

Chapter 6

Mixed-Methods Assessment of Childhood Obesity: Parental and Familial Factors



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Abstract Given the known health risks, societal burden, and healthcare costs associated with childhood obesity, addressing child weight and weight-related behaviors is critical. The home environment is one key domain to examine when trying to understand risk and protective factors for childhood obesity. This chapter presents innovative mixed-methods approaches to measuring key parental and familial factors linked to child weight and weight-related behaviors. The importance of including multiple family members when measuring the influence of the home environment on child weight and weight-related behaviors is discussed. Selected findings from three NIH-funded mixed-methods studies related to parent and familial factors of importance to child weight and weight-related behaviors are reported, and implications for future intervention research are presented.

Keywords Childhood obesity · Mixed-methods · Parent feeding practices · Parenting · Siblings · Ecological momentary assessment · Multiple family members · Familial factors in obesity · Weight-related behaviors · Child weight

Parental and Familial Factors Associated with Child Weight

There are potentially numerous levels of influence (e.g., biological, household, school, neighborhood, societal) on child weight and weight-related behaviors (e.g., diet quality, physical activity, sedentary behaviors). The home environment including parental (e.g., parent feeding practices, parental weight-focused conversations) and familial factors (e.g., family meal frequency) is one central domain that is fundamental to examine. For example, controlling parent feeding practices (restriction, pressure-to-eat) have been shown to be associated with child overweight and disordered eating behaviors (Birch, Fisher, & Davison, 2003; Fisher, Mitchell,

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Smiciklas-Wright, & Birch, 2002; Larson, Eisenberg, Berge, Arcan, & Neumark-Sztainer, 2015; Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016). However, predictors of parental feeding practices, such as stress and mood, are less understood. In addition, the majority of families in the U.S. have at least two children (U. S. Census Bureau, 2010). Thus, it is important to take into consideration the influence of multiple family members (e.g., parents, siblings) on home environment factors related to child weight and weight-related behaviors. Prior studies have not typically included multiple family members. Dyadic and familial-level analyses may create a more refined picture of the home environment and allow for results that disentangle risk and protective factors for childhood obesity (Berge, MacLehose, Eisenberg, Laska, & Neumark-Sztainer, 2012; Davison & Birch, 2001). For example, understanding whether parents utilize similar parent feeding practices with siblings would help inform the development of family-based interventions targeting child weight and weight-related behaviors. Furthermore, inclusion of home environment factors related to childhood obesity is important because many of these factors can be objectively measured for increased precision, and better understood if mixed-methods (e.g., quantitative, qualitative, direct observation) are employed. For example, when investigating the relationship between parental weight-related conversations and child weight status, it would be important to have qualitative data to know what is said in weight-related conversations.

The current chapter aims to: (1) present innovative mixed-methods approaches to measuring key parental and familial factors linked to child weight and weight-related behaviors, (2) identify the importance of including multiple family members when measuring the influence of the home environment on child weight and weight-related behaviors, and (3) present findings from three NIH-funded mixed-methods studies involving multiple family members to examine parental and familial factors of importance to child weight and weight-related behaviors within racially/ethnically diverse and immigrant/refugee households. Additionally, implications for future family-based interventions using cutting-edge mixed-methods such as ecological momentary intervention (EMI) to target childhood obesity in diverse households are discussed.

Family Systems Theory

Family Systems Theory (FST; Bertalanffy, 1952; Whitchurch & Constantine, 1993) is a useful framework for understanding the role of the home environment in child weight and weight-related behaviors. According to FST, the family environment is the most proximal influence on child weight and weight-related behaviors (Berge, Wall, Bauer, & Neumark-Sztainer, 2010; Berge, Wall, Larson, Loth, & Neumark-Sztainer, 2013; Rhee, 2008). FST suggests that intervening on individual-level behavior (e.g., dietary intake) has limited success unless the family-level behavior sustaining or overriding the individual-level behavior (e.g., fruits/vegetables served at family meals, parent feeding practices) changes too (see Fig. 6.1).

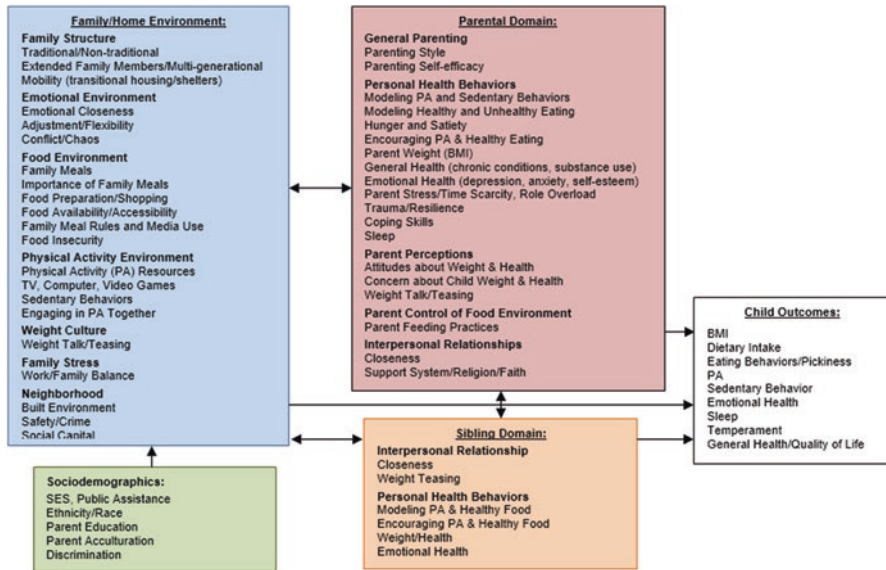


Fig. 6.1 Individual, dyadic, and familial influences on childhood obesity Source: Berge, Trofholz et al. (2017)

Family systems theory focuses on relational connections between family members and how these interconnections can influence individual behavior, as well as family-level behavior. For example, a child may experience negative weight-based talk from a family member. This in turn may increase the child’s negative emotional response, triggering the child to emotionally eat. This increase in unnecessary calories could result in the child gaining weight, thus increasing the likelihood of experiencing more negative weight-based talk. Overweight and obesity, therefore, become a familial-sustained problem. Furthermore, FST suggests that including multiple family members (e.g., parents, grandparents, siblings) in interventions increases the likelihood of family-level change, which promotes more sustainable change (Berge et al., 2014; Berge, Jin, Hannan, & Neumark-Sztainer, 2013). Utilizing FST as an underlying theory for understanding the relationship between parental and familial factors and childhood weight and weight-related behaviors will facilitate solid study design, research question and hypothesis formulation, and analysis and interpretation of results.

Using Mixed-Methods in Child Obesity Research

Applying mixed-methods allows for breadth (e.g., quantitative methods) and depth (e.g., qualitative methods) in understanding potential parental and familial factors of importance to child weight and weight-related behaviors. Collecting different types of data allows for a more complex picture of public health prob-

lems such as childhood obesity and will increase the potential to intervene in these difficult-to-change problems. Three mixed-methodologies used in research on parental and familial factors related to child weight and weight-related behaviors include: video recordings, ecological momentary assessment (EMA), and qualitative interviews.

Ecological Momentary Assessment

Many parental and familial factors can vary across time and context (e.g., parent feeding practices). However, they are often measured using static measures (e.g., one-time surveys) that do not allow for assessing the momentary nature of these factors. For example, parent feeding practices such as restriction, pressure-to-eat, and monitoring may be more likely to vary across time rather than being stable (Berge, Tate, Trofholz, Loth et al., 2018). Parents experience momentary stressors such as difficult child behavior (e.g., picky eating) or a stressful day that leads them to engage in certain feeding practices (e.g., pressure-to-eat). Different feeding practices (e.g., providing choices/options) may be employed when parents are not experiencing stress. Ecological momentary assessment (EMA) is a method that allows for capturing fluctuations in behavior across time and context (De Young et al., 2014; Dunton, Intille, Wolch, & Pentz, 2012; Heron & Smyth, 2010; Shiffman, Stone, & Hufford, 2008). Using a smartphone-based web application to record behaviors and/or ratings of stress, anxiety, hunger, etc., EMA allows for observation of behaviors as they unfold in context, moment-by-moment. EMA has several advantages. First, EMA captures dynamic changes in behavior that are relevant to a participant's environment in real time. Second, EMA measures within- and between-subject variation. EMA can identify whether parental behaviors are state-like, and influenced by momentary mechanisms (e.g., stress) that can be intervened on in real time, or whether they are trait-like. Third, designs that incorporate EMA analyses address limitations of cross-sectional designs, such as reverse causality and temporal ordering of variables. EMA also avoids limitations and biases inherent in retrospective recall. The majority of prior studies have assessed key familial variables such as parent stress or parent feeding practices as static variables. However there may be day-to-day changes in parent stress levels and fluctuations in parent feeding practices that require measurement of intra-individual processes (i.e., occurring within the individual). Using innovative technologies such as EMA can help pinpoint within- and between-day fluctuations to identify nuances within the home environment that amplify or exacerbate childhood obesity risk.

EMA methods also lend themselves well to future intervention delivery. For example, momentary mechanisms that influence parent feeding practices, such as stress or depressed mood, can be identified using EMA. Those mechanisms can then be targeted in interventions that use ecological momentary intervention (EMI) to reduce the use of unhealthy parent feeding practices.

Video-Recorded Direct Observation

Utilizing direct observational approaches, such as video-recording parent and other family members' behaviors, can result in a more in-depth understanding of interpersonal dynamics and nuances in individual, dyadic, and family-level behavior. Specifically, observing behavior unfold in real time allows for capturing potentially more valid behavioral patterns with more variability in behaviors over the observation time period. Prior research has shown that direct observational research conducted in the home using unstructured observations (e.g., play, routines) has more predictive validity and reliability of the behavior under study compared to laboratory settings using structured observations (e.g., eating in a lab; Gardner, 2000; Haidet, Tate, Divirgilio-Thomas, Kolanowski, & Haidet et al., 2009; Paterson, Bottorff, & Hewat, 2003). For example, using direct observational methods to video record a family meal in a family's own home (i.e., natural setting; no observers present) eating as they normally do (i.e., an unstructured way) for 1 week would allow for capturing a more in-depth representation of parental and familial factors with more variability in behavioral patterns, especially interpersonal dynamics.

Best practice in observational research shows that participants acclimate and become less reactive to direct observational equipment as the observational period increases (Gardner, 2000; Haidet, Tate, Divirgilio-Thomas, Kolanowski, & Happ, 2009; Paterson et al., 2003). Using a *sensitizing period* such as recording repeated observations across multiple days or longer observational time periods are strategies to capture a more representative sample of behavior. Not coding the first 10–15 min of behavior can also be used as a sensitizing period. For example, video recording a family while eating meals together for a one-week period would allow for dropping the first day of data collection as a sensitizing period and provide an opportunity for variability in behaviors to emerge.

Direct observational methods such as video recording also have high potential for use in intervention delivery. Video footage of parental feeding practices captured at family meals could be used to work with parents in identifying problematic feeding practices (e.g., restrictive feeding practices). Families could watch the video footage and then be coached how to engage in more healthful feeding practices.

Qualitative Interviews

Capturing individual family member's own words and motivations regarding specific parental and familial factors (e.g., weight talk in the home, controlling parent feeding practices) is a powerful method to gain more in-depth understanding into potential risk and protective factors, in addition to future intervention targets. Having parents discuss the weight culture in their home environment and how they engage (or not) in weight-related conversations, allows for understanding what actual weight conversations sound like, who is more likely to engage in them, how

family members respond to them when they occur, and how they are handled within the family.

These different data types are interesting on their own but are even more powerful when combined. EMA data paired with qualitative data provides important information about the fluctuating nature of parental and familial behaviors (EMA) along with narrative and descriptive information about potential motivations related to the behaviors (interview data). Quantitative data from surveys can provide variables by which qualitative data is stratified to examine research questions related to certain behaviors by group status. An example is: why do households with children who are overweight versus households with children who are nonoverweight engage in different amounts of family meals per week? By grouping the qualitative data by child weight status, important quotes from parents about how and why they carry out family meals can provide insight into future intervention targets.

Using Mixed-Methods to Examine Childhood Obesity

Mixed-methods approaches have enabled researchers to better understand the association between parent and familial factors and child weight and weight-related behaviors. Three large such studies funded by National Institutes of Health are showcased here.

Family Meals, LIVE! and Sibling Edition Studies

Family Meals, LIVE! (Berge et al., 2014) and *Sibling Edition* (Berge, Tate, Trofholz, Conger, & Neumark-Sztainer, 2016) were National Institutes of Health funded mixed-methods cross-sectional studies designed to identify key risk and protective factors for childhood obesity in the home food environment. The two studies were built on each other, with Family Meals, LIVE! being the original study and Sibling Edition being the ancillary follow-up study focused on siblings. Both studies were guided by Family Systems Theory (FST), which recognizes multiple levels of familial influences (i.e., parent, sibling, family-level) on a child's eating behaviors (Berge, Wall, et al., 2013; Bertalanffy, 1952; Whitchurch & Constantine, 1993). Direct observational data were collected including: iPad video recordings of family meals, qualitative interviews, three 24-hour dietary recalls on the target child with primary caregiver assistance, and a home food inventory. Additionally, surveys were conducted with one parent and the child enrolled in the study.

Recruitment and Eligibility Criteria Children ($n = 120$) and their families (primary caregiver, second parent, siblings, extended family members) from four primary care clinics serving diverse and low-income families in Minneapolis/St. Paul participated in Family Meals, LIVE! in 2012–2013 and Sibling Edition in 2014–

2015). A recruitment letter from the child's primary care doctor was sent to the primary caregiver of the eligible child to invite study participation. Children and their families were eligible to participate if the child was between the ages of 6 and 12 years old; had a sibling between the ages of 2 and 18 years; family members spoke and read English; and if the family ate at least three family dinners per week—in order to ensure that families who typically ate family meals together were being recruited. Based on previous literature suggesting inconsistencies in the protective nature of family meals by weight status, recruitment was stratified by weight status ($>5^{\text{th}}$ BMI %ile $< 85^{\text{th}}$ = nonoverweight; $\geq 85^{\text{th}}$ %ile = overweight/obese) to learn how family meals may function differently in these households (Berge, Wall, Hsueh, Fulkerson, & Neumark-Sztainer, 2015; Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008).

Of the 120 participants, 53% were boys and 47% were girls, with an average age of 9 (SD = 2.1; range = 6–12). Siblings were on average 9 years old (SD = 4.2; range = 2–18). The majority of parents/guardians were mothers or other female guardians (90%) and were approximately 35 years old (SD = 7.5; range = 25–65). The racial/ethnic backgrounds of the participating children were as follows: 74% African American, 18% white, 9% American Indian, 6% Asian, and 3% mixed or other race/ethnicity; parents were similarly diverse. Over 50% of the children were from very low socioeconomic status households ($< \$25,000$). The majority of parents had finished high school but had not attended college and about 50% of parents were working full or part time.

Procedures and Data Collection Families participated in two home visits. During the first home visit, families were provided an iPad and asked to record 8 consecutive days of family dinners and to capture both weekdays and weekends. Families were told to eat as they normally do, including moving to locations within the house where they typically eat their meals (e.g., family room). Additionally, families were told that the main aim of the study was to learn about what a “modern day” family meal looked like and that there was no “right” or “wrong” way to have a family meal. Families recorded the meals themselves during the observational period with no study staff present, in order to increase the feeling of a “natural” environment. The first day of recordings was used as a sensitizing period and was not included in the coding of the week-long family meal observation period.

Family Matters Study

Family Matters (Berge, Trofholz, et al., 2017) was a National Institutes of Health funded 5-year incremental (Phase I = 2014–2016; Phase II = 2017–2019), mixed-methods prospective longitudinal study carried out in the home environments of racially/ethnically diverse and primarily low-income children. The Family Matters study was specifically designed to: (a) examine in-depth the home environments of diverse families to identify novel risk and protective factors for childhood obesity

(Phase I, $n = 150$) and (b) examine these factors longitudinally within a large diverse sample to identify potential explanatory mechanisms for childhood obesity disparities (Phase II, $n = 1200$). Children and their families were from six racial/ethnic groups including African American, Hispanic/Latino, Hmong, Native American, Somali, and white. Phase I included 25 children from each racial/ethnic group. A mixed-methods analysis (e.g., EMA, video-recorded direct observations, qualitative interviews, dietary recalls, accelerometry) of the home environments of children ages 5–7 years old and their families was conducted to identify individual, dyadic, and familial risk and protective factors for childhood obesity. For Phase II, a longitudinal epidemiological cohort study of diverse children ages 5–9 years old and their primary caregiver is currently being conducted using online surveys and EMA.

Recruitment and Eligibility Criteria For Phase I, eligible children ($n = 150$) and their families were recruited from the Minneapolis/St. Paul, MN area between 2015 and 2016 via a letter sent to them by their family physician. Children were eligible to participate in the study if they were between the ages of 5 and 7 years old, had a sibling between the ages of 2 and 12 years old living in the same home, lived with their parent/primary guardian more than 50% of the time, shared at least one meal/day with the parent/primary guardian, and were from one of the six racial/ethnic categories for the study. The sample was intentionally stratified by race/ethnicity and weight status (overweight/obese = BMI $\geq 85\%$ ile; nonoverweight = BMI $> 5\%$ ile and $< 85\%$ ile) of the study child to identify potential weight- and/or race/ethnic-specific home environment factors related to obesity risk.

Procedures and Data Collection A 10-day in-home observation was conducted with each family, including two in-home visits and an 8-day direct observational period between home visits. The observational components included: (1) an interactive observational family task (Melby & Conger, 2001) using a family board game with activities around family meal planning, meal preparation, and family physical activity to measure family functioning and parenting practices; (2) EMA (Shiffman et al., 2008) surveys measuring parent stress, depressed mood, parent feeding practices, food preparation, parent modeling of eating and physical activity, and child dietary intake, physical activity, and sedentary behaviors; (3) child and parent accelerometry; (4) three 24-h child dietary recalls; (5) a home food inventory; (6) built environment block audit; (7) objectively measured height and weight of all family members; (8) a parent-completed online survey; and (9) a parent interview. All study materials were translated into Spanish, Somali, and Hmong. Bilingual staff were available at all home visits, allowing families to participate in their preferred language.

Evidence-Based Mixed-Methods Childhood Obesity Studies

The Family Meals, LIVE!, Sibling Edition, and Family Matters studies have identified important parental and familial factors related to child weight and weight-related behaviors by using mixed-methodologies and by including multiple family

members. Key findings from these studies are described below across three key research areas: (1) parent feeding practices, (2) family meals, and (3) weight-related conversations that have been shown to have consistent associations with child weight and weight-related behaviors. Details regarding which mixed-methods were utilized in each study and how these methods were essential in identifying the relationships between home environment factors and child weight and weight-related behaviors are described. In addition, topics for further study in each of the three areas are identified, followed by a discussion of related key findings from Family Meals, LIVE!, Sibling Edition, and Family Matters.

Parent Feeding Practices Prior studies have shown that food-related parenting practices such as parent feeding practices and healthfulness of foods served at family meals are associated with child weight and weight-related outcomes (Birch et al., 2003; Larson et al., 2015; Loth et al., 2016). For example, controlling parent feeding practices such as restriction and pressure-to-eat have been found to be associated with overweight (Birch & Davison, 2001; Birch & Fisher, 2000; Loth et al., 2013), unhealthy diet quality (Birch & Davison, 2001; Birch & Fisher, 2000; Fisher et al., 2002), lower satiety responsiveness (Birch et al., 2003; Fisher & Birch, 1999), and unhealthy weight control behaviors/disordered eating (Loth et al., 2014) in children and adolescents. Additionally, research has suggested that serving unhealthy foods at family meals (e.g., energy dense foods, high-fat foods, sugar-sweetened beverages) is associated with more unhealthy diet quality and overweight status in children (Cullen et al., 2003; Larson et al., 2015; Loth et al., 2016; Neumark-Sztainer et al., 2014). However, factors that influence/predict the use of these food-related parenting practices such as stress and depressed mood are not well understood. It is unknown whether certain types of stress (e.g., chronic, transient) result in different food-related parenting practices (Meyer, 2003; Pearlin, 1989). Chronic stressors are longer-lasting sources of stress (e.g., unemployment > 6 months), whereas transient or acute stressors are temporary and more quickly resolved sources of stress (e.g., momentary conflict with child; Pearlin, 1989). For example, a family experiencing unemployment or chronic illness of a family member may experience high levels of chronic stress that remain constant over days, weeks or months. On the other hand, stress experienced after a difficult encounter with a child around picky eating (transient/acute stress) in the morning may affect evening feeding practices within the day (or between days), but may not maintain across time. Distinguishing between transient and chronic stress in minority and immigrant households would be important because they may be more likely to experience both types of stress, which could put them at higher risk for engaging in restriction and pressure-to-eat feeding practices or feeding their family fast food.

Previous research on parent feeding practices has relied primarily on survey assessments and has not examined whether parent feeding practices vary across different contexts. This is problematic because survey or self-report items assume parent feeding practices are static/unchanging characteristics or trait-like. Thus, it is essential to understand whether parent feeding practices are stable (i.e., state-like) or whether they vary (i.e., trait-like) across time and context and whether parents

engage in restriction or pressure-to-eat of certain types of foods. Addressing these questions will allow for developing interventions that can potentially alter parent feeding practices to thereby reduce childhood obesity. If feeding practices vary across time and context, then targeting real-time predictors of parent feeding practices in interventions could potentially result in decreased restriction and pressure-to-eat feeding practices. It is also important to identify contextual factors occurring during the meal that are associated with using certain feeding practices. For example, if meal characteristics such as the meal atmosphere (e.g., tense, chaotic, relaxed, enjoyable) or meal type (e.g., fast food, homemade) are associated with engaging in one type of parent feeding practice or the other, then these meal characteristics can be targeted in interventions to reduce the likelihood of parents engaging in controlling parent feeding practices.

Furthermore, given that it is common for families in the U.S. to have siblings (U. S. Census Bureau, 2010), examining whether parents adapt their feeding practices to accommodate siblings' eating behaviors in the same household and whether parents use similar feeding practices with both siblings is important to investigate. Previous research examining parental feeding practices with siblings has been limited and inconclusive (Berge, Tate, et al., 2016; Costanzo & Woody, 1985). For example, research has indicated that parents use more food restriction feeding practices when they are concerned about the weight/size of one sibling, when one sibling is a picky eater or when one sibling is heavier than the other sibling (Farrow, Galloway, & Fraser, 2009; Keller, Pietrobelli, Johnson, & Faith, 2006). However, other studies have shown no significant associations between maternal feeding practices (i.e., restriction, pressure-to-eat) and sibling overweight and nonoverweight status (Saelens, Ernst, & Epstein, 2000; Wardle, Sanderson, Guthrie, Rapoport, & Plomin, 2002). Answers to these important questions have been understudied in the field of childhood obesity and are highly relevant for designing effective family-based obesity prevention interventions for families who have more than one child in their household.

Addressing questions related to parent feeding practices is crucial to development of interventions to reduce the use of unhealthy parenting feeding practices and decrease childhood obesity. Four specific questions the Family Meals, LIVE!, Sibling Edition, and Family Matters mixed-methods studies addressed include: (1) Is parent stress and/or depressed mood associated with parent feeding practices and food served at family meals? (2) Do certain types of stressors (transient vs. chronic) increase a parent's potential to engage in controlling feeding practices or to serve unhealthy foods and does this differ by race/ethnicity? (3) Are parent feeding practices variable over time versus stable and what are the predictors of engaging in specific feeding practices? and (4) Do parents use similar or different feeding practices when there are siblings in the home? Results related to these questions are shown below by identifying which study data set was utilized, the hypothesis tested, which mixed-methods measures were used in analyses, and key study findings.

Parent Stress and Mood: Parent Feeding Practices Using EMA data from the Family Matters study that measured both the exposure and outcome variables, we

examined the association between parental momentary reports of stress and mood in the morning and early afternoon and parenting feeding practices (i.e., restriction, pressure-to-eat, types of food served at meals) the same night at dinner. The main hypothesis we tested was: high parental stress and depressed mood experienced earlier in the day will be associated with controlling parent feeding practices (i.e., restriction, pressure-to-eat) and less healthful foods (i.e., pre-prepared foods, fast food) served at family meals the same evening. Our results showed that parents who reported higher stress levels and depressed mood earlier in the day used more pressure-to-eat feeding practices and were more likely to serve fast food and less homemade foods to their children at dinner the same evening (Berge, Tate et al., 2017).

Transient and Chronic Stress: Parent Feeding Practices From the Family Matters study, we utilized our longitudinal time-lagged EMA data that allowed for measuring within-day and across-day variations (i.e., transient stressors measured four times per/day, across one week) and our survey data (i.e., 30-day chronic stress self-report survey measure) to test the hypothesis: transient stressors would be more strongly associated with parent feeding practices than chronic stressors with parent feeding practices. We found that transient stressors (i.e., financial, interpersonal) were more strongly associated with controlling parent feeding practices (i.e., pressure-to-eat) and less healthy foods served at dinner (i.e., fast food) compared to chronic stress. Certain racial/ethnic groups were more likely to experience these transient stressors (i.e., African American, Native American, Hispanic; Berge, Tate, Trofholz, Fertig et al., 2018).

Variability in Parent Feeding Practices Using EMA data and self-report survey data from the Family Matters study we examined the following hypothesis: parent feeding practices will fluctuate across time and context (i.e., state-like) rather than remain stable (i.e., trait-like). Our results found that parent feeding practices (i.e., restriction, pressure-to-eat) were more state-like than trait-like (Berge, Tate, Trofholz, Loth, et al., 2018). In addition, contextual factors at the meal associated with parent feeding practices included: number of people at the meal, who prepared the meal, types of food served at meals (e.g., pre-prepared, homemade, fast food), meal setting (e.g., kitchen table, living room), and meal emotional atmosphere. Parents tended to restrict desserts and dairy and pressure children to eat fruits, vegetables, meat proteins, and refined grains. There were some differences by race/ethnicity across findings, with Hmong parents engaging in the highest levels of pressure-to-eat feeding practices.

Parent Feeding Practices with Siblings Using the Family Meals, LIVE! and Sibling Edition's quantitative survey data and qualitative interviews, the following hypothesis was tested: siblings will have different eating behaviors, and parents will use different feeding practices with siblings when siblings are discordant on weight status (i.e., one child is overweight and one child is nonoverweight). Results showed that when sibling dyads were discordant on weight status, the sibling who was overweight had higher food enjoyment and lower levels of food satiety (Berge, Tate,

et al., 2016). Additionally, within discordant weight status siblings, parents were more likely to use restrictive feeding practices with siblings who were overweight and pressure-to-eat feeding practices with siblings who were nonoverweight (Berge, Meyer, MacLehose, Loth, & Neumark-Sztainer, 2016; Berge, Tate, et al., 2016). Qualitative findings showed that parents used child food preferences, in-the-moment decisions, and planned meals when deciding how to feed siblings (Berge, Trofholz, Schulte, Conger, & Neumark-Sztainer, 2016). Additionally, the majority of parents indicated that they managed picky eating by making one meal or giving some flexibility/leeway to siblings about having other food options. Furthermore, parents endorsed using different feeding practices with siblings (e.g., food restriction, portion control, pressure-to-eat, opportunities for healthful eating) dependent on child weight status or age/developmental stage.

Family Meals Cross-sectional and longitudinal research over the last decade has consistently shown that having frequent family meals is associated with a number of health benefits for children including increased fruit and vegetable intake (Gable & Lutz, 2000; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003), lower levels of extreme weight control behaviors (Neumark-Sztainer, Eisenberg, Fulkerson, Story, & Larson, 2008), and better psychosocial health (Eisenberg, Olson, Neumark-Sztainer, Story, & Bearinger, 2004). These protective associations in children have been found across gender, race/ethnicity, and socioeconomic status (SES; Gable, & Lutz, S., 2000; Neumark-Sztainer et al., 2003). Furthermore, some studies have shown significant associations between the frequency of family meals and reduced risk of childhood obesity, although findings have been inconsistent across studies (Fulkerson et al., 2008; Gable, Chang, & Krull, 2007; Larson, Neumark-Sztainer, Hannan, & Story, 2007a). However, important questions regarding family meals and child weight and weight-related behaviors remain. Examples of important areas to examine are dyadic (e.g., parent/child, child/sibling) and family-level interpersonal and food-related dynamics at family meals, such as communication, group enjoyment, and parental food intrusiveness. Characteristics of family meals such as who is present, number of distractions (e.g., electronics, leaving the table) or length of the meal may give a more comprehensive understanding of the characteristics of family meals that increase their protective nature. Examining interpersonal and food-related dynamics between family members during family meals may lead to identifying modifiable factors in the home. That could inform childhood obesity intervention development aimed at increasing the frequency of family meals and improving the emotional quality of meals. Findings may also inform recommendations for health care providers working with families with school-aged children.

Given the high prevalence of childhood obesity (Larson et al., 2008; Larson et al., 2009; Larson, Neumark-Sztainer, Hannan, & Story, 2007b; Ogden et al., 2006), it is important to know whether differences in family meals exist between households with children who are overweight/obese and children who are nonoverweight. Establishing what meal-level characteristics differ between families that have frequent and infrequent family meals could identify protective factors that other families could engage in to increase the protective nature of family meals.

Furthermore, it would be important to understand the intergenerational transmission of family meals to help more families be able to carry out family meals.

These important unanswered questions related to family meals were examined in the Family Meals, LIVE!, Sibling Edition, and Family Matters mixed-methods studies.

Family Meals, Family Dynamics, Childhood Obesity Risk Using the Family Meals, LIVE! video-recorded data, we tested the association between dyadic and familial interpersonal interactions at family meals and risk for childhood obesity. The main hypothesis of this study was that families with more positive interpersonal (i.e., parent/child, sibling) and food-related dynamics during family meals would have children who are less likely to be overweight/obese. We found that positive family-level (i.e., parent, study child, siblings) and parent-level (i.e., parent/child dyad) interpersonal dynamics (i.e., warmth, group enjoyment, parental positive reinforcement) at family meals were associated with reduced risk of childhood overweight (Berge et al., 2014). Additionally, significant associations were found between positive family-level and parent-level food-related dynamics (i.e., food warmth, food communication, parental food positive reinforcement) and reduced risk of childhood obesity.

Intergenerational Transmission of Family Meals Using the Family Matters qualitative and quantitative data, themes were identified by race/ethnicity and immigrant/refugee status to understand how family meals were transmitted from one generation to the next. Parents overwhelmingly reported learning as children that family meals were important and then conveying this message to their own children (Berge, Miller et al., 2018). Length of time in the U.S. appeared to drive parent responses. For example, parents who were immigrant/refugees and had been in the U.S. longer were more likely to endorse learning/teaching about family meal importance; that the food eaten now is different than when parents growing up; that a chaotic environment was a challenge to having family meals; and that they accommodate family member's schedules in order to have family meals. Differences also existed among racial/ethnic groups. For example, Somali parents frequently endorsed having no challenges with intergenerational transmission of family meal practices, whereas Native American and white families identified difficulties in continuing family meals across generations.

Family Meals: With and Without an Overweight Child The Family Meals, LIVE! qualitative and quantitative datasets were used for this analysis. Qualitative data were coded for family meal-level themes. Data was then stratified by child overweight and nonoverweight status to identify potential family meal-level risk and protective factors for child weight and weight-related behaviors in the home environment. Results showed some similarities and some differences in family meal-level characteristics by child weight status (Berge, Hanson, & Draxten, 2016). Similar themes between families with and without an overweight/obese child included family meals provide more healthful food; families have rules about manners; families use meal planning strategies; and families involve children in meal

preparation. Themes that were different between families with and without an overweight/obese child included connection and communication (nonoverweight households), “clean your plate rule” (overweight households), use of electronic devices at meals (overweight households), and child behavior problems (overweight households).

Frequent and Infrequent Family Meal Households The Family Meals, LIVE! qualitative and quantitative datasets were used for this analysis. Qualitative data were coded for themes related to family meals and were then stratified by family meal frequency to identify potential family meal-level risk and protective factors for child weight and weight-related behaviors in the home environment. Results indicated some similar meal characteristics (e.g., child picky eating) between households having frequent and infrequent family meals. Differences existed between households having frequent family meals (e.g., importance of family meals, more flexibility in the definition of family meals, more family meal rules, no pressure-to-eat feeding practices) versus infrequent family meals (e.g., more pressure-to-eat parent feeding practices, family meals are dinner meals only, and more difficult meal time behaviors; Berge, Draxten, et al., 2018).

Weight-Related Conversations Prior research has shown that weight talk and weight teasing are associated with the onset of obesity, disordered eating behaviors (e.g., binge eating, fasting), early dieting, and psychosocial problems (e.g., depression, low self-esteem) in children (Balantekin, Savage, Marini, & Birch, 2014; Berge, MacLehose et al., 2013; Hanna & Bond, 2006; Neumark-Sztainer et al., 2010). Of concern, many children report that family members are a main source of weight talk or weight teasing (Balantekin et al., 2014; Neumark-Sztainer et al., 2010). However, little is known about what weight talk and weight teasing actually sound like in the home environment. Given the negative consequences of weight talk and teasing, it is important to know more about their occurrence in the home such as what types of weight talk and teasing occur in the home environment; why do families engage in weight talk or teasing; which family members (e.g., parents, brothers, sisters) are more likely to engage; and how is weight talk and teasing handled when it occurs?

In addition, it is important to distinguish between weight-focused and health-focused conversations. Past research has suggested that there are two different types of conversations that parents/family members engage in with their children regarding weight and health including: (1) *weight-focused conversations* where comments are made about the child/adolescent’s weight, shape, or size or they are encouraged to diet or lose weight and (2) *health-focused conversations* where comments are about healthy eating and being physically active to have a strong body (Gillison, Lorenc, Sleddens, Williams, & Atkinson, 2016). Prior research has shown that weight-focused conversations are associated with overweight/obesity, dieting, unhealthy weight control behaviors (e.g., binge eating, skipping meals, taking diet pills or diuretics), and low psychosocial well-being (e.g., depressive symptoms, low self-esteem, low body satisfaction) in children and adolescents (Bauer et al., 2013;

Berge, MacLehose, et al., 2013; Berge, MacLehose et al., 2015; Berge, Winkler et al., 2018; Davison & Deanne, 2010; McCormack et al., 2011; Neumark-Sztainer et al., 2010), and that the impact of these weight-focused conversations tracked from childhood/adolescence into adulthood (Berge, Winkler, et al., 2018). Whereas, other prior studies have shown that health-focused conversations are associated with more healthful weight and weight-related behaviors and better emotional well-being outcomes in children and adolescents (Berge, MacLehose, et al., 2015; Berge, Trofholz, Fong, Blue, & Neumark-Sztainer, 2015; Gillison et al., 2016; Trofholz, Tate, & Berge, 2018). Taken together, these results suggest that health-focused conversations may be a more positive way to approach and address concerns about child weight and/or weight-related behaviors compared to weight-focused conversations. However, because limited studies have been conducted on health-focused conversations it is not clear what form they take, how families/parents engage in them with their children, and whether families who use them are more likely to have children who are nonoverweight/obese. These unanswered questions were examined in the Family Meals, LIVE!, Sibling Edition, and Family Matters mixed-methods studies. Results are presented below.

Parent Weight-Related Conversations Using Family Meals, LIVE! qualitative data, a grounded theory analysis found the following two overarching themes and their sub-themes related to parental engagement in weight-related conversations: (1) weight talk contradictions occurred when parents said they did not use weight conversations in their home, but then identified examples of how weight-related conversations occurred; (2) parents used both overt (intentional) and covert (unintentional) weight-related conversations with their children; reciprocal teasing occurred in the household (i.e., one family member would tease another and then that family member would tease back); and cultural factors related to weight talk/teasing were common (i.e., it is expected that family members will be blunt about weight, shape or size in some cultures; Berge, Trofholz, et al., 2015).

Family-Level Weight Conversations Family Meals, LIVE! and Sibling Edition quantitative data were used to examine the prevalence of negative weight-based talk across mothers, fathers, older/younger brothers, and older/younger sisters and the likelihood of engaging in negative weight-based talk by specific family members. In addition, the qualitative data from Sibling Edition were used to provide a more in-depth picture of what negative weight-based talk sounded like in the home environment. Children reported the highest prevalence of negative weight-based talk from siblings (older brothers in particular) followed by mothers (Berge, Hanson-Bradley, Tate, & Neumark-Sztainer, 2016). In households with younger brothers, children reported less negative weight-based talk compared to other household compositions. Both quantitative and qualitative results indicated that mother's negative weight-based talk focused on concerns about child health, whereas father's and sibling's negative weight-based talk focused on child appearance and included teasing.

Weight Conversations With and Without an Overweight Child in Household Family Matters quantitative data were used to stratify qualitative themes related to weight- and health-focused conversations by child overweight versus nonoverweight status. Results showed that parents of children who were nonoverweight engaged in fewer weight-focused conversations. Rather, they (1) focused on child growth, (2) emphasized that differences in people's body shape and size are normal, (3) took the other person's perspective, and (4) engaged in health-focused conversations emphasizing dietary and physical activity patterns, focusing on physical health, being supportive and encouraging in their language with their children, and shifting potential weight-focused conversations to health-focused conversations (Berge, Trofholz, Danner, Brandenburg, & Loth, [in press](#)). Results indicated that parents of children who were overweight/obese engaged in more weight-focused conversations by (1) being direct, (2) teasing, (3) using mixed weight- and health-focused conversations, (4) discussing health consequences of being overweight/obese, and (5) critiquing their own weight.

Developing Mixed-Methods Family-Level Childhood Obesity Interventions

Real-Time Interventions: Parental and Family Factors

Results from the Family Meals, LIVE!, Sibling Edition, and Family Matters mixed-methods studies have implications for family-based interventions targeting child weight and weight-related behaviors. Specifically, the findings from EMA data in the Family Matters study showing parent feeding practices were more likely to be variable (i.e., state-like) and that parental stress was associated with more controlling feeding practices and less healthful foods being served at family meals, can inform future interventions targeting momentary influences on food-related parenting practices. Intervention methods such as ecological momentary intervention (EMI) will allow for intervening on participants' behaviors in real time, based on previous information participants have provided (e.g., level of stress), to promote behavior change (Clough & Casey, 2011; Heron & Smyth, 2010). For example, a participant responds to a text early in the day regarding their stress level and sources of stress (e.g., too much to get done). An EMI message is then sent later in the day that provides suggestions to support them in making a healthful choice for family meals in the face of stress (e.g., tip for making a quick pasta meal more healthful by adding vegetables; Fertig et al., 2019; Noar, Harrington, Van Stee, & Aldrich, 2011; Rimer & Kreuter, 2006). The Family Matters research team is currently pilot testing this approach.

Video Feedback on Parent/Family Behaviors at Meals

Results from Family Meals, LIVE! and Sibling Edition show that interpersonal dynamics during family meals were associated with increased risk for childhood obesity. Findings can be used to create interventions using video feedback to intervene on parental and child behaviors at family meals. For example, parents and children can be video recorded during family meals to capture interpersonal dynamics, parent feeding practices, and healthfulness of foods served at meals. Interventionists can code these data and provide feedback, using a strengths-based approach such as motivational interviewing, to parents and children about behavior change during family meals to improve the quality of the meal—both the interpersonal interactions and the healthfulness of food served. The Family Meals, Live! and Sibling Edition research team is currently pilot testing this approach.

Interventions Including Multiple Family Members

Findings from Family Meals, LIVE!, Sibling Edition, and Family Matters showed that mothers and brothers were more likely to engage in weight-related conversations, but motivations for engaging in weight-related conversations differed (i.e., mothers = health concern; siblings/fathers = appearance concerns). These findings suggest that including multiple family members in family-based interventions targeting weight-related conversations may be necessary and that intervention components may need to be tailored to specific family members. In addition, findings related to parents engaging in different feeding practices with siblings depending on whether one was overweight or not can set the stage for informing interventions in parental feeding practices and child eating behaviors when there are multiple children in the home.

Conclusions

The prevalence of childhood obesity may have started to plateau for some groups of children (Bethell, Simpson, Stumbo, Carle, & Gombojav, 2010; NIHCM, 2007; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). However, other groups such as children from low-income, minority, or immigrant households are experiencing disparities in childhood obesity (Ogden, Lamb, Carroll, & Flegal, 2010; Orsi, Hale, & Lynch, 2011; Wang, Orleans, & Gortmaker, 2012). Given the known health risks (Daniels, 2006; Gordon-Larsen, The, & Adair, 2010; Merten, 2010; Pi-Sunyer, 2002; Popkin, 2007; Stovitz et al., 2010; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997), societal burden (Finkelstein, Trogdon, Cohen, & Dietz, 2009), and health-care costs (Finkelstein et al., 2009) associated with childhood obesity, addressing

child weight and weight-related behaviors is critical. This chapter has highlighted the importance of utilizing mixed-methodologies and multiple family members when examining parental and familial factors of importance to child weight and weight-related behaviors. These methods can help move the field forward in understanding and intervening on this important public health problem.

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