or parents living in areas with limited access to healthcare providers.<sup>35</sup> Further, research is needed on the roles of fathers and other caregivers in complementary feeding.

Although other systematic reviews have focused on specific foods as this Committee did, 1 other review focused on early infancy (ages birth to 4 months),<sup>36</sup> and 1 focused on other outcomes (cardiometabolic risk biomarkers) not examined by this Committee.<sup>37</sup> Other systematic reviews focused on specific types of diets used for complementary feeding (vegetarian or vegan diets), complementary feeding approaches, and the intersection between complementary feeding and sleep. Their results suggested that: 1) vegetarian or vegan diets during the complementary feeding period have not been shown to be safe due to potential risk of micronutrient deficiencies or insufficiencies leading to growth faltering,<sup>38</sup> 2) complementary feeding approaches do not appear to be associated with risk of choking,<sup>39</sup> and 3) no association exists between timing of introduction to complementary foods and infant sleep duration during the first year of life.<sup>40</sup>

This Committee's findings along with findings of previous systematic reviews on complementary feeding will inform evidenced-based public health efforts to support optimal development in early life. A National Academies committee outlined possible interventions that could be scaled up or implemented at a community or state level to improve infant and young child feeding behaviors.<sup>41</sup> That committee's conclusions of existing ecosystems and infrastructure for complementary feeding interventions included programs in healthcare (expanding state Medicaid and Children's Health Insurance Program coverage of counseling interventions by registered dietitians, psychologists, or social workers, augmented by community health workers or peer counselors); early care and education (routinely introduce new healthy foods, fund and support early care and education providers to adopt healthy meal patterns); university cooperative extension (improve nutrition and training options for caregivers, early childhood educators, and paraprofessionals); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (expand nutrition education and support to individuals of all income levels, and locate services in

healthcare settings), and home visiting (collaboration across systems to develop, distribute, and provide training).

## Feeding Styles and Practices

A number of previously published systematic reviews and meta-analyses have evaluated evidence on associations of caregiver feeding styles and practices with child outcomes. This Committee's review of the evidence, however, differs from previous systematic reviews in 2 important ways. First, most systematic reviews on this topic included cross-sectional studies, whereas the Committee considered evidence from only prospective studies and randomized controlled trials. This is important given longstanding questions regarding the direction of effects between caregiver and child, i.e., the extent to which associations reflect influences of the feeding practice on the child, or alternatively, reflect influences of the child on the feeding practices used by caregivers. Second, previous systematic reviews tended to evaluate the evidence on individual feeding practices. In contrast, the Committee organized and evaluated multiple feeding practices within broad dimensions of structure, autonomy support, and control. This approach enabled a high-level evaluation of the evidence that translates to development of population-based dietary guidance.

The Committee's findings on associations of structure-related feeding practices with child fruit and vegetable intakes are generally consistent with the only other systematic review that evaluated child dietary outcomes. A 2017 systematic review and meta-analysis of mostly cross-sectional studies evaluated associations of individual feeding practices used by caregivers of children ages 2 to 18 years (49 percent of whom were ages 2 to 6 years) with children's intake of healthy (e.g., fruits and vegetables) and unhealthy foods (e.g., SSB).<sup>22</sup> Results of the meta-analysis found that practices reflecting structure (specifically, parental modeling and food availability) showed the strongest positive associations with children's intake of both healthy and unhealthy foods. Other individual practices reflecting control in feeding and autonomy support showed weak associations with children's intake of healthy and unhealthy foods.<sup>42</sup>

Three previous systematic reviews evaluated associations of caregiver feeding styles and individual feeding practices with weight-related outcomes among children.<sup>23,43,44</sup> The Committee's conclusions differ from those of 2 of the systematic reviews, which included mostly cross-sectional studies. Shilom et al.<sup>43</sup> evaluated associations of caregiver feeding styles and practices with child body mass index (BMI) of children ages 4 to 12 years. Results showed that 2 controlling feeding practices, restriction and pressure to eat, were associated with child BMI. Restriction was positively associated with child BMI in most studies, whereas pressure to eat was negatively associated with child BMI in most studies. Moreover, indulgent feeding styles were most consistently associated with child BMI. Similarly, a 2020 systematic review and meta-analysis of mostly cross-sectional studies of children (65 percent of which involved children ages 2 to 6 years) identified associations between controlling feeding practices and child weight status (i.e., weight, BMI, BMI percentile, overweight, obesity).<sup>44</sup> Results showed weak positive effect sizes for associations of restriction and child weight status, and weak negative effect sizes for associations of pressure to eat and child weight status. The Committee's findings, however, are generally consistent with those of the only systematic review to date that has focused solely on prospective studies. Beckers et al.<sup>23</sup> evaluated

associations of food parenting practices and child weight outcomes of children ages 2 to 18 years. Results indicated that restriction and pressure to eat, as well as monitoring (a dimension of structure), were generally not associated with child weight over time. Food parenting practices reflecting autonomy support and other aspects of structure were generally understudied.

The Committee's findings agree with 2 other systematic reviews on repeated exposure. A 2018 systematic review and meta-analysis found small but reliable benefits of repeated exposure to a single vegetable and to a variety of vegetables on children's acceptance of new vegetables.<sup>45</sup> It also found evidence that acceptance may be enhanced with the addition of small non-food rewards such as stickers or praise by incentivizing or encouraging children to try foods. Similarly, a 2017 systematic review that evaluated methods for increasing vegetable consumption among children ages 2 to 5 years concluded that repeated exposure was effective.<sup>46</sup> These findings collectively suggest that repeated exposure will be most effective when paired with positive social environments around eating, where children's willingness to explore and try healthy foods is reinforced and where adults consume and enjoy healthy foods with children and encourage—but do not pressure—children to try them.

In summary, the Committee's conclusions on caregiver feeding styles and practices are generally consistent with recent systematic reviews and extend that work by evaluating broad dimensions of control, structure, and autonomy support and by focusing on dietary outcomes among children. The Committee's findings on structure-related practices are also consistent with evidence-based recommendations from Healthy Eating Research (HER) on promoting healthy eating behaviors among children ages 2 to 8 years.<sup>47</sup> HER recommendations for promoting food acceptance and intake of healthy foods highlight the role of structure-related feeding practices (providing repeated exposure and making healthy foods available) and other feeding practices that may encourage children to try (i.e., taste) new foods (modeling, providing small rewards and praise, and providing non-taste sensory exposure).

## Committee's Advice to the Departments

### Complementary Feeding

Findings from the systematic reviews support existing general recommendations from the *Dietary Guidelines for Americans, 2020-2025* and provide additional details on specific complementary foods:

- Introduce complementary foods around age 6 months to complement human milk and/or iron-fortified infant formula, based on developmental signs of readiness to eat solid foods.
- Encourage infants and young children to consume a variety of foods from all food groups. Include foods rich in iron and zinc, particularly for infants fed human milk.
- Based on this Committee's review of the evidence, fruits, vegetables, and grains are complementary food options between ages 6 and 24 months that were not associated with unfavorable outcomes related to growth and risk of obesity. Vegetables, fruits, and grains are nutrient-dense options that are part of healthy dietary patterns recommended for all life stages.

- Introduce nutrient-dense foods of varying flavors and textures to ensure adequate nutrition and to promote acceptance of a variety of foods and avoid food and beverages with added sugars, and limit foods and beverages high in sodium. Because children’s nutrient needs during the complementary feeding period are high relative to energy requirements, dietary patterns during this period have little to no room for less nutrient-dense choices. (See **Part E. Chapter 1: Overarching Advice to the Departments** for information on the dietary pattern for ages 12 through 23 months.
- Offer developmentally appropriate size and texture of foods to help prevent choking.
- Other considerations: Continue to recommend exclusive human milk feeding during the first 6 months of life and continue to provide inclusive language to reflect current practices; many infants in the United States are fed both human milk and infant formula at some point during infancy.<sup>48</sup>

## Feeding Styles and Practices

Findings from the systematic reviews are consistent with general recommendations for supporting healthy eating among children and adolescents ages 2 through 18 years in the *Dietary Guidelines for Americans, 2020-2025* and provide a strong scientific basis for significantly expanding guidance about how to feed children. Three separate lines of systematic reviews conducted by the Committee highlight the supportive role of structured approaches to feeding children: associations of structured feeding practices with vegetable and fruit intake among children ages 2 to 6 years; effects of repeated exposure on acceptance of vegetables and fruit among children up to age 6 years; and effects of food portion size on energy intake among children ages 2 to 6 years (see **Part D. Chapter 7: Portion Size** for detailed presentation of this evidence).<sup>49,50</sup> Based on these findings, the Committee advises expanding recommendations in the *Dietary Guidelines for Americans, 2025-2030* about how to feed children, building on the existing recommendations:

- Emphasize benefits of structured feeding practices for children’s consumption of healthy foods aligned with *Dietary Guidelines*. Structured feeding practices organize physical and social aspects of children’s eating environments. The Committee recommends that the Departments continue to encourage specific practices mentioned in the *Dietary Guidelines for Americans, 2020-2025* that emphasize structure and expand emphasis on potential benefits for children’s consumption of a diet aligned with the *Dietary Guidelines*. The Committee’s work revealed favorable associations of the use of structured feeding practices with consumption of vegetables and fruit among children ages 2 to 6 years. Guidance should be enhanced to describe practices that organize physical and social aspects of children’s eating environments and provide concrete examples of how these strategies can be employed by caregivers at home and in other settings where children routinely eat. Structured practices that organize physical aspects of children’s eating environment dictate what, when, and how much food is



available and accessible to children in the home and at meals and snacks. These include making healthy foods readily available in the home and in forms that are accessible to children (e.g., pre-cut fruit), providing repeated exposure to those foods, and providing child-sized portions. Structured practices that organize social aspects of children's eating serve to guide children's behaviors and enhance positive experiences around eating. These include having regular eating routines, offering children guided choices that allow them to choose between 2 healthy options, and providing a positive social environment where caregivers eat and enjoy healthy foods together with children.

- Emphasize benefits of repeated exposure on food acceptance for children up to age 6 years and highlight opportunities for other types of non-sensory exposure to healthy foods. Repeated exposure is a type of structured feeding practice that organizes physical aspects of children's eating environment by shaping how often children are offered specific types of foods at meals and snacks. This Committee recommends that the Departments continue to encourage caregivers of young children up to age 24 months to offer 8 to 10 exposures for acceptance of new foods. The Committee's systematic review findings provide robust evidence that the favorable effects of repeated exposure on food acceptance continue up to age 6 years. Enhancements to current guidance should include older children (up to age 6 years) and emphasize the importance of providing repeated exposure to foods in positive eating context, without pressure; caregivers can support children's acceptance of new foods by eating and enjoying those foods with children. The Committee also recommends enhancing recommendations to include other types of sensory exposure such as reading picture books and involving children in food activities. Systematic review findings indicate that providing children with non-sensory exposure to healthy foods may increase the success of repeated exposure by increasing children's willingness to try (i.e., taste) those foods. Repeated exposure is a straightforward strategy that all caregivers can adopt, including early care educators.
- Include explicit focus on the importance of providing child-appropriate portion sizes. The portion sizes of foods and beverages offered to children is an aspect of structured feeding that shapes physical aspects of children's eating environments. The Committee found robust evidence (see **Part D. Chapter 7: Portion Size**) that offering children large portions of energy-dense foods promotes energy intake at meals and over longer periods. This finding suggests that recommendations about how to feed children should be enhanced to increase attention to the importance of providing child-sized portions, emphasizing practical strategies for portion control. The Committee also found evidence that increasing vegetable and fruit portion sizes may be used strategically to promote intake without appreciable effects on children's energy intakes. The success of this strategy may be tied to the use of other practices that promote acceptance of such foods.

The Committee also highlights other considerations regarding how to feed:

- Delineate distinctions between feeding styles and feeding practices in recommendations about how to feed. Enhancements to current guidance should focus on feeding practices, which refer to specific goal-oriented behaviors used by caregivers to shape and/or guide children's eating behaviors. The Committee recommends describing feeding practices along higher-order conceptual dimensions of structure, autonomy support, and control. Although practices emphasizing structure and autonomy support are believed to have favorable influences on children's eating, the systematic review findings provided empirical support only for structured feeding practices; evidence regarding autonomy support and control was limited. Given the lack of evidence in these areas, recommendations about how to feed should focus on structured practices vs. practices that reflect autonomy support or control.

## References

1. Lutter CK, Grummer-Strawn L, Rogers L. Complementary feeding of infants and young children 6 to 23 months of age. *Nutr Rev*. Jul 7 2021;79(8):825-846. doi:<https://doi.org/10.1093/nutrit/nuaa143>
2. D'Auria E, Borsani B, Pendezza E, et al. Complementary Feeding: Pitfalls for Health Outcomes. *Int J Environ Res Public Health*. Oct 29 2020;17(21) doi:<https://doi.org/10.3390/ijerph17217931>
3. DeSilva D, Cruz CM, Beckman K, et al. *Federal Data Analysis Report for the 2025 Dietary Guidelines Advisory Committee: Current Intakes of Food Groups*. U.S. Department of Health and Human Services, Office of the Assistant Secretary for Health, Office of Disease Prevention and Health Promotion and U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion; 2024. <https://doi.org/10.52570/DA.DGAC2025.DA02>
4. DeSilva D, Cruz CM, Beckman K, et al. *Federal Data Analysis Report for the 2025 Dietary Guidelines Advisory Committee: Current Intakes of Nutrients and Dietary Components*. U.S. Department of Health and Human Services, Office of the Assistant Secretary for Health, Office of Disease Prevention and Health Promotion and U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion; 2024. <https://doi.org/10.52570/DA.DGAC2025.DA03>
5. Black MM, Walker SP, Fernald LCH, et al. Early childhood development coming of age: science through the life course. *Lancet*. Jan 7 2017;389(10064):77-90. doi:[https://doi.org/10.1016/S0140-6736\(16\)31389-7](https://doi.org/10.1016/S0140-6736(16)31389-7)
6. Rousham EK, Goudet S, Markey O, et al. Unhealthy Food and Beverage Consumption in Children and Risk of Overweight and Obesity: A Systematic Review and Meta-Analysis. *Adv Nutr*. Oct 2 2022;13(5):1669-1696. doi:<https://doi.org/10.1093/advances/nmac032>
7. Forestell CA. Flavor Perception and Preference Development in Human Infants. *Ann Nutr Metab*. 2017;70 Suppl 3:17-25. doi:<https://doi.org/10.1159/000478759>
8. Hughes S, Power T. Parenting Influences on Appetite and Weight. In: Lumeng JC, Fisher JO, eds. *Pediatric Food Preferences and Eating Behaviors*. 2018:165-182:chap 9.
9. Wood AC, Blissett JM, Brunstrom JM, et al. Caregiver Influences on Eating Behaviors in Young Children: A Scientific Statement From the American Heart Association. *J Am Heart Assoc*. May 18 2020;9(10):e014520. doi:<https://doi.org/10.1161/JAHA.119.014520>
10. Mennella JA. Ontogeny of taste preferences: basic biology and implications for health. *Am J Clin Nutr*. Mar 2014;99(3):704s-11s. doi:<https://doi.org/10.3945/ajcn.113.067694>
11. Mennella JA, Trabulsi JC. Complementary foods and flavor experiences: setting the foundation. *Ann Nutr Metab*. 2012;60 Suppl 2(Suppl 2):40-50. doi:<https://doi.org/10.1159/000335337>
12. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite*. Feb 2005;44(1):83-92. doi:<https://doi.org/10.1016/j.appet.2004.08.007>

13. Stoody EE, Spahn JM, Casavale KO. The Pregnancy and Birth to 24 Months Project: a series of systematic reviews on diet and health. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):685s-697s. doi:<https://doi.org/10.1093/ajcn/nqy372>
14. English LK, Obbagy JE, Wong YP, et al. Timing of introduction of complementary foods and beverages and growth, size, and body composition: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):935s-955s. doi:<https://doi.org/10.1093/ajcn/nqy267>
15. English LK, Obbagy JE, Wong YP, et al. Types and amounts of complementary foods and beverages consumed and growth, size, and body composition: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):956s-977s. doi:<https://doi.org/10.1093/ajcn/nqy281>
16. English LK, Obbagy JE, Wong YP, et al. Complementary feeding and developmental milestones: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):879s-889s. doi:<https://doi.org/10.1093/ajcn/nqy321>
17. Obbagy JE, English LK, Psota TL, et al. Complementary feeding and micronutrient status: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):852s-871s. doi:<https://doi.org/10.1093/ajcn/nqy266>
18. Obbagy JE, English LK, Wong YP, et al. Complementary feeding and food allergy, atopic dermatitis/eczema, asthma, and allergic rhinitis: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):890s-934s. doi:<https://doi.org/10.1093/ajcn/nqy220>
19. Obbagy JE, English LK, Wong YP, et al. Complementary feeding and bone health: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):872s-878s. doi:<https://doi.org/10.1093/ajcn/nqy227>
20. Spill MK, Johns K, Callahan EH, et al. Repeated exposure to food and food acceptability in infants and toddlers: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):978s-989s. doi:<https://doi.org/10.1093/ajcn/nqy308>
21. Spill MK, Callahan EH, Shapiro MJ, et al. Caregiver feeding practices and child weight outcomes: a systematic review. *Am J Clin Nutr.* Mar 1 2019;109(Suppl\_7):990s-1002s. doi:<https://doi.org/10.1093/ajcn/nqy276>
22. Yee AZ, Lwin MO, Ho SS. The influence of parental practices on child promotive and preventive food consumption behaviors: a systematic review and meta-analysis. *Int J Behav Nutr Phys Act.* Apr 11 2017;14(1):47. doi:<https://doi.org/10.1186/s12966-017-0501-3>
23. Beckers D, Karssen LT, Vink JM, Burk WJ, Larsen JK. Food parenting practices and children's weight outcomes: A systematic review of prospective studies. *Appetite.* Mar 1 2021;158:105010. doi:<https://doi.org/10.1016/j.appet.2020.105010>
24. Vaughn AE, Ward DS, Fisher JO, et al. Fundamental constructs in food parenting practices: a content map to guide future research. *Nutr Rev.* Feb 2016;74(2):98-117. doi:<https://doi.org/10.1093/nutrit/nuv061>
25. Fisher JO, Abrams SA, Andres A, et al. *Complementary Feeding and Growth, Body Composition, and Risk of Obesity: A Systematic Review.* U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR18>
26. Fisher JO, Eicher-Miller HA, Odoms-Young A, et al. *Repeated Exposure to Foods and Food Acceptance: A Systematic Review.* U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR06>
27. Fisher JO, Eicher-Miller HA, Odoms-Young A, et al. *Parental and Caregiver Feeding Styles and Practices and Consuming a Dietary Pattern that is Aligned with the Dietary Guidelines for Americans: A Systematic Review* U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR25>
28. Deierlein AL, Raynor HA, Andres A, et al. *100% Juice and Growth, Body Composition, and Risk of Obesity: A Systematic Review with Meta-Analysis* U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR05>

29. Deierlein AL, Raynor HA, Andres A, et al. *Sugar-Sweetened Beverages and Growth, Body Composition, and Risk of Obesity: A Systematic Review with Meta-Analysis*. U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR23>
30. Harrison L, Oh C, Charbonneau KD, Owais A, Keats EC, Bhutta ZA. *The consumption of varying frequencies, varieties, and quantities of fruits & vegetables and pulses, nuts & seeds among children 6-23 months of age and their association with dietary and health outcomes: A systematic review and meta-analysis*. n.d.
31. Das JK, Padhani ZA, Siddiqui FA, et al. *Optimal timing of introduction of complementary feeding: A systematic review and meta-analysis*. n.d.
32. Spahn JM, Callahan EH, Spill MK, et al. Influence of maternal diet on flavor transfer to amniotic fluid and breast milk and children's responses: a systematic review. *Am J Clin Nutr*. Mar 1 2019;109(Suppl\_7):1003s-1026s. doi:10.1093/ajcn/nqy240
33. Raymundo GP, Souza Dos Santos C, da Rosa SV, et al. Influences in food selection during complementary feeding in breastfeeding infants: A systematic review and metasythesis of qualitative studies. *Appetite*. Nov 1 2024;202:107626. doi:<https://doi.org/10.1016/j.appet.2024.107626>
34. Annan RA, Agyapong NAF, Aduku LNE, Boakye OA, Akenteng MW. *Qualitative systematic reviews of complementary feeding recommendations' impact on preferences, equity and rights, resource implications, acceptability, and feasibility*. Organization TWH; 2021. [https://cdn.who.int/media/docs/default-source/nutrition-and-food-safety/complementary-feeding/cf-guidelines/qualitative-review-preferences-equity-resources-acceptability-and-feasibility.pdf?sfvrsn=996ad2df\\_3](https://cdn.who.int/media/docs/default-source/nutrition-and-food-safety/complementary-feeding/cf-guidelines/qualitative-review-preferences-equity-resources-acceptability-and-feasibility.pdf?sfvrsn=996ad2df_3)
35. Spyreli E, McKinley MC, Dean M. Parental considerations during complementary feeding in higher income countries: a systematic review of qualitative evidence. *Public Health Nutr*. Jul 2021;24(10):2834-2847. doi:<https://doi.org/10.1017/S1368980021001749>
36. Milani GP, Edefonti V, De Cosmi V, et al. Protein and growth during the first year of life: a systematic review and meta-analysis. *Pediatr Res*. Sep 2023;94(3):878-891. doi:<https://doi.org/10.1038/s41390-023-02531-3>
37. Markey O, Pradeilles R, Goudet S, et al. Unhealthy Food and Beverage Consumption during Childhood and Risk of Cardiometabolic Disease: A Systematic Review of Prospective Cohort Studies. *J Nutr*. Jan 2023;153(1):176-189. doi:<https://doi.org/10.1016/j.tjnut.2022.11.013>
38. Simeone G, Bergamini M, Verga MC, et al. Do Vegetarian Diets Provide Adequate Nutrient Intake during Complementary Feeding? A Systematic Review. *Nutrients*. Aug 31 2022;14(17) doi:<https://doi.org/10.3390/nu14173591>
39. Correia L, Sousa AR, Capitão C, Pedro AR. Complementary feeding approaches and risk of choking: A systematic review. *J Pediatr Gastroenterol Nutr*. Nov 2024;79(5):934-942. doi:<https://doi.org/10.1002/jpn3.12298>
40. Fu X, Lovell AL, Braakhuis AJ, Mithen RF, Wall CR. Type of Milk Feeding and Introduction to Complementary Foods in Relation to Infant Sleep: A Systematic Review. *Nutrients*. Nov 16 2021;13(11) doi:<https://doi.org/10.3390/nu13114105>
41. National Academies of Sciences E, Medicine, Health, et al. In: Delaney KM, Savitz DA, eds. *Complementary Feeding Interventions for Infants and Young Children Under Age 2: Scoping of Promising Interventions to Implement at the Community or State Level*. National Academies Press (US Copyright 2023 by the National Academy of Sciences. All rights reserved; 2023.
42. Blaine RE, Kachurak A, Davison KK, Klabunde R, Fisher JO. Food parenting and child snacking: a systematic review. *Int J Behav Nutr Phys Act*. Nov 3 2017;14(1):146. doi:<https://doi.org/10.1186/s12966-017-0593-9>
43. Shloim N, Edelson LR, Martin N, Hetherington MM. Parenting Styles, Feeding Styles, Feeding Practices, and Weight Status in 4-12 Year-Old Children: A Systematic Review of the Literature. *Front Psychol*. 2015;6:1849. doi:<https://doi.org/10.3389/fpsyg.2015.01849>

44. Ruzicka EB, Darling KE, Sato AF. Controlling child feeding practices and child weight: A systematic review and meta-analysis. *Obes Rev.* Mar 2021;22(3):e13135. doi:<https://doi.org/10.1111/obr.13135>
45. Appleton KM, Hemingway A, Rajska J, Hartwell H. Repeated exposure and conditioning strategies for increasing vegetable liking and intake: systematic review and meta-analyses of the published literature. *Am J Clin Nutr.* Oct 1 2018;108(4):842-856. doi:<https://doi.org/10.1093/ajcn/nqy143>
46. Holley CE, Farrow C, Haycraft E. A Systematic Review of Methods for Increasing Vegetable Consumption in Early Childhood. *Curr Nutr Rep.* 2017;6(2):157-170. doi:<https://doi.org/10.1007/s13668-017-0202-1>
47. Fisher J, Lumeng J, Miller L, Smethers A, Lott M. *Evidence-Based Recommendations and Best Practices for Promoting Healthy Eating Behaviors in Children 2 to 8 Years.* 2021. <https://healthyeatingresearch.org/>
48. Centers for Disease Control and Prevention, Division of Nutrition PA, and Obesity,. *Breastfeeding Report Card.* 2022. June 11, 2024. <http://www.cdc.gov/breastfeeding>
49. Andres A, Fisher JO, Anderson CAM, et al. *Portion Size and Energy Intake: A Systematic Review.* U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR28>
50. Raynor HA, Gardner CD, Anderson CAM, et al. *Portion Size and Growth, Body Composition, and Risk of Obesity: A Systematic Review.* U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review; 2024. <https://doi.org/10.52570/NESR.DGAC2025.SR17>