



## Nurturing Children's Healthy Eating: Position statement

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### ABSTRACT

The relationship between eating a healthy diet and positive health outcomes is well known; nurturing healthy eating among children therefore has the potential to improve public health. A healthy diet occurs when one's usual eating patterns include adequate nutrient intake and sufficient, but not excessive, energy intake to meet the energy needs of the individual. However, many parents struggle to establish healthy eating patterns in their children due to the pressures of modern life. Moreover, healthcare providers often do not have the time or the guidance they need to empower parents to establish healthy eating practices in their children. Based on existing evidence from epidemiologic and intervention research, the *Nurturing Children's Healthy Eating* collaboration, established by Danone Institute International, has identified four key themes that encourage and support healthy eating practices among children in the modern Western world. The first — positive parental feeding — explores how parenting practices and styles, such as avoiding food restriction, allowing children to make their own food choices, and encouraging children to self-limit their portion sizes, can influence children's dietary intake. The second — eating together — highlights the link between eating socialization through regular family meals and healthful diet among children. The third — a healthy home food environment — explores the impact on eating practices of family resources, food availability/accessibility, parental modeling, and cues for eating. The fourth — the pleasure of eating — associates children's healthy eating with pleasure through repeated exposure to healthful foods, enjoyable social meals, and enhancement of the cognitive qualities (e.g. thoughts or ideas) of healthful foods. This paper reviews the evidence leading to the characterization of these nurturing themes, and ways in which recommendations might be implemented in the home.

### 1. Background

Good nutrition (defined as the intake of an adequate, well-balanced diet to support the body's dietary/energy needs) is a cornerstone for good health throughout life (World Health Organization, 2018a). Unhealthy diets (including excessive consumption of saturated fats, trans fatty acids, sugar and salt) increase the risk of obesity and

noncommunicable diseases such as hypertension, cardiovascular diseases, diabetes, some cancers, and various atopic disorders (Agostoni & Caroli, 2012; Agostoni & Przyrembel, 2013; Brazionis et al., 2013; Brion et al., 2008; He & MacGregor, 2007; He & MacGregor, 2009; NCD risk factor collaboration, 2017; Pearce & Langley-Evans, 2013; Stanhope, 2016; World Health Organization, 2018b;). It is therefore essential to establish healthy eating habits early in life.

*Abbreviations:* HEI, Healthy Eating Index; BMI, body mass index; HCP, healthcare professional; USA, United States of America; UK, United Kingdom

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Children across the world learn eating habits and social behavior from their parents/grandparents, caregivers, siblings, and peers. Consequently, the home environment, community and school are crucial sources of education that help shape what, how much, when and how children eat from the time they are born, throughout childhood and adolescence (Booth et al., 2001; Briefel, Wilson, & Gleason, 2009; Couch, Glanz, Zhou, Sallis, & Saelens, 2014; Masse, de Niet-Fitzgerald, Watts, Naylor, & Saewyc, 2014). The development of feeding habits is complex and is strongly influenced by parents'/caregivers' beliefs and attitudes regarding food, as well as by emotional and cultural relationships with foods. For example, a relationship exists between parental feeding behaviors and children's body mass index (BMI) (Rodgers et al., 2013), and evidence suggests that family meals have a positive impact both on eating habits and dietary intake (Fulkerson, Larson, Horning, & Neumark-Sztainer, 2014; Hughes et al., 2011). However, increased rates of globalization, urbanization and migration over recent decades have had a profound impact on family organization, traditions, lifestyle, and eating habits (Casali, Borsari, Marchesi, Borella, & Bargellini, 2015; Ernstson et al., 2010; Iguacel et al., 2018; Neuhausser, Thompson, Coronado, & Solomon, 2004). Advances in food technology have led to increased availability of foods that are high in energy and low in nutrient content (e.g. potato chips and sugar-sweetened beverages), whereas globalization and urbanization have resulted in changes to the home environment that often influence food availability, parental engagement, parenting behaviors and child self-regulation of eating (Ernstson et al., 2010).

The traditional family model is under intense pressure from the challenges of the modern Western world, with busy parents struggling to balance work and family life (Balistreri, 2018; Bekelman et al., 2018; Berge, Hoppmann, Hanson, & Neumark-Sztainer, 2013). This may be especially true for the increasing numbers of single-parent families (Cherlin, 2010). As a result, parents have less time to shop for and prepare traditional food, and little time to share mealtimes/quality moments with their families. Studies show that increasing levels of parental stress are associated with consumption of less healthy foods (Jastreboff et al., 2018; Lytle et al., 2011; Miller, Miller, & Clark, 2018) and that children from migrant families and/or single-parent families are more likely to be overweight, experience food insecurity (inconsistent access to adequate food levels), and/or have unhealthy eating habits (Balistreri, 2018; Berge et al., 2013; Glanville & McIntyre, 2006; Huffman, Kanikireddy, & Patel, 2010; Iguacel et al., 2018; Neuhausser et al., 2004; Stewart & Menning, 2009). As the demands on parents increase, children spend more time away from the family, either at school or with caregivers (Cleveland, Forer, Hyatt, Japel, & Krashinsky, 2008; Laughlin, 2013; Roberts, Speight, & Save the Children, 2017). This too is likely to have a profound effect on children's eating habits.

Given the changes undergone by society over recent years, effective new strategies are required that support parents in establishing healthy eating habits in their children. With this in mind, *Danone Institute International* brought together pediatricians, dieticians, nutritionists, psychologists, sociologists, and public health professionals to review ways in which our changing lifestyles have influenced eating habits and to identify strategies designed to empower parents/caregivers to nurture healthy eating practices in their children. The Danone Institutes are non-profit organizations whose key missions are to contribute to the improvement of global public health by supporting research and education in the field of nutrition, and to compile and disseminate evidence-based knowledge about the many links between nutrition and health. The aim of the current collaboration was to develop a positional statement on 'Nurturing Children's Healthy Eating' in our changing world, focusing on *how* we eat, rather than on *what* we eat. Overall, four themes were identified that play key roles in the development of healthy eating habits in children: 1. Positive parental feeding for building and shaping healthy eating habits; 2. Eating together as a key element of health promotion in children; 3. A positive home food environment encouraging healthy eating practices; and 4. The pleasure of

eating.

The objectives of this paper are to review the knowledge supporting these key themes, to provide recommendations for parents/caregivers and public health authorities to support healthful eating among children in the modern Western world, and to identify future directions for public health research aimed at promoting children's healthy eating.

## 2. 'Nurturing Children's Healthy Eating'

### 2.1. Theme 1: positive parental parenting

Studies promoting healthier eating habits among children show that *how* children eat is as important as *what* they eat. According to the American Academy of Pediatrics, "Parents and caregivers are responsible for providing a variety of nutritious foods, defining the structure and timing of meals, and creating a developmentally appropriate mealtime environment that facilitates eating and social exchange. Children are responsible for participating in choices about food selection and take primary responsibility for determining how much is consumed at each eating occasion" (AAP Committee on Nutrition, 2013). This advice follows the idea that most children have the ability to self-regulate their eating (Hughes & Frazier-Wood, 2016). Self-regulation of eating is described as both the inborn and socialized ability to begin and end eating in response to internal signals and cues of hunger and fullness (Baumeister & Vohs, 2004). These signals and processes are part of a highly regulated system within children that is responsive to the energy content of foods (Blundell et al., 2010). As long as parents do not override this ability by using highly controlling feeding styles or practices, children will develop healthy eating habits as they grow into adulthood (Hughes & Frazier-Wood, 2016).

#### 2.1.1. Eating socialization

Parents generally encourage their children to adopt goals and values that they believe will help them make appropriate choices in their daily lives as they grow older and become more independent (Baumrind, 1989). This process is called 'socialization'. 'Eating socialization' is the process by which parents help their children adopt healthy eating practices, values, beliefs, and behaviors that are practiced and accepted both by their immediate family and their surrounding culture. The parenting environment remains one of the first and most fundamental contexts in which children's eating behaviors are socialized.

Infants and pre-school children require considerable guidance on appropriate eating practices, food preferences, and eating self-regulation (Nicklaus, 2016a, 2016b, 2017). The parenting environment is traditionally the primary influence during this stage of socialization (Savage, Fisher, & Birch, 2007), although changes to society mean many children spend more time outside the home from a young age (Laughlin, 2013). As children enter elementary school, they encounter a wider range of eating environments and eating companions, and a greater choice of foods. Although the parental environment remains essential, socialization requirements and influences change. As children enter adolescence, parental control diminishes, and peer group influences become more dominant. By this stage, parents hope their children will have adopted family goals and values that can be used to guide food choices and eating behaviors as children grow into adults.

Eating socialization strategies can be categorized according to the ways in which a parent shapes their child's habits. Feeding *practices* are individual, goal-oriented behaviors that parents use to encourage their children to do, or not do, something specific, such as eating their vegetables and not eating cookies or candy. Feeding *styles* are more general, describing the *emotional climate* a parent creates with their child at mealtimes, which in turn influences eating behaviors (Hughes et al., 2011).

#### 2.1.2. Feeding practices

Feeding practices can be categorized according to the ways in which

parents encourage their children's eating habits and routines (Vaughn et al., 2016). Studies suggest that positive practices, such as structured and autonomy support practices, are associated with better outcomes in terms of children's eating habits than more negative (coercive) practices. In general, structured practices (environments that encourage child competence, e.g. regular mealtimes, parental modeling of healthy eating, making sure healthful food is accessible) are linked to healthier eating in children from pre-school age through to adolescence (Vaughn et al., 2016; Vollmer & Mobley, 2013; Yee, Lwin, & Ho, 2017). Autonomy support practices (practices based on encouragement and praise that provide enough support to nurture a child's ability to regulate their eating without being too strict) are linked to healthier eating in children up to 7 years of age, but tend to have less effect in older children and adolescents (Vaughn et al., 2016; Vollmer & Mobley, 2013). Both autonomy support and more negative, coercive practices (e.g. food restriction, pressure to eat, and the use of threats and bribes) are difficult to enforce in older children and are therefore mostly used with younger children. When more controlling practices are used with older children/adolescents, they can be linked to unhealthy eating habits and behaviors (Haycraft, Goodwin, & Meyer, 2014). In general, coercive strategies have a detrimental effect on healthy eating and should be avoided (Vaughn et al., 2016; Ventura & Birch, 2008). Parents' use of specific child feeding practices have been found to vary between different ethnic groups (Cardel et al., 2012; Huang et al., 2012), highlighting the need to tailor advice and recommendations to take account of culture and ethnicity.

### 2.1.3. Feeding styles

Feeding styles are characterized according to: 1) the level of demandingness (control) a parent places on their child's eating, and 2) the level of responsiveness (warmth) with which a parent expresses their demands. Four feeding styles have been defined: 1) Authoritative (parents have reasonable nutritional demands and sensitivity towards the child's needs); 2) Authoritarian (highly controlling parents with little sensitivity towards the child); 3) Indulgent (highly responsive parents who provide little structure); and 4) Uninvolved (parents that do not care what their children eat and/or those that care but cannot provide structure) (Hughes, Power, Fisher, Mueller, & Nicklas, 2005). While authoritative parents make healthy foods readily available and may gently encourage eating, they do not force their children to eat, whereas authoritarian parents may make healthy foods available but expect their children to eat what is put in front of them. Permissive parents (indulgent and uninvolved) have low expectations regarding child eating behaviors; indulgent parents want their children to be happy so they provide only foods that they know their children will eat, whereas uninvolved parents provide foods that are convenient for them at that time without considering nutrient values or child preferences. According to previous studies, approximately 17% of parents in the USA are classified as authoritative, 34% as authoritarian, 34% as indulgent, and 17% as uninvolved (Hughes, Power, O'Connor, Orlet, & Chen, 2016; Hughes et al., 2011; Hughes et al., 2005).

In general, children of authoritative parents have the best outcomes in terms of healthy eating and self-regulation (Arlinghaus et al., 2017; Hughes & Power, 2018a). Compared with children of authoritarian parents, these children typically have a lower intake of low-nutrient, energy-dense foods (Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2012), a higher intake of fruits and vegetables (Patrick, Nicklas, Hughes, & Morales, 2005), and better nutritional intake during their main meal (Arlinghaus et al., 2017). Additionally, children of authoritative parents show better diet quality of the dinner meal compared with children of authoritarian parents based on the Healthy Eating Index (HEI), a measure of how closely individuals meet the Dietary Guidelines for Americans. Conversely, children of indulgent parents have poorer outcomes, including larger self-selected portion sizes (Fisher, Birch, Zhang, Grusak, & Hughes, 2013), lower intakes of fruits, vegetables, dairy products (Hoerr et al., 2009), and whole grains (Tovar

et al., 2015), and higher intake of low-nutrient energy-dense foods (Vaughn et al., 2016). Although useful, most feeding style studies focus on children aged 3–11 years, and do not examine the effects of feeding styles on eating practices among older children and adolescents. The effects of 'uninvolved' feeding styles, and the reasons why some parents adopt one style over another are unclear.

### 2.1.4. Summary and future directions

Parental behaviors that shape early eating habits provide a foundation for children as they grow up and become more independent. The goal of healthy eating strategies is therefore to encourage parents to establish healthy habits early in their child's life so that good habits will be carried through into adulthood. An authoritative feeding style promotes eating self-regulation among children and has been shown to support healthier outcomes (Arlinghaus et al., 2017; Hughes & Power, 2018a). In terms of feeding practices, both autonomy support and structure are important parental behaviors early on, whereas structured feeding practices (modeling and food availability) are linked to healthier eating in children and (especially) adolescents (Hughes & Power, 2018b). However, there is an emerging literature supporting the premise that parents exhibit a myriad of feeding behaviors to feed their children and these behaviors may be dependent on the situation. Both feeding practices and feeding styles have been shown to be only moderately stable over time and across meals, supporting this premise that situational factors may greatly influence parental behavior (Garcia et al., 2018; Loth, Uy, Neumark-Sztainer, Fisher, & Berge, 2018). Healthcare professionals (HCPs) should educate parents and caregivers about parental feeding practices/styles and suggest ways in which they might be implemented in our changing society (Table 1).

## 2.2. Theme 2: eating together

Although definitions vary between studies (Horning, Fulkerson, Friend, & Neumark-Sztainer, 2016; McCullough, Robson, & Stark, 2016), 'eating together' or 'a family meal' is usually defined as 'a child having a planned meal with at least one parent or adult relative/carer' (Hammons & Fiese, 2011). Prospective studies among adults and youths suggest that the frequency of eating together has declined over recent years (Mestdag, 2005; Neumark-Sztainer, Wall, Fulkerson, & Larson, 2013; Walton et al., 2016), largely due to parental time constraints and scheduling challenges (Dwyer, Oh, Patrick, & Hennessy, 2015). Understanding the impact of eating together on dietary intake at various ages, as well as key motivators and barriers related to having meals together as a family, is essential if we are to identify the most appropriate timing of interventions designed to establish family meal routines.

### 2.2.1. Frequency of family meals

Studies examining the association between family meal frequency and dietary intake show a consistent positive association between family meal frequency and healthier eating patterns among school-aged children and adolescents (Gillman et al., 2000; Hammons & Fiese, 2011; Woodruff & Hanning, 2008; Woodruff, Hanning, McGoldrick, & Brown, 2010). Studies in the USA, Australia, Canada, Finland, Japan, and New Zealand found that, compared with children and adolescents who rarely have family meals, those who eat with their families three or more times per week had greater odds of consuming healthful foods (e.g. fruits and vegetables), and lower odds of consuming energy-dense, low-nutritional value foods (e.g. fast food and sugar-sweetened beverages) (Hammons & Fiese, 2011). Research also suggests that, compared with youth who rarely have family dinners, adolescents who have more frequent family meals have healthier diets in young adulthood (Larson, Neumark-Sztainer, Hannan, & Story, 2007). This suggests that the benefits of regular family meals during adolescence may extend into adulthood.

Whereas the dietary benefits of frequent family meals have been

**Table 1**  
Evidence-based recommendations for Nurturing Children's Healthy Eating.

Theme	Recommendations for parents/caregivers	Recommendations for HCPs and health authorities
Positive parental feeding	<ul style="list-style-type: none"> <li>● Adopt positive feeding practices (e.g. structured mealtimes, encouragement).</li> <li>● Avoid negative, coercive practices (e.g. pressure to eat specific foods).</li> <li>● Have reasonable nutritional demands and sensitivity towards the child's needs.</li> <li>● Avoid highly controlling/indulgent feeding styles.</li> <li>● Discourage consumption of sugar-sweetened beverages, but avoid restricting a child's consumption of specific foods in the home.</li> <li>● Encourage children to:               <ul style="list-style-type: none"> <li>○ Eat meals at the same time each day</li> <li>○ Eat with families/peers (provides opportunities for parents/peers to model healthy eating practices, talk positively about healthy foods)</li> <li>○ Self-regulate portion sizes</li> <li>○ Make their own food choices by participating in menu planning and food preparation.</li> </ul> </li> <li>● Low-nutrition, high-energy 'treats' should be offered on occasion.</li> </ul>	HCPs should offer advice to families about parental feeding practices and styles.
Eating together	<ul style="list-style-type: none"> <li>● Regular family mealtimes should be encouraged.</li> <li>● Try to have mealtimes free from screens (TV, tablets, cellphones, etc.)</li> <li>● Use mealtime conversation to discuss healthful foods.</li> </ul>	Intervention programs are required that effectively support busy families, thereby enabling them to eat together (particularly important for single-parent families, families from other countries, and families in lower socioeconomic groups).
Healthy home food environment	<ul style="list-style-type: none"> <li>● Provide an enjoyable, positive, healthy home-food environment.</li> <li>● Model healthy behaviors, such as healthful food intake, good eating patterns, and moderate consumption of snacks and desserts.</li> <li>● Discuss the benefits of a healthful diet without mentioning weight or body shapes.</li> <li>● Encourage healthful food choices by ensuring nutritious foods are readily available, appealing, and easily accessible within the home.</li> </ul>	Health authorities should consider providing resources to help improve the home food environment. These might include: <ul style="list-style-type: none"> <li>● Financial help.</li> <li>● Educational resources to help families plan menus, meal times, and prepare meals ahead of time.</li> </ul>
Pleasure of eating	<ul style="list-style-type: none"> <li>● Encourage healthy eating by focusing on the pleasure (gained and expected) from eating healthful food.</li> <li>● Expose infants and children to a variety of healthy tastes and encourage them to learn to like healthful foods through repeated exposure.</li> <li>● Enable children to attend enjoyable, sociable mealtimes so they can see and hear other people enjoying healthful foods.</li> <li>● Use recipes or cooking techniques that their children enjoy.</li> <li>● Provide positive comments that encourage children to eat well through emotional pervasion.</li> <li>● Avoid negative interactions (e.g. nagging about what or how much to eat).</li> <li>● Be aware of the marketing messages to which their children are exposed; these should be discussed.</li> <li>● Avoid emphasizing the pleasure of consuming unhealthy food by, for instance, offering them as a reward.</li> </ul>	<ul style="list-style-type: none"> <li>● Instead of promoting healthful foods based on their nutritional content, public health campaigns should consider emphasizing the pleasures gained from consuming healthful foods in terms of taste, social eating, and cognitive pleasure.</li> <li>● Marketing strategies can be used to influence the pleasure of eating healthful foods.</li> <li>● 'Sensory imagery' can be applied to make people happier with smaller portions of 'treat' foods, even in out-of-home catering.</li> </ul>

HCP, healthcare professional.

well established among school-aged children and adolescents, less research has been conducted among children under 5 years of age, and results from those studies that have been conducted are inconsistent. For example, studies of pre-school children in Australia (Wyse, Campbell, Nathan, & Wolfenden, 2011) and the UK (Sweetman, McGowan, Croker, & Cooke, 2011) failed to show a significant association between family meal frequency and intake of fruits/vegetables. In contrast, a study in the USA found that more frequent family meals were associated with increased odds of families serving fruits and vegetables, although the impact of overall dietary intake was not assessed (Fitzpatrick, Edmunds, & Dennison, 2007). Some research suggests that more frequent family meals are associated with more food enjoyment and less fussy and emotional eating among young children (Verhage, Gillebaart, van der Veek, & Vereijken, 2018).

Parents of young children identify social connection and practical considerations as reasons for eating with their children, whereas poor planning and the possibility of messy mealtimes are cited as reasons for not eating with their children (Verhage et al., 2018). Parents of school-

aged and adolescent children also identify social connection as a key motivation for eating together, as well as an opportunity to model healthful behaviors and provide structure for their children (Dwyer et al., 2015). Key barriers to family meals among parents of older children include time constraints, not having enough energy to make meals, limited financial resources and challenges dealing with the food preferences of various family members (Dwyer et al., 2015).

More frequent family meals are hypothesized to improve children's eating habits through the following mechanisms: 1) Foods eaten during family meals are healthier than those consumed alone or outside of the home (Berge et al., 2012; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003); 2) Eating together as a family allows parents an opportunity to model healthful food intake and eating patterns (Fulkerson et al., 2006); and 3) Eating together provides a context in which children can implicitly learn about healthy eating through mealtime conversations and the emotional tone of the mealtime (Marty, Chamberon, Nicklaus, & Monnery-Patris, 2018). Understanding the key mechanisms whereby family meals lead to improved dietary intake will help

improve the development of effective interventions to support families to eat together.

### 2.2.2. Family meal context

In addition to the frequency of eating together, research suggests that the physical and/or social environment in which we eat plays a major role in shaping child and adolescent eating patterns (Skafida, 2013). Studies show that the use of screens/television during mealtimes is associated with less healthful foods being offered and reduced healthful food intake (Avery, Anderson, & McCullough, 2017). In addition to limiting television viewing and/or screen use during mealtimes (Avery et al., 2017; Fitzpatrick et al., 2007), contextual factors that potentially have a positive influence on children's eating habits include engaging them in meal preparation (Berge, MacLehose, Larson, Laska, & Neumark-Sztainer, 2016; Larson, Story, Eisenberg, & Neumark-Sztainer, 2006), eating at regular times, children eating the same foods as their parents, and a positive mealtime environment (Skafida, 2013).

### 2.2.3. Summary and future directions

The frequency and context of family meals have the potential to improve dietary intake among children of all ages (Burgess-Champoux, Larson, Neumark-Sztainer, Hannan, & Story, 2009; Fitzpatrick et al., 2007; Gillman et al., 2000; Hammons & Fiese, 2011; Verhage et al., 2018; Woodruff et al., 2010; Woodruff & Hanning, 2008); however, the frequency of eating together is declining (Mestdag, 2005; Neumark-Sztainer et al., 2013; Walton et al., 2016). Intervention programs that effectively support busy families, thereby enabling them to eat together, are clearly required (Table 1).

## 2.3. Theme 3: healthy home food environment

The home environment plays an important role in shaping children's habits, including eating behaviors, and is considered one of the most important settings with regards to the development of healthy eating habits among children. A myriad of factors influences the home food environment, including family resources (financial and emotional), foods available in the home, food accessibility, and cues for eating that exist in the home environment.

### 2.3.1. Family resources

Adults in the USA consume approximately 65%–72% of their daily energy intake in the home (Smith, Ng, & Popkin, 2013); the quality of the foods and nutrients that are available in the home is therefore of utmost importance to the health of all family members. Parents are important gatekeepers for the food choices that youth make at home but many struggle with providing the healthiest options on a regular basis (Neumark-Sztainer et al., 2014; Rosenkranz & Dziewaltowski, 2008). Studies have documented that fruit and vegetable intake among youth is positively associated with the availability of healthful foods in the home and negatively associated with the availability of less healthful foods (Ding et al., 2012). In addition, the availability of more energy-dense, low-nutritional value foods in the home has been associated with greater consumption of sweet and savory snacks and higher intakes of high-calorie beverages by youth (Campbell et al., 2007; Couch et al., 2014). The availability of sugar-sweetened beverages in the home has been negatively associated with dairy product intake (Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005). In addition to affecting nutrient intakes among youth, the availability of food in the home has also been shown to be associated with obesity risk among both parents and their offspring (Fulkerson et al., 2008).

Family resources (in particular income, but also less tangible resources associated with the educational levels of parents) and the cost of food largely determine which foods parents bring into the home. Healthful foods, such as fruits, vegetables, lean meats and fish are usually more expensive than high-energy foods, such as refined grains

and high-sugar foods (Drewnowski, 2004).

In addition to purchasing power, income often affects food-related activities. For example, lower-income families may include adults with multiple jobs; they may have little time to prepare meals (Bauer, Hearst, Escoto, Berge, & Neumark-Sztainer, 2012). However, trends in home food preparation in the USA suggest that the proportion of daily energy intake consumed from home food sources and time spent in food preparation decreased significantly for all socioeconomic groups between 1965–1966 and 2007–2008 (Smith et al., 2013). While income is related to food availability, research suggests that both high- and low-income families now have more foods that are less healthful in the home than they did in previous years (Ding et al., 2012). However, higher income families have more healthful foods available in the home as compared with lower-income families. Therefore, children in lower-income families are challenged to choose a healthy diet when their home environment has an abundance of less healthful foods and fewer healthy choices. Research from the UK suggests that lack of time and the cost of food are major barriers for providing healthful foods in the home (Holley, Farrow, & Haycraft, 2017). This observation was reflected in a Brazilian study, which showed that children attending preschool centers for 8–10 h per day had higher energy intake with poorer nutritional quality if they ate at home instead of at pre-school (Vieira, Castro, Fisberg, & Fisberg, 2017). Further studies show that family discussions about food choices, quality and/or price influence adolescents' attitudes regarding healthy eating and that discussions vary depending on socioeconomic status (Fielding-Singh & Wang, 2017). Helping families from lower socioeconomic groups increase the availability of healthful foods in the home is therefore of utmost importance.

### 2.3.2. Emotional environment

The emotional environment of the home has a major impact on the quality of the family diet (Hearst et al., 2012; Lytle et al., 2011). High levels of parental stress, caused by a variety of factors including economic pressures, difficulty juggling work and family responsibilities, time restraints, gender inequity and discrimination of all types, and/or depression, have been associated with less frequent family meals, more frequent consumption of sugar-sweetened beverages, and increased fast food consumption by parents (Dimsdale, 2008; Lytle et al., 2011; Rice, 2012; Williams, Neighbors, & Jackson, 2008). As stress levels increase, family meals become less healthy and children's weight increases (Jastreboff et al., 2018; Miller et al., 2018).

### 2.3.3. Food accessibility

The term 'food accessibility' refers to the provision of foods in places that can be reached, in a form that is easy to eat. Cutting and peeling fruits (Wyse et al., 2011), for example, and ensuring children have easy access to water (Lahlou, Boesen-Mariani, Franks, & Guelinckx, 2015) have both been linked to increased consumption of these products among children. 'Food accessibility' also refers to the size of the portions offered to children in the home (Rolls, Engell, & Birch, 2000; Wansink & Sobal, 2007). Increasing the accessibility of nutrient-dense foods while limiting the accessibility of energy-dense, nutrient-poor snacks by offering smaller portions helps minimize the negative impact of less healthful treats (Rolls et al., 2000; Wansink & Sobal, 2007).

### 2.3.4. Cues for eating

The home environment provides multiple cues for eating that not only have an impact on immediate food intake but also establish habits and norms regarding when, what, how much and why to eat.

Television viewing is a particularly powerful cue for children and adolescents (Borzekowski & Robinson, 2001; Dovey, Taylor, Stow, Boyland, & Halford, 2011). Reducing children's access to television is important for reducing obesity risk, partly due to the association between television and sedentary behavior, but also due to food advertisements, which provide cues to eat in the absence of hunger and promote the consumption of less healthful food types (Boles, Scharf,

Filigino, Saelens, & Stark, 2013; Borzekowski & Robinson, 2001; Dovey et al., 2011; Kelly et al., 2010).

Another important eating cue for children is the eating pattern of their parents (Wyse et al., 2011; Campbell et al., 2007; Vereecken, Haerens, De, I, & Maes, 2010). Studies show that the overall quality of the parent's diet has a significant impact on the quality of their child's diet, and that a child's daily mean energy intake is directly related to the parent's daily mean energy intake (Robson et al., 2016). This suggests that parental food preferences and habits, combined with the family's food-related culture and eating environments, are modeled and learned in the home.

### 2.3.5. Summary and future directions

An enjoyable, positive, healthy home environment is essential for shaping children's eating behaviors. Parents should be encouraged to model healthy behaviors, discuss the benefits of a healthful diet with their children, discourage screen time during mealtimes, and ensure nutritious foods are readily available, appealing, and easily accessible within the home (Table 1). Health authorities should consider providing financial help and educational resources to help families plan menus, meal times, and prepare family meals.

## 2.4. Theme 4: the pleasure of eating

Among the various factors that control eating, pleasure plays a particular role, as food choices are driven by the search for pleasure and reinforced by the pleasure experienced by food consumption in relation to the basic neurobiology associated with eating (Veldhuizen, Rudenga, & Small, 2010). In other words, pleasure plays an essential role in determining food choices. This may be particularly true in children, because other determinants of food choices (e.g., nutrition information, price) are less prominent due to the immature cognitive abilities of children (Albuquerque et al., 2018; Hart, Bishop, & Truby, 2002; Brug, Tak, te Velde, Bere, & De, 2008). However, in a food environment where energy-dense foods are over-abundant, pleasure can also be a threat for healthy eating, both in terms of food choices, and of the amount of food and calories consumed. Understanding how and when pleasure is derived from eating is important if we are to understand how, and in what context, the pleasure of eating can be used to promote healthy habits among children (Marty et al., 2018).

Theoretical models of food choice decision-making generally identify three main types of determining factors of consumption: factors related to the food, to the context of eating, or to the individual. Based on this observation, three dimensions of pleasure from eating have been identified for children (Marty et al., 2018): 1) The sensory dimension (the pleasure experienced during and after the consumption of food); 2) The interpersonal dimension (the pleasure experienced from the social context of food consumption); and 3) The psychosocial dimension (pleasure related to the cognitive representations related to foods).

### 2.4.1. The sensory dimension

Pleasure experienced before and after eating a food is linked to the perceptual characteristics of the food (i.e. appearance, taste, flavor and texture), and can be modified by the rewarding properties of the food, for example, its ability to satisfy energy needs.

Sensory pleasure from eating is partly determined by our innate or rapidly developing liking of particular tastes (e.g. sweetness, savory/umami tastes, saltiness) and partly learned *in utero* and in the first years of life (Hausner, Nicklaus, Issanchou, Molgaard, & Moller, 2010; Mennella, Daniels, & Reiter, 2017; Mennella, Jagnow, & Beauchamp, 2001; Nicklaus, 2016b; Schwartz et al., 2017). Infants often prefer the flavors of foods to which they were exposed prenatally and during breast/formula feeding (Mennella et al., 2001). They continue to taste and smell compounds found in foods soon after birth (Schwartz et al., 2017), and later develop the ability to process foods with different textures (Demonteil et al., 2019; Nicklaus, Demonteil, & Tournier,

2015). Learning to like new foods relies on repeated exposure; however, the amplitude of this effect varies according to the characteristics of the child (Caton et al., 2013) and/or food (Barends, de Vries, Mojet, & de, 2014; Nicklaus, 2011; Nekitsing, Blundell-Birtill, Cockcroft, & Hetherington, 2018). Children are also able to non-attentively process information regarding the energy density of a food and, through conditioning, associate this unconditional stimulus to the flavor of the food, adapting their energy intake accordingly (Remy et al., 2014; Remy, Issanchou, Chabanet, & Nicklaus, 2013). Through this associative conditioning mechanism, children can learn to associate the taste and flavor characteristics of a food to its energy density (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Keller, 2014; Kern, McPhee, Fisher, Johnson, & Birch, 1993).

Some cooking and feeding practices make use of these mechanisms to promote the pleasure of eating healthful foods. For instance, parents can make the sensory properties of food more appealing to their children by identifying and using healthful recipes or cooking techniques that their children enjoy (Zeistra, Koelen, Fok, & de Graaf, 2010). They may use fresh fruits to satisfy children's liking of sweet foods, and include a variety of flavors and textures in recipes to make foods appealing to their children. Cooking techniques may also help increase the energy density of low-energy, healthful foods by, for instance, adding small amounts of fat (e.g. drizzling olive oil over vegetables), because energy-rich foods tend to be preferred over foods lower in energy (Gibson & Wardle, 2003). The addition of seasoning may make the taste of foods more acceptable (van Stokkom, Poelman, de, van, & Stieger, 2018), but it is unclear whether this could help change the long-term acceptance of the foods (Bouhhal, Issanchou, Chabanet, & Nicklaus, 2014; Caton et al., 2013; Hausner, Olsen, & Moller, 2012; Remy et al., 2013). Finally, parents can encourage their children to like healthful foods by providing them with an opportunity to learn to like tastes through repeated exposure, although in some instance this approach may not be successful, depending for instance on the child's eating behavior temperamental trait (Caton et al., 2014; Keller, 2014). Fussy children might require more exposure before learning to like a food.

### 2.4.2. The interpersonal dimension

Eating is often a social situation, especially for infants who are not able to self-feed. Social eating encourages interactions between people during feeding or mealtimes, and is crucial for the development of eating habits (Shutts, Kinzler, & DeJesus, 2013). Eating socialization strategies (i.e. feeding styles and practices) (Theme 1) and the benefits of frequent family meals (Theme 2) have already been discussed. However, other aspects of social eating, such as talking about what is eaten, can also be influential. For example, studies of mealtime conversations show that expressions about the pleasure of eating reflect internal individual experiences, and are inseparable from social, conversational and eating practices (Wiggins, 2002, 2015). Healthy eating practices may be nurtured by increasing the pleasure of eating through the various benefits of social meals.

### 2.4.3. The psychosocial dimension

The act of eating is associated with cognitive processes such as thoughts, images and ideas that can modulate pleasure from eating. As Levi-Strauss said, "foods are chosen not because they are 'good to eat' but because they are 'good to think'" (Levi-Strauss, 1963). This is also true for children.

Cognitive qualities of foods can be described as: 1) Search qualities (determined by the consumer prior to purchase), 2) Experience qualities (ascertained after purchase), and 3) Credence qualities (qualities indirectly related to the product, such as a brand, label, packaging and/or marketing).

Marketing strategies commonly use credence cues to create positive expectations about a food product (Albuquerque et al., 2018; Fernqvist & Ekellund, 2014; Piqueras-Fiszman & Spence, 2014; Story & French, 2004). Studies show that advertising has an impact on food intake

among children of all ages (Boyland et al., 2016); hence marketing strategies can be a lever to consider for influencing the pleasure of eating healthful foods in children of all ages. However, the way in which a child comprehends and responds to advertising varies with age and individual characteristics (Roedder, 1999). Brand representation awareness begins to emerge in children aged 3–5 years (McAlister & Cornwell, 2010), and generally has a stronger effect on food choices if children have been previously exposed to the brands (Robinson, Borzekowski, Matheson, & Kraemer, 2007; Sosa & Hough, 2006). Screen-based advertising (as opposed to other forms of marketing) is particularly persuasive for children and is largely based on affective claims, such as premium offers (free gifts, competitions, vouchers etc.), the use of promotional characters, the taste of a food, and suggestions that the food is fun. In general, children up to 7–8 years old view advertising as entertaining or informative, which makes them particularly vulnerable to strategies designed to modify attitudes. After this, children begin to understand the persuasive intent of commercials and start viewing advertising in a more analytical way (Albuquerque et al., 2018; McAlister & Cornwell, 2010; Roedder, 1999; Story & French, 2004). However, older children can still be persuaded by the emotive messages of advertising (Roedder, 1999; Story & French, 2004). This suggests that marketing strategies can be used to influence the pleasure of eating healthful foods in children of all ages.

#### 2.4.4. *Pleasure from eating: a lever to encourage healthy eating*

At times, children and parents face the dilemma of considering nutrition and health versus pleasure, which can lead to the counter-productive effect of nutrition claims on healthful food choice (Maimaran & Fishbach, 2014; Wardle & Huon, 2000). Instead of promoting healthful foods based on their nutritional content, public health campaigns should consider emphasizing the pleasures gained from consuming healthful foods in terms of taste, social eating, and cognitive pleasure. The pleasure of eating healthful foods can also be enhanced by repeatedly exposing a child to specific foods early in life, and by sharing or discussing healthful foods with others.

In addition to encouraging healthful food choices, the pleasures of eating can be used to limit unhealthy food intake. ‘Sensory imagery’ can be used to enhance the sensory-based expectations of eating an unhealthy (low-nutrition, high-energy) food without reducing the actual pleasure derived from consuming that product (Cornil & Chandon, 2016). The aim of this technique is to make people happier with smaller portions of ‘treat’ foods; this technique is effective with adults and also with children. Conversely, parents should avoid emphasizing the pleasure of consuming unhealthy foods by, for instance, not offering them as a reward.

#### 2.4.5. *Summary and future directions*

Parents can encourage healthy eating practices among children by repeatedly exposing infants and children to healthy food tastes, by using recipes or cooking techniques that their children enjoy, and by enabling children to attend enjoyable, sociable mealtimes (Table 1). Parents should provide positive comments that encourage children to eat well through emotional pervasion, avoid negative interactions, and be aware of the marketing messages to which their children are exposed. Health authorities should consider using marketing strategies to influence the pleasure of eating healthful foods and the use of ‘sensory imagery’ to make people happier with smaller portions of ‘treat’ foods.

### 3. Conclusion

In today's climate of globalization, urbanization and migration, numerous factors make it challenging for families to nurture healthy eating practices among their children. This may be particularly true for working parents and single-parent families who may struggle to balance work/life commitments, low-income families, and families from other cultures who may not be familiar with local foods. Effective strategies

and intervention programs are needed to help healthcare providers and health authorities guide and support families to nurture healthy eating practices among children. Further studies are required to identify the most appropriate timing of these interventions.

The ‘Nurturing Children's Healthy Eating’ position statement aims to improve public health through the identification and implementation of key themes that support healthy eating practices among children: positive parenting, eating together, a healthy home food environment, and the pleasure of eating healthful foods. Healthcare providers (in particular, pediatricians and nutritionists) should aim to understand a child's past and current eating habits. Table 1 provides evidence-based recommendations for improving healthy eating practices. When considering these recommendations, healthcare providers and health authorities should be aware that the position statement is largely based on studies carried out in Western, mostly affluent, cultures and might not be applicable to all populations across the world. A future aim of this working group would be to provide comprehensive recommendations designed to bridge the gap better between best practice and current barriers to optimal eating practices for all populations. To do this, additional research is needed to understand key barriers and issues of consideration within non-Western and low- and middle-income countries.

The success of the ‘Nurturing Children's Healthy Eating’ position statement depends not only on families and healthcare providers, but also on governments, food industries, marketing companies, and other stakeholders. Every member of this network should consider that the aim of feeding encompasses far more than providing nutrients: we should also take into account pleasure, taste, and individual choice. Finally, we all have a shared responsibility towards public health, sustainability and the future of humankind; we can feed our children and at the same time prepare them for a healthy future.

### Declarations

#### *Ethics approval and consent to participate*

Not applicable.

#### *Consent for publication*

Not applicable.

#### *Availability of data and materials*

Not applicable.

#### *Competing interests*

Authors have no competing interests.

#### *Authors' contributions*

All authors contributed to, read, and approved the final manuscript.

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### Appendix A. Supplementary data

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