

# Feeding Guidelines for Infants and Young Toddlers: A Responsive Parenting Approach

## Healthy Eating Research

Building evidence to prevent childhood obesity

February 2017





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## Definitions

**BABY-LED WEANING (BLW)** A method of adding solid foods to a baby’s diet of breast milk or formula. Following a “food progression” approach, BLW seeks to develop age-appropriate oral motor control while maintaining eating as a positive, interactive experience. BLW is expected to facilitate the ability of babies to self-regulate their solid food consumption by allowing them to self-feed and explore with their senses (touching, smelling, licking), starting when they are introduced to solid foods for the first time.<sup>1</sup>

**COMPLEMENTARY FEEDING** A process that starts when breast milk or infant formula is complemented by other foods and beverages and ends when the young child transitions fully to family foods. The complementary feeding period typically continues to 24 months of age (P/B-24 Project<sup>2</sup> working draft definition).

**COMPLEMENTARY FOODS** Foods and beverages other than breast milk or infant formula (liquids, semisolids, and solids) provided to an infant or young child to provide nutrients and energy (P/B-24 Project<sup>2</sup> working draft definition).

**EARLY CARE AND EDUCATION PROGRAMS** Diverse non-parental child-care arrangements including child-care centers, home care by a relative, or home care by a non-relative.<sup>3</sup>

**FIRST 1000 DAYS** The life course period spanning from conception through two years of age.

**FITS** The Feeding Infants and Toddlers Study (FITS), a cross-sectional dietary intake survey conducted in 2008 in a nationally representative sample of U.S. children under four years of age.<sup>4</sup>

**HEALTHY FOODS** Foods that contribute to healthy diets if consumed in appropriate amounts.<sup>5</sup>

**IFPS-II** The Infant Feeding Practices Study II (IFPS II), a U.S. national longitudinal study, and its corresponding six-year follow-up study (Y6FUP). IFPS-II collection started in 2005 with approximately 2,000 mothers that were followed from the last trimester of pregnancy through the first year postpartum. The Y6FUP took place in 2012.<sup>6</sup>

**NEOPHOBIA** Rejection of novel foods.

**NONRESPONSIVE FEEDING** Feeding characterized by a lack of reciprocity between the caregiver and child and can include: (a) the caregiver taking control and dominating the feeding situation as reflected in controlling and pressuring behaviors; (b) the child controlling the situation leading to indulgence; or (c) the caregiver being uninvolved and ignoring the child. When caregivers over-control the feeding, not only do they potentially override the child’s internal hunger and satiety regulatory cues, but it is thought that they may interfere with the child’s emerging autonomy and striving for competence.<sup>7</sup>

**RESPONSIVE FEEDING** A key dimension of responsive parenting involving reciprocity between the child and caregiver during the feeding process. It is grounded upon the following three steps: (1) the child signals hunger and satiety through motor actions, facial expressions, or vocalizations; (2) the caregiver recognizes the cues and responds promptly in a manner that is emotionally supportive, contingent on the signal, and developmentally appropriate; and (3) the child experiences a predictable response to signals.<sup>8</sup>

**RESPONSIVE PARENTING** A parenting style that is meant to foster the development of self-regulation and promote cognitive, social, and emotional development. Self-regulation includes overlapping constructs that can affect feeding behaviors including self-control, will power, effortful control, delay of gratification, emotional regulation, executive function, and inhibitory control.<sup>9</sup>

**UNHEALTHY FOODS** Foods high in saturated fats, trans-fatty acids, added sugars, or sodium (i.e., energy-dense, nutrient-poor foods).<sup>5</sup>

## Executive Summary

The *Dietary Guidelines for Americans (DGA)* provide evidence-based food and beverage recommendations for Americans ages 2 and older with the goals of promoting health, preventing chronic disease, and helping individuals reach and maintain a healthy weight. Since their inception, the *DGA* have not included dietary guidance for infants and toddlers younger than 24 months, which is understandable given that dietary needs are very unique, specific, and rapidly changing during the first two years of life. However, in the past several years conclusive evidence has emerged that the first 1,000 days – or the period from conception to age 2 – is critical for childhood obesity prevention. This research led the U.S. Congress to enact a law requiring these groups be included in the next edition of the *DGA*, which will encompass 2020 through 2025.

The specific objective of this project was to develop evidence-based infant and toddler feeding guidelines that focus on what and how to feed infants and toddlers, within the context of the growing child and responsive parenting. Although the main focus was the development of guidelines for caregivers on how to prevent excessive weight gain in infants and toddlers, whenever possible the recommendations also took into account outcomes of major public health concern strongly influenced by dietary practices, such as iron deficiency and oral health. In addition, other behaviors influencing hunger and satiety such as physical activity, media use, and sleep, were addressed.

The aim of the guidelines presented in this report is to empower caregivers to address the nutritional status and well-being of infants and toddlers by offering them healthier food and beverage options in response to their hunger and satiety cues. Thus the report does not focus on clinical guidelines regarding specific nutrient supplementation needs for infants and toddlers.

Healthy feeding behaviors by infants and toddlers are needed for healthy growth as well as social, emotional, and cognitive development. This is a crucial time period because food preferences, dietary patterns, and the risk of obesity are rapidly

developing between birth and 2 years of age. In fact, the strong and consistent relationship between rapid weight gain during infancy and later childhood obesity indicates the importance of identifying factors that can lead to excessive caloric intake and thus accelerated growth during infancy.

Given the central role that early life feeding behaviors play in establishing food preferences and obesity risk, the prevalence of poor dietary patterns among infants and toddlers, and the fact that previous comprehensive guidelines are dated, it is imperative for an expert committee to make specific recommendations for this population. In taking on this task, the Expert Panel convened by Healthy Eating Research, a national program of the Robert Wood Johnson Foundation, reviewed the evidence that has emerged over the past two decades, especially with regards to the role that responsive parenting plays in establishing the feeding and physical activity behaviors of young children.

The four responsive parenting dimensions addressed in this report are feeding, soothing, sleep, and physical activity, including active play time and sedentary behaviors such as screen time. As indicated in the responsive parenting section of this report, these dimensions are interrelated and together influence child weight through dietary intake and physical activity pathways.

This report is broken down into 7 primary sections: the epidemiology of infant and toddler feeding practices in the U.S.; the methodology followed in the development of these guidelines; what to feed infants and toddlers; responsive parenting and feeding; other behaviors found to be interrelated to feeding and important in responsive parenting; overcoming barriers for implementation of the guidelines by caregivers; and key research recommendations identified by the expert panel as important to moving the field forward.

## Introduction

The *Dietary Guidelines for Americans (DGA)* provide evidence-based food and beverage recommendations for Americans ages 2 and older with the goals of promoting health, preventing chronic disease, and helping individuals reach and maintain a healthy weight. The *DGA* also form the basis of federal nutrition policy and programs and help to guide local, state, and national health promotion and disease prevention initiatives.<sup>10</sup> Since their inception, the *DGA* have not included dietary guidance for infants and toddlers younger than 24 months.<sup>10,11</sup> This is understandable given the very unique, specific, and rapidly changing dietary needs during the first two years of life. However, in the past several years, conclusive evidence has emerged that the first 1,000 days – or the period from conception to age 2 – are critical for childhood obesity prevention.<sup>3,12-14</sup> This research led the U.S. Congress to enact a law requiring these groups be included in the next edition of the *DGA*, which will encompass 2020 through 2025.<sup>2,10,15</sup>

Given the seriousness of the childhood obesity epidemic facing the nation, how risk for overweight and obesity tracks into adulthood,<sup>16</sup> and the fact that a substantial amount of evidence has recently emerged to better inform dietary guidelines for infants and toddlers, it is important to reach an evidence-based consensus among experts on the messages and recommended strategies for caregivers to improve the dietary, weight, and overall health outcomes of their children in the first two years of life. This work is not intended to duplicate, but rather to complement and benefit, the ongoing USDA/DHHS Birth to 24 Months and Pregnancy Project (P/B-24), which is expected to inform the deliberations of the 2020 *DGA* committee and the development of the 2020 *DGA* corresponding to children under 2 years of age.

## Rationale

Healthy feeding behaviors by infants and toddlers are needed for healthy growth as well as social, emotional, and cognitive development.<sup>26,27</sup> For this reason, dietary guidance for infants and toddlers should focus on advising caregivers what young children should eat, as well as the right environment for their children to learn to eat healthfully (i.e., the how). This is a crucial time period, because food preferences, dietary patterns, and the risk of obesity are rapidly developing between birth and 2 years of age.<sup>3,12-14,28,29</sup>

A recent systematic review of 282 studies found that the following early life factors were consistently associated with later childhood obesity risk<sup>30</sup>: higher maternal pre-pregnancy BMI, prenatal tobacco exposure, excess maternal gestational weight gain,

The specific objective of this project was to develop evidence-based infant and toddler feeding guidelines that focus on what and how to feed infants and toddlers, within the context of the growing child and responsive parenting. Although the main focus is the development of guidelines for caregivers on how to prevent excessive weight gain in infants and toddlers, whenever possible the recommendations also took into account outcomes of major public health concern strongly influenced by dietary practices, such as iron deficiency and oral health.<sup>17-19</sup> In addition, other behaviors influencing hunger and satiety, such as physical activity, media use, and sleep, were addressed.

The American Academy of Pediatrics (AAP) has published existing nutrient requirements for infants and toddlers commonly used in practice.<sup>20</sup> While current recommended energy requirements are likely to be excessive,<sup>21,22</sup> the RWJF HER expert panel chose not to address this issue as it is expected that the P/B-24 and 2020 *DGA* Committee will conduct an in-depth assessment of the appropriateness of nutrient intake recommendations for children under two.

The aim of the guidelines presented in this report is to empower caregivers to address the nutritional status and well-being of infants and toddlers by offering them healthier food and beverage options in response to their hunger and satiety cues. Thus the report does not focus on clinical guidelines regarding specific nutrient supplementation needs for infants and toddlers. It is important to note however that the AAP<sup>20</sup> has current specific recommendations regarding iron<sup>23</sup>, Vitamin K<sup>24</sup>, and Vitamin D<sup>25</sup>, taking into account the infant's feeding mode (i.e., breastfed or formula-fed). AAP has also issued guidelines regarding infant formula preparation in communities with local water containing excessive amounts of fluoride, which puts the child at risk for fluorosis.<sup>20</sup>

high infant birth weight, and rapid weight gain during infancy. The strong and consistent relationship between rapid weight gain during infancy and later childhood obesity indicates the importance of identifying factors that can lead to excessive caloric intake and thus accelerated growth during infancy. For example, sugar-sweetened beverages (SSBs) are a cause of public health concern as they are a major contributor to caloric intake in young children.<sup>3,22,31,32</sup> Prospective studies have documented that SSB intake in infancy predicted obesity at 6 years<sup>33</sup> and that infant feeding practices, including not breastfeeding versus breastfeeding for at least 12 months and SSB intake, were associated with obesity during toddlerhood.<sup>34</sup> Additionally, a recent longitudinal analysis of the Infant Feeding Practices Study (IFPS)-II data showed that low fruit and vegetable intake or the addition of

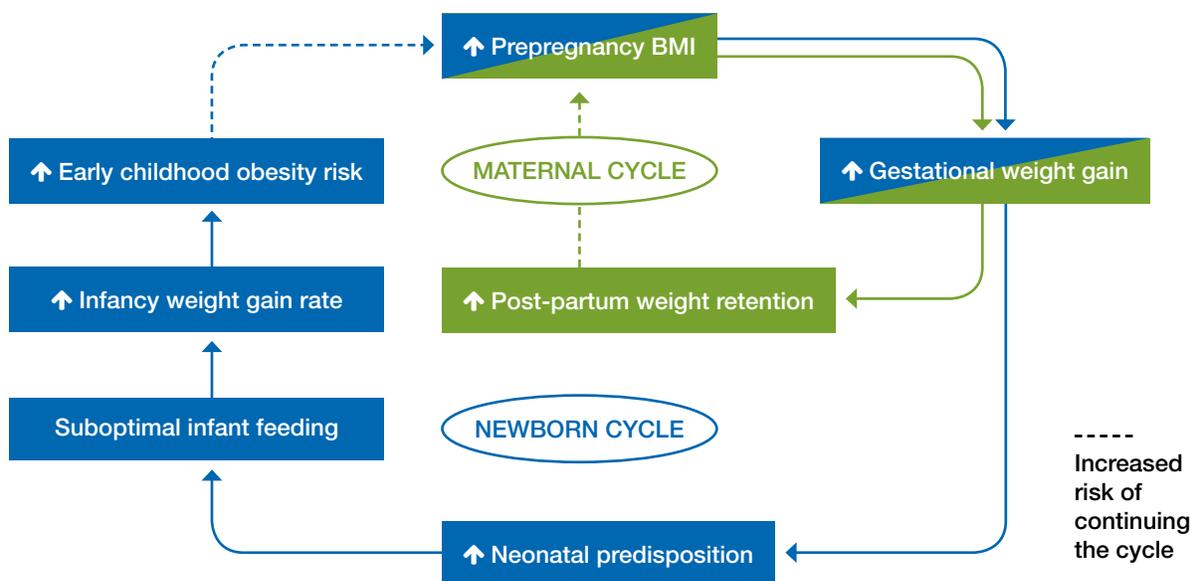
developmentally inappropriate high energy density foods during infancy are associated with higher weight status at 1 year of age.<sup>35</sup> These findings highlight the strong importance of fostering healthy eating behaviors starting early in life.

Although there are few studies, the evidence also supports the possibility that the following early life factors may increase the risk of rapid weight gain or obesity: gestational diabetes, child-care attendance, suboptimal maternal-infant interactions, low socioeconomic status (SES), household food insecurity, insufficient sleep, inappropriate bottle use, introduction of complementary foods before 4 months of age (risk may be even stronger among formula-fed infants), and antibiotic exposure during infancy.<sup>30</sup> The association between breastfeeding and childhood obesity has been strongly debated as a result of mixed findings across systematic reviews.<sup>36</sup> However, the most recent comprehensive meta-analysis that had global representation and adjusted for key study design and contextual factors, concluded that breastfeeding may protect children against the development of childhood obesity.<sup>37</sup> As expected, the number of children in the general population who would benefit is small, given the numerous biological, economic, social, and lifestyle factors that affect the risk of obesity; however, there is evidence indicating the protective benefit may be more pronounced among children with genetic predisposition for obesity.<sup>38</sup> These findings are highly consistent with the current understanding of childhood obesity risk as a life-course process that starts at the time of conception (Figure 1).<sup>3,12-14</sup>

Given the central role that early life feeding behaviors play in establishing food preferences and obesity risk,<sup>26</sup> the poor dietary patterns among infants and toddlers (see section on epidemiology of infant and toddler practices in this report), and the fact that previous comprehensive guidelines are dated,<sup>39</sup> it is imperative for an expert committee to make specific recommendations for this population. In taking on this task, the RWJF HER expert panel takes into account the evidence that has emerged over the past two decades, especially with regards to the role that responsive parenting plays in establishing the feeding and physical activity behaviors of young children (Figure 2).

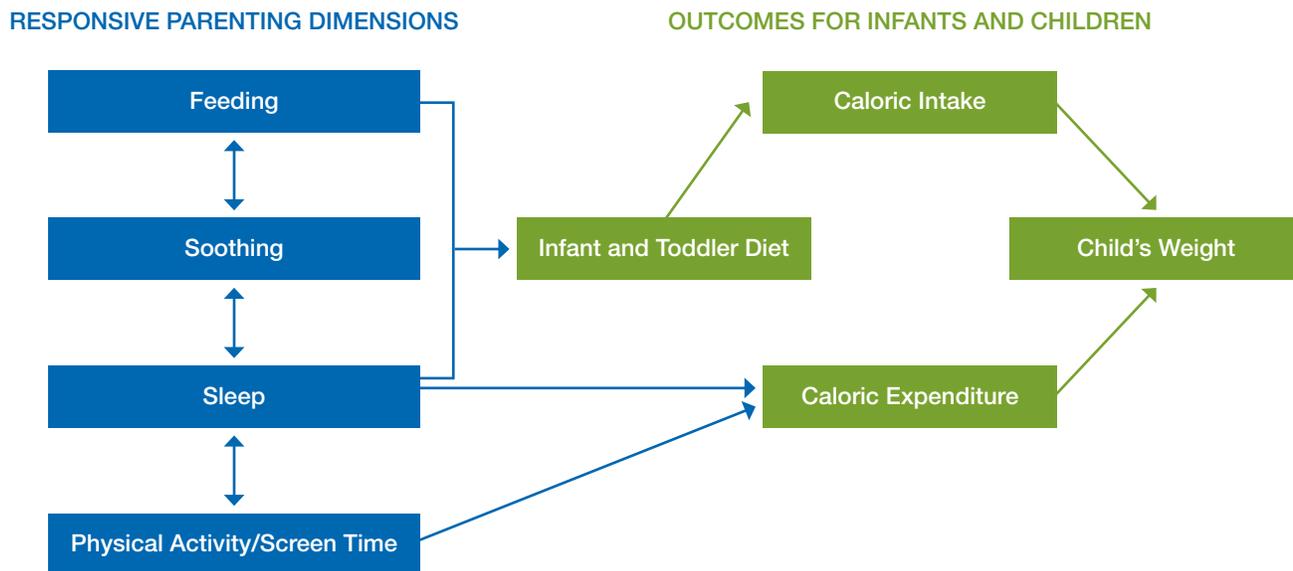
The four responsive parenting dimensions addressed in this report are feeding, soothing, sleep, and physical activity, including active play time and sedentary behaviors such as screen time. As indicated in the responsive parenting section of this report, these dimensions are interrelated and together influence child weight through dietary intake and physical activity pathways. For example, feeding infants and toddlers only in response to hunger and satiety cues, instead of using food as a soothing strategy in the absence of hunger cues, can improve sleep behaviors which in turn can help the child to be more physically active when awake and better self-regulate her/his appetite.<sup>9</sup>

Figure 1. Maternal-child life-course obesity framework



Note: From "Early life nutrition disparities: Where the problem begins?" by R. Pérez-Escamilla and O. Bermudez, 2012, *Adv Nutr*, 3, p. 72.<sup>13</sup> Reprinted with permission from author.

Figure 2. Responsive parenting framework guiding the development of infant and toddler feeding guidelines



Note: Original figure developed by authors of this report.

### Organization of Report

This report is broken down into 7 primary sections. The first section, “The Epidemiology of Infant and Toddler Feeding Practices in the United States”, reveals the extent to which there is a need for improvement. The second section presents the methodology followed in the development of the guidelines. The third section focuses on what to feed infants and toddlers, taking into account when flavor and food preferences get established and how children learn to eat. The fourth section focuses on responsive parenting and feeding (i.e., how to feed infants and toddlers). The fifth section focuses on a variety of other behaviors found to be interrelated to feeding and important in responsive parenting approaches, including: soothing/sleep, physical activity, screen time/sedentary behaviors, food safety, and considerations for food allergies. The sixth section takes a systems level approach to overcoming barriers for implementation of the guidelines by caregivers and

specifically addresses early care and education programs, food assistance programs, the health care system, and food marketing practices targeting young children. Finally, the seventh section provides a list of key research recommendations identified by the expert panel as important to moving the field forward.

The responsive parenting/feeding guidelines resulting from the expert panel process are presented as Appendices to this report according to “what to feed” and “how to feed” infants and toddlers responsively at different stages of development (See Appendices 1-5). These guidelines were separated into three key time periods: 0 to 6, 6 to 12, and 12 to 24 months. Infant- and toddler-specific food safety guidelines focusing on the prevention of foodborne illnesses, food-related choking, and safe handling and storage of expressed human milk and infant formula are presented in Appendix 6. Pacifier use guidelines and food allergy considerations are presented in Appendices 7 and 8.

## Epidemiology of Infant-Toddler Obesity and Dietary Intake Patterns in the United States

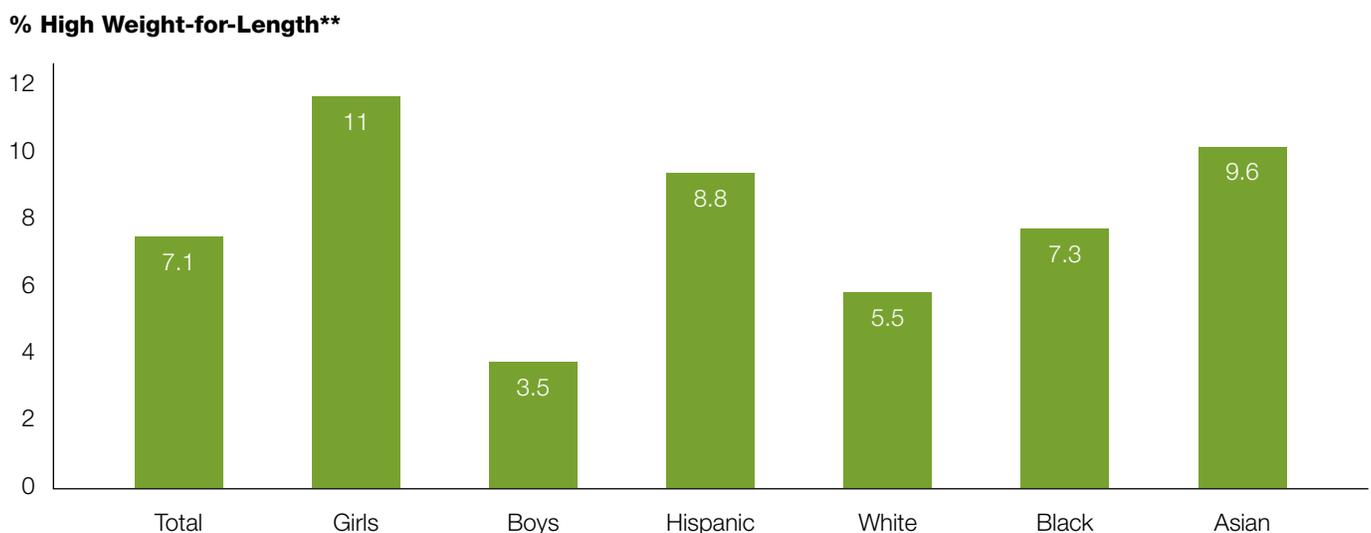
In the United States a significant proportion of children 2 years of age or younger are at risk of childhood obesity.\* Data from the 2011-2012 National Health and Nutrition Examination Survey (NHANES) show that 8.1 percent of children ages 2 or younger had a weight-for-length at or above the 95<sup>th</sup> percentile and 7.1 percent were at or above the 97.7<sup>th</sup> percentile.<sup>40</sup> In an optimally nourished population the expected prevalence would be 5 percent and 2.3 percent, respectively. Child sex and race/ethnicity were associated with excessive weight. The percentage of girls and boys ages 2 or younger at or above the 97.7<sup>th</sup> percentile were 11 percent and 3.5 percent, respectively. Excessive weight prevalence (weight-for-length at or above the 97.7<sup>th</sup> percentile) was 9.6 percent for Asian, followed by 8.8 percent for Hispanic, 7.3 percent for black, and 5.5 percent for white infants and toddlers (see Figure 3). No improvements in overweight rates among infants and toddlers occurred between the 2003-2004 and 2011-2012 NHANES highlighting the need to address early life risk factors for the development of childhood obesity.<sup>40</sup>

Given the role that diet plays in the later development of childhood obesity, the following subsections, which document suboptimal infant and toddler feeding behaviors in the United States, provide strong justification for the development of infant and toddler feeding guidelines.

### Breastfeeding

Due to the health benefits that breastfeeding offers to children and women, the AAP<sup>20</sup> recommends that infants be breastfed exclusively from birth until about 6 months. Once complementary foods are introduced, it is recommended that breastfeeding continues until the child is at least 1 year old. Among infants born in 2013, 81.1 percent of women in the United States initiated breastfeeding; however, by six months the prevalence of women engaged in any breastfeeding dropped to 51.8 percent, and by one year to 30.7 percent.<sup>41</sup> The corresponding Healthy People 2020 targets are 81.9 percent for

Figure 3. High weight-for-recumbent length among U.S. infants and toddlers, birth to two years of age

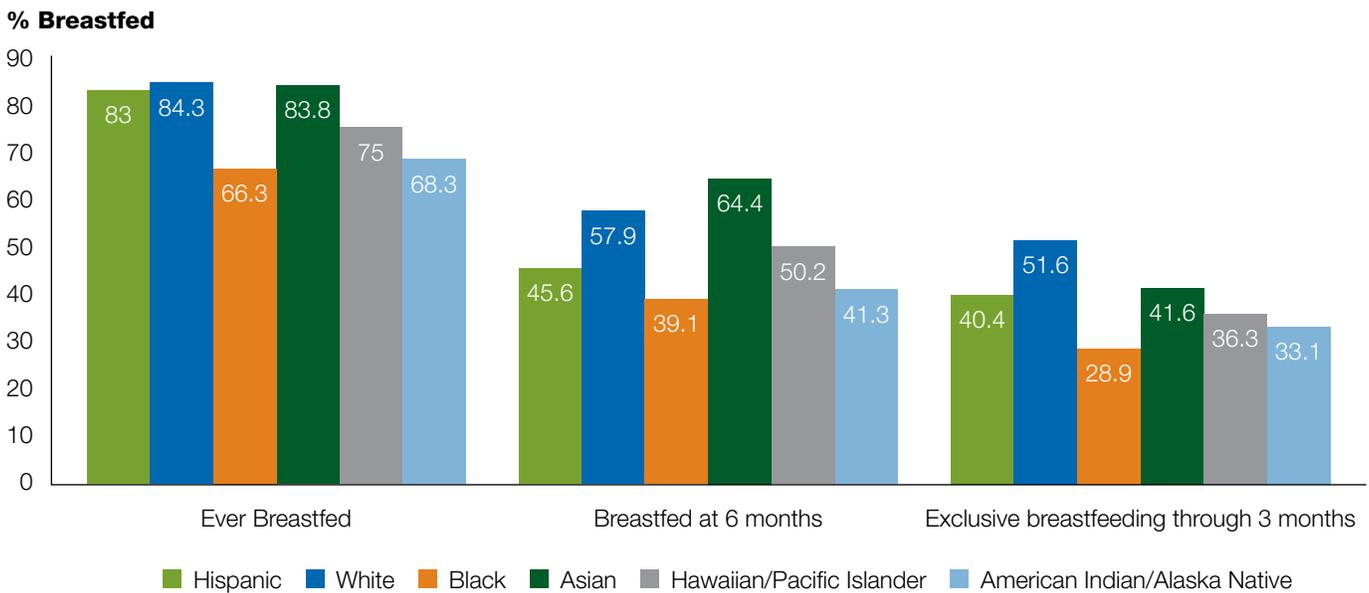


Note: Data from the 2011-2012 National Health and Nutrition Examination Survey (NHANES). Adapted from Ogden et al. (2014).<sup>40</sup>

\* Body Mass Index (BMI) is not used until after two years of age for the diagnosis of obesity. During the first two years of life, weight-for-length has been shown to be associated with later overweight/obesity.<sup>88,203</sup> The AAP supports the use of weight-for-length in the assessment of relative weight for children younger than age 2 years, but indicates the term “obese” should generally not be used for this age group.<sup>20</sup> Given the measure of relative weight commonly used for this age group, “high weight-for-recumbent length” has been used to classify high weight status in lieu of the term “obesity”,<sup>40</sup> although the AAP recommends the use of the term “overweight” for infants and toddlers exceeding the 95<sup>th</sup> percentile on the weight-for-length growth charts.<sup>20</sup> Whenever possible we adhere to this nomenclature recommendation throughout this report, but we cite findings from studies based on the nomenclature used in original papers.

\*\* High Weight-for-Length defined as Weight-for-Length  $\geq$  97.7<sup>th</sup> percentile of WHO 2006 growth charts.

Figure 4. Breastfeeding outcomes across U.S. ethnic/racial groups for children born in 2013



Note: Data from Centers for Disease Control and Prevention (CDC) National Immunization Survey (NIS).<sup>41</sup>

breastfeeding initiation, 60.6 percent for any breastfeeding at 6 months, and 34.1 percent for any breastfeeding at 1 year of age. Differences in breastfeeding prevalence are observed across income categories, with 70.1 percent of women in the top income categories engaging in breastfeeding at six months versus 38.2 percent of women in the bottom income categories.<sup>41</sup>

Breastfeeding practices also vary among states. For example, the prevalence of breastfeeding initiation ranged from 52 percent in Mississippi to 94.4 percent in Utah. The corresponding prevalence for exclusive breastfeeding through 3 months of age ranged from 21.4 percent in Mississippi to 60.7 percent in Montana, and for breastfeeding through 1 year of age from 11.3 percent in Mississippi to 44.9 percent in Oregon.<sup>41</sup> There are also substantial inequities related to race/ethnicity across key breastfeeding outcomes for children born in 2013 (see Figure 4).<sup>41</sup>

### Infant Formula and Cow's Milk

The 2008 Feeding Infants and Toddler Study (FITS) found that the proportion of infants consuming infant formula at least once per day was 65.3 percent among 4- to 5.9-month-olds, 74.5 percent among 6- to 8.9-month-olds, and 63.8 percent among 9- to 11.9-month-olds. These percentages declined sharply during the second year of life ranging from 24.4 percent among 12- to 14.9-month-olds to 1.3 percent among 21- to 23.9-month-olds. As expected, the opposite trend was observed for cow's milk consumption with the prevalence increasing by

age: 0 percent among 4- to 5.9-month-olds to 16.6 percent among 9- to 11.9-month-olds, and then rapidly increasing during the second year from 70.2 percent among 12- to 14.9-month-olds to 87.7 percent among 21- to 23.9-month-olds. Consumption of soy milk/rice milk was infrequent—less than 2 percent reported among infants 9 to 11.9 months old, and below 6 percent at all age points during the second year of life.<sup>42</sup> Overall, these patterns are consistent with current guidelines calling for switching from infant formula to pasteurized cow's milk by 12 months of age.<sup>20</sup>

### Weaning Age and Complementary Feeding Patterns

The AAP recommends that infants be introduced to complementary foods when they are developmentally ready, which usually happens between 4 and 6 months of age.<sup>20</sup> Infants should not be introduced to complementary foods before 4 months of age given the immaturity of their gastrointestinal, immunological, and renal systems, as well as the increased risk for rapid weight gain associated with this practice.<sup>30</sup> The FITS and IFPS-II study found that over 40 percent of infants were introduced to complementary foods before they were 4 months old and that the great majority were introduced to complementary foods by 6 months of age.<sup>42,43</sup> A multi-country study conducted in Belgium, Germany, Italy, Poland, and Spain found that by 6 months of age at least 90 percent of infants were consuming solid foods, with most infants being introduced to solid foods between 4 and 6 months.<sup>44</sup>

The introduction of complementary foods before 4 months of age has been associated with formula feeding, lower levels of maternal education, being a single mother, being a mother younger than 25 years of age, and participating in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).<sup>9,45</sup> The main reasons given by IFPS participants for introducing complementary foods early included advice from health care professionals and perceptions that the infant was old enough, hungry, and would sleep longer.<sup>45,46</sup>

The complementary food patterns found in the 2008 FITS do not adhere to a healthy dietary pattern. The study documented a high prevalence of daily consumption of sweets, such as desserts and SSBs (above 40% among 9- to 11.9-month-olds) and a relatively low prevalence of daily consumption of meats/protein (about 40% among 6- to 8.9-month-olds). Daily consumption of vegetables increased with age from 60 percent among 4- to 5.9-month-olds to 70 percent among 6- to 8.5-month-olds.

On average, the 2008 FITS found that total daily caloric intake among infants and toddlers exceeded the estimated energy requirements as established in the U.S. Dietary Reference Intakes (DRIs) throughout the first 2 years of life.<sup>47</sup> In addition, over 40 percent of toddlers (12-23 months of age) exceeded the upper limit for sodium, while their mean intake of fiber was less than half of what is recommended (8 vs. 19 grams per day) reflecting low intakes of vegetables, fruits, and whole grains.

Over one-third of the absolute calorie increase between 6 and 48 months of age comes from sweets and SSBs.<sup>9</sup> About 40 percent of 9- to 11.9-month-olds and 79 percent of 1- to 2-year-olds consumed a sweet on any given day. By 2 to 3 years of age, the prevalence of daily sweet consumption (82%) was higher than fruits (73%) and vegetables (71%); this trend continues among 3- to 4-year-olds.<sup>4,42</sup>

About 17 percent of U.S. infants 6 to 11 months old are brought to fast-food restaurants at least once per week; this prevalence increases to 95 percent among 3- to 4-year-olds.<sup>48</sup> More than one-third (37%) of toddlers and more than half (55%) of preschoolers ate fast food one or more times per week; 9 percent of preschoolers did so at least 3 times per week.<sup>48</sup> African American and Hispanic children are significantly more likely than their white counterparts to be brought to fast-food restaurants.<sup>49</sup>

Overall, dietary patterns of U.S. infants and toddlers are especially concerning. Specifically they are characterized by low rates of exclusive breastfeeding, introduction of solid foods before 4 months of age, infrequent consumption of leafy green and yellow vegetables, short breastfeeding durations, under-consumption of foods rich in fiber, and excessive consumption of added sugars and sodium.<sup>42,47</sup> This is especially concerning as food preferences are established early in life. A retrospective

study conducted in California found that SSB intake in infancy was associated with obesity among 2- to 4-year-old children enrolled in the WIC program.<sup>34</sup> Likewise, the IFPS-II showed that consumption of SSBs in infancy doubles the odds of consuming them at 6 years of age<sup>33</sup> and is associated with increased odds of obesity at 6 years of age.<sup>50</sup> Consistent with these findings, the Viva prospective cohort study found that fruit juice and SSB consumption at 1 year of age was a predictor of fruit juice consumption and adiposity at 3.1 and 7.7 years of age.<sup>51</sup> Infrequent consumption of fruits and vegetables during infancy has been associated with infrequent consumption at 6 years of age.<sup>28</sup> Lack of breastfeeding has also been associated with poor dietary practices later on, including reduced consumption of a variety of vegetables.<sup>6,29,52</sup>

### Disparities in Exposures to Early Life Risk Factors for Childhood Obesity

There are racial/ethnic disparities in infant and toddler overweight prevalence as well as feeding practices, including breastfeeding, introduction of complementary foods before 4 months of age, and consumption of sugar-sweetened beverages and highly processed foods.<sup>49</sup> There are also large disparities in non-food behaviors that can increase children's risk for obesity including suboptimal sleep, excessive TV/screen time, and maternal depression.<sup>53-55</sup> Studies have found that ethnic/racial minority infants, toddlers, and young children are more likely to be exposed to a majority of these risk factors.<sup>54,55</sup> This may explain why the risk of having a higher weight-for-length and rapid infant weight gain is higher among Hispanic and black infants compared with their white counterparts, and brings attention to the need for culturally and socioeconomically sensitive approaches to improving dietary quality and reducing the risk of later obesity among infants and toddlers.<sup>56</sup>

It is likely that poverty-related factors explain, at least in part, the disparities in exposure to early life obesity risk factors and the corresponding increase in risk for childhood obesity. In a recent follow up of the Viva study, Taveras et al. (2013) found that at 7 years of age Hispanic and black children had higher BMIs and fat mass than their white counterparts.<sup>49</sup> These differences became strongly attenuated after adjusting for parental BMI and socioeconomic confounders as well as obesity risk factors in infancy and early childhood. A recent study with mothers of 2-month-olds participating in the Greenlight randomized controlled trial found that black women were much more likely than their white counterparts to engage in infant feeding practices and styles that increase the risk of rapid weight gain during infancy.<sup>57</sup> Black women were also more likely than their white counterparts to spend more time watching television.<sup>57</sup> These differences across racial/ethnic groups place minority children at a disadvantage from the beginning of life.<sup>56</sup>

These findings suggest that socioeconomic inequities may, in part, explain differences in early life obesity risk across ethnic/racial groups, and reinforce the need to develop culturally and socioeconomically tailored parenting programs that support recommended infant feeding behaviors and parental feeding

## Methodology

The development of the infant and toddler responsive parenting/feeding guidelines followed a 5-step process: (1) a review of key studies on topics identified as crucial, including: disparities in early life risk factors for childhood obesity, epidemiology of infant and toddler feeding patterns in the U.S., how children learn to eat, the shaping of food preferences, and responsive feeding; (2) a review of responsive feeding randomized control trials (RCTs) focused on dietary behaviors and weight outcomes among infants and toddlers; (3) a review of infant and toddler feeding guidelines from diverse countries including the U.S. (When no guidelines were available for the first 2 years of life, guidelines targeting preschoolers (3- to 5-year-olds) were reviewed. This was the case for guidelines regarding healthier beverages in toddlers);<sup>31</sup> (4) interviews with experts in the field including academic researchers and maternal-child health program delivery/evaluation professionals; and (5) development of messages on what and how to feed infants and toddlers following an expert panel consensus process methodology.

The expert panel consisted of 14 members, a chair, and a co-chair. The expertise of the interdisciplinary panel included young child nutrition, pediatric medicine, pediatric dentistry,

## What to Feed Infants and Toddlers

Evidence-based infant/toddler feeding guidelines or recommendations were reviewed to reach consensus on the most relevant messages for caregivers regarding what foods their children need for optimal development. Given that the RWJF HER guidelines target U.S. caregivers, priority was given to consensus recommendations and statements from the AAP. Due to the rapid development and changing dietary needs of children under two, the guidelines focusing on what to feed infants and toddlers are presented by three age groups: birth to 6 months, 6 to 12 months, and 12 to 24 months (See Appendices 1-2). The guidelines also briefly address maternal diet during pregnancy given its importance in helping shape offspring's food preferences.

The resulting guidelines make specific recommendations during the first 6 months of life regarding breastfeeding, formula feeding, and the type and timing of introduction

styles that protect young infants against the subsequent development of obesity. This is necessary to enable all children to have the opportunity to grow up at a healthy weight regardless of their social position.

health disparities, child development, public health, and epidemiology. Consensus was reached through 10 web-based meetings that took place between February 16 and August 28, 2016. Each meeting lasted 1 to 1.5 hours, and all but one (due to technical difficulties) were tape-recorded and accessible to the panel members throughout the consultation process. In addition to the panel members, representatives from the USDA Center for Nutrition Policy and Promotion and the U.S. DHHS-CDC Division of Nutrition, Physical Activity and Obesity participated as observers and were asked to contribute their expertise as needed.

The expert panel's recommendations are based on the best available science and current best practices in the field for promoting healthy nutrition, feeding patterns, and weight status for infants and toddlers from birth to 24 months. The recommendations are intended to serve as guidelines and to be used by caregivers to aid in addressing the nutritional needs and well-being of young children. The key stakeholders targeted by these guidelines are parents, child-care settings/providers, WIC and other food assistance programs serving children under two, and health care providers of young children.

of complementary foods (Appendix 1). During the second 6 months of life the guidelines focus on the continuation of breastfeeding or formula feeding in the context of an increasing nutrient contribution from a variety of healthful complementary foods (Appendix 1). The guidelines targeting the first year of life also make specific recommendations regarding the need to limit or avoid certain foods, including unmodified cow's milk (i.e. cow's milk that has not been modified to meet the nutrient needs of infants) and sugar-sweetened beverages (Appendix 1). During the second year of life the guidelines focus on increasing dietary diversity as well as recommendations about specific nutrients, foods, or food groups including milk, water, and sugar-sweetened beverages, whole grains, fiber, omega 3 fatty acids, sugar, sodium, and trans fats (Appendix 2). The guidelines also take into account the context of the developing child and behaviors associated with feeding, such as physical activity, screen use, soothing, and sleep (Appendices 3-5).



### The Shaping of Food Preferences among Infants and Toddlers

Understanding how flavor and food preferences are established early in life is crucial as early childhood dietary patterns track into later childhood<sup>6,51,58</sup> and adolescence.<sup>59</sup> Mennella, Reiter, and Daniels<sup>29</sup> (2016) reviewed the process of flavor preference development, documenting how crucial the first years of life are for establishing long-term preferences for healthy foods and beverages. Gestation and the first two years of life represent a sensitive period or “window of opportunity” for humans to learn to eat healthy, nutritious diets that, among other things, help protect against the risk of childhood obesity. A key aspect of this sensitive period is that it lays the foundation for the development of flavor preferences through life. Because humans are born with an innate taste preference for sweet, and a rejection of sour and bitter (e.g., vegetable) tastes, the first 1,000 days of life represent a very important period for facilitating the acceptance of the bitter flavors that characterize most vegetables. Indeed, infants and toddlers can learn to accept and like healthy food with bitter and sour tastes through repeated exposures. Maternal diet during pregnancy and lactation also sets the stage for the development of flavor preferences. A wide variety of flavors from foods (e.g., fruits and vegetables), beverages (e.g., alcohol), and flavor enhancers (i.e., spices) consumed by the mother, as well as inhaled products such as tobacco, get transferred to the fetus or infant through the amniotic fluid and breast milk. The evidence suggests that children born to mothers who consumed fruits and vegetables during pregnancy and the lactation period are more likely to learn to accept these foods.<sup>29,52,60</sup>

Regardless of exposure during pregnancy and lactation, repeated exposure to novel foods is necessary so that infants and young children learn to like them, especially for foods that have bitter or sour taste profiles, as is the case with many vegetables.<sup>29,52,60</sup>

This principle applies to breastfed, formula-fed, or mixed-fed infants, although it may take fewer tries for breastfed infants to accept novel tasting foods. For example, studies have shown that infants may need to be exposed to fruits and vegetables many times, ranging from 6 to 35 exposures across studies, to learn to like them.<sup>29</sup> Offering infants a variety of vegetables, compared to offering the same vegetable repeatedly, has been shown to increase the acceptance of more vegetables and lead to greater amounts of each novel vegetable consumed.<sup>29</sup> It is important to note that children may still learn to like novel vegetables even when exposed to them at older ages, however the longer it takes for a child to be exposed, the more difficult it will be for him/her to learn to accept and like them (i.e., neophobia, or fear of new foods, increases with age).<sup>26</sup>

Likewise, it is vital to expose the infant to different food textures in order to properly transition to table foods—for example, moving from pureed to mashed to lumpy and to chopped soft solid foods during the first two years of life.<sup>27,61</sup> By 2 years of age it is expected that children will have fully transitioned to food that comprises the family diet. For this reason it is crucial for the family diet to include a plentiful supply of fruits and vegetables. This will provide the child with the sensory experiences needed to continue liking nutritious foods, and will allow the child to be positively influenced and provide opportunities for modeling of healthy behaviors by caregivers, as discussed in the following section.

The evidence reviewed regarding the shaping of food preferences in young children supports providing pregnant women and caregivers of infants and toddlers with the following information: (a) mothers consuming a healthy diet rich in vegetables and fruits during pregnancy and lactation can help shape healthy food preferences among their offspring (Appendix 1); (b) breastfed infants are more likely than formula-fed infants

to consume healthier diets by the time they reach school age (Appendices 1-5); (c) infants and toddlers should be exposed repeatedly to healthy foods, including vegetables, until they learn to accept and like them (Appendices 1-5); (d) healthy foods, including fruits, vegetables, and whole grains, should be readily available to serve to infants (when developmentally ready, somewhere between 4 and 6 months of age) at home and in child-care settings where they may spend many hours of the day (Appendices 1-5; see section on early care and education programs in this report); and (e) infants and toddlers should not consume (or consume a very small amount) of foods and beverages rich in added sugars and sodium (Appendices 1-5).

### **Learning to Eat – the Role of the Feeding Context**

Recent reviews have concluded that the feeding context also plays an important role in establishing children's dietary preferences and the ability to self-regulate their intakes to prevent over-eating (i.e., starting to eat when hungry and stopping when satiation is reached).<sup>26,27,62</sup> Caregivers influence three forms of learning that have been associated with eating behaviors in young children: familiarization, associative learning, and observational learning. Through a combination of these pathways children learn to like or dislike specific foods. Infants and toddlers rely entirely on their caregivers to learn what, when, and how to eat. As such, infant and toddler feeding is a key component of parenting that involves more than simply offering food. For example, caregivers should decide on which types of food are made available to infants and toddlers and the amount of food served, the frequency with which foods are offered, and the type and size of utensils used to eat (if any). Caregivers also influence the social context around eating, including when and where food is served, acting as models that children learn to emulate, and interacting with children during feeding in a manner that reflects caregiver goals and responsiveness to child needs. Caregivers also influence “non-feeding” behaviors that affect feeding practices including active play, screen time, sleep, and soothing techniques.<sup>26,62,63</sup> As an example, research has shown that feeding to soothe fussy infants has been associated with excessive weight gain<sup>64</sup> and that poor sleep routines during the first two years of life are related to poor dietary quality and obesity risk in early childhood.<sup>30,62</sup>

The feeding style that caregivers of infants and toddlers follow can have a substantive impact on child food preferences and obesity risk. Findings from IFPS–II indicate that pressuring infants to finish the formula in the bottle predicts that the child will be more likely to finish everything served on the plate at 6 years of age and that the mother will be more concerned about making sure the child has had enough food to eat, both of which may increase the risk of childhood obesity.<sup>57</sup> Likewise, pressuring toddlers to eat vegetables can result in a strong dislike for them and pressuring to eat healthy foods has been associated with a higher consumption of energy-dense sweets and snacks

among preschoolers.<sup>27,63,65</sup> By contrast, providing a warm and nurturing feeding environment that takes into account the needs and developmental stages of infants and toddlers allows the caregiver to become a role model for healthy eating and is likely to improve child dietary and body weight outcomes (see responsive parenting/feeding section below).

As discussed in the previous section, allowing infants and toddlers to become familiar with healthy foods that are not readily accepted, such as vegetables, is key for the development of healthy food preferences. Although this seems obvious, in practice it is not that simple for caregivers to implement as children are born with a preference that favors liking of energy-dense sweet and savory foods as well as sweet beverages. Thus, infants are likely to accept and like sweet and savory foods from the first try compared with the numerous attempts needed for most infants to accept and learn to like a novel vegetable.

Associative learning, or the associations made with the emotional nature of a social event, such as eating, has been found to be strongly linked with eating preferences and behaviors in animal models.<sup>26</sup> Although this phenomena has not been thoroughly examined in children under 2 years of age, studies conducted with 3- to 5-year-olds have shown that pressuring children to finish a food, such as pureed vegetable soup, led to less soup consumption and more negative feelings of the child towards it, compared to when not pressured to finish the soup.<sup>65</sup> The principle of associative learning can also be used to increase the chances of acceptance of a novel food by pairing it with a food or sauce the child is already familiar with and likes (e.g., red bell peppers or yellow squash with a preferred healthy dip).<sup>27</sup> These studies underscore the importance of providing positive experiences and associations with healthful foods as a means of promoting acceptance.

Observational learning refers to the strong capacity that infants and children have to observe, process, and imitate what their caregivers do, including what they eat. Evidence shows that young children are more likely to try unfamiliar foods when they observe their caregivers eating them enthusiastically, as opposed to when the food is offered to them without having a role model present.<sup>26,66</sup> They are also less likely to accept healthy foods if their caregivers express dislike in front of them.<sup>66</sup>

In sum, the social and food environment surrounding feeding can both facilitate and prevent the familiarization of the young child with healthy foods. Responsive feeding that provides a developmentally appropriate and positive interaction between the caregiver(s) and child during each feeding occasion is necessary for infants and toddlers to try and learn to like healthy foods and beverages without undue pressure. Young children are actively observing and learning from their surroundings, and as such it is important that the whole family consumes healthy meals and beverages and that the infant is engaged with family meals as soon as she/he is developmentally ready. By 2 years

of age, children are expected to have fully transitioned from pureed to table foods (i.e., what the rest of the family is eating). Thus, guidance for caregivers of infants and toddlers is urgently needed during this highly active developmental period. Non-feeding lifestyle behaviors including active play, screen time, sleep patterns, and soothing behaviors also have an important influence on infant and toddler feeding behaviors and need to be included as part of the “feeding” guidance.

The evidence surrounding how children learn to eat supports providing pregnant women and caregivers of infants and

toddlers with the following information (see Appendices 4 and 5): (a) caregivers should serve as role models by eating the same healthy foods that they want their infants and toddlers to learn to accept and like; (b) caregivers should follow responsive feeding (including pleasant verbalization) while feeding their infants and toddlers; and (c) caregivers should not “force” infants to finish the bottle with formula or expressed breast milk, or “force” toddlers to finish all the food served on their plates. The following section on responsive parenting and feeding will dive into many of these behaviors in more detail.

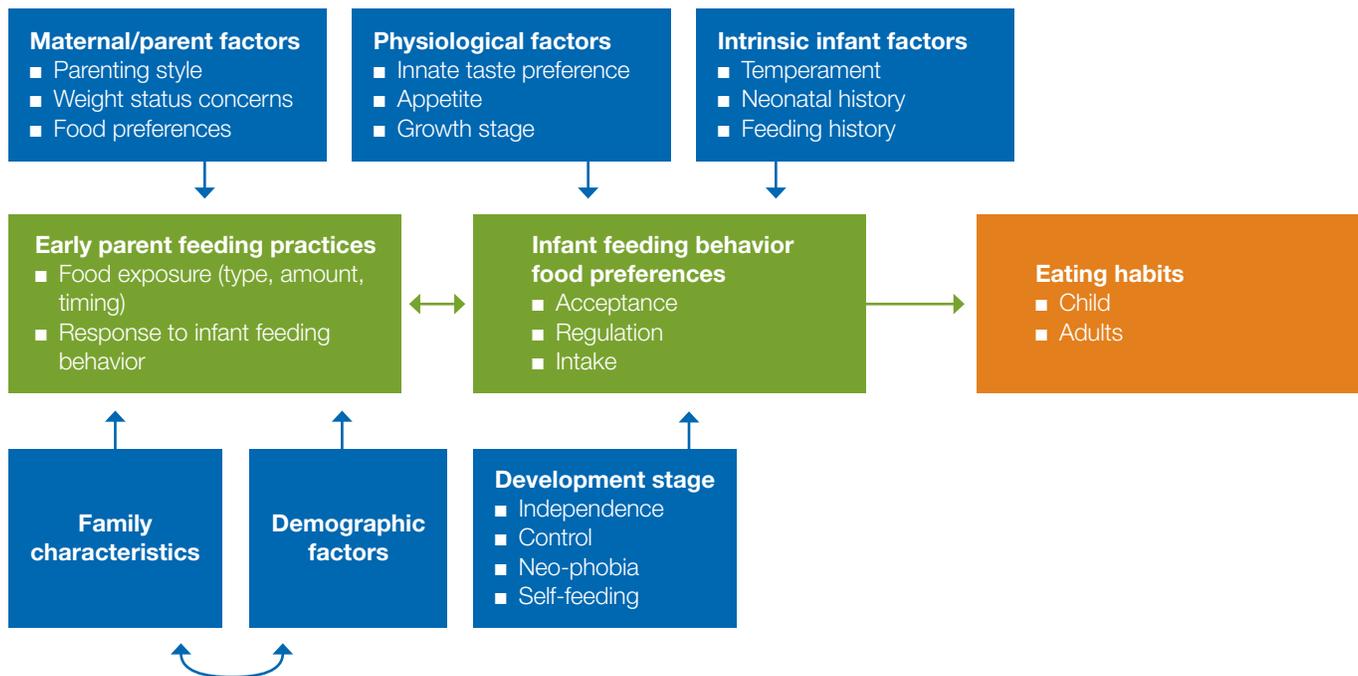
## How to Feed Infants and Toddlers: Responsive Parenting and Feeding

Responsive parenting and feeding emerged as a key topic related to infant and toddler feeding guidelines based on our literature review, which included: review of existing guidelines from the United States<sup>20,31,39,67,68</sup>, Australia<sup>69</sup>, Canada<sup>70</sup>, Hong Kong<sup>71</sup>, Mexico<sup>72</sup>, South Africa<sup>73</sup>, and European countries including France and the United Kingdom<sup>74</sup>; recommendations for future infant feeding guidelines globally<sup>5</sup>; and most importantly, the expert panel’s consensus on recent responsive feeding randomized controlled trials. For this reason, this section is devoted to covering this central topic.

### What is responsive feeding?

The first two years of life represent a crucial window of time for the rapidly developing infant and toddler to learn to accept and like healthy foods and establish long-term dietary patterns that can prevent the onset of obesity, chronic diseases, and oral health problems.<sup>3,17,26,27,29</sup> Because infants do not have the capacity to verbalize their feeding and psycho-emotional needs, caregivers must learn to understand how their infants communicate with different behaviors. A responsive parenting approach aims for proper interpretation of the infant’s signals

Figure 5. Key factors that influence the reciprocal relationships between parent feeding practices and infant feeding



Note: Reproduced with permission from “The Nourish randomised control trial: Positive feeding practices and food preferences in early childhood - a primary prevention program for childhood obesity,” by L.A. Daniels, A. Magarey, D. Battistutta et al., 2009, *BMC Public Health*.<sup>77</sup> License at <http://creativecommons.org/licenses/by/2.0>.

## Text box 1. Responsive feeding: Key steps and principles

Key Steps	Key Principles
<ul style="list-style-type: none"><li>■ Child displays hunger signals</li><li>■ Caregiver properly interprets hunger signals</li><li>■ Predictable feeding response from caregiver</li></ul>	<ul style="list-style-type: none"><li>■ Pleasant, warm, and nurturing feeding environment</li><li>■ Child seated comfortably facing caregiver and others</li><li>■ Clear and consistent reciprocal communication of feeding expectations</li></ul>
<ul style="list-style-type: none"><li>■ Child displays satiety signals</li><li>■ Predictable “stop feeding” response from caregiver</li></ul>	<ul style="list-style-type: none"><li>■ Predictable feeding schedules help ensure child is hungry when offered food</li><li>■ Offering of healthy developmentally appropriate beverages and healthy, tasty foods</li><li>■ Responding promptly to the child's hunger and satiety signals</li><li>■ Feeding response needs to be emotionally supportive, contingent, and developmentally appropriate</li></ul>

Note: Adapted from Black and Aboud (2011),<sup>7</sup> Bentley and Wasserman (2011),<sup>8</sup> and DiSantis et al. (2011).<sup>78</sup>

and emphasizes positive affection and responding with high levels of warmth and nurturance through rich verbal acknowledgment.<sup>75,76</sup> Parental feeding behaviors play a key role in establishing food preferences among infants (Figure 5).<sup>77</sup> Thus, responsive feeding, a key dimension of responsive parenting, is necessary for developing healthy habits beginning in infancy (Text box 1).

Bentley and Wasserman<sup>8</sup> (2011) and DiSantis et al.<sup>78</sup> (2011) conceptualize responsive feeding as a process that involves reciprocity between the child and caregiver during the feeding process. Responsive feeding is grounded on the following three-step process: (1) the child signals feeding requests through motor actions, facial expressions, or vocalizations; (2) the caregiver recognizes the signals and responds promptly in a manner that is emotionally supportive, contingent on the signal, and developmentally appropriate; and (3) the child experiences a predictable response to signals (i.e., reassuring her/him that the caregiver understands when she/he needs to be fed). By the same token, the caregiver should properly recognize satiety cues and respond accordingly. In other words, responsive feeding emphasizes the importance for caregivers to decide *when to start* and *when to stop* feeding based on the infant's hunger and satiety cues. Consistent with these principles, Black and Aboud<sup>7</sup> (2011) recommend the following specific responsive feeding guidelines: (1) ensuring that the feeding environment is pleasant with few distractions (e.g., no television or other screens); (2) ensuring that the child is seated comfortably, ideally facing others; (3) ensuring that the expectations from the caregiver and child are communicated clearly and consistently; (4) ensuring that the food is healthy, tasty, developmentally appropriate,

and offered on a predictable schedule so the child is likely to be hungry; (5) encouraging and attending to the child's signals of hunger and satiety; and (6) responding to the child's feeding needs in a prompt, emotionally supportive, contingent, and developmentally appropriate manner. It is also important for caregivers to understand that infants and toddlers have a limited stomach capacity and thus they need to be fed portion sizes that are appropriate for their age and developmental stage, with the frequency necessary for their nutritional needs to be met. Thus, it is important that parents are educated on the use of developmentally appropriate feeding containers and utensils. For example, the U.S. Greenlight study showed that feeding formula in early infancy with a large bottle was associated with greater weight gain and change in weight-for-length Z-scores at 6 months than when a more age-appropriate bottle size was used.<sup>79</sup>

Nonresponsive feeding is strongly discouraged as it is characterized by a lack of reciprocity between the caregiver and child. Nonresponsive feeding can lead to: (a) the caregiver taking control and dominating the feeding situation by controlling and pressuring behaviors; (b) the child controlling the situation leading to indulgence; or (c) the caregiver ignoring the child and becoming uninvolved. When caregivers control the feeding, not only do they potentially override the child's internal hunger and satiety regulatory cues, but it is thought that they may interfere with the child's emerging autonomy and striving for independence based on the learning of new skills.<sup>7</sup> Each of these undesired outcomes of nonresponsive feeding have been associated with the development of poor dietary habits and/or increased childhood obesity.<sup>26,80,81</sup>

How caregivers respond to other behaviors, such as sleeping/waking patterns, and the soothing techniques they use to calm their distressed infants, can influence the infant's ability to learn to properly self-regulate food intake. For example, if in response to an infant crying a caregiver offers sugar-sweetened foods or beverages to calm her/him down, the infant may expect to be soothed this way whenever in distress. By doing this, the caregiver may negatively affect not only the foundational dietary habits developed by the infant, but also the child's ability to learn to self-regulate her/his own emotions. Understanding the rapidly changing sleeping patterns of infants during the first years of life (i.e., characterized by relatively short sleep/wake cycles in early infancy compared to longer periods of sleep by 6 months) has also been identified as central for preventing unhealthy eating behaviors and obesity risk in young children.<sup>30,62,82</sup> A qualitative study with mothers from California enrolled in WIC reported infant crying and waking at night as very stressful for them and their families, and most mothers believed that crying was almost always a sign of hunger. The mothers also believed that early introduction of formula, solid foods, or a combination of both (e.g., baby cereal mixed in bottle) were needed to soothe the crying infant and ensure that the infant slept quietly and for longer periods during the night.<sup>82</sup>

Screen-time, physical activity, and sleep patterns are interrelated.<sup>9,83</sup> For example, a recent longitudinal analysis of the five-year follow-up data from the Australian Healthy Beginnings Trial<sup>83</sup> found that mothers' screen-time during pregnancy and children's daily screen-time at age 1 were independently associated with daily screen-time across ages 2 to 5. Practicing tummy time daily, maternal physical activity level, and having been informed during pregnancy about playing with the child predicted children's outdoor playtime across ages 2 to 5. These findings suggest that: (a) caregivers' screen-time and physical activity behaviors are reflected in the corresponding behaviors of their children; (b) anticipatory guidance to women on the need to play with their children may improve amount of playtime; and (c) providing ample opportunities for physical activity during infancy may set the foundation for increased outdoor play time for children through the age of 5. Data from the same trial showed that screen-time between 2 and 5 years of age was associated with shorter sleep, longer sleep latency, and later bedtime.<sup>84</sup>

The evidence reviewed in this section supports providing caregivers of infants and toddlers with sufficient information to understand the benefits of responsive feeding, as well as the risks of non-responsive feeding in relation to the ability of children to learn to self-regulate food intake for proper growth and development. The following section further reviews the recently published literature considered by the expert panel in developing responsive parenting/feeding guidelines included in this report (see Appendices 3-5).

## **Responsive Parenting/Feeding Interventions Assessed with Randomized Controlled Trial Designs**

Key experimental evidence on the impact of responsive parenting/feeding on dietary and health outcomes has emerged over the past decade. The expert panel reviewed five randomized controlled trials (RCTs) exploring responsive parenting/feeding interventions in order to inform the development of recommendations in this area. All articles reviewed met the following criteria: (a) at least 50 participants per arm; (b) intervention conducted in a high income country; (c) intervention met the expert panel's operational responsive parenting/feeding definition; and (d) was published in a peer-reviewed journal. All research reviewed is summarized in Table 1, and more detailed descriptions can be found in Appendix 9.

All trials examined had different intervention designs including timing, dosage (frequency and duration), content, and modes of delivery. Most were not designed to isolate the independent impact of specific subcomponents of feeding or soothing/sleep interventions. Nevertheless, the RCTs collectively offer important insights to take into account in feeding guidance for infants and toddlers. For instance, the majority found impacts on desirable caregivers' responsive parenting/feeding behaviors and four trials found improvements in weight outcomes at 1 to 2 years of age. For this reason, it is appropriate to conclude that responsive parenting/feeding approaches should be central to the development of new dietary guidance targeting infants and toddlers.

These trials emphasize the need for responsive parenting/feeding interventions to be timely, preferably starting with anticipatory guidance during pregnancy, and to provide adequate "dosage" and developmentally appropriate advice during the most sensitive developmental periods. Collectively, the RCTs indicate that teaching parents to correctly interpret infant hunger and satiety cues is key for allowing the child to learn to self-regulate food intake properly. It is also important for caregivers to understand the sleeping patterns of infants and how rapidly they evolve during the first year of life. Advice should also include developmental readiness for the introduction of complementary foods, the importance of repeated exposures to a variety of healthy foods such as vegetables and fruits, and allowing the infant to experiment with different foods and textures to ease the transition from pureed foods into table foods.

The expert panel's review of the responsive parenting/feeding RCTs supports the view that infants and toddlers should not be pressured to eat or finish the food served to them and caregivers and family members should serve as positive role models by also consuming healthy foods. The RCTs consistently emphasized the importance of allowing the infant and toddler to participate in family meals and to avoid distractions during mealtimes, including TV viewing and digital device screens. The

**Table 1. Responsive Parenting/Feeding Randomized Controlled Trials**

<b>Trial</b>	<b>Study Design</b>	<b>Intervention</b>	<b>Outcomes</b>	<b>Key findings</b>	<b>Conclusion</b>
<ul style="list-style-type: none"> <li>■ Paul et al. (2011)<sup>85</sup></li> <li>■ Sleeping and Intake Methods Taught to Infants and Mothers Early in Life trial (SLIMTIME)</li> <li>■ Pennsylvania</li> </ul>	<ul style="list-style-type: none"> <li>■ 2 x 2 factorial design                             <ul style="list-style-type: none"> <li>– Soothe/sleep</li> <li>– Introduction of solids</li> </ul> </li> <li>■ 160 full-term singleton healthy infants; healthy primiparous English speaking women with relatively high levels of education and who intended to breastfeed their children</li> <li>■ Two home visits at 2-3 wks and at 4-6 mo pp, 1y assessment at clinic</li> </ul>	<ul style="list-style-type: none"> <li>■ Soothe/Sleep: Parents were taught soothing and calming strategies for fussy child to improve sleep and feeding behaviors</li> <li>■ Introduction of Solids: Parents were taught hunger and satiety clues, and cues for timing of introduction of solids foods. At 4-6 mo pp they were advised on repeated vegetable exposure</li> <li>■ Delivered by home visiting nurses at 2-3 wks and at 4-6 mo pp</li> </ul>	<ul style="list-style-type: none"> <li>■ Weight-for-length at 1y</li> <li>■ Responsive feeding behaviors</li> <li>■ Sleep and feeding behaviors</li> </ul>	<ul style="list-style-type: none"> <li>■ Exposure to both interventions led to lower weight-for-length percentiles at 1y</li> <li>■ Soothe/Sleep intervention led to longer sleep and fewer nocturnal feedings among predominantly breastfed infants</li> <li>■ Solids intervention led to increased acceptance of vegetables and reduction in introducing solids before 4 mo</li> </ul>	<ul style="list-style-type: none"> <li>■ Intervention led to improved weight status at one year of age and better sleep and feeding behaviors among predominantly breastfed infants</li> </ul>
<ul style="list-style-type: none"> <li>■ Savage et al. (2016)<sup>86</sup>; Paul et al.(2016)<sup>87</sup></li> <li>■ The Intervention Nurses Start Infants Growing on Healthy Trajectories</li> <li>■ (INSIGHT)</li> <li>■ Pennsylvania</li> </ul>	<ul style="list-style-type: none"> <li>■ Two group parallel RCT</li> <li>■ 291 primiparous English speaking healthy mothers; singleton full term healthy baby; planning breastfeeding or formula feeding</li> <li>■ Home at 2 wks pp, followed by four home visits at 3, 16, 28, 40 wks, and 1y pp</li> </ul>	<ul style="list-style-type: none"> <li>■ Parents taught to recognize hunger and satiety cues, feed adequate portion sizes, repeated exposure to promote acceptance of food by their infants, and how to interpret infant growth</li> <li>■ Active play, infant sleep, soothing and emotional regulation</li> <li>■ Delivered by home visiting nurses</li> </ul>	<ul style="list-style-type: none"> <li>■ Infant weight and weight gain</li> <li>■ Infant feeding mode</li> <li>■ Infant sleep and feeding behaviors</li> </ul>	<ul style="list-style-type: none"> <li>■ Intervention led to slower weight gain during the first 6 months and less overweight at 1y</li> <li>■ Intervention improved sleep and responsive feeding behaviors including less feeding immediately before bed, self-soothing to sleep, and longer nocturnal sleep duration</li> </ul>	<ul style="list-style-type: none"> <li>■ Intervention led to slower weight gain; reduced risk of overweight at 1y; improved sleep; and responsive feeding behaviors</li> </ul>
<ul style="list-style-type: none"> <li>■ Daniels et al. (2015)<sup>88</sup>; Daniels et al. (2012)<sup>89</sup></li> <li>■ NOURISH</li> <li>■ Australia</li> </ul>	<ul style="list-style-type: none"> <li>■ Two group parallel RCT</li> <li>■ 698 adult primiparous English speaking mothers; full term healthy infants</li> <li>■ Recruited in 7 maternity wards located in two cities</li> <li>■ Randomized at 4 mo pp</li> <li>■ Data collection at 4 mo, 14 mo, 2y, 3.5 and 5y of age</li> </ul>	<ul style="list-style-type: none"> <li>■ Anticipatory guidance intervention; two modules with six group sessions; each module delivered over 12 wks - 4 to 7 mo and 13 to 16 mo of age</li> <li>■ Session themes: Increased exposure to healthy foods and decreased exposure to unhealthy foods; responsive feeding; positive parenting</li> <li>■ Delivered by dietitian and psychologist</li> </ul>	<ul style="list-style-type: none"> <li>■ Child weight status</li> <li>■ Maternal feeding practices</li> </ul>	<ul style="list-style-type: none"> <li>■ Non-significant trend for lower child BMI z scores during first 5y even though improved weight outcomes had been reported at 1y of age</li> <li>■ Intervention led to more responsive (e.g., predictable feeding schedule, interpreting hunger satiety cues, repeated exposure to healthy foods) and less nonresponsive (e.g., pressure to eat, food as a reward) maternal feeding behaviors</li> </ul>	<ul style="list-style-type: none"> <li>■ Intervention led to improved maternal responsive feeding practices which were sustained up to 5y of age</li> </ul>

**Table 1. Responsive Parenting/Feeding Randomized Controlled Trials (cont.)**

<b>Trial</b>	<b>Study Design</b>	<b>Intervention</b>	<b>Outcomes</b>	<b>Key findings</b>	<b>Conclusion</b>
<ul style="list-style-type: none"> <li>■ Wen et al. (2012)<sup>90</sup></li> <li>■ Healthy Beginnings</li> <li>■ Australia</li> </ul>	<ul style="list-style-type: none"> <li>■ Two group parallel RCT</li> <li>■ 667 socioeconomically disadvantaged primiparous English speaking mothers; at least 16y old</li> </ul>	<ul style="list-style-type: none"> <li>■ Eight home nurse visits, 1 prenatally and seven postnatally between 1 and 24 mo</li> <li>■ Intervention promoted: breastfeeding, delayed introduction of solids until 6 mo, responsive feeding, child nutrition and active play, social support, and family nutrition and physical activity</li> </ul>	<ul style="list-style-type: none"> <li>■ 24 mo BMI</li> <li>■ Maternal and child eating, physical activity, and screen time behaviors</li> </ul>	<ul style="list-style-type: none"> <li>■ Child: Intervention led to lower BMI at 24 mo; higher vegetable intake among children; less use of food as a reward; less eating in front of TV and less TV watching</li> <li>■ Mother: More likely to eat more than 2 servings per day of vegetables and to be more active</li> </ul>	<ul style="list-style-type: none"> <li>■ Intervention effective in preventing childhood obesity at 2y of age*, improving children's and mothers' vegetable intake</li> </ul>
<ul style="list-style-type: none"> <li>■ Fangupo et al. (2015)<sup>91</sup></li> <li>■ Prevention of Overweight in Infancy (POI) Study</li> <li>■ New Zealand</li> </ul>	<ul style="list-style-type: none"> <li>■ 2 x 2 factorial design</li> <li>■ 802 pregnant English or Te Reo Māori speaking women ≥ 16 years of age, healthy term newborn</li> <li>■ Data collection took place at baseline (late pregnancy), 18 mo, and 2y of age</li> <li>■ Dietary intake assessed using a semi-quantitative FFQ</li> </ul>	<ul style="list-style-type: none"> <li>■ Food, Activity and Breastfeeding (FAB): Eight additional parent contacts for BF education and support, food and activity education at different points during the first 18 mo pp. Trained research staff delivered the intervention as individual education; last session in group setting</li> <li>■ Sleep: Two additional parent contacts - one antenatal and an individual home visit at 3 wks of age</li> </ul>	<ul style="list-style-type: none"> <li>■ Eating behaviors at 2y of age</li> <li>■ Parental feeding practices</li> </ul>	<ul style="list-style-type: none"> <li>■ No significant impact on weight status</li> <li>■ No significant impact in food group intakes</li> <li>■ No significant differences in the amount of food consumed and nutrient intake among the groups receiving FAB</li> <li>■ No significant differences in eating behaviors at 24 mo</li> <li>■ At 18 mo, FAB led to children having greater control over eating and less pressure on children to eat</li> <li>■ At 24 mo, FAB led to higher encouragement to consume more nutrient-dense foods</li> </ul>	<ul style="list-style-type: none"> <li>■ FAB had no impact on food, energy, and nutrient intake, eating behavior at 2y of age, or weight status</li> <li>■ FAB had an impact on some responsive feeding practices, less pressure to eat, and more eating self-control at 18 and 24 mo</li> </ul>

\* Impact not sustained by 5y of age (Wen 2015)<sup>92</sup>

Definitions of abbreviations and terms used: antenatal—during pregnancy; BF—breastfeeding; FFQ—Food Frequency Questionnaire; mo—month(s); pp—postpartum (after birth); Primiparous—first time moms; wks—weeks; y—year

importance of mealtimes being a warm and pleasant experience with plenty of verbal and non-verbal interactions between the caregiver and the child was reiterated. The RCTs also emphasized the importance for caregivers to help infants and toddlers learn to follow routine feeding and sleeping schedules. This approach is likely to not only be crucial for the infant's self-regulation of food intake but also of her/his emotions. Physical activity was also an integral part of the interventions resulting in a positive impact on weight outcomes, reinforcing the need to not only foster the development of healthy eating behaviors, but also of healthy physical activity patterns that are developmentally appropriate for infants and toddlers.

As mentioned above, it is critical for parents and caregivers to understand infants' sleep patterns and their rapid evolution during the first year of life. For example, the infant will experience frequent sleep/wake cycles throughout the day and night early on, but by 6 months of age they should largely be sleeping throughout the night. Responsive parenting/feeding trials that included soothing and/or sleeping components were successful at improving sleeping patterns and feeding behaviors, especially at night. Those trials highlight the need to respond to infant crying and distress with feedings only when the infant is hungry. They also discourage the use of food as a reward as this will condition the infant to expect to be fed when waking up or in distress even when not hungry.

Findings from the SLIMTIME trial suggest that infant temperament may be an effect modifier of the relationship between responsive parenting/feeding interventions and feeding and child outcomes. Infants who are more "difficult" or fussy are likely to benefit the most from these interventions.<sup>64,93-95</sup> These same aspects of temperament have been linked to obesity, highlighting the potential of responsive parenting/feeding interventions to promote healthy outcomes among those most in need.

Appendices 3-5 provide a comprehensive list of responsive parenting/feeding guidelines for caregivers with infants/toddlers ranging from birth to 24 months of age. As supported by the RCTs, these guidelines include recommendations for the establishment of healthy sleeping and active play routines. Given the central role that the guidelines place in the correct interpretation of developmental milestones for introduction of solid foods and of identifying and responding to hunger and satiety cues, the following sections review the evidence and address processes that are crucial for infants to learn to accept and like healthy foods and beverages, and to self-regulate caloric intake in response to their needs.

### **How to Know When Infants Are Ready to be Introduced to Complementary Foods**

Although some current international recommendations call for introducing complementary foods at 6 months of age,<sup>96</sup> in reality there is a wide range of ages at which individual infants are developmentally ready. Research examining infants' attainment of key developmental milestones<sup>20</sup> indicates that the appropriate window of time for introducing complementary foods is between 4 and 6 months of age for most infants, and that introducing complementary foods at the "developmentally right time" for each infant is needed for fostering long term preferences for healthy foods.<sup>97,98</sup> For this reason, it is crucial that caregivers know how to tell when an infant is ready to be introduced to complementary foods. It is important to note that consistent with the developmental readiness evidence, most infants are introduced to complementary foods between 4 and 6 months of age across countries.<sup>42,44</sup>

There is broad consensus that complementary foods should be introduced once the infant is: able to sit without support and has good head and neck control; has the ability to munch or chew and to use the tongue to move pureed foods to the back

#### **Text box 2. Introduction of complementary foods: Key developmental milestones**

- sits without support and has good head and neck control
- munches or chews and uses the tongue to move pureed foods to the back of the mouth for swallowing
- no longer has extrusion reflex\*
- brings hands and toys to the mouth for exploration
- indicates a desire for food, e.g., eagerness to participate in family mealtimes and trying to grab food to put in her/his mouth

Note: Adapted from AAP (2013),<sup>20</sup> Dietitians New Zealand (2011),<sup>99</sup> National Health and Medical Research Council (2012),<sup>69</sup> and Schwartz et al. (2011).<sup>74</sup>

\* Does not automatically push solids out of the mouth with her/his tongue

**Text box 3. Evolution of hunger and satiety signals during the first two years of life**

Age	Hunger Signals	Satiety signals
Birth through 5 months	<ul style="list-style-type: none"> <li>■ Wakes and tosses</li> <li>■ Sucks on fist</li> <li>■ Cries or fusses</li> <li>■ Opens mouth while feeding to indicate wanting more</li> </ul>	<ul style="list-style-type: none"> <li>■ Seals lips together</li> <li>■ Turns head away</li> <li>■ Decreases or stops sucking</li> <li>■ Spits out the nipple or falls asleep when full</li> </ul>
4 through 6 months	<ul style="list-style-type: none"> <li>■ Cries or fusses</li> <li>■ Smiles, gazes at caregiver, or coos during feeding to indicate wanting more</li> <li>■ Moves head toward spoon or tries to swipe food towards mouth</li> </ul>	<ul style="list-style-type: none"> <li>■ Decreases rate of sucking or stops sucking when full</li> <li>■ Spits out the nipple</li> <li>■ Turns head away</li> <li>■ May be distracted or pays more attention to surroundings</li> </ul>
5 through 9 months	<ul style="list-style-type: none"> <li>■ Reaches for spoon or food</li> <li>■ Points to food</li> </ul>	<ul style="list-style-type: none"> <li>■ Eating slows down</li> <li>■ Pushes food away</li> </ul>
8 through 11 months	<ul style="list-style-type: none"> <li>■ Reaches for food</li> <li>■ Points to food</li> <li>■ Gets excited when food is presented</li> </ul>	<ul style="list-style-type: none"> <li>■ Clenches mouth shut or pushes food away</li> </ul>
10 through 12 months	<ul style="list-style-type: none"> <li>■ Expresses desire for specific food with words or sounds</li> </ul>	<ul style="list-style-type: none"> <li>■ Shakes head to say “no more”</li> </ul>
1 to 2 years	<ul style="list-style-type: none"> <li>■ Combines phrases with gestures such as “want that” and pointing</li> <li>■ Can lead parent to refrigerator and point to a desired food or drink</li> </ul>	<ul style="list-style-type: none"> <li>■ Uses words like “all done” and “get down”</li> <li>■ Plays with food or throws food when full</li> </ul>

Note: Adapted from Butte et al. (2004)<sup>39</sup> and WIC (2009).<sup>68</sup>

of the mouth for swallowing; no longer has the extrusion reflex (i.e., does not automatically push solids out of the mouth with her/his tongue); demonstrates ability to bring hands and toys to the mouth for exploration; and indicates a desire for food, such as showing eagerness to participate in family mealtimes and trying to grab food to put in her/his mouth.<sup>20,69,74,99</sup> As indicated previously, the vast majority of infants reach these developmental milestones between 4 and 6 months of age.<sup>20</sup> The ability to sit without support is considered to be a key cue for assessing readiness for introduction of complementary foods as it correlates strongly with the rest of the cues and also with physiological development including gastrointestinal, renal, and immunological system maturation.<sup>20</sup> Expert bodies also agree that complementary foods should not be introduced before 4 months of age as the infant’s body is not physiologically or developmentally ready.<sup>19,100</sup> Early introduction of solids also may increase the risk of childhood obesity.<sup>30</sup>

Based on the evidence reviewed, caregivers of young infants should be educated on how to identify the developmental readiness cues – outlined in Text box 2 – in order to determine when an infant is ready to be introduced to solid foods. Responsive parenting/feeding guidelines incorporating these developmental milestones are included in Appendix 1.

**Recognizing Infants’ and Toddlers’ Hunger and Satiety Cues**

Responsive feeding of infants and young toddlers relies heavily on learning how they communicate hunger and fullness. Infants’ primary form of communication is crying, and research has shown this causes distress to caregivers who often interpret crying as hunger.<sup>82,101</sup> Because infants cry for many reasons other than hunger, such as being tired or having a wet diaper, offering

food to the infant whenever she/he cries may lead to overfeeding and prevent the infant from learning how to self-regulate food intake and her/his own emotions.<sup>26</sup>

In early infancy, crying should be interpreted as a sign of hunger only if it is accompanied by additional cues, including: hand-to-mouth movements, mouthing, rooting, sucking noises/motions, fast breathing, clenched fingers and fists over chest and tummy, and flexed arms and legs.<sup>101,102</sup> Infants use different signals to indicate that they are full (i.e., reached satiety) such as closing their mouths when food is offered and turning their head away from the food.<sup>101,102</sup> As infants become older and enter toddlerhood, hunger cues also include leaning towards food, visually tracking food with eyes, excitatory limb movements, opening mouth as the spoon approaches, and asking for or

pointing to food.<sup>103</sup> In general, feeding cues progress as the child ages from behaviors that are subtle and primarily oral (e.g., mouthing) to those that are active and tend to involve greater body movements (e.g., reaching, pointing). If ignored, early and active cues are followed by late cues, which indicate heightened levels of agitation including crying and struggling.<sup>103</sup>

The evidence reviewed in this section supports providing pregnant women and caregivers of infants and toddlers with information for understanding how their infants communicate hunger and satiety and how these cues evolve during early toddlerhood (see Text box 3 and Appendices 3-5). It is also important for caregivers to be aware of the small portion sizes typically consumed by infants and toddlers given their limited gastric capacity (See Appendix 10).

## Other Important Considerations for Infants and Toddlers

### Sleep Considerations for Infants and Toddlers

The prevalence of short sleep duration, behavioral sleep problems, and sleep-disordered breathing among preschoolers ranges from 20 percent to 50 percent.<sup>53</sup> This is cause for public health concern as inadequate or poor quality sleep in early childhood negatively affects social-emotional and cognitive function and may increase obesity risk via irregularities in hormonal mechanisms. Healthy sleep habits increase sleep duration and prevent sleep problems. Lack of sleep among children under 2 has been identified as a risk factor for the development of childhood obesity.<sup>104</sup> For example, in the U.S. Project Viva cohort study, children with less than 12 hours of daily sleep between 6 and 24 months had almost twofold odds of obesity at age 3 compared with those sleeping at least 12 hours per day. Promoting healthy sleep is a central focus of the responsive parenting trials that have been found to be effective at improving feeding behaviors and weight outcomes among infants and toddlers (see responsive parenting/feeding interventions section in this report).

Healthy sleep requires adequate duration, appropriate timing, good quality, regularity, and the absence of sleep disturbances or disorders. An expert panel convened by the American Academy of Sleep Medicine recently developed evidence-based sleep guidelines for children and adolescents.<sup>105</sup> Sleep duration is a frequently investigated sleep measure in relation to health, and for this reason sleep guidelines focus on this sleep dimension. To promote optimal health, infants ages 4 to 12 months should sleep a total of 12 to 16 hours per day (or 24 hour cycle), including naps, on a regular basis. Children ages 1 to 2 should sleep 11 to 14 hours per 24 hours (including naps) on a regular basis. An important finding from the consensus committee was that recommendations for infants younger than 4 months could not be issued due to the wide range of normal variation in duration and patterns of sleep in early life, and insufficient evidence for associations with health outcomes. The expert panel concurred with the sleep recommendations from the American Academy of Sleep Medicine, and they are incorporated into the responsive parenting/feeding guidelines included in Appendices 3 and 5.

#### Text box 4. Recommended amount of sleep for children under 2 years of age

- Infants ages 4 to 12 months should sleep 12 to 16 hours per 24 hours (including naps) on a regular basis to promote optimal health\*
- Children ages 1 to 2 should sleep 11 to 14 hours per 24 hours (including naps) on a regular basis to promote optimal health

Note: Adapted from the American Academy of Sleep Medicine (Paruthi et al. 2016).<sup>105</sup>

\*Recommendations for infants younger than 4 months were not issued due to the wide range of normal variation in duration and patterns of sleep, and insufficient evidence for associations with health outcomes.

**Text box 5. Physical activity recommendations for infants and toddlers**

<b>Shape America Recommendations*</b> Target audience: Parents and caregivers	<b>Committee on Obesity Prevention Policies for Young Children Recommendations**</b> Target audience: Child-Care Regulatory Agencies
<b>Guidelines for Infants</b>	
<ul style="list-style-type: none"> <li>■ Infants should interact with caregivers in daily physical activities that are dedicated to exploring movement and the environment.</li> <li>■ Caregivers should place infants in settings that encourage and stimulate movement experiences and active play for short periods of time several times a day.</li> <li>■ Infants’ physical activity should promote skill development in movement.</li> <li>■ Infants should be placed in an environment that meets or exceeds recommended safety standards for performing large-muscle activities.</li> </ul>	<ul style="list-style-type: none"> <li>■ Provide daily opportunities for infants to move freely under adult supervision to explore their indoor and outdoor environments.</li> <li>■ Caregivers should engage with infants on the ground each day to optimize adult-infant interactions.</li> <li>■ Provide daily “tummy time” (i.e., in the prone position) for infants less than 6 months of age.</li> </ul>
<b>Toddlers and Preschoolers</b>	
<ul style="list-style-type: none"> <li>■ Toddlers should engage in a total of at least 30 minutes of structured physical activity each day.</li> <li>■ Toddlers should engage in at least 60 minutes— and up to several hours—per day of unstructured physical activity and should not be sedentary for more than 60 minutes at a time, except when sleeping.</li> <li>■ Toddlers should be given ample opportunities to develop movement skills that will serve as the building blocks for future motor skillfulness and physical activity.</li> <li>■ Toddlers should have access to indoor and outdoor areas that meet or exceed recommended safety standards for performing large-muscle activities.</li> <li>■ Those in charge of toddlers’ well-being are responsible for understanding the importance of physical activity and promoting movement skills by providing opportunities for structured and unstructured physical activity and movement experiences.</li> </ul>	<ul style="list-style-type: none"> <li>■ Provide opportunities for light, moderate, and vigorous physical activity for at least 15 minutes per hour while children are in care.</li> <li>■ Provide daily outdoor time for physical activity when possible.</li> <li>■ Provide a combination of developmentally appropriate structured and unstructured physical activity experiences.</li> <li>■ Caregivers should join children in physical activities.</li> <li>■ Integrate physical activity into activities designed to promote children’s cognitive and social development.</li> <li>■ Provide an outdoor environment with a variety of portable play equipment, a secure perimeter, some shade, natural elements, an open grassy area, varying surfaces and terrain, and adequate space per child.</li> <li>■ Provide an indoor environment with a variety of portable play equipment and adequate space per child.</li> <li>■ Provide opportunities for children with disabilities to be physically active, including equipment that meets the current standards for accessible design under the Americans with Disabilities Act.</li> <li>■ Avoid punishing children for being physically active.</li> <li>■ Avoid withholding physical activity as punishment.</li> </ul>

Note: Adapted from Shape America (2009)<sup>107</sup> and the IOM Committee on Obesity Prevention Policies for Young Children (2001).<sup>3</sup>

\* Designed to “reflect the best thinking of specialists in motor development, movement, and exercise about the physical activity needs of young children during the first years of life.” Shape America position statement: “All children from birth to age 5 should engage daily in physical activity that promotes movement skillfulness and foundations of health-related fitness.” Key statement: “Those in charge of infants’ well-being are responsible for understanding the importance of physical activity and should promote movement skills by providing opportunities for structured and unstructured physical activity.”

\*\* The committee’s task was to focus on policies that would promote and support obesity prevention among young children. Key statement: “Child-care regulatory agencies should require child-care providers and early childhood educators to provide infants, toddlers, and preschool children with opportunities to be physically active throughout the day.”

## Physical Activity Considerations for Infants and Toddlers

It is well recognized that daily physical activity is important for the health and well-being of children and adults. This is also the case for infants and toddlers, where active play and exploration is central for motor and cognitive development. Physical activity in early childhood is critical for achieving developmental milestones and learning and practicing fundamental movement skills so that children have the ability and confidence to engage in physical activity throughout childhood and into adulthood.<sup>106</sup> Physical activity and healthy eating are the two main pillars of childhood obesity prevention strategies. While no U.S. federal guidelines exist for physical activity in infants, toddlers, and preschoolers, recommended standards have been published by the National Academy of Medicine, Caring for our Children: National Health and Safety Performance Standards, and Shape America.

In 2011, The Early Childhood Prevention Policies committee, convened by the National Academy of Medicine (NAM)<sup>\*</sup>, provided a set of physical activity recommendations for young children based on the need to promote physical activity and discourage sedentary behaviors beginning at an early age (see Text box 5).<sup>3</sup> These recommendations specifically target child-care settings, early childhood educators, and communities, but they also can be followed by caregivers or caretakers of young children. The NAM recommends for adults with infants younger than 6 months of age to interact with their infants placed in a prone position (“tummy time”) daily. Adults can interact with infants by playing with them on the ground, providing opportunities for infants to move freely (always under close adult supervision). Adults taking care of toddlers should provide the child with supervised opportunities to freely move indoors and outdoors for at least 15 minutes every hour. For 3- to 5-year-olds the committee recommended a total of 180 minutes of physical activity every day.<sup>3</sup> The committee also made the following recommendations to decrease sedentary behavior in infants: use cribs, car seats, and high chairs only for their essential purpose—sleeping, car traveling, and eating (i.e., limit the use of strollers, swings, and bouncers for the purpose of restraining the child while they are awake), and keep toddlers and preschoolers active by limiting activities that keep them sitting or standing to no more than 30 minutes at a time. NAM also concluded that there is a need to better understand the best physical activity patterns for young children, and how they impact activity patterns later on in life.

Both unstructured and structured physical activity are important for young children. Structured physical activity is led by teachers/caregivers and supports the development and practice of gross movement and fundamental motor

skills.<sup>3</sup> The committee highlighted research demonstrating that structured physical activity results in more moderate to vigorous physical activity than unstructured, or free play.<sup>3</sup> To properly implement physical activity recommendations, training and professional development should be provided to teachers and caregivers on the importance of physical activity in early childhood, the recommendations on how much physical activity young children need, and how to lead structured physical activities that support gross motor movement and fundamental movement skills.<sup>3</sup>

Shape America has also published physical activity recommendations for infants and toddlers,<sup>107</sup> which are highly consistent with the recommendations from the NAM (see Text box 5)<sup>3</sup>. The Shape America<sup>107</sup> guidelines specifically call for infants to be encouraged to perform movement and active play (both structured and unstructured) for short periods of time several times per day. They also recommend toddlers engage in structured physical activity 30 minutes per day and unstructured physical activity opportunities at least 60 minutes per day, and to not be sedentary for more than 60 minutes at a time (except for sleep time).<sup>107</sup> These recommendations were endorsed by the expert panel and are reflected in the guidelines presented in Appendices 4 and 5.

The evidence reviewed in this section indicates that infancy is a time when movement and active play facilitate the motor, social, and cognitive development needed for healthy growth and well-being. Toddlerhood is indeed a time when children are eager to actively explore and learn from their environments. For this reason, proper infant and toddler development relies heavily on early life opportunities to explore and move frequently. Motor, social, and cognitive development are fundamental for developing healthy eating habits, thus physical activity and active play opportunities are strongly linked to the proper implementation of responsive feeding guidelines. As with feeding behaviors, caregivers should also be role models for their infants paying attention to their own sedentary (e.g., screen time) and physical activity behaviors.<sup>83</sup>

## Screen Time/Sedentary Behavior Considerations for Infants and Toddlers

Typical sedentary behaviors of children two years old or younger refer to the time that they spend sitting while playing or engaged in learning activities; the time that children spend watching TV or in front of a digital device screen (i.e., electronic tablet, smartphone, computer screen); and the time spent restrained in a car seat, high chair or stroller, or inside of a playpen or crib while the child is awake. It is important that health professionals working with parents of young children are

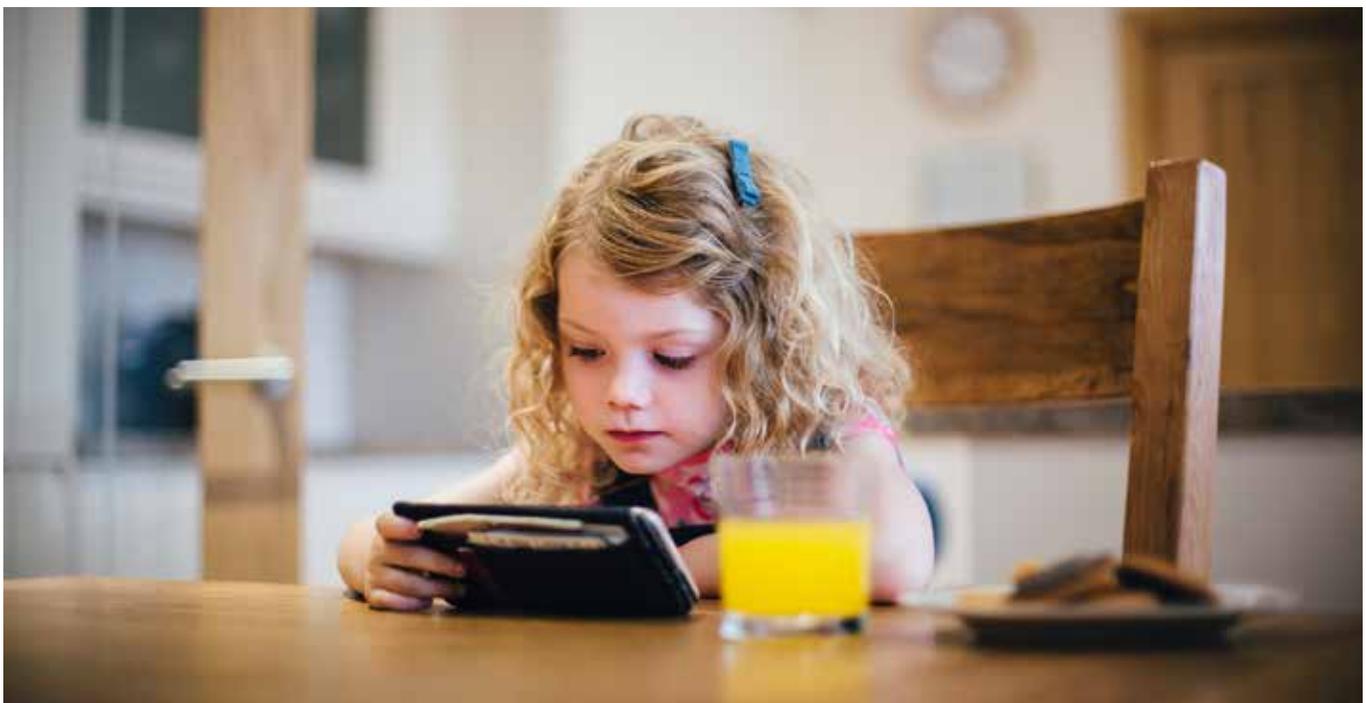
<sup>\*</sup> Formerly, the Institute of Medicine

well-trained to provide adequate advice to parents on how to decrease sedentary behaviors,<sup>3</sup> especially those related to screen time and the time that children spend restrained in equipment or in an area that restricts movement.

AAP recently issued an evidence-based policy statement regarding media exposure and early child development.<sup>108</sup> As with adults, information technology innovations have greatly increased media access in the lives of infants and young children. Even in households of low socioeconomic status, infants, toddlers, and young children are routinely exposed to innovative digital interactive and mobile media which can have both positive and detrimental effects on the development of the child. On the one hand, by 24 months of age, children can learn words from live video-chatting with a responsive adult or from an interactive touchscreen interface that nudges the child to choose the relevant answers, especially when interaction is facilitated by the child caregiver. This is important to highlight as many parents now use video-chat, including Skype and FaceTime, to facilitate social interactions with distant relatives. On the other hand, there is evidence of harm from excessive digital media use as it can interfere with healthy responsive eating behaviors and displace sleep, exercise, play, reading aloud, and rich social interactions.<sup>108</sup> As with the use of food as a soothing tool even in the absence of hunger among children with “difficult” temperaments, excessive television/media exposure is also more likely to happen among infants and toddlers with a difficult temperament and socio-emotional problems. Caregivers should be aware that using mobile devices to soothe fussy children has been associated with less than

optimal child development.<sup>108</sup> Parental media use behavior can also influence child development through different pathways. Parents’ background television use interferes with healthy parent-child interactions and child play. Heavy parent use of mobile devices is associated with fewer verbal and nonverbal interactions between parents and children and may increase the risk of parent-child conflict.<sup>108</sup> Thus, parental media use can interfere with responsive parenting and feeding behaviors. Based on this evidence, AAP specifically recommends: (1) to avoid using screen media for children younger than 18 months, with the exception of video-chatting facilitated by an adult caregiver; (2) for parents who want to use digital media with their 18- to 24-month-old toddlers to choose high-quality programming/apps and use them together with children (letting toddlers use media by themselves should be avoided); (3) to avoid exposing infants and toddlers to screens during meals and for 1 hour before bedtime; (4) for caregivers to avoid using media to calm their children; (5) to keep bedrooms, mealtimes, and parent-child playtimes screen-free for children and parents; and (6) to avoid exposing toddlers to apps with advertising and/or unhealthy messages.<sup>108</sup>

A recent systematic review of 24 studies assessing the prevalence of sedentary behaviors reported in children under 2 years of age found that most sedentary behaviors at this age were based on parental self-report of screen time.<sup>109</sup> The review found a wide range of screen time exposure per day among infants and toddlers (37 min to 330 min/day). Overall there was a lack of data for other sedentary behaviors. This review concluded that most children had high exposure to TV and screen time by two



years of age.<sup>109</sup> The first evidence-informed Canadian Sedentary Behavior Guidelines for Early Years (0 to 4 years) were released in 2012. These guidelines recommend that for healthy growth and development parents should minimize the time that their infants and young children spend on sedentary activities while awake. In summary, caregivers should avoid using screen media for children younger than 18 months, with the exception of video-chatting facilitated by an adult caregiver, and prolonged sitting or being restrained is not recommended for more than one hour at a time.<sup>110</sup>

### **Food Safety Considerations for Infants and Toddlers**

Children under 5 years of age are highly vulnerable to foodborne illness because their immune systems are still developing and they produce less stomach acid that kills harmful bacteria. Indeed, children under 5 years of age have the highest incidence rates of any age group of infections from dangerous pathogens found in foods including *Campylobacter*, *Clostridium Botulinum*, *Cryptosporidium*, *E. Coli* 0157, *E. Coli* non-0157, *Listeria*, *Salmonella*, *Shigella*, and *Yersinia*. Food illnesses can be lethal for infants and toddlers because they are often accompanied by diarrhea, which in turn can quickly deplete the young child's vital body fluids (i.e., severe dehydration). Foodborne illnesses can also cause serious discomfort and seriously disrupt feeding routines and behaviors as they often lead to nausea, vomiting, stomach pain and cramps, fever, and chills.<sup>111</sup> Two other important food safety concerns for infants and toddlers are food-related mouth burns (from offering fluids or solid foods that are excessively hot) and choking. Food safety for infants and toddlers relies almost entirely on their caregivers. Thus, as part of dietary advice targeting the first two years of life, it is important to communicate clear evidence-based food safety guidelines targeting caregivers of infants and toddlers. The evidence reviewed in this section led to the evidence-based food safety recommendations endorsed by the expert panel (See Appendix 6).

### **Food Allergy Considerations for Infants and Toddlers**

Food allergies affect 4 to 6 percent of U.S. children and youth under 18 years of age and 4 percent of adults.<sup>112</sup> While any foods can cause an allergic reaction, the vast majority of food allergies are caused by eight foods: eggs, milk, peanuts, tree nuts, fish, shellfish, wheat, and soy (referred to as “common allergenic foods” in this report).<sup>112</sup> Food allergies are caused by immune responses to diverse proteins in foods. Symptoms can range from mild (e.g., skin rash) to severe (e.g., anaphylaxis), and can involve the skin, gastrointestinal tract, cardiovascular system, and respiratory tract responses. Pregnancy and early life are highly sensitive periods for the development of the

immune system and related outcomes, including risk for the development of food allergies.<sup>113-115</sup> Thus, it is understandable that in the past, experts have recommended that dairy products and other highly allergenic foods like eggs, peanuts, and fish not be introduced until after an infant's first birthday.<sup>116</sup>

Recent systematic reviews have found that maternal diet during pregnancy and lactation was not associated with the development of food allergies in children.<sup>117-120</sup> Recent evidence has also shown that there is no reason to delay introduction of allergenic foods beyond 12 months<sup>118,121</sup> and perhaps not even beyond 4 to 6 months of age,<sup>117,119</sup> when most infants are ready to be introduced to complementary foods. Additional evidence suggests that exposing infants during the first year of life to common allergenic foods may actually decrease the risk of subsequent development of allergies to those foods. Specifically, The Learning Early About Peanut Allergy (LEAP) trial found, among infants at high risk for peanut allergy, that consistent consumption of age-appropriate peanut containing foods (e.g., peanut butter, peanut soup), beginning in the first 11 months of life, resulted in an 81 percent lower rate of peanut allergy at 60 months of age compared with children who avoided foods containing peanuts.<sup>122</sup> This evidence has led to new interim guidance recommending the introduction of age-appropriate food products containing peanuts between 4 and 11 months of age.<sup>123</sup> Delaying the introduction of foods containing peanuts beyond this age can actually increase the risk of peanut allergies.<sup>123</sup>

The use of hydrolyzed infant formulas among infants considered at high risk of food allergy has not been found to be protective against the development of cow's milk allergies.<sup>119,124,125</sup> Likewise, the use of maternal omega 3 fatty acid supplementation and maternal or infant supplementation with probiotics has not been found to help reduce the risk of food allergies in the child.<sup>117,119,126</sup>

However, given the many unknowns with regards to the development of food allergies, it is still important to be cautious when introducing infants to the solid foods that are most commonly associated with food allergies. The American Academy of Allergy, Asthma & Immunology (2015)<sup>121</sup> recommends introducing the first tastes at home rather than at child care or a restaurant. They also recommend for caregivers to consult with their baby's doctor *before* introducing common allergenic foods if any of the following applies: if the infant has had an allergic reaction to a food or has a known food allergy; the infant has persistent, moderate to severe atopic dermatitis despite recommended treatment; the infant's sibling has a peanut allergy; or the infant has had positive blood tests to food allergen(s).<sup>121</sup> The RWJF HER expert panel recommendations regarding food allergy considerations for infants and toddlers are presented in Appendix 7.

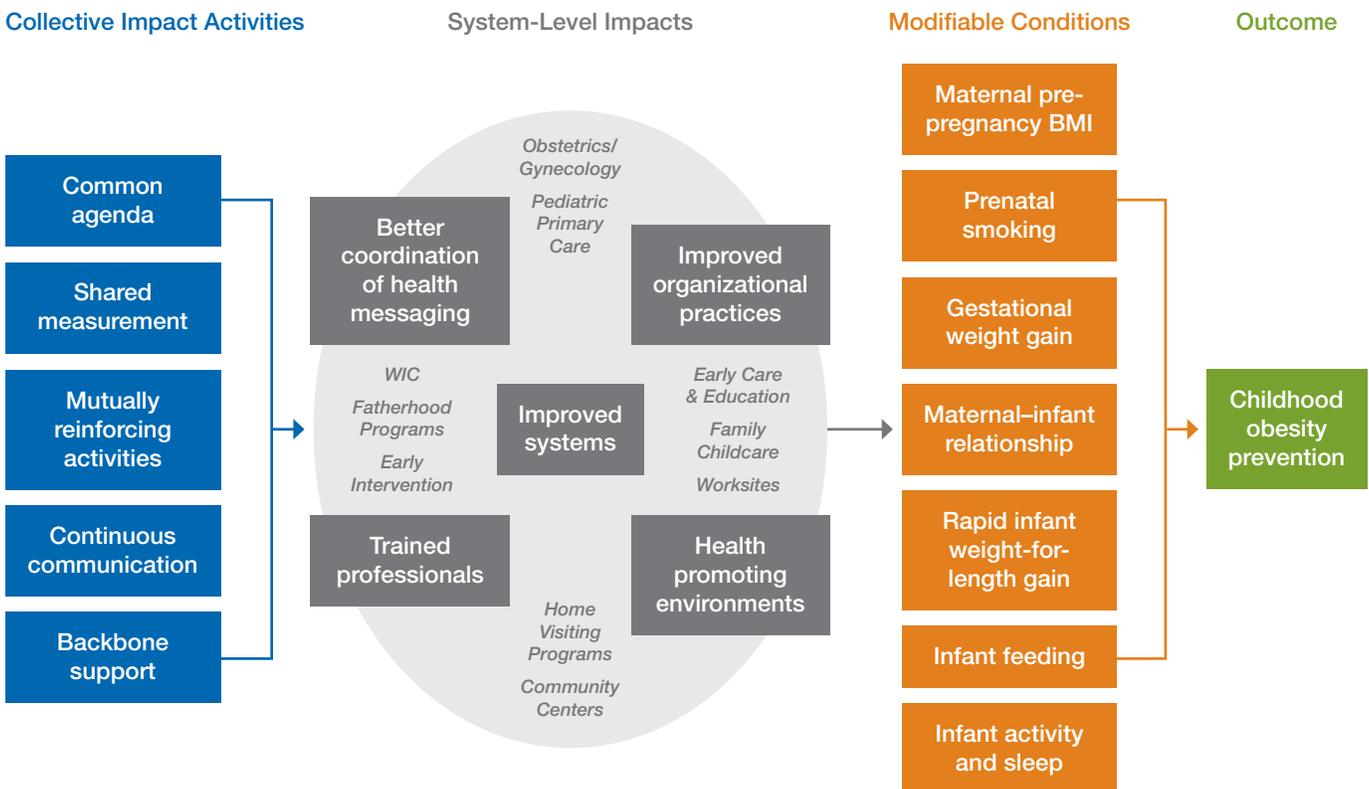
## Implementation Considerations for Infant/Toddler Responsive Feeding Guidelines

### Environmental Influences

In order to effectively implement the responsive feeding guidelines recommended in this report, caregivers need to have adequate access to social, economic, and family support. Proper implementation of the guidelines also requires caregivers to have the knowledge, time, and patience to offer a warm and nurturing environment to infants and toddlers, as well as access to the healthy foods being recommended.<sup>127</sup> By the same token, the development of healthy feeding patterns early in life also requires that environments where many infants and toddlers spend a substantial amount of time outside the home, such as child care, also offer healthy foods and responsive feeding interactions to infants and toddlers. Moreover, the household context often includes other family members who feed the infant/toddler; for example, in some cultures grandmothers exert an influence on maternal and child nutrition-related behaviors. Thus, it is important to expand the focus to include extended networks involved in infant/toddler feeding, and to address the resulting sociocultural dynamics.<sup>128</sup>

For caregivers to learn the principles of responsive parenting/feeding and how to tailor them to the specific needs of individual children, they must have access to a learning process preferably starting in pregnancy and continuing throughout the first year of life. This process must also anticipate, and include, the developmental stages of the child at which key feeding decisions are made or major transitions happen. Given the widespread contact of women and young children with the health care system it is important for health care providers to be well trained on responsive feeding and to have the resources necessary to provide their clients with the appropriate support for learning responsive feeding. The federal WIC program, the Child and Adult Care Food Program (CACFP), and early childhood education settings also provide ideal opportunities for education and guidance on responsive feeding.

Figure 6. Systems changes needed for childhood obesity prevention during the first 1,000 days



Note: Reproduced from "Interventions for childhood obesity in the first 1,000 days a systematic review," by T.L. Blake-Lamb et al., 2016, Am J Prev Med, 50, p.786.<sup>80</sup>

## Economic and Social Determinants of Health

The economic and social determinants of health, including income, education, and the neighborhood or community where individuals live, have a strong impact on the ability of caregivers to properly feed infants and toddlers.<sup>12,80,129</sup> Thus, it is paramount to address the challenges that low-income families face in regards to implementation of responsive parenting/feeding guidelines. The dietary intake of infants and toddlers is strongly influenced by the different layers of the socioecological model.<sup>14</sup> This includes food policies as well as an in-depth understanding of the health and food systems surrounding caregivers and infants and toddlers. This context is necessary to provide the information, education, and support on responsive parenting/feeding to caregivers, as well as to address access to healthy foods and snacks in a culturally appropriate manner.

Although discussion of the role of specific policies, such as paid maternity leave, is beyond the scope of this report, the section below outlines some of the system-level changes that are crucial for the proper implementation of the responsive parenting/feeding guidelines recommended in socioeconomically disadvantaged groups/communities, which are more likely to be affected by the childhood obesity epidemic.<sup>40,130</sup>

## Systems Changes

As Figure 6 shows there are numerous system-level changes needed for the prevention of childhood obesity during the first two years of life. These include addressing early care and education programs, the health care system, food assistance programs, and the marketing of food products to young children and their caregivers.

## Early Care and Education Programs

In 2012, 60 percent of children from birth to 5 years of age were under non-parental care during the week at child-care centers (41%), home care by a relative (26%), and/or home care by a non-relative (5%) (NCES, available at [http://nces.ed.gov/nhes/tables/nonrelative\\_care.asp](http://nces.ed.gov/nhes/tables/nonrelative_care.asp)). These arrangements are collectively referred to as Early Care and Education programs (ECE).<sup>131</sup> Given how relevant ECEs are for the effective implementation of responsive parenting/feeding and dietary guidelines targeting young children, including infants and toddlers, it is important to review existing policies and opportunities for ECEs to become partners in this endeavor.

In 2010, The White House Task Force on Childhood Obesity Prevention recommended ECEs provide enhanced opportunities for offering healthy foods, supporting breastfeeding, promoting physical activity, and reducing screen time.<sup>132</sup> One of the products of the task force was the “Let’s Move!” campaign for preventing childhood obesity, which includes “Let’s Move! Child Care,” a web resource for child-care providers and trainers (Available at: <https://healthykidshealthyfuture.org/>). Let’s Move! Child Care is a collaboration of several governmental and non-governmental agencies, including the CDC, which has developed an action guide to support states in their childhood obesity prevention efforts within ECE settings. This guide, known as “Spectrum of Opportunities” (Available at: <https://healthykidshealthyfuture.org/state-local-leaders/spectrum-of-opportunities/>), recommends diverse actions that can be taken at the state level as part of ECE programs’ strategic plans to improve the nutrition, breastfeeding, physical activity, and screen time practices and environments for the children they serve. Some of these actions include:

- Setting minimal requirements or standards for childhood obesity prevention practices as part of state child-care licensing regulations, including healthy eating, breastfeeding, physical activity, and screen time.
- Going above and beyond the meal pattern guidelines provided in CACFP, a federal nutrition assistance program that provides reimbursements for meals and snacks served to qualifying children, regardless of whether the ECE program participates in CACFP’.
- The inclusion of specific state quality standards for childhood obesity prevention as part of the Quality Rating and Improvement Systems (QRIS), which assess the quality at ECE and school-age care education programs.

The agency also provides ideas to states for taking advantage of other federal funds to support childhood obesity prevention efforts.

CDC emphasizes the need for technical support, training for providers, facility level interventions, parental engagement, and access to health promoting environments as important aspects for the implementation of evidence-based obesity prevention practices at ECEs. A strong call is also made regarding the need for ECEs to establish community partnerships and statewide ECE provider networks to achieve their childhood obesity prevention goals. Indeed, the *National Health and Safety Performance Standards: Guidelines for Early Care and Education Programs, Caring for Our Children*, include a set of evidence-

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\* CACFP provides aid to child and adult care institutions and family or group day care home for the provision of nutritious foods that contribute to the wellness, healthy growth, and development of young children, and the health and wellness of older adults and chronically impaired disabled persons.

based nutrition, physical activity, and screen time standards, which can be used as a guide for states in childhood obesity prevention initiatives.<sup>106</sup>

A recent study of ECE programs evaluated four strategies for childhood obesity prevention (healthy eating, breastfeeding, physical activity, and limited screen time) among states using Quality Rating Improvement System (QRIS). Results revealed that 40 states and the District of Columbia have adopted QRIS.<sup>133</sup> Over three quarters (77%) of QRIS administrators, indicated that they included the recommended obesity prevention strategies as part of their QRIS at ECEs. However, only 46 percent of them reported having specific information about whether ECE providers were implementing these practices, and only 29 percent had conducted a survey to identify these practices. It is important to maintain state-level commitments to preventing childhood obesity through ECEs, but it is equally important for this effort to be better evaluated in terms of quality, coverage, and impacts.

NAM also emphasizes responsive feeding and sleep hygiene as important strategies for early childhood obesity prevention in ECE settings.<sup>3</sup> A pilot study was conducted in 29 child-care centers in Massachusetts to assess the implementation of six nutrition and responsive feeding best practices recommended in the report (n=166 child-care providers, 57 working with infants

and 109 with toddlers).<sup>134</sup> The main purpose of the study was to identify characteristics associated with the implementation of selected NAM-recommended feeding practices among providers working in child-care centers. The study measured healthy eating outcomes (daily offering of fruits and vegetables, and avoiding offering fast foods, sugary foods, or desserts), and three responsive feeding practices (allowing children to eat when hungry, sitting down with children during mealtime, and allowing children to leave their food unfinished) for both infants and toddlers. Infant-care providers were more likely than toddler-care providers to follow responsive feeding and healthy eating practices. A relevant policy finding from this study was that providers working at centers participating in CACFP were more likely to practice responsive feeding and healthier eating practices with both infants and toddlers.<sup>134</sup> For example, practices such as sitting with children at meals and limiting fast food were significantly associated with CACFP participation. An interesting finding was that providers at centers serving meals family style were less likely to allow children to leave food unfinished, perhaps because of food waste concerns. It is likely that in this instance children are not necessarily serving themselves an amount based on hunger as this requires advanced thinking, well beyond most young children's abilities.<sup>135</sup>

The need for more health professionals to be trained in early childhood nutrition and physical activity and on how to work



at child-care centers is illustrated by a multi-state randomized controlled trial conducted in 17 licensed child-care centers mostly serving low-income communities.<sup>136</sup> This 7-month intervention was delivered by nurses who were child-care consultants and used the Nutrition and Physical Self-Assessment for Child Care (NAP SACC) to improve providers' and caregivers' nutrition and physical activity knowledge, the center's nutrition and physical activity practices, and children's BMI (among 3- to 5-year-olds). The study found significant improvements in providers' knowledge, child-care center's policies, and a lower BMI in preschoolers.<sup>136</sup>

In summary, there are existing policies, programs, and tools that can be used to implement improved obesity prevention efforts through ECEs. These resources are key for curbing the childhood obesity epidemic as a very high proportion of young children in the United States, including infants and toddlers, attend childcare. The infant-toddler responsive feeding guidelines developed by this expert panel can be implemented at ECEs. However, training a critical mass of providers and providing access to qualified technical support and resources will be needed for effective implementation of these and other evidence-based obesity prevention strategies at ECEs. Sound process and impact evaluations of interventions seeking to improve dietary, physical activity, and sleep behaviors among infants and toddlers at ECE sites is also needed.

## Health Care System

The health care system surrounding pregnant women, mothers, infants, and toddlers needs to be substantially strengthened at the community level (e.g., local health departments, primary health care centers, community health worker networks, WIC).<sup>12,14,22,80,137</sup> Obstetricians and pediatricians have a central role to play in addressing the childhood obesity epidemic.<sup>22,137</sup> Studies have shown that pediatricians have serious time constraints given the large amount of information that they need to convey in a very short period of time during each well child visit.<sup>138,139</sup> For this reason, it is important for nurses and other health care providers, besides pediatricians, to also be well-trained in responsive parenting/feeding principles. It is also important for public health workers, including home visiting nurses and community health workers, to be engaged in educating and supporting caregivers with the implementation of responsive parenting/feeding guidelines. For example, breastfeeding peer counseling models that link facility care with community care offer many lessons from which the implementation of responsive parenting/feeding guidelines could benefit.<sup>140</sup> Additionally, the combination of counseling

with text messaging and web-based support and information has strong potential to aid the primary health care system to better address the childhood obesity epidemic by sharing current, accurate recommendations for infant and toddler feeding guidelines based on responsive parenting/feeding principles.<sup>141</sup>

The seminal INSIGHT trial highlights the potential for mothers to learn from home visiting nurses responsive parenting practices across behavioral domains, with observed protective effects on subsequent growth. This efficacy trial intervention suggests that frequent and high-quality interactions, information exchanges, and follow-up plans between the caregiver and the provider can facilitate proper implementation of responsive parenting and feeding guidelines. Responsive parenting/feeding interventions should be built around a strong health care system that has seamless coordination between facility and community-based care, including community health care centers.

## Food and Nutrition Assistance Programs

A number of food and nutrition assistance programs can influence the types of foods offered to infants and toddlers. Likely the most influential is WIC as it covers over half of the infants born in the United States and is the only federal nutrition program with mandated nutrition education targeting pregnant and postpartum women and children under 5 years of age. In addition, WIC specifically targets the health and nutrition needs of vulnerable populations.<sup>22</sup> Responsive parenting and feeding of children under 2 years of age has been endorsed by WIC for several years, with a focus on teaching mothers how to identify hunger and satiety cues in infants and how to properly respond to infant fussiness and night awakenings through an understanding of infant sleep patterns and reasons for crying, several of which can be unrelated to hunger.<sup>102</sup> Although this is a good start, it is very important for WIC to standardize delivery of high-quality responsive parenting/feeding education and support across states. The goal for WIC should be to continue strengthening its responsive parenting/feeding initiatives taking into account recently published RCT interventions in these areas and to evaluate formally the impact and cost of delivery through diverse modalities (face-to-face, group sessions) and ancillary approaches (social marketing within and outside WIC clinics). It is also important for WIC to extend its reach to pediatric and primary health care practices to ensure that the responsive parenting/feeding messages being conveyed are consistent across health sectors.

CACFP also plays a critical role in shaping early nutrition environments in ECE settings. CACFP's meal and snack standards were recently revised by a panel of experts to align with the 2010 *DGA*.<sup>142</sup> Based on these recommendations and input from stakeholders, along with financial considerations, the USDA Food and Nutrition Services (FNS) formulated new CACFP meal patterns, which were released in 2016 and are required to be implemented by October 2017.<sup>143</sup> Compared to the old meal patterns, the new patterns provide for a wider variety of fruits and vegetables, increased whole grains, and reduced added sugar and saturated fat. The new infant meal patterns are divided into two age groups (birth to 5 months and 6 to 11 months of age), with the new standards supporting breastfeeding by providing reimbursement for meals when breastfeeding women come to nurse their infant on site. CACFP recommends offering only breast milk and/or formula to infants from birth to 5 months of age, with the gradual introduction of solids foods around 6 months of age taking into account the infant's developmental readiness. For 6- to 11-month-olds, CACFP now requires a variety of fruits and vegetables be offered and disallows juices or cheese spreads. In addition, the revised guidelines will limit fruit juice to no more than once a day, provide at least one serving of whole grains per day, add more protein options that can be served during breakfast in place of a grain component, and allow tofu to be served as a meat alternative for those older than one. CACFP will provide guidance and training to providers for the implementation of these new standards. Since the inception of CACFP in 1968, this is the first major revision of its meal patterns; it has been recommended that the standards are reviewed every 10 years going forward. Future revisions of the CACFP guidelines and best practices should include greater emphasis on responsive feeding.

CACFP has aligned its meal requirements with the WIC food packages based on the latest edition of the *DGA*, and with recommendations from the AAP. The educational component of WIC provides an opportunity for taking a more comprehensive approach to childhood obesity prevention by offering anticipatory responsive feeding guidance to mothers beginning at gestation. This guidance should continue and be reinforced once the infant is born and also strongly supported by providing child-care providers with the necessary training and technical support for the implementation of the new CACFP meal standards. Implementation of the revised CACFP standards should include the infant-toddler responsive parenting/feeding guidelines put forth by this expert panel.

## Marketing of Foods, Beverages, and Infant Formula to Young Children and Their Caregivers

Marketing by the food industry has been identified as a powerful factor affecting the foods and beverages that caregivers offer to young children.<sup>144-146</sup> Overall food marketing targeting children under 11 years of age, especially children from racial/ethnic minority groups, focuses heavily on unhealthy foods and beverages.<sup>147</sup> The use of cartoon characters to promote unhealthy products has been associated with a higher preference from young children for unhealthy foods and snacks with excessive amounts of added sugars, sodium, and saturated fat.<sup>145</sup> Even though most of this research has been done with preschoolers or older children, there is strong evidence that marketing unhealthy foods to caregivers of infants and toddlers is likely to also be highly effective. For example, mailings of vouchers for free infant formula and/or providing cases with free samples of formula to postpartum mothers without their prior consent is likely to undermine their ability to breastfeed even if they were intending or considering to do so.<sup>148</sup> The marketing of energy-dense foods of poor nutritional value to caregivers of young children may also negatively affect the ability of infants to learn to self-regulate their food intake with perhaps lifelong implications (see report section on how children learn to eat).

For this reason, food industry marketing practices need to be aligned with the national goal of improving infant/toddler feeding practices. It is important to further document marketing approaches and the nature of the foods and liquid products being offered to caregivers of infants and toddlers in today's marketplace and assess the impact of these products and marketing approaches in the responsive parenting/feeding context. In the meantime, it is recommended that states consider the principles outlined in recent guidelines seeking to prevent unethical marketing of foods and beverages to the detriment of children's well-being.<sup>147</sup> Those guidelines emphasize the need for food products marketed to children to meet specific nutrition criteria and for the implementation of measures to protect children against unethical marketing of unhealthy food products rich in added sugars, sodium, and/or saturated fat.

Because the composition and affordability of the U.S. food supply also affects what families with young children have access to, policies that shape the composition of the food supply, including its content of added sugars, salt, and saturated as well as trans fats, are a powerful factor influencing the ability of caregivers to implement the guidelines recommended by this expert panel.

## Research Recommendations

Moving forward, responsive parenting/feeding interventions should include guidance on hunger/satiety cues, soothing, sleep, physical activity, and boundaries set on media exposure. Caregivers' responsive parenting/feeding education facilitated by discussions around the healthy feeding, eating, sleep, and physical activity behaviors that lead to healthy growth and development patterns of their infants and toddlers is a promising strategy. Research indicates that the same responsive parenting/feeding intervention can be beneficial to both breastfed and formula-fed infants. However, it is still unclear if and how caregivers of formula-fed infants differ in the way they interpret hunger and satiety cues when compared to caregivers of breastfed infants. For example, studies have shown that bottle size matters in terms of how much formula infants consume, which clearly is not a consideration for exclusively breastfed infants (unless they are receiving expressed human milk).

During the panel deliberations there were a number of knowledge gaps identified that will need to be addressed through future research. These include:

- Conduct responsive infant/toddler feeding studies among low socioeconomic and ethnic/racial minority groups in the United States, as they have been seriously underrepresented in responsive feeding research. In particular, these studies should help understand how best to support families with low incomes in implementing the RWJF HER responsive infant and toddler feeding guidelines.
- Conduct studies to determine ideal mode or combination of modes (e.g., WIC, health care, CACFP, home health care workers, promotoras, etc.) of delivery of education and support on the RWJF HER infant/toddler feeding guidelines to parents and child-care providers.
- Conduct studies to assess the effect on breastfeeding of policy changes to WIC food packages and support of breastfeeding mothers.
- Conduct systems studies to find out how best to achieve intersectoral coordination to provide the right environments for caregivers of infants and toddlers to implement the RWJF HER responsive parenting/feeding guidelines (see Pérez-Escamilla and Hall Moran (2016)<sup>149</sup> for an example of how systems thinking frameworks can be applied to scaling up of breastfeeding programs globally).
- Conduct studies to understand the types of early exposure that best help infants and toddlers learn to accept healthful foods as they transition from infancy into toddlerhood, when poor dietary patterns begin to emerge.
- Conduct studies focusing on dietary pattern modeling during the first 2 years of life. This is a key research gap given the strong indicators that dietary patterns are better predictors of weight outcomes in infancy than individual foods.<sup>35</sup> One major challenge is the lack of statistical power in NHANES and in general the scarcity of adequate dietary intake data for this age group.
- Design studies to determine the most appropriate milk type—whole, 2%, 1%, non-fat—to offer young children ages one and older with respect to diet and obesity outcomes.
- Conduct Baby Led Weaning (BLW) studies in diverse socioeconomic and cultural settings to better understand the efficacy of this method as well as the ability of diverse groups to implement this approach. The few BLW studies available provided very useful information in the development of the RWJF HER guidelines as BLW focuses heavily on responsive feeding principles. However, we were unable to identify a critical mass of evidence to take a position on recommending (or not) this weaning method.
- Conduct studies to better understand how caregivers of formula-fed infants interpret hunger and satiety cues as compared to their breastfed counterparts. This line of research may help understand why infants that are formula-fed tend to be introduced earlier to complementary foods than those who are breastfed.
- Conduct studies to better understand if there are differences in caloric self-regulation among infants fed human milk from the breast vs. a bottle.<sup>150,151</sup>
- Conduct studies to better understand the caloric and nutrient intake from complementary foods for formula-fed compared to breastfed infants.
- Conduct research on toddler feeding to develop interventions to reduce intake of SSBs and added sugars.
- Conduct studies on physical activity/active play patterns and child growth and development outcomes among children under 2 years of age. These studies need to take into account the wide “natural” developmental variability across children who have the same chronological age.
- Form a consensus expert committee to revise the energy requirements of infants and toddlers. Current recommendations may be based on assumptions that overestimate the energy expenditure through physical activity among young children.

- Conduct studies to reaffirm the energy content of breast milk over time—it is plausible that this has been overestimated as it was unknown at the time of the original studies that some of the oligosaccharides in human milk are not digested and therefore should not be included in total energy estimates. If the current assumed energy content of 20 kcals/ounce is higher than actual (even by a small amount), then formula-fed babies have been receiving more calories/ounce than needed.
- Conduct studies on the impact of pre-masticating solid foods before feeding to infants (instead of mashing solid foods with a fork or kitchen utensil) on child health outcomes. This has been a longstanding question in low-income countries where traditional societies follow this practice. However pre-mastication has now been documented among WIC participants<sup>152</sup> and a recent IFPS-II analysis suggests that this practice may increase the risk of diarrhea among U.S. infants.<sup>153,154</sup>
- Conduct studies to better understand the sedentary behaviors of infants, toddlers, and preschoolers.<sup>110</sup>
- Conduct early life sleep pattern studies. Specifically, sleep recommendations for infants younger than 4 months of age are needed, including whether, among the wide range of variation in duration and patterns of sleep, certain patterns are linked with health outcomes.
- Conduct risk-benefit analyses to issue updated recommendations on the use of pacifiers. These analyses need to take into account the pros (e.g., reduction in SIDS risk, soothing) and cons (e.g., interruption of exclusive breastfeeding, poor oral/teeth development) at different developmental stages.<sup>155</sup>

## Conclusion

The first 1,000 days of life represent a highly sensitive period of time for children to learn to accept and like healthy foods. Given that the foods and beverages infants and toddlers are exposed to depend primarily on their caregivers, it is crucial for responsive parenting principles associated with healthy eating to be followed to foster optimal child development and prevent excessive weight gain. In addition to responsive feeding, responsive parenting behaviors that influence early life feeding behaviors and weight outcomes include physical activity, soothing, and sleep hygiene.

Responsive parenting has indeed become central for the development of infant and toddler feeding guidelines. Previous guidelines in the United States and other countries have included responsive parenting/feeding principles; however, as far as we know, the RWJF HER evidence-based guidelines produced by this expert panel provide the most comprehensive and pragmatic approach for communicating to caregivers what and how best to feed infants and toddlers, while also

taking into account the rapidly changing developmental stages during the first two years of life. The guidelines also make recommendations about system changes that are needed for parents/caregivers to be able to implement the recommended guidelines. The primary audience for these recommendations is caregivers, including, but not limited to caregivers in the home setting. These guidelines can also be applied through child-care settings where many infants and toddlers are now being served.

While much has been learned over the past decade on how best to feed infants and toddlers, much still remains to be discovered. This is true not only in terms of ways to improve proximal factors such as dietary quality, sleep, and physical activity, but also on how best to implement responsive feeding guidelines taking into account current systems-level challenges. The expert panel hopes that the principal research questions put forward in this report will begin to shed new light on many of these important issues.

## Appendix 1. Infant Feeding Guidelines: What to Feed From Pregnancy to One Year

### Prenatal & Postnatal<sup>6,29,156-159</sup>

- Healthy eating during pregnancy and while breastfeeding, including consuming plenty of vegetables and fruits, will help shape your child's preferences for healthy and nutritious food.
- Eating fatty fish during pregnancy and while you breastfeed will provide your baby with more omega 3 fatty acids which are needed for the optimal development of her/his brain. Guidelines for safely eating fish during pregnancy and while breastfeeding can be found at <http://www.fda.gov/food/foodborneillnesscontaminants/metals/ucm393070.htm> and <https://www.epa.gov/fish-tech/epa-fda-advisory-mercury-fish-and-shellfish>.

### 0 to 6 Months<sup>20,25,79,96,160-164</sup>

- For the first 6 months (or until the introduction of solid food), most babies only need breast milk (or formula). Breast milk provides nearly all the nutrients needed for optimal growth, and strengthens the infant's immune system. The composition of breast milk changes as your baby grows to match her/his individual nutritional needs. Breastfeeding is recommended to continue until your baby is at least 1 year old.
- It is recommended that exclusively breastfed infants receive a daily supplement of vitamin D (400 IU), since this vitamin is low in breast milk. Infant formulas are fortified with vitamin D. However, if your baby consumes less than 1 liter per day of formula, your doctor may advise a vitamin D supplement for your baby.
- If you are not feeding your baby breast milk, iron-fortified formula is the next best choice to satisfy your baby's nutritional needs during the first six months of life. Do not feed low-iron formulas (those that have less than 6.7 milligrams of iron per liter) to your baby.
- Newborns consume about 1 to 2 ounces of formula per feeding occasion during the first month of life. This amount increases to about 2 to 3 ounces per feeding during the second month, and then gradually increases to 4 to 6 ounces by 5 months. Pay attention to your baby's hunger and fullness signals and never pressure her/him to finish the bottle. Your baby does not need to finish the formula in the bottle.
- Be cautious about the volume of formula or expressed breast milk given at each feed. Studies have shown that bottle size matters. The bigger the bottle used, the more likely the baby will be to consume more than needed.
- It is not recommended to offer fruit juices or sugar-sweetened beverages before your baby's first year of life.
- Only breast milk or formula should be fed with a bottle to babies. Don't add cereal to the milk in your baby's bottle. This practice will not improve the sleep of your baby at night and it may interfere with how well nutrients in breast milk or formula are absorbed.

### 6 to 12 Months<sup>3,6,20,26,29,35,61,74,97,143,162,165-169</sup>

- When your baby is between 4 and 6 months old, pay attention to her/his developmental signs to find out if your baby is ready to start eating solid food. Signs your baby is ready include sitting up unsupported, munching and chewing food, and the ability to swallow food, grasp items, and bring food to her/his mouth. If your baby pushes solids out with her/his tongue when food is offered (thrust reflex), and/or gags when a spoon or food is placed in her/his mouth then she/he is not yet ready to be introduced to solid food.
- Sometime between 4 and 6 months (when your baby is developmentally ready) your baby's nutritional needs can no longer be met by breast milk or formula alone. At this time, gradually start introducing solid food by offering 1 to 2 teaspoons of a pureed or mashed food, slowly increasing the amount while paying attention to your baby's hunger and fullness signals. If your baby is still hungry after consuming the small amount of solids recommended, then feed breast milk or formula.
- Mothers who choose to breastfeed are encouraged to continue breastfeeding until their babies are at least 1 year old.
- From 6 to 12 months, breast milk or formula continues to be the most important source of nourishment for your baby. Solid food needs to be introduced gradually. Solid food will initially provide about one-third, increasing to over half, of the total calories that your baby needs by the time she/he is 1 year old. Examples of the amount of solids needed between 6 and 12 months can be found at: [http://www.fns.usda.gov/sites/default/files/cacfp/CACFP\\_infantmealpattern.pdf](http://www.fns.usda.gov/sites/default/files/cacfp/CACFP_infantmealpattern.pdf).
- Exclusively breastfed babies need to get started on solid foods that are rich in iron and zinc sometime between 4 and 6 months, because by that time breast milk does not provide enough of these nutrients. Iron-zinc fortified baby cereals or pureed/mashed meats are recommended as first solid foods for exclusively breastfed babies. In general, about 2 servings per day of cereal (2 tablespoons/serving) OR 1 to 2 ounces of meat per day is recommended to meet the need for these nutrients. However, each baby needs different amounts to start. Pay attention to your baby's hunger and fullness signals to find out how much your baby needs to eat.

## Appendix 1. Infant Feeding Guidelines: What to Feed From Pregnancy to One Year (cont.)

### 6 to 12 Months (cont.)<sup>3,6,20,26,29,35,61,74,97,143,162,165-169</sup>

- If you choose to formula feed, it is recommended that you give your baby formula fortified with iron and zinc. The gradual introduction of solid food to your baby sometime between 4 and 6 months of age is important because it supports her/his ability to learn to eat a variety of healthy food with different textures and flavors. Introduction of solid food also helps with your baby's development, including social skills.
- After introducing iron- and zinc-fortified baby cereals or mashed meats, there is no particular order to follow for introducing solid food. At this point, your baby is able to digest and absorb the nutrients from healthy food belonging to different food groups. However, it's important to keep in mind that the earlier vegetables are introduced (once your baby is ready to consume solid food), the more she/he is likely to easily accept them.
- When introducing a new vegetable, it is recommended to mix it first with a familiar food such as breast milk, formula, or cereal. Combining new food items that are more difficult to accept by babies, such as some vegetables, with food they are already familiar with can help your baby accept and learn to like vegetables more readily.
- Introduce your baby to a variety of food from all the food groups (vegetables, fruits, grains, meats/protein, dairy) by the time she/he is 7 to 8 months old.
- Offering a variety of vegetables and fruits and avoiding food of limited nutritional value, such as those high in calories, sugar, salt, and fat (e.g., French fries, sugary cereals, cookies), helps your child gain a healthy amount of weight.
- What your baby eats at around 9 months is indicative of what she/he will like to eat when school-aged. Offer your baby a variety of vegetables and fruits and whole grain products (e.g., brown rice, whole grain cereals).
- It is important to introduce your baby to a large variety of vegetables and fruits prepared in different healthy ways and textures before she/he turns 1 year old. This will expose your baby to an array of flavors and textures that will make it easier for her/him to accept and learn to like healthy food from all the food groups (fruits, vegetables, whole grains, dairy, and protein). Your baby will also learn to self-control the desire for unhealthy food that has excessive amounts of added sugars, sodium (salt), saturated fat, and calories.
- Sometime between 6 and 8 months, introduce your baby to pureed or mashed food, and gradually transition into lumpy food and soft finger food. Then, between 8 and 12 months, your baby can start eating minced, chopped food and hard finger food. Experiencing different textures will help your baby with her/his chewing skills, and with learning to accept and like different healthy food. Encourage your baby to self-feed as soon as she/he is ready.
- Between 6 and 11 months, babies eat about every two to three hours or about five or six occasions during the day.
- Besides offering 6 to 8 ounces of breast milk or iron-fortified formula, at each meal you can offer your baby:
  - Up to 4 tablespoons of iron-fortified infant cereal or protein foods (meats, eggs, legumes) or dairy foods such as cottage cheese (up to 4 ounces), cheese (up to 2 ounces), or yogurt (up to 8 ounces)AND
- Up to 2 tablespoons of vegetables or fruit
- For a smaller meal or snack you can offer breast milk or formula (2 to 4 ounces), AND:
  - Up to ½ slice of whole grain bread or up to 2 whole grain crackers, or up to 4 tablespoons of iron-fortified infant cerealAND
- Up to 2 tablespoons of vegetables or fruit, or a combination of both
- Once your baby starts solid food, it is recommended to offer a total of 4 to 8 ounces per day of plain drinking water in a cup. This will help your baby get familiar with the taste and to learn to like plain water.
- When preparing food for your infant, do not add salt or sugar. Likewise, when choosing baby food that is already prepared, choose options without (or with limited amounts of) added salt or sugars. This will help your baby learn to like the natural flavors of food and help your child avoid consuming excessive amounts of salt and sugar later on in life.
- Feed your baby only healthy food that provides plenty of vitamins, minerals, and fiber, including fresh vegetables, fruits, and age-appropriate whole grain products. Also, make sure to feed your baby nutritious food that provides an adequate amount of protein (such as eggs, fish, meat) and energy.

## Appendix 1. Infant Feeding Guidelines: What to Feed From Pregnancy to One Year (cont.)

### Foods to Avoid or Limit<sup>3,20,97,162</sup>

- Cow's milk should NOT be offered before the child turns 1 year old because it may cause intestinal bleeding.
- Plant-based beverages (e.g., soy, rice, almond milks) are NOT recommended for your child in place of breast milk or formula, unless prescribed by your pediatrician (e.g., commercially prepared soy-based infant formula). These beverages are not designed to meet the nutritional needs of your child to the same extent as breast milk or infant formula.
- It is recommended to offer mashed fresh fruits instead of fruit juices since they have a higher nutritional value. Also, keep in mind that fruit juices and sugar-sweetened beverages are a concentrated source of calories that may displace other food with better nutritional value, or discourage your baby from eating other nutritious food that is not sweet. AVOID introducing fruit juices during the first year of life. Avoiding sugar-sweetened beverages can also help prevent dental cavities.
- It is strongly recommended to offer NO sugar-sweetened beverages such as flavored drinks (including Kool-Aid, fruit drinks, sodas, horchata (sweetened rice water), sports drinks, sweetened teas, or any other sugar-sweetened beverages) to your baby during the first year of life. Doing so could reinforce your baby's strong preference for sugary food and beverages and make it more difficult for her/him to learn to like healthy food such as vegetables, fruits, and plain water.
- Before choosing food for your baby, check the food label and ingredient list. Choose food with no or very limited amounts of added sugars and sodium (salt).
- Honey should NOT be given to children under 12 months old since it may cause a serious condition known as botulism.
- Supervise your child during feeding time and avoid offering food items that are a choking hazard such as nuts, grapes, popcorn, hot dogs, and hard candies.

### Spoon, Cup, and Self-Feeding<sup>162,170</sup>

- Between 6 and 12 months, it is recommended to transition infants from using a bottle to a cup.
- By 12 months, your baby should be able to spoon feed herself/himself and hold a cup with both hands.
- At around 6 months, you can use a baby spoon to start offering pureed food, and water in a sippy cup held by an adult.
- At around 8 months, your baby will start to try to spoon-feed by herself/himself, and she/he most likely will be able to drink from a cup with less spilling.
- Babies prefer to use their hands to explore solid food. Although this is messy, it allows the child the opportunity to explore and learn to like healthy food. Encourage your baby to self-feed.

## Appendix 2. Toddler Feeding Guidelines: What to Feed During the Second Year of Life

### Developmentally Appropriate Feeding<sup>3,20</sup>

- One- to 2-year-olds have small tummies and can only eat small portions at a time, so they should eat five to six times a day (this can be from meals and healthy snacks). Sliced fresh fruit (e.g., apples, peaches, strawberries), cooked vegetables or vegetables with dip (e.g., carrots, broccoli, peas), and whole grain crackers with cheese are all good ideas of healthy snacks.
- By 1 year of age, children need about 1,000 calories every day. However, each child has different needs, so pay attention to her/his hunger and fullness signals. Examples of healthy meal patterns that provide adequate amount of nutrients and calories for 1- to 2-year-olds can be found at: [http://www.fns.usda.gov/sites/default/files/cacfp/CACFP\\_childadultmealstandards.pdf](http://www.fns.usda.gov/sites/default/files/cacfp/CACFP_childadultmealstandards.pdf).
- Once your child is 1 year old, structure eating occasions—she/he needs to eat three meals and two to three healthy snacks at about the same time every day. Following a regular schedule will help your child learn when and what to expect to eat during the day. However, don't worry if your child decides to skip a meal or snack. What is important is for you to remember to offer the food and let her/him decide how much she/he wants to eat.
- As much as possible make sure that your child's meals are part of your family meals. Toddlers learn to eat table food and socialize during family meals.

### Milk<sup>3,20,143,16</sup>

- The American Academy of Pediatrics recommends giving pasteurized whole cow's milk to 1- to 2-year-olds. However, your health care provider may recommend pasteurized reduced fat milk (2%) instead if there is a family history of obesity or heart problems.
- Offer cow's milk with no added sugars (e.g., no flavored milks). Added sugars may interfere with the development of your toddler's preferences for healthy food (such as vegetables and fruit) and may cause oral health problems, including dental cavities, and lead to extra calorie intake.
- Give your toddler cow's milk in a cup instead of a bottle. Offering milk in a cup instead of a bottle can help your toddler improve his/her motor skills.
- Too much milk may decrease your toddler's appetite for other food needed to meet nutritional needs. Keep your child's total milk consumption to no more than 2 cups (16 fluid ounces) per day while offering a variety of healthy food.
- At each meal, or as part of a snack, offer your toddler ½ cup (4 ounces) of milk.
- You can offer ½ to ¾ cup of yogurt in place of milk during meal or snack times, but serve only plain yogurt or yogurt without excessive total sugars (no more than 23 grams per 6 ounces). Plain yogurt can be mixed with fruits to increase its acceptance by your toddler.
- It is fine to continue breastfeeding beyond one year if desired by parent and child. The frequency of breastfeeding and how long each nursing episode lasts typically decreases quite a bit during this time as your child consumes more solid food.
- Bottle feeding is strongly discouraged after 12 months. Try to wean your child from the bottle by the time she/he is 1 year old. Doing so will reduce the risk of dental cavities and other dental problems later on.

### Water, Fruit Juice, and Sugar-Sweetened Beverages<sup>3,20,143,145,161,171</sup>

- Water is the best option to quench your child's thirst. Your toddler needs about 2 cups of water per day to cover her/his fluids needs. Use a cup to offer water. Do not serve sugar-sweetened beverages (e.g., soft drinks, sports drinks, fruit drinks, energy drinks, sweetened teas). Your toddler is still learning to accept and like healthy food and beverages, and consuming sugar-sweetened beverages can interfere with this process.
- Whenever possible, offer fresh fruit instead of 100% fruit juice to your toddler since whole fruit provides less sugar and more fiber than juice. Avoid fruit canned in heavy syrup or with sugar added. Excessive fruit juice and fruit with added sugar can displace other nutritious food and lead to dental cavities.
- If you decide to offer 100% fruit juice to your toddler, limit intake to no more than 4 ounces per day and offer it with a cup, not a bottle.
- Don't put your toddler to sleep with a bottle or sippy cup. This can cause dental cavities and other oral health problems.

## Appendix 2. Toddler Feeding Guidelines: What to Feed During the Second Year of Life (cont.)

### Dietary Diversity<sup>3,20,143</sup>

- Plan meals and snacks to provide a variety of healthy food from all food groups (fruits, vegetables, meats/protein, dairy, whole grains).
- Multivitamins are not needed if your child is eating a healthy nutritious diet. If your doctor or health care provider recommends giving multivitamins to your child, choose brands that are low in sugar. Talk to your dentist if you don't know which ones are low in sugar.
- Include a variety of vegetables, especially dark green, red, and orange types. These vegetables are rich in many nutrients that are difficult to get in adequate amounts from other food. Exposure to a variety of vegetables will also help your child learn to like vegetables. Offer ¼ to ½ cup of vegetables at most eating occasions.
- Offer a variety of fruits of different colors. Offer your child ¼ to ½ cup of fruit at each eating occasion.
- Provide a variety of poultry, fish, meats, and meat alternates (e.g., beans, lentils, tofu) to your toddler. Offer ½ to 1 ounce of poultry, fish, meat or meat alternate at most meals and snacks. Avoid feeding your toddler food that is high in sodium (salt) such as processed meats like ham, lunch meats, and packaged breaded chicken and fish.

### Snacks<sup>3,143</sup>

- Offer only nutritious snacks to your toddler. Remember that at this age, snacks are a very important source of nutrients for growth and development and help to shape eating habits for life. At most snacking occasions, include a fruit or a vegetable combined with food from the grain or dairy group.

### Whole Grains and Fiber, Omega 3 Fatty Acids<sup>3,143,172</sup>

- Offer your toddler whole grain food, such as whole wheat bread, whole wheat pasta, corn tortillas, or brown rice. These food items are rich in fiber which is often missing from children's diets. Offer ½ to 1 slice of whole grain bread, or ¼ to ½ cup of whole grain cereal or pasta at most meals and snacks.
- Offer your toddler deboned fish such as salmon, white tuna, and trout. Fish is a good source of healthy fats known as omega 3s that are very important for brain development.
- Choose food for your toddler prepared with healthy oils, such as olive, canola, corn, or sunflower oil.

### Limit Sugar and Sodium and Avoid Trans Fats<sup>3,32,172-174</sup>

- Avoid adding too much salt or sugar to your toddler's food. Otherwise your child will develop a strong preference for salty and sweet food and beverages. Remember that the food that you prepare can be seasoned with natural herbs and spices (e.g., basil, oregano, cumin, chili, ginger) instead of salt, sugar, honey, and other sweeteners.
- Read food labels and the list of ingredients when choosing already prepared food for your toddler. Avoid food that has high amounts of any type of added sugars, including high fructose corn syrup (e.g., sugar-sweetened beverages like Kool-Aid, sodas, sports drinks) or sodium (e.g., packaged macaroni and cheese) or that contains any amount of trans fats (e.g., French fries). The American Heart Association and the Academy of Nutrition and Dietetics both recommend that children under 2 years old should not consume any added sugars from food or beverages.
- Limit your toddler's consumption of snacks high in sodium and with added sugars. Remember that your toddler is still learning to develop eating habits for the rest of her/his life.

## Appendix 3.

### Responsive Parenting/Feeding Guidelines for Caregivers: How to Feed in the First 6 Months

#### Responsive Feeding; Hunger and Satiety Cues<sup>7,75,81,85,88,101,102,150,175-179</sup>

- Responsive feeding involves recognizing and understanding your baby's hunger and satiety cues and associated behaviors and responding accordingly through a warm and nurturing relationship.
- Babies are born with a natural ability that helps control their appetite. It's important for you to learn how to interpret and respond accordingly to your baby's hunger and fullness signals. Being able to do that takes some learning.
- Misinterpreting your baby's hunger and fullness signs can reduce your baby's ability to self-control her/his appetite and lead to overeating as she/he grows up.
- Help your baby learn to eat only in response to hunger and stop when full, so that she/he doesn't learn to eat for reasons other than hunger.
- Crying by itself cannot be interpreted as a sign of hunger. Additional cues that may indicate that your baby is hungry at this age are: bringing hands to mouth, rooting reflex (ability that babies are born with to help with breastfeeding; it involves turning their heads toward anything that strokes their cheek or mouth), sucking noises, fast breathing, clenching fingers, flexing arms and legs.
- Although many parents interpret crying as a sign that the baby is hungry, it is important to remember that babies cry for many reasons—they may be wet, uncomfortable, or tired.
- When your baby cries, before offering food, try to soothe to calm her/him down and first check for things that are making your baby uncomfortable. Doing this may help you avoid overfeeding your baby or setting up the expectation that crying will always lead to feeding.
- Your baby will let you know when she/he is full and no longer wants to eat. For example, at this age she/he may push you away, stop sucking, extend or relax her/his arms, legs, and fingers, or simply fall asleep.
- Babies have tiny stomachs, so they need to feed often throughout the day.

#### Baby's Wake/Sleep Cycles<sup>85,102,105,180,181</sup>

- Parents may feel overwhelmed when their babies cry or seem fussy.
- During a typical day between 4 months and 1 year, a baby sleeps from 12 to 16 hours distributed across frequent wake/sleep cycles.
- During the first month of life, it's normal and part of healthy development for babies to wake up three or more times at night, and sleep for short periods of time during the day.
- As your baby approaches 6 months, it's normal for her/him to sleep through the night.
- As your baby grows, she/he will sleep for longer periods of time during the night. However, at times your baby's sleep patterns may fluctuate. She/he will typically get back on track, so be consistent with how you respond to your baby's waking at night.
- Strategies recommended for responding appropriately to night waking include: waiting a minute to see if baby settles on her/his own and then going in and trying soothing techniques besides feeding if not showing hunger signs (lengthening the wait time as the child develops); feeding if hungry; making nighttime visits short and relatively "quiet" so that the baby doesn't expect stimulation time in the middle of the night.

#### Soothing Techniques to Calm a Baby<sup>85,102,180</sup>

- Use soothing techniques to calm a crying baby, such as rocking, swinging, swaddling, repeating a word, shushing, or changing her/his environment.
- Some, but not all, babies may need a pacifier to calm down.
- If your baby was recently fed and is crying or fussy make sure to check for things that are making her/him uncomfortable, such as a wet diaper, and try to calm her/him down using soothing techniques.

### Appendix 3. Responsive Parenting/Feeding Guidelines for Caregivers: How to Feed in the First 6 Months (cont.)

#### Temperament<sup>64,95</sup>

- Knowing your baby's temperament and causes of fussiness can help you to interpret the soothing and feeding needs she/he is communicating, and help your baby develop and grow well.
- Your baby's fussiness is not always related to hunger. For example, it may be related to being wet, too warm or cold, tired, overstimulated, teething, or being ill.
- Some babies have a fussier personality or temperament than others or experience times that they are more fussy than usual. Fussiness could be interpreted as a baby being hungry when it's not, and could lead to overfeeding.

#### Pressure to Finish a Feed<sup>85,88,101,102,176,179</sup>

- Don't force your baby to finish the bottle or continue eating from your breast, since this will interfere with the baby's natural ability for appetite control down the road. Remember that your baby knows when to stop feeding.

#### Bottle Use<sup>79,82,85,102,182-185</sup>

- Be cautious about the volume of formula or breast milk given at each feed. Studies have shown that bottle size matters. The bigger the bottle used, the more likely babies will be fed more than what they need.
- It is not recommended to mix cereal with formula or breast milk in a bottle. There is no evidence that this helps babies sleep longer and it could be a choking hazard.
- Feeding cereal in a bottle can diminish your baby's ability to regulate her/his appetite resulting in overfeeding and gaining weight excessively.
- Feeding cereal in a bottle to infants 0 to 6 months may cause discomfort as their tummies may not be ready for the cereal.
- Do not practice "bottle propping" (leaning the bottle against a pillow or other support at the stage when babies cannot hold the bottle on their own). This practice is an example of nonresponsive feeding.
- You should not put your baby to bed with a bottle. This practice can affect the health of the baby's teeth and is an example of nonresponsive feeding.

#### Introduction to Solid Food<sup>1,19,160,176</sup>

- It is not recommended to introduce solid food before baby is 4 months old as the baby's body is not ready and this adds unnecessary calories to her/his diet.
- Infants should be fed only breast milk and/or formula for about 6 months. However, babies may be ready to be introduced to solid food between 4 and 6 months if they are able to sit with good head control and showing other signs of readiness.
- Babies are likely to be ready to be introduced to solid food if they can sit up well with little or no support, have good head control, do not automatically push solids out of their mouths, and are able to munch and swallow. They may also show interest in food, including trying to grab it and put it in their mouths.

#### Feeding Environment<sup>7,57,90,186,187</sup>

- Feed your baby in a pleasant environment where you can interact warmly with your baby.
- Do not pressure your baby to finish the bottle or food on the plate.
- Do not give a bottle or food to your baby as a reward for behaving the way you want. Only offer food in response to your baby's hunger signals.
- Do not feed your baby in front of the TV. Meals should be a bonding and social occasion where both parent and baby benefit from the nurturing interactions that occur during a feed.
- Remember to interact warmly and to be responsive to your child's behaviors while feeding.
- Avoid distractions while feeding your baby, including using your smartphone. Your baby requires your full attention and interaction while eating.

## Appendix 4. Responsive Parenting/Feeding Guidelines for Caregivers: How to Feed During 6 to 12 Months

### Responsive Feeding, Meals, and Sleeping Routines<sup>7,20,26,69,73,85,86,162,180,181</sup>

- Expect that at around 6 months your baby will be able to sit, chew, and swallow semi-solid food. These are skills your baby needs to have before starting to eat solid food.
- Sometime between 6 and 12 months your baby will be able to self-feed either with a spoon or by holding age-appropriate finger food. Encourage your baby to do so.
- From 6 to 12 months, continue following your baby's hunger and fullness signals. Remember that adequately responding to her/him in a prompt and caring way will help your baby develop healthy eating habits.
- While paying attention to your baby's hunger and fullness signs, keep in mind that your baby's appetite may change during periods of fast growth or when she/he is feeling sick.
- Hunger signs for 6- to 12-month-old babies include opening mouth when spoon gets near; reaching for the spoon or food; pointing to food; getting excited when food is presented; and expressing a desire for specific foods with words or sounds.
- Fullness signs for 6- to 12-month-old babies often involve shaking of their head, turning head away from food, and not opening mouth when spoon is close to indicate that no more food is desired.
- Establish a consistent regular schedule for your baby's meals, snacks, and sleep times. Establishing routines can help your baby set up good habits and learn when to expect to eat.
- Actively engage in conversations with your baby while feeding her/him and as you change routines throughout the day. Explain to your baby what you are doing and what is coming next, and warmly respond to his/her verbal cues. These interactions will help her/him to understand expectations and facilitate transitions.
- By 6 months, many babies sleep longer periods of time during the night, but they may still wake up. During night awakenings, first give your baby an opportunity to self-soothe back to sleep before picking her/him up. If this does not work, before feeding try using other soothing strategies that work for your baby.
- If your baby does not seem to be hungry during night awakening, check for things that may be making her/him uncomfortable and soothe her/him to help her/him go back to sleep. Remember to keep night awakenings short and quiet.
- When your baby cries try to use soothing strategies to calm her/him down such as: (1) swaddling, (2) side or stomach position while awake, (3) shushing, (4) swinging, and (5) sucking from a pacifier.

### Mealtime as a Pleasant Experience<sup>7,26,73,81,88,180,188</sup>

- Make sure to create a comfortable, stress-free, caring environment with few distractions when your child is eating.
- Make mealtime a pleasant experience for you and your baby. Talk warmly to your baby during feeding, and respond to her/his sounds or words. Encourage, but don't force, your baby to eat.
- Your baby will learn that you understand and will respond to her/his hunger and fullness signs. This will help you in building a positive trusting relationship with your baby.
- Make your baby's eating experience part of family meals. Preparing healthy meals for the whole family will introduce your baby to these food items.
- During family mealtimes, place your child seated facing the other family members so that she/he has an opportunity to interact with them.

## Appendix 4. Responsive Parenting/Feeding Guidelines for Caregivers: How to Feed During 6 to 12 Months (cont.)

### Introducing Your Baby to Different Flavors and Textures Using Responsive Feeding<sup>7,26,27,29,78,159,162,188</sup>

- From around 6 months to 12 months, your baby will progress from assisted feeding to self-feeding. During this time offer your baby food of different flavors and textures.
- Take your time feeding your baby, and be patient while offering new healthy food. Don't give up if your baby doesn't accept the food the first time you offer it. Try again during a different eating occasion. It may take as many as 15 to 20 tries before your baby learns to like a new food.
- Eating habits are established early in life, so it is important that parents only offer healthy food to their babies. Offer your baby a variety of soft/cooked vegetables, fruits, and other healthy food with different flavors and textures so that she/he learns to like them.
- Provide healthy, tasty food that is appropriate for your child's age at regular times and in a pleasant environment, and let your baby decide how much she/he wants to eat.
- Support your baby's attempts to self-feed. Let your baby explore different food items and tastes with her/his hands. This is messy but very important for your baby to develop healthy eating habits.
- When introduced to new food, some babies will make "faces" that look like they do not like the food. This is a normal part of learning to like new food and does not mean your baby will dislike the food. Be patient and keep offering the food.
- Remember that it may take more tries for your baby to learn to like vegetables than other healthy food like fruits. Continue offering a variety of vegetables and other healthy food, and let your child decide when she/he is ready. The most important thing is that you keep offering vegetables. Be patient and keep trying.

### Parental Role Modeling<sup>7,26,29,159,168,180</sup>

- Babies imitate their caregivers. Eat a variety of healthy food in front of your baby, and always show a positive attitude towards healthy food.
- Never force your baby to eat. Let her/him choose what and how much she/he wants to try and eat.
- Correctly interpreting hunger and fullness signs will allow your baby to learn how much food she/he needs to consume, and prevent her/him from eating for reasons other than hunger.

### Do Not Practice Restrictive Feeding with your Baby<sup>26,55</sup>

- Some parents may be concerned about their babies not gaining enough or gaining too much weight. Trust your baby's hunger and fullness cues. Work with your pediatrician to resolve any weight gain concerns.

### Screen Time and Physical Activity<sup>3,55,88,90,107,180,189</sup>

- Avoid TV and other screen time during mealtimes. This can interfere with the opportunity for the baby, you, and other members of the family to socialize and interact with each other. These interactions are very important for your baby's development and in the establishment of healthy eating habits.
- Engage in fun, developmentally appropriate active play with your baby every day.
- Provide supervised times during the day for your infant to freely move and explore the world around her/him.

### Establishing Sleep and Feeding Routines<sup>26,73,104</sup>

- It may take some time for you and your baby to establish a sleep and feeding routine. Once it happens, it's important to be consistent as having regular schedules can help babies be less fussy and develop healthy sleeping and feeding patterns.
- Expect normal growth spurts that may temporarily disrupt your baby's regular schedule. Teething near 6 months of age may also be temporarily disruptive. Try keeping your baby's sleep and feeding routines as consistent as possible but be sensitive to your baby's needs during these transition times.

## Appendix 5. Responsive Parenting/Feeding Guidelines for Caregivers: How to Feed During 12 to 24 Months

### Responsive Mealtime Routines<sup>7,26,73,74,138,172,178,189-193</sup>

- Establish a feeding routine for your child's meals and snacks. Children of this age usually consume three meals and two or three healthy snacks every day.
- Meal and snack time should be a pleasant experience for your toddler. Take the time your child needs to have a non-rushed and enjoyable mealtime or snacking experience in a stress-free environment with few distractions (e.g., without TV or other distracting screens).
- Eat with your toddler and let her/him be part of family meals. Talk to your toddler during meals and respond to her/his verbal and non-verbal requests. Continue to pay attention to hunger and fullness signs. Don't pressure your toddler to finish her/his plate.
- Provide a healthy food environment at home for your toddler. Offer healthy meals and snacks to the entire family and don't have unhealthy food around her/him, including sugar-sweetened beverages, sweets, salty snacks, and fried food/snacks.
- Screen time and media use during feeding is strongly discouraged since it can interfere with the caregiver-child interactions that your toddler needs to experience in order to learn to eat healthy.

### Self-Feeding and Transitioning to Table Food<sup>26,73,172,190,193</sup>

- Let your child self-feed with age appropriate utensils such as baby spoons, toddler plates, and child size cups (e.g., sippy cups). This is important for your toddler's fine motor skills development and allowing her/him to decide when to start and stop eating in response to her/his own hunger signals.
- By 1 year, your child is expected to have started transitioning into "table or family food" (non-pureed food items, such as chopped cooked spinach, cooked green peas, diced cooked carrots, diced fruits, small bits of chicken, pasta, etc.). Your child should be fully transitioned to "table or family food" by 2 years.

### Learning to Like Healthy Food<sup>7,26,66,69,73,74,168,172,178,191,193-196</sup>

- During the transition to family food, continue to expose your baby to healthy food including plenty of vegetables and fruits, and avoid offering unhealthy food such as sugar-sweetened beverages, sweets, salty food/snacks, and fried food/snacks that are high in added sugars, calories, and/or salt.
- It is normal for a child to continue to reject new food items the first time they are offered, especially those that taste bitter such as vegetables. Don't forget that it may continue to take some children up to 15 or 20 tries before accepting a new food.
- Let your child use all her/his senses to explore new food. Smelling, licking, touching, and playing with new foods is needed by children to learn to like them. It does take time, and patience with messiness.
- Picky eating, including wanting just a few food items, is a common behavior among toddlers. During this period, children go through major transitions in what and how they like to eat. Sometimes they even start refusing food they once liked (food jags). Be patient with your toddler. Continue to uphold feeding routines, provide a variety of healthy food and textures, and encourage her/him to try new foods or accept again food they previously liked. But do not pressure her/him, and continue allowing her/him to determine how much to eat.
- Children learn from observing their caregivers' behaviors. Caregivers and the family as a whole (as young children will model older children as well as caregivers) are strongly encouraged to always eat healthy food and beverages (both inside the home and when eating out). It's also important to avoid making negative comments, facial expressions, or reactions about healthy food and beverages in front of your child.
- Offer healthy food in a form appropriate for your child's age, and in a manner that is easy to chew and swallow.

## Appendix 5. Responsive Parenting/Feeding Guidelines for Caregivers: How to Feed During 12 to 24 Months (cont.)

### **Appetite Control and Pressure to Eat**<sup>7,73,74,86,127,172,178,190,193,197-199</sup>

- Children may eat less at one meal but compensate at another meal by eating more. Indeed, some 1-year-olds only eat a single larger meal per day with smaller amounts at other times. Offer your child the recommended portion of healthy food from the different food groups (fruits, vegetables, grains, proteins, dairy) at each meal, and let her/him decide how much to eat.
- Don't pressure your toddler to eat, and don't show signs of frustration or anger if your child decides not to eat the food that you offer her/him. There is always a next time to try to offer the new food again.
- To minimize food waste, offer small tastes when new food is offered. You can always give more to your child if she/he is still hungry. Also, if you are having a problem with fresh fruits and vegetables going bad before being consumed, consider using frozen fruits and vegetables.
- Praising your child for eating a healthy food may encourage her/him to learn to like it. However, it is not recommended to use food as a reward (e.g., giving candy as a reward for eating vegetables or for the child to stop crying) or "bribe" (e.g., offering a toy in exchange for finishing all the food on the plate). Doing this can interfere with your child's ability to learn how to control her/his appetite.
- Offering sweets or sugar-sweetened beverages may be very tempting when your child is crying a lot or having a tantrum. Avoid doing so as it may prevent your child from learning how to eat healthy and also control her/his own emotions.

### **Sleep Routines**<sup>3,105,138</sup>

- Set consistent bedtime and nap routines. From 12 to 24 months, children sleep between 11 to 14 hours per day, including at night and naps. Children should be able to sleep throughout the night by this point. Children that have enough sleep are more likely to eat and grow healthy.

### **Screen Time and Physical Activity**<sup>3,107,138,189</sup>

- From 12 to 24 months, screen time and media use should be limited as it can prevent your toddler from being physically active and eating healthy. Also remember that your child's language and social development is greatly facilitated by the social interactions that you have with your child, including conversations.
- Video-chatting with relatives away from home can provide benefits to the development of your child if you or another adult caregiver supervises the child.
- If you want to use digital media with your 18- to 24-month-old toddler choose high-quality programming/apps and use them together with your child. Don't let your child use the media by herself/himself.
- Do not expose your toddler to screens during meals and for one hour before bedtime.
- Avoid using media to calm your child.
- Keep bedrooms, mealtimes, and playtimes screen-free for you and your child.
- Avoid exposing your toddlers to apps with advertising and/or unhealthy messages.
- Caregivers are encouraged to be role models to their toddlers by limiting their own media use during those times when they are interacting with them.
- Provide opportunities for your toddler to be active throughout the day every day, with structured (adult-guided) and unstructured (free play) activities taking place both indoors and outdoors where she/he can move and play freely and safely. Play, walk, dance, be active with your child and let her/him do physical activities on her/his own. Remember that toddlers like to move around independently but still need close supervision when doing activities on their own.
- Toddlers are very energetic, moving constantly; they like to explore their environments, looking around and inside objects. Daily and frequent age-appropriate, supervised, safe activities including jumping, walking, and pushing things around, throwing balls, and dancing to music help toddlers release their energy. These activities also help with their motor development.
- Equipment that limits or controls a child's movements, such as car seats, high chairs, cribs, small playpens, and strollers, should be used only for what they were designed to do (safety, transportation, eating, sleeping) and not simply for confining the child to a space.

## Appendix 6. Food Safety for Infants and Toddlers

### Food Safety Guidelines for Caregivers of Infants and Toddlers: Preventing Foodborne Illnesses

#### PASTEURIZATION AND COOKING TEMPERATURES

- Do not offer your child unpasteurized juice, milk, or dairy products.
- Do not offer your child undercooked meats, poultry, eggs (e.g., runny eggs), or seafood. Recommended cooking temperatures can be found at [http://www.fsis.usda.gov/wps/portal/food-safety-education/get-answers/food-safety-fact-sheets/safe-food-handling/safe-minimum-internal-temperature-chart/ct\\_index](http://www.fsis.usda.gov/wps/portal/food-safety-education/get-answers/food-safety-fact-sheets/safe-food-handling/safe-minimum-internal-temperature-chart/ct_index).

#### FOUR STEPS TO KEEP FOOD SAFE FROM BACTERIA

- Always follow these four steps to keep food safe from bacteria:
  - CLEAN: Wash hands and food preparation/serving surfaces often. Fruits and vegetables should be thoroughly rinsed with warm water before offering to child.
  - SEPARATE: Keep raw meats, poultry, eggs, and fish separate from other ready-to-eat food.
  - COOK: Cook food to the proper internal temperatures (<https://www.foodsafety.gov/keep/charts/mintemp.html>).
  - CHILL: Keep cold food in the refrigerator and get other food into the refrigerator within two hours of being opened or prepared. More information available at: <https://www.foodsafety.gov/keep/index.html>.

#### COLD STORAGE GUIDELINES

- The following cold storage guidelines should be followed:
  - Expressed breast milk at [https://wicworks.fns.usda.gov/wicworks/Topics/FG/Chapter3\\_Breastfeeding.pdf](https://wicworks.fns.usda.gov/wicworks/Topics/FG/Chapter3_Breastfeeding.pdf), <http://www.cdph.ca.gov/programs/wicworks/Documents/NE/WIC-NE-EdMaterials-PumpingAndStoringBreastmilkForYourBaby.pdf>
  - Infant formula at [https://wicworks.fns.usda.gov/wicworks/Topics/FG/Chapter4\\_InfantFormulaFeeding.pdf](https://wicworks.fns.usda.gov/wicworks/Topics/FG/Chapter4_InfantFormulaFeeding.pdf), <http://www.cdph.ca.gov/programs/wicworks/Documents/NE/WIC-NE-EdMaterials-WhenYouFeedMeFormula.pdf>
  - Strained fruits and vegetables (prepared at home or from open jarred food): should be kept a maximum of two to three days in the refrigerator.
  - Strained meats (prepared at home or from open jarred food) and eggs: should be kept a maximum of one day in the refrigerator.
  - Meat and vegetable mixed dishes: should be kept a maximum of one to two days in the refrigerator.
  - The refrigerator temperature should be kept between 32 to 39 degrees Fahrenheit.

#### HANDLING OF LEFTOVERS

- At each feeding occasion, serve the portion that your child is likely to eat separate from the jar or bowl. This way you can avoid the unconsumed portion getting mixed up with your baby's saliva, and save for a future feeding. Discard any unconsumed food that was part of the portion offered to the child.
- Always throw away any leftover formula or breast milk. Leftover formula or breast milk that has not been refrigerated can grow germs and make your baby sick. Do not feed your baby breast milk or formula left at room temperature for more than one hour.

Note: Adapted from FoodSafety.gov (<https://www.foodsafety.gov/risk/children>).<sup>111</sup>

## Appendix 6. Food Safety for Infants and Toddlers (cont.)

### Food Safety Guidelines for Caregivers of Infants and Toddlers: Preventing Mouth Burns

- When microwaving solid food, do so in a dish and for short time intervals (e.g., test after 15 seconds on high). Let food stand for 30 seconds after microwaving and before offering to child; stir before serving.
- Before serving cooked food or re-heating solid food for your child, always test the temperature of the food to be offered. They should feel lukewarm.
- There is no medical reason for warming expressed human milk or formula. If you do so, don't warm by microwaving bottles with breast milk or formula. They don't heat evenly and can burn your child's mouth.
- You can heat bottles with breast milk or formula by putting the bottle under hot running water from the tap for about two minutes. You can also heat bottles by warming water in a pan on the stovetop, then removing it from the heat and putting the bottle in the water until it feels lukewarm.

Note: Adapted from FoodSafety.gov (<https://www.foodsafety.gov/risk/children/>)<sup>111</sup> and California WIC Program ([https://wicworks.fns.usda.gov/wicworks/Sharing\\_Center/spg/CA\\_report2006.pdf](https://wicworks.fns.usda.gov/wicworks/Sharing_Center/spg/CA_report2006.pdf)).<sup>162</sup>

### Food Safety Guidelines for Caregivers of Infants and Toddlers: Preventing Food Choking

- Supervise your infant during feeding time and avoid offering food items that are a choking hazard.
- Toddlers can choke on food items that have certain shapes (small and round) and/or textures (hard, very slippery or elastic). Examples of common choking hazards are grapes, nuts, peanuts, popcorn, hard candy, carrots, hot dogs, meatballs, and chewing gum. Avoid offering these food items, or cut the round food in half or quarters before serving.
- Sit your child in a high chair or secure to a seat for meals and snacks and supervise her/him at all times while eating. Remember that eating while walking may increase risk of choking.
- If you offer fish to your toddler, which is strongly recommended, make sure it's completely deboned.

Note: Guidelines adapted from AAP Committee on Nutrition (2013).<sup>21</sup>

## Appendix 7. Food Allergy Considerations for Infants and Toddlers

- There is no need for pregnant or breastfeeding women to avoid consuming common allergenic food items such as eggs, milk, peanuts, tree nuts, fish, shellfish, and wheat. Doing so does not help lower the risk of food allergies in children.
- If the biological parent has allergies to any food items, talk to your child's doctor about any precautions you need to take regarding the introduction of common allergenic food items (such as products with peanuts, eggs, dairy, or wheat) to your infant.
- Ask your child's doctor if you are considering using hydrolyzed or "hypoallergenic" infant formulas as these formulas have not been found to help prevent food allergies in infants.
- You can introduce common allergenic food items to your baby when she/he is ready to eat solid food (usually between 4 and 6 months of age). These food items include dairy products such as yogurt or cow's milk protein formula, eggs, soy, wheat, peanut butter, fish, and shellfish.
- Introduce common allergenic food items to your baby after other solid food has been fed and tolerated, and with the first taste being at home. If no reaction occurs, then you can gradually increase the amount at a rate of one new food every three to five days.
- You do not need to avoid acidic food for your baby, such as berries, tomatoes, citrus fruits, and vegetables, that may cause a rash around the mouth or buttocks. The rash is the result of irritation from the acid in the food, not from an allergic reaction to the food.
- Some infants and toddlers do develop food allergies. If your infant or toddler develops signs of a food allergy (e.g., skin rashes, trouble breathing, nausea, vomiting, or loose stools in response to feeding) seek medical care and advice right away. You may also be referred to an allergist/immunologist—a doctor with experience in food allergy—for further evaluation.
- Your doctor may recommend a comprehensive evaluation and the development of a personalized plan to introduce solid food to your infant.

Note: Guidelines adapted from American Academy of Allergy, Asthma & Immunology (2015)<sup>121</sup> and Australasian Society of Clinical Immunology and Allergy (2016).<sup>124</sup>

## Appendix 8. Pacifier Use Guidelines for Caregivers of Infants and Toddlers

- Non-nutritive sucking (sucking on something other than a breast or a bottle nipple) is normal for babies. Giving a baby a pacifier satisfies the need to suck and can help calm your baby.
- Once your baby is feeding well, your baby may be offered a pacifier.
- If your baby shows no interest in using a pacifier, do not force it. Your baby may not need a pacifier.
- If your baby is introduced to a pacifier make sure she/he stops using it by 2 years of age to avoid affecting her/his oral development.
- When the time comes for your child to stop using a pacifier, start by gradually limiting its use during the day and eventually at night as well by trying new ways to put your child to sleep. If it's too difficult for your child to give up the pacifier, seek advice from your pediatrician.
- Using a pacifier when baby is about to fall asleep may help protect her/him against Sudden Infant Death Syndrome (SIDS).
- Using a pacifier for too long may increase the risk of your child getting ear infections.
- Using a pacifier for more than two years may cause your child to have teeth that do not fit together properly. Also keep in mind that the longer your child uses a pacifier, the more difficult it will be for her/him to stop using it.
- For your baby's safety, avoid using a string around the neck to hold the pacifier.

Note: Guidelines adapted from Sexton & Natale (2009),<sup>200</sup> AAP (2005),<sup>201</sup> and Wehner et al. (2004).<sup>202</sup>

## Appendix 9. A Detailed Review of Responsive Parenting/Feeding RCTs

### Responsive parenting/feeding Randomized Controlled Trials

The Sleeping and Intake Methods Taught to Infants and Mothers Early in Life trial (SLIMTIME) was based on a two by two factorial design where 160 mother-infant dyads were randomly assigned to receive a solid food introduction intervention, a soothe/sleep intervention, both interventions, or the control group.<sup>85</sup> Healthy mothers residing in Central Pennsylvania were recruited from a maternity ward and were included if they were first time moms, spoke English, delivered at or after 34 weeks of gestation, and planned to breastfeed after hospital discharge. Dyads were excluded from the study if either the newborn or the mother had serious medical conditions in the immediate postpartum period. The interventions were delivered by visiting home nurses between two and three weeks postpartum and at the timing of introduction of complementary foods, typically between 4 and 6 months after birth. As part of the soothe/sleep intervention, caregivers were taught different soothing and calming strategies with the goal of reducing feeding as the first response to fussiness, especially at night. During the first 4 months postpartum, the soothe/sleep intervention increased the amount of time the infants slept and decreased the number of nocturnal feeds, compared with the control group, among infants who were predominantly breastfed at 16 weeks postpartum. By contrast, the intervention had no impact on either nocturnal sleep or feeding among infants who were being mixed (i.e., combination of breast milk and formula) or formula fed at 16 weeks.

The intervention focusing on introduction of solids taught parents how to identify their infant's hunger and satiety cues as well as developmental milestones indicative of readiness for introduction of solid foods. Once parents reported that they had introduced solid foods, the nurse returned within two weeks to highlight the importance of repeated exposure for the infant to learn to accept and like diverse foods including vegetables. The nurse also advised on how to feed pureed solid foods when the infant was calm and alert (i.e., not crying or fussing). Participants receiving the solid foods intervention were less likely to introduce complementary foods before 4 months of age (13% vs. 29% in the control group). Participants receiving both the sleep and solid food interventions had significantly lower average weight-for-length percentiles compared with those receiving only one of the interventions and the control group. Importantly, there was no evidence that SLIMTIME led to undernutrition. Within the group that only received the solid foods intervention, the amount of green beans, peas, and squash increased significantly during the first six days of repeated

exposure. However, the intervention did not have an impact on the consumption of carrots which was already the vegetable option most accepted at day one.

SLIMTIME served as the foundation for The Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) RCT.<sup>86</sup> The primary aim of this study was to assess the impact of a responsive parenting intervention on infant weight gain between birth and 28 weeks postpartum and to document weight status during the first 3 years after birth. A total of 291 predominantly white, well-educated, first time mothers and their newborns were recruited at a university hospital in Hershey, Pennsylvania, and randomly allocated to the multifocal responsive parenting intervention or to a safety control intervention. The INSIGHT intervention focused on infant responsive feeding (hunger and satiety cues, age-appropriate portion sizes, avoiding using food as reward or punishment, repeated exposure to healthy foods, healthy eating behaviors modeling by caregiver, establishing feeding routines, establishing self-regulation of food intake), sleep hygiene (longer sleep duration and avoiding feeding to sleep), developmentally appropriate active social play (ranging from “tummy” time to outdoor play, limiting screen time), emotion regulation (not offering food as automatic response to calm a fussy infant), and education on how to track and interpret infant growth trajectories using color-coded growth charts. INSIGHT's conceptual framework is grounded on addressing the four behavioral states characterizing infant behaviors (i.e., drowsy, sleepy, fussy, and alert). As part of the intervention, responsive parenting materials were mailed to the participant's home. Research nurses conducted home visits at 3, 16, 28, and 40 weeks postpartum and the participants were seen at the research clinical facility annually, beginning at 1 year of age. INSIGHT had an impact on rate of weight gain between birth and 6 months of age, regardless of whether the neonates were being predominantly breastfed or not. The responsive parenting intervention was significantly associated with a slower rate of weight gain. In addition, infants in the intervention group were significantly less likely than those in the control group to be overweight at 1 year of age (5.5% vs. 12.7%,  $p=0.05$ ).

The NOURISH trial was conducted with 698 first time mothers from Australia who delivered healthy term infants.<sup>88</sup> Pregnant mothers were randomly assigned to anticipatory responsive feeding guidance. The intervention consisted of six group sessions divided in two modules delivered at health care centers over a period of 12 weeks, between months 4 and 17 postpartum. It emphasized repeated exposure to a variety of healthy foods such as vegetables and fruits, and minimal

exposure to unhealthy foods (i.e., those high in added sugars, sodium, saturated fat, and excessive calories); hunger/satiety cues to let the infant learn how to properly self-regulate food intake; and positive parenting skills fostering the infant's autonomy and self-efficacy. It also focused on promoting the infant's "healthy growth" instead of "obesity prevention." Children exposed to the intervention had lower BMI Z-scores than their counterparts in the control group during the first 5 years of life, although the difference was marginally significant. This impact may have been mediated by improved responsive feeding practices, as between 2 and 5 years of age there was a decrease in non-responsive practices, including pressure to eat and emotional feeding, captured by six out of nine scales. Likewise, at 5 years of age there was an improvement in the frequency of appropriate caregiver responses to food refusals, including accepting that the child was not hungry and not interpreting an infant food preference before offering a new food more than six times.

The Healthy Beginnings trial included 667 low-income, first time mothers living in Sydney, Australia.<sup>90</sup> The responsive feeding intervention was delivered through eight home visits by community nurses, one before birth and seven between 1 and 24 months postpartum. The intervention focused on improving infant feeding practices, eating habits, and active play, and reducing TV time and family-level risk factors for childhood obesity (e.g., family meals and family physical activity). The key intervention messages were: "Breast is best; no solids for me until 6 months; I eat a variety of fruit and vegetables every day; Only water in my cup; and I am part of an active family." BMI was significantly lower in the intervention compared with the control group, equivalent to a 2.9 percent reduction in the prevalence of overweight/obesity. This study also detected improvements in infant feeding and physical activity behaviors, that may have acted as mediators of impact on weight outcomes, including breastfeeding duration, appropriate

timing of introduction of solids, at least one daily serving of vegetables, less use of food as a reward, more "tummy time," and less eating in front of the TV. Interestingly, the intervention also had a positive impact on maternal food and physical activity behaviors. However, a follow-up of this study found that the positive child feeding behaviors and weight outcomes documented during the first 2 years of life were no longer present by 5 years of age, suggesting the need for additional intervention by 5 years of age.<sup>92</sup>

The Prevention of Overweight in Infancy (POI) trial included 802 high-income, well-educated women living in New Zealand with at least one child.<sup>91</sup> Women were recruited prenatally, but had to deliver a healthy term newborn to remain in the study. The interventions consisted of eight educational contacts focusing on food, physical activity, and breastfeeding, and two contacts focusing on sleep hygiene. Like SLIMTIME, the POI trial followed a two by two factorial design. Key messages involved specific dietary advice (e.g., eat a variety of foods, two different fruits and two different vegetables each day, avoidance of sugar-sweetened foods and beverages), as well as recommending responsive feeding practices (e.g., parental modeling of healthy eating, following authoritative feeding style). Regarding the timing of the intervention, breastfeeding was addressed before birth and at 1 week postpartum; sleep was addressed before birth (group session) and at 3 weeks postpartum; infant feeding was the focus of three face-to-face sessions at 4, 7, and 13 months postpartum, followed by a group session at 18 months postpartum; and physical activity was taught at 3, 9, and 18 months postpartum. POI did not have an impact on food and nutrient intakes and infant and toddler eating behaviors. However, it did have an impact on responsive parental feeding outcomes including less pressure to eat and greater eating self-control at 18 months of age. The sleep intervention did not have an impact on infant feeding behaviors.

## Appendix 10. Sample Meal Patterns and Typical Portion Sizes Needed by Infants and Toddlers

Infant Feeding Meal Patterns with Typical Portion Sizes by Age Group			
Meal	0 to 5 months	6 to 11 months	Sample Menu: 6 to 11 months
<ul style="list-style-type: none"> <li>Breakfast</li> <li>Lunch or Dinner</li> </ul>	<ul style="list-style-type: none"> <li>4 to 6 fluid ounces of breast milk or formula<sup>i</sup> at each feeding</li> </ul>	<ul style="list-style-type: none"> <li>6 to 8 fluid ounces of breast milk or iron-fortified formula<sup>i</sup></li> <li>AND</li> <li>0 to 4 tablespoons infant cereal<sup>ii</sup>, meat, fish, poultry, whole eggs, cooked dry beans or peas; or</li> <li>0 to 2 ounces of cheese; or 0 to 4 ounces of cottage cheese; or 0 to 8 ounces of yogurt; or a combination</li> <li>AND</li> <li>0 to 2 tablespoons vegetable, fruit, or both<sup>iii</sup></li> </ul>	<p><b>Breakfast</b></p> <ul style="list-style-type: none"> <li>6 to 8 fluid ounces of breast milk or iron-fortified formula<sup>i</sup></li> <li>0 to 4 tablespoons of oat or rice baby cereal mixed with breast milk or formula</li> <li>0 to 1 tablespoon of pureed/mashed/sliced banana</li> <li>0 to 1 tablespoon of pureed/mashed/sliced fruit (peaches)</li> </ul>
			<p><b>Lunch</b></p> <ul style="list-style-type: none"> <li>6 to 8 fluid ounces of breast milk or iron-fortified formula<sup>i</sup></li> <li>0 to 2 tablespoon of barley cereal mixed with breast milk or formula</li> <li>0 to 2 tablespoons of pureed/mashed cooked peas</li> <li>0 to 1 tablespoons of pureed/mashed cooked carrots</li> <li>0 to 1 tablespoons of fruit (unsweetened apple sauce)</li> </ul>
<ul style="list-style-type: none"> <li>Snack</li> </ul>	<ul style="list-style-type: none"> <li>4 to 6 fluid ounces of breast milk or formula at each feeding</li> </ul>	<ul style="list-style-type: none"> <li>2 to 4 fluid ounces of breast milk or formula</li> <li>AND</li> <li>0 to 1/2 slice of bread; or 0 to 2 crackers; or 0 to 4 tablespoons of infant cereal or ready-to-eat breakfast cereal</li> <li>AND</li> <li>0 to 2 tablespoons vegetable, fruit, or a combination of both</li> </ul>	<p><b>Dinner</b></p> <ul style="list-style-type: none"> <li>6 to 8 fluid ounces of breast milk or iron-fortified formula<sup>i</sup></li> <li>0 to 2 tablespoons of pureed/mashed cooked green beans</li> <li>0 to 2 tablespoons of pureed/mashed/finely cut deboned fish or chicken</li> <li>0 to 2 tablespoons cooked lentils</li> </ul>
			<ul style="list-style-type: none"> <li>2 to 4 fluid ounces of breast milk or formula</li> <li>0 to 2 whole wheat crackers</li> <li>0 to 2 tablespoons of pureed/mashed cooked sweet potatoes</li> </ul>

Note: Adapted from CACFP New Infant Meal Patterns available at: [http://www.fns.usda.gov/sites/default/files/cacfp/CACFP\\_infantmealpattern.pdf](http://www.fns.usda.gov/sites/default/files/cacfp/CACFP_infantmealpattern.pdf). Portion ranges include “0” to acknowledge the fact that not all children are introduced to solid foods by 6 months of age. Ranges also acknowledge that the amount of food consumed per feeding episode is expected to increase gradually during the second semester of life.

<sup>i</sup>Infant formula and <sup>ii</sup>dry infant cereal must be iron-fortified. <sup>iii</sup>Fruit and vegetable juices must not be served.

Appendix 10. Sample Meal Patterns and Typical Portion Sizes Needed by Infants and Toddlers (cont.)

Toddler Daily Meal Patterns with Portion Sizes: 1 to 2 years olds									
	Breakfast <sup>i</sup>		Lunch		Dinner		Snack		
	portion	menu	portion	menu	portion	menu	Snack portion <sup>ii</sup>	Snack 1	Snack 2
Milk <sup>iii</sup>	1/2 cup	1/2 cup of whole milk	1/2 cup	1/2 cup of whole milk	1/2 cup	1/2 cup of whole milk	1/2 cup		
Meat and meat alternates			1 ounce or 1/4 cup	1/4 cup of hummus	1 ounce	1 ounce of diced grill chicken	1/2 ounce	1/4 cup of plain yogurt <sup>iv</sup>	
Vegetables <sup>v</sup>	1/8 cup		1/8 cup	1/8 cup of cooked spinach	1/8 cup	1/4 cup of cooked broccoli	1/2 cup		1/2 cup of sliced cucumbers
Fruit	1/8 cup	1/4 cup of sliced strawberries	1/8 cup	1/8 cup of blueberries	1/8 cup		1/2 cup	1/2 cup of sliced apples	1/2 cup of cut up cherry tomatoes
Grains	1/2 cup	1/2 cup of breakfast cereal <sup>vi</sup>	1/2 ounce equivalent	1/2 slice of pita bread	1/2 ounce equivalent	1/2 cup of cooked pasta	1/2 ounce equivalent		

Note: Adapted from CACFP New Meal Patterns available at: [http://www.fns.usda.gov/sites/default/files/cacfp/CACFP\\_childadultmealstandards.pdf](http://www.fns.usda.gov/sites/default/files/cacfp/CACFP_childadultmealstandards.pdf).

<sup>i</sup>Meat and meat alternates may be used to substitute the entire grains component.

<sup>ii</sup>Select two of the five components for snack. Some children may need one or two snacks.

<sup>iii</sup>Only unflavored whole milk must be served to 1-year-olds.

<sup>iv</sup>Yogurt must contain no more than 23 grams of sugar per 6 ounces.

<sup>v</sup>Vegetables and fruit recommendation were combined on the breakfast and dinner menus.

<sup>vi</sup>Breakfast cereals must contain no more than 6 grams of sugar per dry ounce.

## Appendix 11. Expert Panel Bios

### Best Practices for Promoting Healthy Nutrition, Feeding Patterns, and Weight Status for Infants and Toddlers from Birth to 24 Months Expert Panel

**Dr. Rafael Pérez-Escamilla, PhD, *Panel Chair***  
**Professor of Epidemiology & Public Health**  
**Director of the Office of Public Health Practice**  
**Director of the Global Health Concentration**  
**Yale School of Public Health**

Dr. Pérez-Escamilla is Professor of Epidemiology & Public Health, Director of the Office of Public Health Practice, and Director of the Global Health Concentration at the Yale School of Public Health. His global public health nutrition and food security research program has led to improvements in breastfeeding programs, iron deficiency anemia among infants, household food security measurement and outcomes, and community nutrition education programs. His health disparities research involves assessing the impact of community health workers at improving behavioral and metabolic outcomes among Latinos with type 2 diabetes. He has published over 145 research articles, two books, and numerous journal supplements, book chapters, and technical reports. He is a member of the Institute of Medicine (IOM) Food and Nutrition Board. He has been a senior advisor to maternal-child community nutrition programs as well as household food security measurement projects funded by WHO, PAHO, UNICEF, FAO, UNESCO, UNDP, CDC, USDA, USAID, The World Bank, the Gates Foundation, and the Governments of Mexico, Brazil, and Colombia.

**Sofía Segura-Pérez, MS, RD, *Panel Co-Chair***  
**Associate Unit Director of Community Nutrition**  
**Hispanic Health Council in Hartford, Connecticut**

Sofía Segura-Pérez is a Registered Dietitian with an MS in Food Science and Nutrition. She has close to 20 years of experience working in maternal-child community nutrition research and services projects. During the last 10 years she has been the Associate Unit Director of Community Nutrition at the Hispanic Health Council in Hartford, Connecticut. During this time, she has coordinated the implementation of a statewide SNAP-Ed Program designed to promote good family eating habits and other healthy lifestyles for the prevention of chronic diseases. She also played a central role coordinating a complex NIH-funded five-year long randomized community trial assessing the impact of community health workers on type 2 diabetes self-management among Latinos. She is currently coordinating another RCT examining the impact of a social marketing campaign at improving purchases of fruits and vegetables among SNAP-Ed participants at a local mobile market. She has also coordinated the development of culturally

appropriate nutrition and food access education materials for low literacy populations. She serves on the advisory boards of the Hartford Policy Commission and the New Haven Wellness Committee, and is a former member of the steering committee of the Connecticut Food Alliance. She has published over 40 peer-reviewed articles in the field of community nutrition and recently conducted a systematic review commissioned by the Pan American Health Organization comparing the conditional cash transfer programs of Brazil, Colombia, and Mexico.

**Dr. Stephanie Anzman-Frasca, PhD, *Panel Member***  
**Assistant Professor**  
**Division of Behavioral Medicine, Department**  
**of Pediatrics University at Buffalo**

Dr. Anzman-Frasca is an Assistant Professor of Pediatrics at the University at Buffalo. She received a bachelor's degree in Psychology from Bucknell University and MS and PhD degrees in Human Development and Family Studies from Penn State University, where her dissertation research explored intersections between infant temperament and early obesity risk in the context of a behavioral obesity preventive intervention targeting first-time parents and their infants. The overarching goal of Dr. Anzman-Frasca's research is to promote healthy developmental trajectories for all individuals beginning in early life, with a current focus on young children's self-regulation abilities, healthier children's meal options in restaurants, and intersections between obesity prevention efforts and children's socio-emotional development.

**Dr. Shari Barkin, MD, MSHS, *Panel Member***  
**Professor of Pediatrics, Department of Pediatrics**  
**Chief of General Pediatrics at the Monroe Carrel**  
**Jr. Children's Hospital**  
**Vanderbilt University School of Medicine**

Dr. Barkin earned her undergraduate degree at Duke University (1986), her medical degree at University of Cincinnati (1991), and completed her pediatrics residency at Children's Hospital of Los Angeles (1994). Her research has focused on examining the effectiveness of pediatric office-based interventions. She was a Robert Wood Johnson Clinical Scholar at UCLA and received a National Research Service Award from the Agency for Health Research and Quality (AHRQ), completing a 4-year fellowship in Health Services Research. During this time, she conducted both qualitative and quantitative research examining the role

of the pediatric provider in office-based violence prevention. She was chosen as one of 15 generalists from across the country to be a Robert Wood Johnson Generalist Faculty Scholar (2000-2005). She served as an NIH-funded PI for a national randomized controlled trial. This was the first such large-scale trial to test the effectiveness of anticipatory guidance in general pediatrics. In collaboration with the Pediatric Research in Office Settings Network (the largest primary care practice-based research network in the United States), this national NIH-funded study evaluated the effectiveness of an office-based violence prevention intervention and included almost 5,000 families in 41 states, Canada, and Puerto Rico. Currently, she serves as the PI for an NIH-funded study to evaluate the use of a recreation center as the extension of a doctor's office for the issue of childhood obesity for preadolescent Latino children.

**Dr. Leann Birch, PhD, MA, *Panel Member***  
**William P. 'Bill' Flatt Childhood Obesity Professor**  
**Department of Foods and Nutrition**  
**University of Georgia**

Dr. Birch is William P. "Bill" Flatt Professor in the Department of Foods and Nutrition at The University of Georgia. As a developmental psychologist, her research career has focused on individual and contextual factors that influence the developing controls of food intake and obesity risk among infants, children and adolescents. Early research from Dr. Birch's laboratory on factors affecting the developing controls of food intake, including food preferences and responsiveness to portion size and energy density, have contributed to the evidence base on behavioral factors implicated in the development of childhood obesity. These findings laid the groundwork for exploring individual, familial, and contextual factors that shape the development of differences in eating behavior and obesity. Author of over 200 publications, Dr. Birch is internationally recognized for her research. She currently serves as co-leader of the UGA Obesity Initiative's Maternal and Childhood Obesity Team, focusing on obesity as it relates to prenatal, postnatal, infant, and childhood obesity.

**Katrina Holt, MPH, MS, RD, FAND, *Panel Member***  
**Senior Research Fellow**  
**McCourt School of Public Policy**  
**Georgetown University**

Katrina Holt has over 25 years of experience in public health and community nutrition. She is currently a project director at Georgetown University's Health Policy Institute in Washington, DC. Throughout her career, she has worked on numerous nutrition, oral health, and physical activity initiatives focusing on health promotion and disease prevention for pregnant women, infants, children, adolescents, and their families. In this capacity, she works closely with staff from federal agencies and

national organizations, as well as experts in the field, to convene national conferences and advisory committee meetings and to develop educational resources for health professionals, program administrators, policymakers, and families.

**Dr. Rachel Johnson, PhD, MPH, RD, *Panel Member***  
**Robert L. Bickford Jr. Green and Gold Professor**  
**of Nutrition**  
**College of Agriculture and Life Sciences,**  
**Department of Nutrition and Food Sciences**  
**University of Vermont**

Dr. Johnson has spent her career researching the science behind childhood obesity—with over 100 peer-reviewed papers in scientific journals, 12 book chapters, and funded grants and contracts totaling nearly \$3.5 million. Thanks to her authoritative research credentials and knack for communicating clearly, Johnson has become a go-to national public health advocate for groups like the American Heart Association (AHA), whose nutrition committee she recently chaired. She worked with NBC News to develop the nutrition content for the network's award-winning website, Parent Toolkit. She currently serves on the National Academy of Sciences Institute of Medicine Committee to Review the WIC Food Packages.

**Dr. Martha Ann Keels, DDS, PhD, *Panel Member***  
**Duke Street Pediatric Dentistry**

Dr. Keels grew up in the foothills of North Carolina in Morganton. Every time she goes home to visit family she gets sentimental about the Grandfather Mountain and Blowing Rock. She graduated from Duke University with a BA in Chemistry. After graduating from the University of North Carolina at Chapel Hill School of Dentistry with a DDS, she continued on to complete specialty training at UNC with a certificate in Pediatric Dentistry. During her residency, Dr Keels received the prestigious Dentist-Scientist Award from NIH, which allowed her to complete a PhD in epidemiology—with a focus on the cases of craniofacial birth defect.

**Dr. Angela Odoms-Young, PhD, *Panel Member***  
**Associate Professor**  
**Department of Kinesiology and Nutrition,**  
**UIC College of Applied Health Sciences**  
**Fellow, The Institute for Health Research and Policy**  
**University of Illinois at Chicago**

Dr. Odoms-Young's research is focused on understanding social, cultural, and environmental determinants of dietary behaviors and diet-related diseases in low-income and minority populations. Her current projects include studies to evaluate the impact of the new WIC food package on dietary intake,

weight status, and chronic disease risk in 2- to 3-year-old low-income children and vendor participation; identify strategies to improve program participation and retention among WIC-eligible children; evaluate the efficacy of a community-based participatory weight loss intervention in African American women; and examine community engagement approaches to promote food justice. She has contributed to several Institute of Medicine reports, including the Review of WIC Food Packages: Proposed Framework for Revisions: Interim Report, published in November 2015.

**Dr. Jennifer Orlet Fisher, PhD, MA, *Panel Member***  
**Associate Director**  
**Center for Obesity Research and Education**  
**Temple University**

Dr. Fisher is a professor in the Department of Social and Behavioral Sciences at Temple University and Associate Director of the Center for Obesity Research and Education where she directs the Family Eating Laboratory. She holds graduate degrees in Nutrition from the University of Illinois (MA, Nutritional Sciences, 1993) and from the Pennsylvania State University (PhD, Nutrition, 1997). Prior to her appointment at Temple University, Dr. Fisher was an Assistant Professor of Pediatrics at Baylor College of Medicine and scientist at the USDA/ARS Children's Nutrition Research Center in Houston TX. Dr. Fisher's research focuses on the development of eating behavior during infancy and early childhood. The broad goal of her research is to understand how early eating environments influence child behavioral controls of food intake and health outcomes, particularly overweight. Her efforts focus on the role of the family environment, as a first and fundamental context in which eating habits develop.

**Dr. Ian M. Paul, MD, MSc, *Panel Member***  
**Professor of Pediatrics and Public Health Sciences**  
**Penn State University**

Dr. Paul is a Professor of Pediatrics and Public Health Sciences and Chief of the Division of Academic General Pediatrics at the Pennsylvania State University College of Medicine. He is also Vice Chair of Clinical Affairs and Director of the Pediatric Clinical Research Office at Penn State Children's Hospital. Dr. Paul is a pediatrician and clinical researcher with principal interests in preventive interventions for newborns, infants, and families and clinical therapeutics for children.

**Dr. Lorrene Ritchie, PhD, RD, *Panel Member***  
**Director of the Nutrition Policy Institute (NPI)**  
**University of California**

Lorrene Ritchie, PhD, RD, is the inaugural Director of the Nutrition Policy Institute (NPI) and Cooperative Extension Specialist in the University of California Division of Agriculture and Natural Resources (ANR). The mission of NPI is to improve nutrition and reduce obesity, hunger, and chronic disease risk in children and their families in diverse settings. NPI provides nutrition policy leadership built from ANR's numerous research and education activities, and works in synergy with research and outreach efforts being conducted throughout the UC system. Dr. Ritchie has devoted her career to the development of interdisciplinary, science-based, and culturally relevant solutions to child obesity and has conducted studies in numerous settings on the impact of nutrition policies and programs. Current research interests include evaluation of the relationship of school-level programs and policies on student dietary intakes, the impact of policy on nutrition practices in child-care settings, the relationship of federal, state, and community-level programs and policies with child nutrition and weight status, and the impact of WIC nutrition education on child feeding practices.

**Dr. Anna Maria Siega-Riz, PhD, *Panel Member***  
**Professor of Public Health Sciences and Obstetrics and Gynecology**  
**Department of Public Health Sciences**  
**University of Virginia**

Dr. Siega-Riz, a nutritional epidemiologist, uses a multidisciplinary team perspective as a way to address complex problems such as prematurity, fetal programming, racial disparities and obesity. She has been involved in several large cohort studies involving pregnant women, children, and Hispanics as well as one multi-centered intervention study for preventing type 2 diabetes in middle-school children. She is interested in using cutting edge methodology to assess dietary intake for the purpose of examining the relationship between maternal diet and birth outcomes as well as prenatal determinants of childhood obesity. Her work also involves the determinants and consequences of gestational weight gain as well as the influence of maternal obesity on short- and long-term maternal and child health outcomes.

**Dr. Madeleine Sigman-Grant, PhD, RD, *Panel Member***  
**Associate Editor, Journal of Nutrition Education and Behavior**  
**Professor Emeritus with UNR Maternal and Child Health Extension Specialist**  
**University of Nevada-Reno**

Spanning a career of more than 30 years, Madeleine Sigman-Grant has focused on the promotion, protection, and support of breastfeeding. Her areas of interest also include nutrition guidelines for feeding children, as well as childhood obesity prevention programs. Madeleine works with families to help them facilitate behavior change in their food and physical activity choices. She also works with health professionals to understand and apply techniques to help facilitate behavior change in their target audiences. Madeleine Sigman-Grant, PhD, was Maternal and Child Health and Nutrition Specialist and Professor with the University of Nevada Cooperative Extension. Although retired, she is a frequent speaker at meetings and conferences for health professionals, academicians, and scientists as well as for consumers. She received a BS in Nutritional Sciences (specialty - dietetics) from the University of California at Los Angeles; completed a dietetic internship at the Veteran's Administration, West Los Angeles; received a Master of Science in Nutrition from Loma Linda University; and a PhD in Nutrition from the University of California at Davis.

**Dr. Elsie M. Taveras, MD, MPH, *Panel Member***  
**Chief, Division of General Academic Pediatrics**  
**Associate Professor of Nutrition**  
**Harvard School of Public Health**

Dr. Taveras is Chief of the Division of General Pediatrics and Director of Pediatric Population Health Management at Massachusetts General Hospital for Children. She is also an Associate Professor of Pediatrics and Population Medicine at Harvard Medical School, and Associate Professor of Nutrition at the Harvard School of Public Health. Prior to joining MGHfC, Dr. Taveras co-directed the Obesity Prevention Program at the Department of Population Medicine at Harvard Medical School. She was also on staff at Children's Hospital Boston where she founded and directed a multidisciplinary childhood obesity prevention clinic in General Pediatrics. Dr. Taveras' main focus of research is understanding determinants of obesity and developing interventions across the lifecourse to prevent obesity, especially in underserved populations.

**Dr. Shannon Whaley, PhD, *Panel Member***  
**Director of Research and Evaluation for PHFE WIC**

Dr. Whaley is the Director of Research and Evaluation for PHFE WIC, the largest local agency WIC program in the nation. In her 17 years of experience on the front lines of WIC, Dr. Whaley has become an expert in understanding both how the program functions and how it can be maximally effective in achieving positive health outcomes for the families WIC serves. Dr. Whaley's expertise is in the planning, development, and evaluation of programs designed to optimize the healthy development of children and families served by WIC. Her work spans a broad range of topics including childhood nutrition and obesity, prevention of prenatal alcohol use, promotion of early literacy for low-income children, and examination of the impact of the recent WIC food package change on WIC participants. Her work includes controlled research studies as well as implementation of community-based interventions using evidenced-based practices. In her role at PHFE WIC, Dr. Whaley has been successful in supporting her work with public and private grants that support research endeavors as well as enhance core WIC services. She supervises graduate students from local universities and has mentored a postdoctoral researcher who recently moved on to a full time academic position. Dr. Whaley serves as Chair of the Evaluation Committee of the National WIC Association and in this role works closely with other WIC programs to advance the national WIC research agenda.

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### **About Healthy Eating Research**

*Healthy Eating Research* (HER) is a national program of the Robert Wood Johnson Foundation. Technical assistance and direction are provided by Duke University and the University of Minnesota School of Public Health under the direction of Mary Story, PhD, RD, program director, and Laura Klein, MPH, deputy director. HER supports research to identify, analyze, and evaluate environmental and policy strategies that can promote healthy eating among children and prevent childhood obesity. Special emphasis is given to research projects that benefit children and adolescents and their families, especially in lower-income and racial and ethnic populations at highest risk for obesity. For more information, visit [www.healthyeatingresearch.org](http://www.healthyeatingresearch.org) or follow HER on Twitter at [@HERResearch](https://twitter.com/HERResearch).

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**Healthy Eating Research**  
Building evidence to prevent childhood obesity

  
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