Early Feeding Practices and Development of Childhood Obesity

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Introduction

Early feeding practices are believed to be an important contributor to obesity risk in early childhood. Feeding practices can be considered to encompass both what and how caregivers, usually parents, feed their children. In this chapter, we will review the evidence to support links between feeding practices and the development of childhood obesity. We will begin by reviewing the evidence linking infant feeding practices and obesity, including breastfeeding, formula composition, the timing of introduction of solid foods, and bottle use.

Next, we will move on to consider the evidence for associations between parent feeding practices in toddlerhood and beyond with child obesity. Specifically, we will review the main constructs typically used to conceptualize parental feeding practices, including pressure, monitoring, restriction, promotion of autonomy, repeated exposure, modeling, and teaching. We will also briefly consider the beliefs about child obesity and feeding that often underlie these practices. We will consider the home feeding environment with a focus on the role of television, family mealtimes, and timing of eating in childhood obesity. We will consider the composition of food served, including dietary variety.

Finally, we will consider the role of the child in shaping the parent's feeding behavior. Children are not "blank slates", but rather active participants in the parent-child interaction around feeding. Just as parents may shape children's obesity risk, children's individual traits and behavior shape parenting practices. We will consider children's food preferences, eating in the absence of hunger, responsiveness to hunger and satiety, emotional or stress eating, and temperament as predictors of parent feeding practices. We will close by considering directions for future research.

It is important to note that the vast majority of research on this topic to date has focused on mothers. Future work should include fathers and father figures, as they also play critical roles in parenting and shaping a child's obesity risk. In addition, much of the work on early feeding practices has occurred in US or European populations of children, most of whom are white and relatively well resourced. Future work should consider whether the findings are generalizable to other populations of children. Finally, understanding feeding practices is complicated

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by challenges in measurement. The vast majority of studies have gathered data via maternal self-report on questionnaires, which has inherent bias. A growing body of work has employed videotaped observation, though this approach has its own limitations. Ultimately, capturing feeding practices requires a multi-method approach that can consolidate, and facilitate interpretation of, available evidence.

Feeding in Infancy and Childhood Obesity Risk

Infancy is a critical period for obesity risk. The rate of weight gain in infancy is associated with future obesity, and food preferences and feeding practices established in infancy often track into later childhood and adulthood. Parents of infants may also be particularly responsive to interventions designed to shape feeding practices, as behaviors may not yet be firmly established. We review here the evidence linking breastfeeding, formula composition, and introduction of complementary foods with childhood obesity.

Breastfeeding

Breastfeeding promotion as a target for obesity prevention in infancy and early childhood has received substantial attention and a great deal of study. A major motivator for this focus has been the low rates of breastfeeding in low-income and minority populations with high obesity risk, which has led interventionists to suspect a causal relationship. Mechanisms involving improved satiety responsiveness and metabolic programming related to breast milk composition have been posited. Support for the breastfeeding-obesity link grew as observational cohort studies repeatedly showed small protective effects. More recent work, however, has called into question the association of breastfeeding and obesity prevention and particularly whether the association is causal. Specifically, large observational cohort studies that have been able to more robustly attend to residual confounding have not detected an independent association [1]. Most recently, no effect of breastfeeding on obesity risk at middle childhood was found in a large randomized controlled trial. The Promotion of Breastfeeding Intervention Trial involved more than 17,000 healthy newborns with more than 80% retention to age 11 years and found no statistically significant effect of breastfeeding on children's body mass index [2]. In summary, although breastfeeding has many critical benefits, focusing on breastfeeding promotion for the purpose of obesity prevention is unlikely to be effective.

Formula Composition

Formula-fed infants are larger than breastfed infants by the end of the first year of life [3]. It has been proposed that the composition of infant formula may be a critical contributor to the rate of weight gain in infancy. A key proposed mechanism for this effect is the protein composition of infant formula. In one study, infants consuming protein hydrolysate formula, as compared to those fed cows' milk formula, were satiated sooner and had more normative (less excessive) rates of weight gain [4]. There are several hypotheses for the mechanism of this effect. Free glutamate, which is abundant in human breast milk, is thought to act as a satiety signal. Conversely, high levels of ingested protein may promote production or secretion of hormones that increase infant weight gain and growth: circulating levels of insulin and insulin-like growth factor 1 (IGF-1) are lower in infants fed breast milk or low-protein formula than in those fed higher-protein formula. The effect of protein on infant growth rates has been demonstrated in a randomized controlled trial design. Specifically, among more than 1000 infants randomized to low- versus high-protein infant formula, those consuming the lower-protein formula, which is most similar in protein content to breast milk, had lower rates of weight gain up to age 6 years [5]. In summary, infant formula composition, particularly with regard to protein content, may be a valuable strategy for shaping infant weight

gain trajectories. Importantly, however, the long-term effects on growth, obesity risk, and other important outcomes remain unknown.

Complementary Foods: Timing of Introduction and Composition

Complementary foods, also known as "solids," are the foods given to infants besides formula or breast milk. Parents often introduce complementary foods earlier than the recommended age of 6 months because they perceive the infant to be hungry and presume that these foods increase satiety more than formula or breast milk alone. This practice is more common in lower-income and racial/ethnic minority groups with the highest risks of obesity, which has led to the hypothesis that the early introduction of solid foods could increase the risk of excess weight gain. Advising against the early introduction of solid foods is therefore frequently included in intervention trials designed to prevent obesity. However, systematic reviews find no consistent association between the timing of introduction of complementary foods and risk of obesity [6].

While the majority of research on complementary foods has focused on the timing of their introduction, few studies have examined their composition. The limited available data suggest that greater rate of weight gain in infancy is linked with higher dietary protein, but not with dietary fat. Future work might consider focusing on the macronutrient composition of complementary foods as opposed to the timing of their introduction.

Feeding Behaviors, Practices, and Styles

Parents' feeding behaviors, practices, and styles are generally considered to be the approaches parents take to achieve a certain dietary intake or growth pattern in their child. *Behaviors* are generally considered to include pressuring or restricting intake. In contrast, *practices* comprise the specific approaches employed, such as bribing a preschooler or spoon-feeding a toddler to pressure intake. Finally, *styles* are generally conceptualized as the tone that pervades these behaviors and practices. For example, pressure can be delivered with varying degrees of sensitivity. Feeding style is generally defined similarly to the classic categorization of parenting styles. Specifically, very sensitive parents (e.g., those who are attuned and responsive to their child's cues and needs) but who also impart many rules and a great deal of structure are considered *authoritative*. Less sensitive parents with many rules and a great deal of structure are considered *authoritarian*. Sensitive parents with fewer rules and less structure are considered *permissive or indulgent*. Finally, less sensitive parents with fewer rules and less structure are considered *neglectful*.

The measurement of feeding behaviors, practices, and styles is methodologically challenging [7]. Specifically, most studies rely on parent self-report questionnaires, which have the benefit of capturing patterns over extended periods of time, but may be influenced by social desirability bias. Other studies have used videotaped mealtime observations, which may offer different information than questionnaires but also are limited by social desirability as well as being only a brief window into the feeding interaction. Methods employing ecological momentary analysis, which allows a research participant to report on affect and behavior close in time to the experience, or emerging technologies such as continuous audio or video recording may hold promise for capturing feeding practices that occur outside of mealtime and therefore may constitute a substantial amount of the parenting that occurs around feeding. A major limitation of the available literature is that few studies have examined feeding approaches and weight status longitudinally, making inferences about causation very challenging.

As we will review below, the literature for each feeding approach remains equivocal regarding whether a given feeding approach causes excess weight gain or is a response to a child's weight or eating behavior. The associations are in all likelihood bidirectional and transactional. In

other words, while parental feeding approaches may shape a child's weight, parents also likely change their feeding practices in response to a child's weight and eating behaviors. Despite the limited evidence for a causal relationship with obesity, interventions and practice guidelines continue to recommend that parents avoid excessive pressure or restriction and promote children's autonomy. We will review below the strength of evidence for these recommendations for each feeding approach below.

Pressure

Pressuring feeding approaches consist of strategies parents use to encourage children to eat more food or certain types of food. Some have theorized that these strategies contribute to increased obesity risk because they override a child's ability to attend to and respond to physiologic satiety cues. Children who are repeatedly pressured to eat beyond their own internal satiety cues may learn to ignore these cues and ultimately develop patterns of overeating and obesity. Pressuring feeding approaches are also thought to emanate from some parents' beliefs that a heavier child is a healthier child and their desire for their child to have a heavier body type. This parent belief and resulting pressuring behavior is theorized to peak in early childhood at the time of adiposity rebound, i.e., the period when children's adiposity reaches its lowest point. As children's adiposity naturally declines to a low point between ages 4 and 7 years, parents may pressure children to eat more to prevent this decline in adiposity, which they view as unhealthy.

Although these theoretical models are logical and often compelling explanations for obesity in young children, the data linking pressuring feeding approaches and obesity risk are actually remarkably equivocal. Specifically, pressuring feeding approaches have been positively [8], negatively [9], and not [10–14] associated with risk of childhood obesity. In summary, although there may be some parent-child dyads in which excessive pressuring of children to eat beyond satiety may cause excessive weight gain and obesity, the evidence does not support a robust effect for most children.

Monitoring

Monitoring refers to the extent to which parents keep track of their children's food intake, generally with regard to both quality and quantity. Monitoring at its most fundamental level is simply the parent being aware of and attending to their child's intake. For example, parents who make note of how many glasses of milk their child drank that day already, or how many cookies their child takes from the platter at a party, are monitoring their child's intake. Although one would hypothesize that parents who monitor intake more would have children who are less likely to be obese, monitoring has been inconsistently associated with risk of obesity, eating behaviors, and dietary intake [15]. These associations may be inconsistent because parents are likely to monitor intake of children who they perceive to be too thin, as well as those they perceive to be too heavy. In addition, the inconsistent associations may reflect bidirectional relationships, in that parental monitoring may increase in response to voracious child eating behaviors and obesity.

Restriction

Restriction can refer to restricting the quantity, quality, or timing of a child's intake. For example, parents may limit portion size of dessert, limit their child's intake of processed food, or limit snacking to a predetermined snack time. Restriction can be practiced with sensitivity, manifesting with gentle guidance, or with harshness, manifesting as critical and negative comments about a child's intake. Restriction can also occur overtly, with explicit comments and articulation of household rules, or covertly, with parents making choices not to purchase certain foods to avoid having them in the house. Parents are advised against "overly restricting" children's

intake [16] due to concerns about promoting unhealthy weight control behaviors as well as the potential for overriding children's physiologic hunger cues, thereby leading to future overeating. However, the data linking restrictive feeding with obesity is conflicting. Restrictive feeding approaches have been associated with both heavier [17–20] and thinner [21] child weight status, while still other studies find no associations [22, 23]. This conflicting literature may be due to a lack of specificity in research to date on restriction. Specifically, prior work on restriction has often not differentiated extreme versus moderate restriction, sensitive versus harsh restriction, or overt versus covert restriction. In the current obesity-promoting food environment, it is likely that parents will have to educate their children about the need for self-restraint. Future research should consider how parents can communicate restriction to children in adaptive, healthy ways.

Promotion of Autonomy

Promotion of autonomy in eating is defined by supporting the child's presumably innate ability to recognize and appropriately respond to physiologic hunger and satiety cues. A number of interventions have sought to train children to accurately recognize hunger and satiety, which seems to be achievable at least in the short term [24]. These approaches, however, are predicated on the notion that children adhering to their physiologic hunger and satiety cues will promote healthy weight status in all children. Although this may be true in the short term [25], it is not clear that relying on physiologic hunger and satiety cues is a viable method of obesity prevention for all individuals. Specifically, some individuals may have inborn or acquired drives that limit satiety and therefore predispose to obesity. Overall, the correct behavioral approach for obesity prevention likely needs to be tailored to the individual. Some children may be able to achieve a healthy weight if parents simply reduce intrusion and control and allow the child to attend to and follow his or her own physiologically driven hunger and satiety cues. However, other children provided no guidance regarding portion size, food choice, and frequency of eating may develop obesity if they rely only on physiologically driven hunger and satiety. The correct parenting approach likely needs to be tailored to the behavioral phenotype of the individual child.

Repeated Exposure

Parents of young children are often advised to offer new foods repeatedly to increase food tolerance and enjoyment. This feeding recommendation is based on the goal of expanding dietary variety and increasing children's intake of vegetables. Indeed, young children typically require up to ten repeated tastes of a new food in order to develop increased liking for and acceptance of the food [26, 27]. Of note, however, although increased dietary variety may have a number of health benefits, links between dietary variety and weight status in young children are mixed, with greater dietary variety possibly even conferring greater risk for obesity [28]. Thus, although a focus of feeding advice is often to encourage children to try new foods by offering them repeatedly, the current state of the science does not support this approach as an effective strategy for obesity prevention.

Modeling

Children's diets tend to be very similar to their parents' diets [29], which has led to recommendations that parents role model healthy eating to prevent obesity [16]. The scientific evidence to support this recommendation is limited, however. For example, although modeling is very effective in persuading children to sample a new food [30], it has a less robust effect on actually changing a child's food preferences or increasing intake. In addition, there are very few data regarding whether modeling restraint (i.e., not eating junk food or limiting portion size) has robust effects on children's intake or weight status. Finally, as with all research linking parent and child behavior, it is

very difficult to disentangle the effects of nurture versus nature. Specifically, a significant proportion of the variance in food preferences and picky eating behaviors is accounted for by genetics. When children like the same vegetables their parents like, at least part of this behavior may be due to shared genetic inheritance as opposed to parental modeling. Compared to other feeding behaviors, the role of parental modeling in preventing childhood obesity has received relatively little research attention and will be an important direction for future work.

Teaching

A relatively small body of research has focused on how to most effectively teach children about healthy eating, and whether this sort of teaching actually changes children's dietary intake and obesity risk. As is true with many types of health behavior, knowledge is necessary but not sufficient to achieve behavior change. Providing children health information about a food has not had strong effects on intake, food tolerance, or food appreciation [31] with one study even showing that when children are told a food is healthy, their liking for the food declines [32]. Research in developmental cognitive psychology is generating important new insights into how children understand and learn about the world around them, as well as how this information influences their behavior [33]. Future work should consider bringing these insights to nutrition education efforts with the goal of enhancing intervention effectiveness.

Beliefs About Feeding

Parents' choices about how to feed their children are embedded in complex belief systems influenced by culture and personal experience. Qualitative studies have described parents' skepticism about definitions of childhood obesity and whether these definitions apply to their children [34]. In fact, parents (even of obese or overweight children) often conceptualize child obesity as due to inept or neglectful parenting [35]. If parents believe that childhood obesity is due to "bad parenting," it is therefore not surprising that they may reject a label of "obese" for their own child. The balance between attributing obesity to societal and biological factors versus personal responsibility (i.e., parenting) is a critical consideration in working with families. While achieving behavior change requires internalization of personal responsibility, attributing obesity to personal "failure" is also the root of the intense stigma that obese individuals experience. Particularly in the context of the very mixed evidence linking parenting behaviors and obesity, interventionists should try to avoid implying that a child is obese due to inadequate parenting. The belief that many parents have internalized from pervasive societal messaging that childhood obesity is caused by "bad parenting" may be one reason why it is difficult for clinicians to engage parents around childhood obesity interventions.

The Home Feeding Environment

The structure of the home feeding environment can be considered to include the family's use of media, structured family mealtimes, the timing of eating, and the composition of meals served. Specific feeding approaches occur within this overall context, and certain approaches may not be necessary if structural changes are made. For example, parents may not need to exert as much restriction if the family routine is to only eat at certain times and junk food is kept out of the house. Thus, structural elements of the family's home and routine are important to consider as contributors to child obesity and may either strengthen or attenuate the impact of specific feeding behaviors or practices on children's obesity risk.

Media

More hours of television has been linked to a greater prevalence of childhood obesity in multiple studies over the past 30 years. This association is

well recognized, and screen time is one of the most robust risk factors for child obesity and therefore a frequent intervention target. The mechanism of effect, however, is less well understood. Although reduced physical activity has been theorized to be the key mechanism, this hypothesis has not been supported in meta-analysis [36]. Instead, the evidence has suggested an important role for television commercials in shaping children's food requests and preferences [37, 38]. Yet, in the last decade, the manner in which young children consume media has changed substantially, such that they tend to watch more television shows that do not include commercials. Therefore, the role of television commercials for unhealthy foods in shaping young children's eating behavior may be declining. Another mechanism via which screen time or television may shape children's eating behaviors is through snacking. Young children tend to snack more while watching television as compared to when not watching it [39], and the foods that are eaten while the television is on tend to be less healthy than when it is off [40, 41].

Finally, in the last 5 years, mobile devices have become ubiquitous. To our knowledge, no studies have examined if parents' or children's use of mobile devices is associated with child obesity risk and, if so, if this risk occurs only in the context of certain ways of using the device (i.e., watching videos vs. playing games vs. texting). Research studies are needed to determine if mobile devices constitute a new risk factor for obesity, and if so via which mechanism. Overall, it is possible that the role of television, which was a robust and well-evidenced risk factor for 30 years, may be declining as the role of television in families' homes changes. Research into links between media exposure and child obesity should reconsider this association in the context of the rapidly changing media landscape.

Family Mealtimes

Family mealtimes are recommended as a key strategy for childhood obesity prevention [16, 42]. Recommendations emerged from observational cohort studies showing links between greater family meal frequency and healthier child dietary intake [43, 44]. However, the literature linking family meal frequency and child obesity is relatively inconsistent, with studies showing positive [45], inverse [46, 47], and null [43] associations. These associations may also be moderated by race/ethnicity, socioeconomic status, and child sex [46]. These inconsistent associations may be due to demographic factors acting as moderators but may also be due to structural and relationship-based characteristics of family meals that have received less attention in work to date. Emotionally positive, harmonious family mealtime interactions have been associated with a lower prevalence of child obesity in most studies [42, 48]. In contrast, greater parental oversight and management have been associated with a lower prevalence of child obesity in some studies [49] but not in other studies [42, 48]. Studies examining the quality of mealtime routines, defined as structural and interpersonal characteristics of the family meal (i.e., the length of the meal, types of food served, communication, affect of family members present, etc.), have also found inconsistent associations with child weight [48, 50]. In summary, although family mealtimes are frequently recommended as a child obesity prevention target, much additional work is needed to confirm a causal association in randomized controlled trial designs, to examine moderators of the association, and to identify features of the family meal that confer protection.

Timing of Eating: Structured Meals and Snacking

Snacking among young children has increased in the last 20 years [51], and frequent snacking has been theorized to contribute to obesity. Opportunities to eat have become increasingly common as food is now ubiquitous in the environment. Very few studies have examined snacking behavior and child obesity risk. It is possible that allowing children to snack when hungry could appropriately reinforce physiologic hunger cues. On the other hand, snacking could have unintended consequences on physiology that lead

to changes in metabolism that are obesity promoting. The effect of snacking on obesity risk also needs to consider the frequency, timing, and composition of snacks consumed. There have been very few studies of snacking, likely because snacking behavior is difficult to measure accurately. Most snacking studies use parent-report questionnaires, which may have substantial error. The few available studies suggest that having more structured eating times is associated with a lower risk of child obesity [52]. Much additional work is needed to understand the ideal eating patterns for obesity prevention in young children.

Dietary Composition

Practice guidelines recommend that parents encourage the consumption of fruits and vegetables [16, 53] and fiber-containing foods [16, 53]. Parents are also advised to encourage dietary variety [54] by providing "opportunities for children to enjoy a variety of nutritious foods by regularly exposing them to, and encouraging them to taste, these foods" [55]. Despite these practice guidelines, there are little to no data supporting an association between a specific dietary composition and obesity prevention in children [54, 56]. There are relatively robust data to support limiting children's intake of sugar-sweetened beverages as an obesity prevention strategy [57], but evidence for other foods or dietary patterns is equivocal. In summary, it is unclear how much effort parents should place on promoting or discouraging the intake of certain foods in the service of obesity prevention given the lack of evidence for a causal effect.

Parenting Reponses to Child Eating Behaviors

Children are not blank slates; they come to the parent-child feeding relationship with predispositions to certain types of eating behaviors, and parents are faced with the task of responding to these behaviors in adaptive ways. A growing body of research in the last 20 years has informed our understanding of the complexities and determinants of eating behaviors. We will discuss here some of the eating behaviors that have received particular attention in children and how they may contribute to parent feeding behaviors.

Food Preferences

Food preferences are the primary predictor of children's intake [58] and dietary preferences established in childhood persist [59]. Food preferences seem to have an innate component (preference for sweet and dislike for bitter is observable within hours of birth [60]) but are also malleable (greater exposure, even prenatal exposure via transmission of the mother's diet in the amniotic fluid, leads to greater liking [61]). For example, in experimental designs, consumption of carrots during pregnancy was associated with greater infant liking for carrots when solid foods were introduced. In addition, infants who consume elemental formulas in infancy (which have a sour taste) have greater liking for sour flavors at the preschool age range. There is a relatively large body of research examining the ontogeny of flavor preferences in infancy and early childhood [61, 62]. It is unknown, however, how these flavor preferences and their development in early childhood are linked to obesity risk. This may be a valuable focus for obesity prevention research.

Eating in the Absence of Hunger

The continued consumption of foods past satiety, referred to as eating in the absence of hunger (EAH), is correlated with greater food responsiveness and enjoyment and less satiety responsiveness, as well as greater risk of obesity [63]. Interventions that reduce responsiveness to food cues [64, 65] have been shown to reduce EAH, but interventions that increase children's awareness of hunger and satiety cues had no effect [64]. Thus, EAH may primarily reflect food enjoyment and responsiveness as opposed to sensitivity to hunger and satiety cues. EAH has been linked to certain genetic risk alleles [66]. Thus, a parent

faced with child with high eating in the absence of hunger must find strategies for responding to a child who enjoys food and will eat food when given the opportunity, even when already satiated, because of the pleasure it provides. Encouraging parents to teach children to attend to hunger and satiety cues is unlikely to be effective for these children. Parents need new, evidence-based strategies to prevent excessive intake of palatable foods among children who are genetically predisposed to eat in the absence of hunger.

Responsiveness to Hunger and Satiety

On average, infants downregulate volume of milk intake in response to more calorically dense feedings [67] or the provision of additional calories in the form of solid foods [68, 69]. Thus, infants have the capability of adjusting caloric intake in response to caloric loads. Compensation is not perfect, however, a lesser ability to do so has been identified in infants with poor growth [70]. There is a notable lack of research regarding individual differences in satiety responsiveness. For example, it is generally assumed that all young children will effectively downregulate intake in response to a larger caloric preload or greater caloric destiny. However, there is likely substantial variability within the population with a lesser ability to accurately downregulate possibly linked to a higher risk of obesity. Children who are less able to downregulate intake accurately in response to internal satiety cues may require more parental monitoring and the provision of more external cues (i.e., predetermined portion sizes) to prevent excess caloric intake and obesity. Much additional work is needed in this area, particularly with regard to adaptive strategies parents might undertake to support their children in maintaining a healthy weight.

Emotional or Stress Eating

Psychosocial stressors are associated with an increased risk of childhood obesity. In general, it is theorized that stress interferes with the ability to exercise self-restraint or self-control in relation to tempting foods. One potential mechanism is thought to be that stress increases cortisol, which increases appetite [71]. Ongoing work seeks to understand if stress causes increases in eating in the absence of hunger, reduces the ability to delay gratification for food, or increases responsiveness to food cues. Interventions to reduce eating in response to stress or emotion in young children could focus on reducing stress, improving the ability to cope with stressors, or reducing the stress eating that occurs in response to those stressors. Indeed, at least two interventions to date that have focused on improving children's emotional and behavioral regulation have shown beneficial effects on obesity risk [72, 73]. Importantly, however, parents of children from low-income populations, who are at the highest risk of psychosocial stressors and obesity, generally do not believe that their children experience enough stress to cause stress eating and view stress eating as occurring only in the context of severe life stressors such as abuse, neglect, or a death in the family [74]. Interventions might consider providing education about the potential role of psychosocial stress in conferring obesity risk and shaping children's eating behavior and providing parents tools for how to improve children's ability to cope with stressors or prevent eating in response to a stressor.

Difficult Temperament

Temperament is a modifiable but relatively enduring child characteristic that includes constitutional differences in reactivity and self-regulation. Temperamental traits such as lower inhibitory control, higher surgency, and negative affectivity are thought to lead to more emotional and disinhibited eating, which are in turn linked with a higher risk of obesity [75]. Children with lower *inhibitory control* may not be able to restrain themselves when faced with tempting food. Children with this temperamental profile may impulsively eat and require significant external controls from their parents to prevent overeating. *Surgency* is characterized by impulsivity and intense pleasure. These children tend to eat more in the absence of hunger

and are less picky in their eating, both of which confer greater obesity risk. *Negative affectivity* is characterized by mood instability and over-reactivity, including dysregulated negative emotions. Children with more negative affectivity may self-soothe with food to cope with emotional stress. Parents of children with these temperamental traits likely will need to use different parenting strategies tailored to their child's particular temperamental profile and the manner in which that temperamental profile confers increased obesity risk. Ultimately, there is unlikely to be a "one size fits all" approach to parenting to prevent childhood obesity, but approaches will need to be tailored to the individual child's risk factors.

Summary

Early childhood may be a critical period for preventing obesity and establishing lifelong habits linked with obesity risk. Thus, parenting in early childhood is theorized to play a critical role in preventing obesity throughout the lifespan. Parents are generally eager for strategies they can employ to effectively prevent obesity in their children, but the evidence linking particular parenting approaches to child obesity risk is equivocal and does not provide support for clear guidelines. More randomized controlled trials are needed to determine causation and to characterize individual behavioral phenotypes that require specific parental management approaches. Given the lack of evidence that child obesity is due to inadequate or inappropriate approaches to child feeding, caution should be exercised in attributing a child's obesity to parenting. The current evidence suggests that the role of parenting in causing a child's obesity is modest, at best. Just as individuals with obesity experience substantial stigma, parents of children with obesity experience stigma, as they are often perceived as neglectful or inept. It is essential to invoke a more complex view of childhood obesity and reduce the blame placed on parents as the sole agents responsible for a child's obesity. Although early feeding practices are contributors to obesity risk, as with all obesity risk factors, their individual effect size is modest.

Editor's Comments and Questions

1. Having long worked with parents frustrated by the apparent resistance of their children to standard dietary recommendations, I am sympathetic to your idea that the associations between parental behavior and child feeding are "in all likelihood bidirectional and transactional" and shaped by innate or acquired differences in child temperament and sensitivity to the hedonic properties of food. I also agree wholeheartedly with your recommendation that parenting approaches "be tailored to the behavioral phenotype of the individual child."

But given the lack of a strong base of evidence in support of specific feeding practices, what general guidelines would you recommend for preventing obesity in young children? How might your approach be altered if one or both parents are obese?

2. You argue that "food preferences are the primary predictor of children's intake and that dietary preferences established in childhood persist." Yet population increases in the prevalence of childhood (or adult) obesity cannot be readily explained by recent changes in *innate* food preferences; presumably the rise in obesity reflects increasing access to, and intake of, palatable, high-calorie foods and changes in daily energy expenditure.

When I spent the first of two sabbaticals in Paris in 1993, I was struck by the general expectation that young children should (and would) eat the same food as their parents. There were at the time no "happy meals" or "children's meals"; a typical school lunch for my 6-year-old son might consist of baked fish, broccoli, milk, and French cheese. There was also little or no snacking between meals. Presumably this had a powerful influence on food preference and might

(among other things) have contributed to the very low rates of childhood obesity in France. Things of course have changed, even in France, with increasing penetration of fast-food restaurants, but in many follow-up visits, I continue to be impressed with the relative tolerance of French children for foods that are considered intolerable by many American children (and adults). It may be relevant that governments in the European Union and parts of Canada have for many years actively limited the marketing of junk food to young children on television and in schools.[a,b] Unfortunately, online advertising to children has risen in parallel.[b]

Authors' Responses

1. The most common guidelines that exist around feeding (i.e., MyPlate, American Heart Association, and American Academy of Pediatrics) are good places to start as they recommend the promotion of a balanced diet and active lifestyle. However, these guidelines may be difficult for families to adhere to, especially those with two working parents, with limited resources, or with children with more challenging eating temperaments. Even when parents try to do their best with regard to obesity prevention, they may not be able to completely overcome the strong environmental and genetic influences at play. We encourage families to try to find a middle ground when it comes to lifestyle—eating healthy yet affordable and palatable foods in moderate portions, incorporating exercise when possible, but also recognizing the external and internal influences on a child's obesity risk. Focusing on being healthy as a family, and instilling body acceptance and positive self-image in children, may be more important for parents than concentrating on the numbers on the scale.
2. The editor raises many excellent points. The global food environment has certainly become more obesogenic over the last several decades and plays a role in children's obesity risk. However, it is important to consider the interaction between an individual's genetic and behavioral risk of obesity and the food environment. An individual's innate preference for sweet or fatty foods, combined with a genetic propensity toward weight gain in a more obesogenic food environment, are all factors which likely interact to increase obesity risk.

Repeated exposure to different foods increases liking and acceptance of those foods by children.[c] That exposure can begin in utero, with the foods their mothers consumed during pregnancy.[d] The fact that French children are expected to try and eat the same foods that their parents do is likely a result of both of these factors. While developing a preference and acceptance for healthy foods (such as vegetables and baked fish) likely has some health benefits, recent work has shown that greater dietary variety and diversity are actually associated with higher body mass index z-scores in American children.[e] These findings call into question whether targeting dietary variety through increased food acceptance should be part of obesity prevention strategies in the USA.

Perhaps the biggest differences between French and American children when it comes to eating, diet, and obesity risk are the societal norms and policies that support healthy lifestyles in each country. In France, factors such as government subsidies for healthy foods and quality childcare, parental leave, a 35-hour workweek, and stricter food marketing regulations all likely contribute to helping families make healthy choices in child feeding. Without

these supports and cultural traditions, American families arguably have more obstacles to overcome in child feeding and obesity prevention.

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