



Creating Healthy Nutrition Environments

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CREATING HEALTHY NUTRITION ENVIRONMENTS

NEHA KHANDPUR

A Dissertation Submitted to the Faculty of
The Harvard T.H. Chan School of Public Health
in Partial Fulfillment of the Requirements
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Harvard University
Boston, Massachusetts.

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CREATING HEALTHY NUTRITION ENVIRONMENTS

Abstract

The home nutrition environment and the consumer nutrition environment present two important settings for addressing the high prevalence of overweight and obesity among children and adults. They provide the broader context for the three papers that constitute this dissertation.

Chapters 1 and 2 are situated within the home nutrition environment and further our understanding of the role that fathers play in child feeding. Semi-structured interviews were conducted with 40 fathers and qualitative methods were used to organize and analyze the data. Both papers draw from the same data set. **Chapter 1** identified the strategies used by fathers to feed their children or, their food parenting practices. Thematic analysis was conducted to identify 13 responsive practices and 7 unresponsive practices. Differential use of food parenting practices was found by fathers' education and residential status.

Chapter 2 examined how fathers and mothers co-parent around responsibilities for child feeding tasks and FPPs used. Sixty two percent of the fathers used a variety of approaches to manage planning, procuring and preparing food along with the mother. Co-operative FPPs around structuring, monitoring and organizing the child's meals were reported by 46% of fathers. Forty percent reported instances of conflicting FPPs regarding access to energy-dense, nutrient-poor snacks and introducing variety in the diet. Dissimilarities in practices were driven by differences in parental eating habits, feeding philosophies and concern for child health. They resulted in the practices of one parent being undermined and in child tantrums or refusal to eat.

Chapter 3 is based within the consumer nutrition environment. The goal of this randomized, controlled, experimental study was to test the influence of different formats for

displaying added sugars on consumer understanding, perceptions, and purchase intentions.

Amazon's Mechanical Turk was used to recruit 2,509 U.S adults. Participants were randomized to one of eight display formats and responded to a quiz that assessed study outcomes. Displaying added sugars in relative formats (grams accompanied by high/medium/low text, % DV, or the combination of the two) led to the most accurate understanding of added sugars content and judgments about product healthfulness. None of the eight display formats impacted purchase intentions.

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Chapter 1. Diversity in fathers' food parenting practices: A qualitative exploration within a heterogeneous sample

Neha Khandpur^{1*}, Jo Charles¹, Rachel E. Blaine², Christine Blake³, Kirsten Davison^{1, 4}

¹ Department of Nutrition, Harvard T.H. Chan School of Public Health, Harvard University, Boston, Massachusetts

² Department of Family and Consumer Sciences, California State University, Long Beach, Long Beach, California

³ Department of Health Promotion, Education, and Behavior, University of South Carolina, Columbia, South Carolina

⁴ Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Harvard University, Boston, Massachusetts

*Corresponding author

Abstract

Background: Food parenting practices (FPPs) are important in shaping children's dietary behaviours. However, existing FPP knowledge is largely based on research with mothers.

Objectives: This study (1) identified fathers' FPPs; (2) described differences in FPP use by fathers' education and residential status.

Methods: Semi-structured interviews were conducted with 40 fathers (39 ± 9.1 years; 37.5% non-residential; 40% $\geq$ college education). Interviews were audio-recorded and transcribed. NVivo 10 was used for theme detection, categorization and classification using inductive and deductive approaches. FPPs were identified and their relative distribution was examined across education and residential status.

Results: Twenty FPPs were identified - 13 responsive practices and 7 unresponsive practices. *Having food rules* was the most common responsive FPP (81.5%), followed by *feeding on schedule* (60%) and *making healthy food accessible* (60%). Common unresponsive FPPs were *letting child dictate preferences* (70%), *incentivizing food consumption* (60%) and *pressuring the child to eat* (35%). Compared to fathers with a college education, more fathers without a college education reported *letting child dictate preferences* (92% vs. 37%), *educating their children about food* (37% vs 12%), fewer reported *feeding on schedule* (50% vs. 75%), *modelling healthy practices* (29% vs. 50%), and *using distraction to feed* (4% vs. 37%). Compared to residential fathers, more non-residential fathers *monitored* (60% vs. 40%) or *encouraged* (60% vs. 36%) child food intake and *let child dictate preferences* (87% vs. 60%).

Conclusion: Fathers used an extensive variety of FPPs, similar to those identified in mothers.

Further study on the influence of fathers' education and residential status on FPP use is warranted.

Background

The pediatric literature on father involvement suggests that fathers are increasingly involved in food-based interactions with their children (Jones & Mosher, 2013). Fathers of young children consider child feeding well within their proximal role as parents. Their engagement during mealtimes ranges from structuring the meal, and employing strategies to feed their children (Horodyski & Arndt, 2005) to determining correct portion sizes and types of foods eaten (Vollmer, Adamsons, Foster, & Mobley, 2015b). Quantitative data collected from over 400 fathers of preschool aged children reiterate the significant role that fathers' play in shaping their children's meal times (Mallan et al., 2014). Fathers who report eating meals frequently with their children consider themselves responsible for organizing a child's meal at least half of the time, deciding what foods to feed the child and how much to offer (Mallan, et al., 2014). This growing involvement in what was traditionally the mother's domain, can be attributed to a number of societal changes including changing responsibilities induced by increased maternal employment (Yeung, Sandberg, Davis-Kean, & Hofferth, 2001), evolving family structures (Cooksey & Fondell, 1996), changing social expectations (Yeung, et al., 2001) and an expanding sense of paternal identity (Blake et al., 2009; Rane & McBride, 2000).

Food parenting practices have consistently been associated with child weight (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Johannsen, Johannsen, & Specker, 2006; Khandpur, Blaine, Fisher, & Davison, 2014). Often used interchangeably with feeding practices, food parenting practices are defined as specific behaviors or strategies employed by parents to manage how much, when and what their children eat (Gerards & Kremers, 2015; Gevers, Kremers, de Vries, & van Assema, 2014; Hughes et al., 2013; Jansen, Daniels, & Nicholson, 2012). Food parenting practices play an important role in shaping child food preferences and eating patterns

(L. L. Birch, 1999). Responsive practices that attend to child's cues of hunger and fullness, make healthy foods available and accessible and facilitate children's autonomy in food selection and energy regulation, are found to be protective against childhood obesity (Pinquart, 2014; Sleddens et al., 2014). On the other hand, unresponsive food parenting practices are characterized by a lack of reciprocity between parent and child and serve to limit children's food autonomy and disregard their satiety cues (L. Birch & Ventura, 2009; Black & Aboud, 2011). Unresponsive food parenting practices such as pressuring a child to eat or being excessively indulgent of children's food requests, may increase risk for childhood obesity (L. L. Birch, Fisher, & Davison, 2003; DiSantis, Hodges, Johnson, & Fisher, 2011; Hurley, Cross, & Hughes, 2011).

Assessing fathers' influence on child weight through their food parenting practices is therefore, important to address childhood obesity. However, barring a few exceptions (Pulley, Galloway, Webb, & Payne, 2014; Vollmer, Adamsons, Foster, & Mobley, 2015a), fathers are conspicuous by their relative absence from the feeding literature. Existing knowledge about the relationship between food parenting and child eating behavior and weight status comes largely from research with mothers (Faith, et al., 2004; Hurley, et al., 2011). Moreover, mothers oftentimes serve as proxy reporters for fathers' food parenting practices, which may bias the resulting information on fathers' food parenting and mask any true differences that exist between parents. Fathers may use different food parenting practices to mothers or use specific practices more or less often than mothers. Evidence from the child development literature indicates that fathers manage, interact and play with their children differently than mothers (Craig, 2006; Paquette, 2004; Parke & Sawin, 1976) and there is some suggestion that such differences may play out in the domain of food parenting as well (Khandpur, et al., 2014). These qualitative and quantitative differences are important to study but are currently lacking in the literature.

Contextual and socio-demographic differences in fathers' food parenting have also received comparatively little attention. Data have primarily been collected from White, well-educated fathers, co-habiting with the mother and the child (Khandpur, et al., 2014). An understanding of the association of socio-demographic factors is important for two reasons. Firstly, these factors have been shown to be differentially associated with food parenting practices. For instance, low-income parents report using higher levels of coercive food parenting practices compared to White, high income parents (Huang et al., 2012; Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2013; Wehrly, Bonilla, Perez, & Liew, 2014). Secondly, the prevalence of obesity is unequally distributed across social strata, being highest among ethnic and racial minorities (Ogden, Carroll, Kit, & Flegal, 2014). Successful strategies for addressing obesity in these vulnerable populations, therefore, need to be sensitive to a variety of contextual realities. While there is growing understanding of differences in food parenting by ethnic origins and income levels (Anderson, Nicklas, Spence, & Kavanagh, 2010; Clark et al., 2008; Hughes et al., 2006; Pesch, Harrell, Kaciroti, Rosenblum, & Lumeng, 2011; Vollmer & Mobley, 2013), differences by education levels and parent residential status (i.e., whether or not a parent lives with a child) are less frequently studied, particularly in fathers.

In short, there are tremendous gaps in our understanding of fathers' food parenting practices that warrant a more nuanced assessment. This paper provides a detailed analysis of fathers' food parenting practices based on interviews with 40 fathers from diverse backgrounds. Study objectives were to (1) identify the specific food parenting practices utilized by fathers and (2) describe how these practices varied by fathers' education levels (no college vs. college) and their residential status (not residential with child vs. residential with child).

Methods

Study design

Qualitative interviews were conducted to provide an in-depth description of the specific food parenting practices adopted by fathers. An initial phase of the study helped inform the design of qualitative data collection instruments and the data analysis plan. Important field-level partnerships with community based organizations, local governments and experts on fatherhood were established during this initial phase, as was a growing database of fathers from across the U.S. These provided invaluable assistance with study recruitment. Community partners included family service agencies, fatherhood programs and local departments of health. This initial phase also provided preliminary quantitative evidence on the high levels of paternal engagement in the preparation and provision of meals and snacks for their children. Data were collected using an online survey from a geographically diverse sample of fathers. The 303 fathers who participated (33% non-White; 32% no college degree) reported providing or preparing a meal or snack for their children an average of 6.6 times /week. Also, they ate 8.3 (± 4.7) meals with their children every week (data not published).

Ethical approval for the study was obtained from the Harvard T.H. Chan School of Public Health, Office of Human Research Administration (IRB number 13-0679).

Participant recruitment

A combination of purposive stratified sampling and snow-ball sampling was used to recruit an approximately equal number of fathers with high and low levels of education, while factoring in diversity in their residential status. Data saturation was informed by evidence-based recommendations for non-probabilistic sample sizes for interviews (Guest, Bunce, & Johnson,

2006; Patton, 1990; Teddlie & Yu, 2007), and was expected upon recruiting 40 fathers with a minimum of 12 fathers in any group examined (e.g., residential versus non residential). Four distinct recruitment strategies were used to maximize variation in education levels and residential status of the sample. First, all fathers who had participated in the initial phase of the study and had agreed to be contacted again were invited through email or phone calls, to participate. Second, fathers were directly recruited at local fatherhood and community-based events, from multiple localities within Boston, Cambridge, Fitchburg and New Bedford. Third, participant fathers were encouraged to invite people from their social networks to participate in the study. Finally, community-based partners were sent emails and flyers that they distributed to the population of fathers they served. All English-speaking, adult US men, who self-identified as a father of a child between the ages of 2-10 years were eligible to participate.

Data collection procedures

Data were collected using individual, semi-structured interviews. Interviews were conducted in person or by phone, with phone interviews reserved for participants residing outside of the New England area. Several strategies were employed to maximize the quality of the data collected. In-person interviews were conducted at easily accessible and quiet locations to ensure respondent privacy and comfort and facilitate interviewer-participant rapport. All interviews were conducted by trained research assistants (NK, JC) and typically lasted 60-90 minutes. Written informed consent was obtained from all respondents. Participants were reimbursed \$80 for an in-person interview (including travel compensation) and \$40 for interviews conducted over the phone. The interviews were conducted between June and September 2014.

Data collection instruments

A semi-structured interview guide, with follow-up questions and suggested probes, was used to structure the interview (see Table 1). The guide was informed by the conceptual model proposed by Faith et al., that highlights the contextual influences (parental attributes, environmental factors and child attributes) on food parenting practices and their subsequent influence on child outcomes (Faith et al., 2012). While the interview was not strictly structured, questions were asked in largely the same sequence. Interview questions were framed to be neutral, non-judgmental and open ended. In instances when the father had more than one child in the age range of 2 – 10 years, fathers were asked to respond with reference to the younger child in this age bracket. The interview guide was pretested with 4 fathers, not included in the final sample, to ensure that all questions were unambiguous, minimized one-word responses and encouraged discussion. Example scenarios and probes were simplified and the interview guide was revised based on their feedback. All interviews were audio-recorded, transcribed verbatim.

Table 1.1: Sample questions from the interview guide

Domain	Sample questions
Background	Walk me through a typical weekday. Can you talk about the typical interactions around feeding your child through the day? What does a typical weekend day look like? What are some of your CHILD's favorite foods? What about foods CHILD dislikes? Is there anything that I should know about him/her to help me understand your approach to feeding him/her?
Feeding roles and responsibilities	What is important to you when you feed your child? Do you have any meal rules or practices that you frequently follow? What might these be? Do you think that food plays an important role in your interaction with your CHILD when you spend time with her/him? How/why might that be? What about your other children: do you have a similar role in feeding them?
Food parenting practices	Do you face any challenges with regards to feeding CHILD? What might these be? Tell me about a time when it was difficult to get CHILD to eat. What did you do? Can you tell me about some of the things you do to encourage CHILD to eat more/less? Do you have any concerns about your child's eating patterns or diet? What would these be? Do you have any concerns about how much CHILD eats? Why/why not?

Data organization

Coding and codebook development. The interview transcripts were imported into QSR NVivo 10 where they were organized and sorted into themes or 'coded'. The iterative process of coding involved theme detection, categorization and classification (Ritchie, Lewis, Nicholls, & Ormston, 2013).

Theme detection - First, a list of structural codes to identify the demographic characteristics of the sample (age of father, target child, marital status of father, ethnicity, education level etc.) was developed. Transcripts were then read in full and all passages in the transcripts that indicated a food parenting practice were identified. Food parenting practices (themes) were defined as goal-directed strategies, behaviors and/or observable interactions between father and child, in settings where feeding occurs, during an eating occasion, that intend to change the content, amount, duration, or frequency of the child's food consumption (Gerards & Kremers, 2015; Hughes, et al., 2013).

Theme categorization - Twenty transcripts (50%) were re-read and specific food parenting practices (themes) that emerged from the transcripts were identified. This generated an initial list of distinct, broadly defined food parenting practices. Subsequently, themes and their definitions were refined based on: (1) their appropriateness to capture food parenting practices across all 40 transcripts, (2) existing theory and published research on food parenting practices, (3) consensus reached through peer review and (4) consultations with 3 experts in food parenting. This iterative process of data triangulation resulted in precise definitions and ensured verifiability and validity of the emergent themes (see Table 2). It also led to the concurrent development of a codebook. The codebook contained a list of every structural code and theme (identified by its thematic code), a detailed definition including instances of when it should and should not be applied and excerpts of interview text that served as examples of when that code was applicable (see Appendix 1). The lead author developed the codebook and coded the interviews (NK), with feedback from the senior authors (KD, CB). Twenty percent of the transcripts were independently double-coded by two co-authors (JC, RB) to ensure appropriate

identification of text and consistent application of the codes. Any discrepancies in coding were discussed and resolved by the team and the codebook was revised accordingly.

Theme classification - Further analysis of the data followed the building of a thematic framework as suggested by Ritchie and colleagues (Ritchie, et al., 2013) where the list of themes were linked and grouped into categories (see Figure 1). These broad categories (*autonomy support, structure, coercive control and permissiveness*), informed by existing literature (Davison et al., 2015) were further grouped into overarching, higher order categories (*responsive and unresponsive food parenting practices*) (Black & Aboud, 2011; Hughes, Power, Fisher, Mueller, & Nicklas, 2005; Hurley, et al., 2011; Sleddens, et al., 2014). In this way an analytical framework was developed and applied across all 40 transcripts. The entire coding process used a combination of inductive and deductive approaches – the process of theme identification and definition was inductive while a deductive approach was used for theme refinement and for the development of the theoretical framework.

Data analysis

Following data coding and the finalization of the specific food parenting practices the relative distribution of the reporting of each food parenting practice was examined for all fathers. The distribution was also assessed for fathers with and without a college degree and for residential and non-residential fathers. Single fathers and fathers who lived with their partner and child 100% of the time were categorized as ‘residential’ while those that shared custody with another caregiver, had visitation rights only or fathers with whom the child did not reside 100% of the time were termed ‘non-residential’. This categorization presented distinct and mutually independent categories.

Table 1.2: Theme categorization and refinement of food parenting practices

Emerging themes (Initial list)	Refined themes (Based on theory and existing literature)	Final themes and definitions (Based on expert consultations and peer review)
1. Feeding on schedule	Feeding on schedule	1. Feeding on schedule Controlling feeding time. Quotes that indicate regimen, structure, consistency in meal timings or a set routine in eating practices.
2. Encouraging/ pressuring	Pressure/ encouragement to eat	2a. Pressuring the child to eat Using verbal or physical pressure to increase food intake that may range from stern instruction to forcing or physically making the child eat. May or may not be accompanied by reasoning or justification for the action. 2b. Encouraging the child to eat Verbally encouraging the child's intake of certain foods. May or may not be accompanied by games, reasoning or justification for the action.
3. Using incentives to encourage healthy eating	Instrumental feeding	3a. Incentivizing food consumption Using food, play or TV to stimulate the child to eat. Includes instances where the father withholds these incentives until <u>after</u> the child eats the food in question. 3b. Using food as a reward Using food as a reward for the child's behavior that does not involve eating.
4. Modeling good eating practices		4. Modeling eating practices Displaying and role modeling eating practices and behaviors, to influence the child's eating behaviors. This strategy is employed by the father where either he or a family member's serves as the model for good eating practices.
5. Using distraction to feed	Using distraction to feed	5a. Using distraction to feed Purposefully structuring the child's environment to distract the child <u>during</u> an eating episode to promote intake of food. 5b. Minimizing distraction while feeding Minimizing distraction to help child focus on food intake.
6. Food rules	Food rules	6. Having food rules Predictable practices involving food and drink that the child is aware of, that are generally considered non-negotiable. Includes limits set on amount and time at which food is eaten. May also be institutionalized feeding practices or articulated expectations.
7. Persisting through initial rejection of food	Patience and persistence	7. Being patient and persistent Giving the child time with the food, persisting through initial rejection of the food. Also includes quotes that indicate repeated exposure to the food.

Table 1.2: Theme categorization and refinement of food parenting practices (Continued)

8. Monitoring snack intake	Monitoring food access, availability and amount	8a. Monitoring Keeping track of child's appetite, kinds of food/drink consumed and their portion sizes.
	Changing food presentation, quality or quantity	8b. Making healthy food available Making healthy purchases, having healthy foods present at home or when the child is away, in order to increase intake of certain food.
		8c. Making healthy food accessible Making foods available in a form and at a time that facilitates consumption. Changing the presentation, serving size, method of preparation or flavor of the food or drink, to increase the likelihood of being eaten by the children. Also includes instances where father provides appropriate alternatives. These strategies are generally not perceived by the child.
9. Restricting / limiting access to certain foods	Restricting / limiting access to certain foods	9. Restricting consumption of food Using harsh verbal or physical measures to restrict the child's intake of certain foods and/or beverages. May or may not be accompanied by reasoning or justification for the action.
10. Indulging the child	Indulging the child	10. Letting child dictate food preferences, timing Allowing the child to direct all decisions around meal timings, choice of meals, snacks or beverages meals and snacks including when, where and how much they ate with few boundaries or limits. Having low or no limits on amount of snacks and sugary beverages consumed by the child.
11. Other strategies	Using food to bond	11a. Using food to bond with the child Using time spent eating to bond with the child, using food to show affection.
	Being responsive	11b. Responding to child cues Being aware of and responsive to child's cues of hunger and satiety. Factoring in child preferences, past foods eaten into decision, anticipating child hunger.
	Supportive strategies	11c. Introducing variety in the diet Exposing the child to a wide variety of food products. Including different food groups at every meal.
		11d. Educating about food Teaching the child about healthy foods, appropriate portion sizes, consequences of eating certain foods.
		11e. Involving child in food selection or preparation Giving the child controlled choice, letting the child pick what to purchase at a grocery store or prepare for a meal. Also includes instances where the child assists in meal preparation.

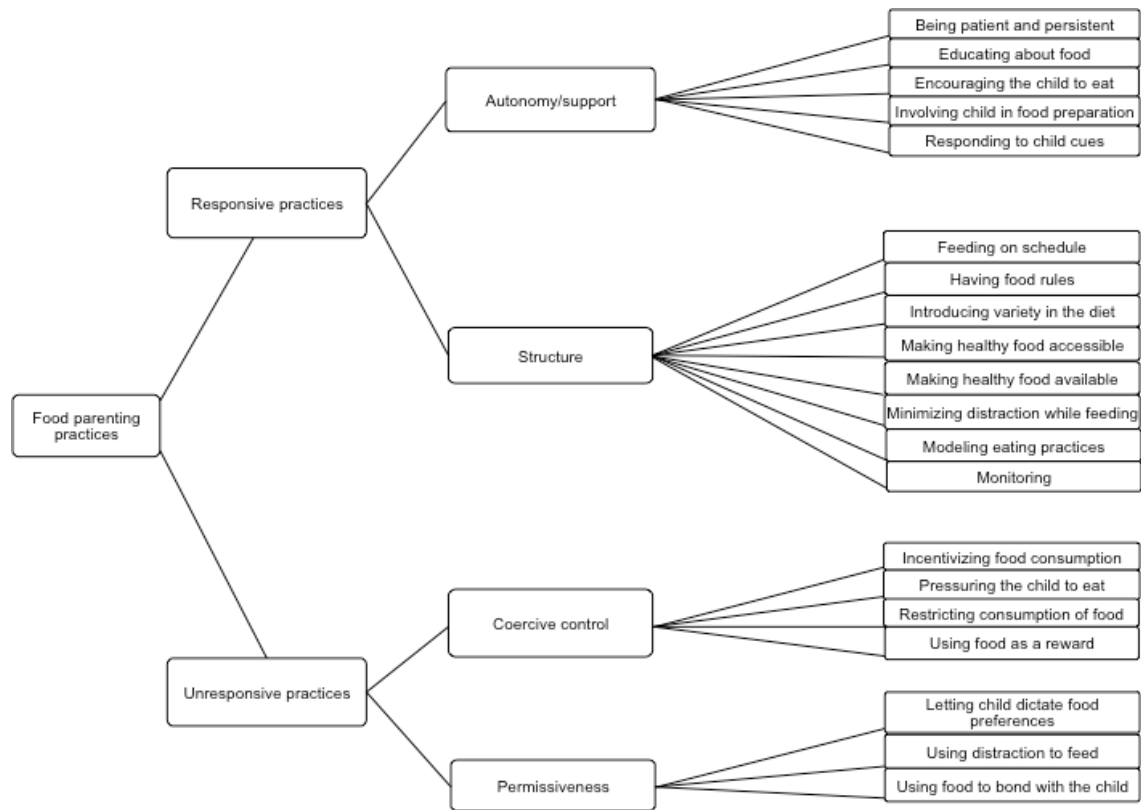


Figure 1.1: Theme classification and thematic framework

Results

Participant characteristics

Participating fathers ($n = 40$; mean age 39 ± 9.1 years) were recruited from the existing database of fathers ($n = 11$, 27.5%), fatherhood events ($n = 4$, 10%) and through snowball techniques ($n = 3$, 7.5%) and referrals from community based partners ($n = 22$, 55%). Thirty interviews (75%) were conducted in-person and 10 interviews (25%) were conducted over the telephone. A similar number of White (40%) and Black (47%) fathers were included (see Table 3). Almost 40% of the fathers were non-residential and either shared custody with the other caregiver (the mother in most instances, $n = 10$) or had child visitation rights only ($n = 5$). A similar percentage of fathers had a college education or higher ($n = 16$).

Table 1.3: Participant characteristics

Characteristics	Total sample N= 40	
Age (mean years, SD)	39.1	(± 9.1)
Age range of target child (n, %)		
2-5	25	62.5
6-10	15	37.5
Sex of target child (n, %)		
Male	21	52.5
Female	19	47.5
Race (n, %)		
Black	19	47.5
White	16	40.0
Asian	1	2.5
Native American	1	2.5
Mixed	2	5.0
Hispanic	1	2.5
Education level (n, %)		
High school/GED	12	30.0
Some college	12	30.0
College graduate	5	12.5
Postgraduate	11	27.5
Employment status (n, %)		
Employed / self employed	30	75
Unemployed	10	25
Living arrangement/residential status (n, %)		
Residential, child and partner	19	47.5
Residential, single father	6	15.0
Non-residential, shared custody	10	25.0
Non-residential, visitation only	5	12.5
Relationship status w.r.t mother of target child (n, %)		
Married/ in a relationship	19	47.5
Divorced/ separated	21	52.5

Some demographic differences were observed for fathers with and without a college degree and for residential and non-residential fathers. Compared to fathers with a college education and higher, those with less than a college education (n = 24) were older (mean age 41.6 years vs 35 years), non-residential (58% vs 19%), had children over the age of 5 (54% vs 12%) and self-reported their race/ethnicity as Black (62% vs 25%). Compared with residential fathers, a greater percentage of non- residential fathers (n=15) were also older (mean age 40.4 years vs 38.3 years), unemployed (33% vs 20%), with less than college education (80% vs 48%),

and reported their race/ethnicity as Black (60% vs 40%). An equal percent of both residential and non-residential fathers had children between 2 – 5 years of age (60%).

Food parenting practices

Twenty unique food parenting practices were identified in this sample of fathers (see Figure 2). On average, fathers reported using 8 unique food parenting practices in their interactions with their children around food. The most common food parenting practices - *having food rules* and *letting child dictate food preferences* - were reported by over 70% of fathers, followed by *incentivizing food consumption*, *making healthy food accessible* and *feeding on a schedule* each of which were reported by approximately 60% of fathers. The least common food parenting practices were *restricting food consumption*, and *using distraction to feed* which were reported by less than 20% of fathers. Overall, more responsive food parenting practices than unresponsive food parenting practices were reported by fathers.

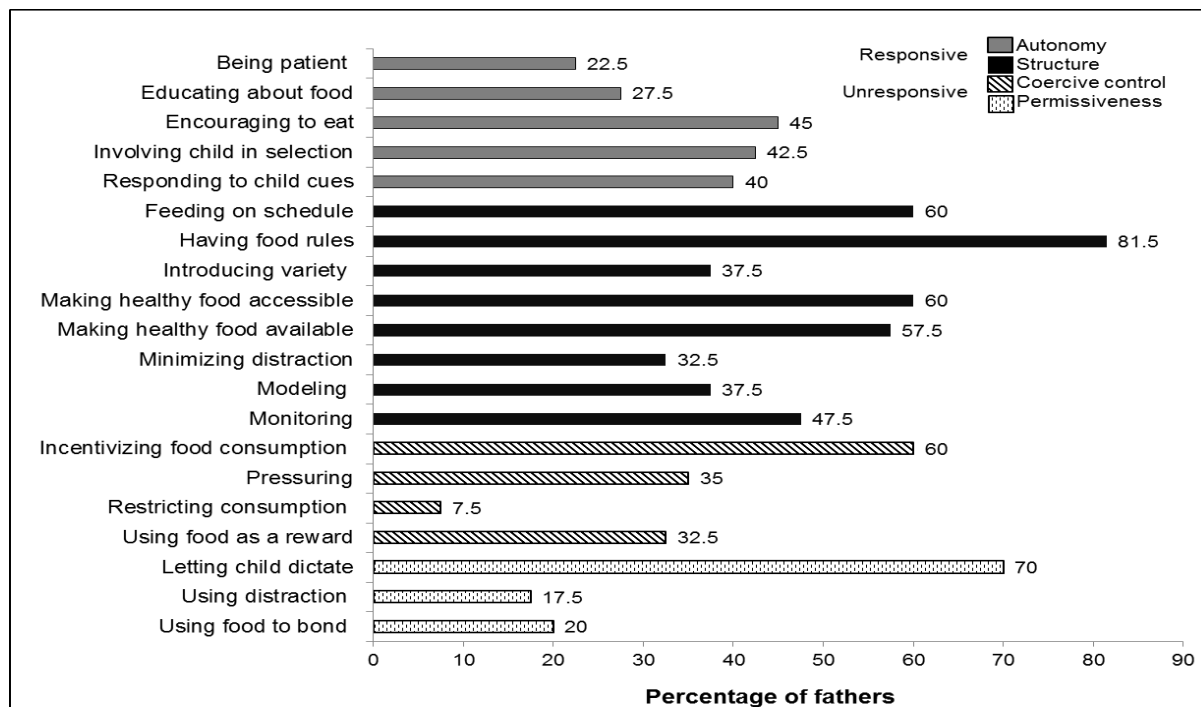


Figure 1.2: Food parenting practices, N = 40

1. Responsive food parenting practices

Thirteen responsive practices were identified of which five practices indicated autonomy support, and eight indicated structure.

1.1 Practices indicating autonomy support

One in five fathers mentioned giving their child time with the eating process. They persisted through the initial rejection of the food, especially new food, and repeatedly offered the same food to the child in an effort to get them to try it. As one father explained:

“I try to be persistent. If he tells you ‘no,’ it’s ‘cause it’s an automatic response. Just keep trying.” – Being patient and persistent.

Nearly 30% of the fathers spoke to their children about appropriate portion sizes, the benefits of eating healthy foods and the consequences of eating unhealthy food.

“Hey, you wanna be smart. You gotta feed your brain. You wanna be strong. I just tell him that to make him see that it’s important to eat healthy.” - Educating about food.

Nearly half the fathers encouraged their children to eat food, fruits and vegetables in particular and to taste unfamiliar foods.

“I encourage him to take a bite. Why don’t you take a bite first, and let’s see? He’s usually pretty good about, if we do that, he’ll take a bite.” - Encouraging to eat.

About 40% of the fathers involved children in the selection or preparation of a dish for a meal or in the selection of food items while grocery shopping. A father who took his son shopping said:

“I’ll say to my son, you’re gonna give me a hard time over vegetables today, so pick a vegetable you’ll eat today and we’ll go home and cook it.” - Involving child in food selection or preparation.

Fathers were sensitive to child hunger and fullness cues. They anticipated and prepared for child hunger by organizing food or snacks in advance and factored child preferences for specific food into their feeding decision. A father who regularly packed his child’s lunch said:

“I always pack her an extra snack because I know after camp, she’s gonna be really hungry.” - Responding to child cues.

1.2 Practices indicating structure

Sixty percent of the fathers reported that they had a feeding routine where children were fed at specific times during the day. This applied to both meals and snacks. These routines were

consistent through the week, with some fathers alluding to flexibility over the weekends and holidays.

“Pretty much everything is on the schedule. He’ll eat breakfast no later than nine. Lunch is no later than one. As for dinner, he’s not going to eat after 8:00. It doesn’t matter what day it is.” - Feeding on schedule.

Over 80% of the fathers had food rules that applied to the eating environment such as location of meals (e.g., “*We eat at the kitchen table.*”), use of electronics, (e.g., “*No TV while they’re eating.*”), dining etiquette (e.g., “*No elbows on the table.*”), finishing a meal (e.g., “*They are not to get up until they finish eating.*”), types of food (e.g., “*She has to take a bite of everything.*”), and amounts of some foods, especially snacks (e.g., “*She can only have one treat a day.*”).

Over 35% of fathers included food from different food groups at every meal and exposed their children to a wide range of foods to ensure variety in the diet.

“I like to introduce new things to the kids once in a while and open up their minds to trying new stuff.” - Introducing variety in the diet.

In an effort to get their children to try new foods or eat less-liked foods, particularly vegetables, fathers often cooked foods differently or used additional condiments. As one father explained:

“There’re some vegetables that he still hasn’t really become comfortable with, like broccoli, spinach. I’ve been able to mix it in and figure out ways around that. I make a turkey burger with spinach in it, like a lot of spinach. It’s basically a spinach burger with a little bit of turkey, and he eats that.” - Making healthy food accessible.

Fathers also indicated using additional condiments, offering healthy alternatives, camouflaging vegetables, or getting creative with presentation. They resorted to serving smaller portions, and either not telling the children what ingredients went into the meal or telling them it was a food they liked.

“We’ll try to mix it in other foods, to see if he likes it that way and chop it up and we’ll see if he’ll eat it with that.” – Making healthy food accessible.

About 60% of the fathers controlled the availability of food at home by making healthy food purchases and limiting junk food. This control extended outside of home too as fathers often packed meals for their children to take to school or day care.

“I pack her a lunch.”; “I try to give him bags of fresh fruit with a few cherries, strawberries, sliced apple, peanut butter.” - Making healthy foods available.

One in three fathers minimized distraction during meal times to help their child focus on eating.

“I turn the TV off while we eat.” - Minimizing distraction while feeding.

Over 35% modeled good eating behavior – either eating healthy food or limiting intake of unhealthy food – in an attempt to have their children follow suit. Partners, siblings and toys were also used by fathers to model desired eating behaviors.

“I’d tell her ‘Oh Wa-Wa (toy) just had some of that. Wa-Wa liked it a lot, maybe you should try it.” - Modeling eating practices.

Nearly half of the fathers monitored the kinds of food, particularly snacks, their children consumed, the portion sizes and the times at which they were eaten and actively factored that into any subsequent decisions they made about feeding their children.

“I’m really conscious of the amount of food me and my son eat, all the time.” -

Monitoring.

This involved day-to-day monitoring of foods and general appetite and also extended across longer periods of time.

“I’m always trying to figure out what he’s eating, trying to count it as best I can so I know what he ate in the last meal, so I can think about what he needs to eat that next meal.” - Monitoring.

2. Unresponsive food parenting practices

Although responsive food parenting practices were widely reported by fathers, a large majority of fathers also reported using unresponsive approaches. A total of seven unresponsive food parenting practices were identified including three practices which reflected permissiveness and four that indicated coercive control.

2.1 Practices indicating coercive control

In an attempt to increase food consumption, particularly that of fruit and vegetables at meal times, 60% of fathers reported using sugary snacks or beverages as rewards for eating or withheld TV or play time until after the child finished eating.

"If you don't finish your dinner, you're not gonna be able to have the dessert that I bought tonight." - Incentivizing food consumption with food, play, TV.

Nearly one in three fathers resorted to using pressure to get their children to eat.

“Now eat. I’ll sit at the table with him. You can’t leave this table until you eat.”- Pressuring the child to eat.

Fewer than 10% of the sample reported verbally or physically limiting the intake of sugary snacks and beverages, candy or junk food. As one father explained:

“I take it away from her and not give it back to her. Then she’ll throw a fit.” - Restricting consumption of food.

One in three fathers used sugary snacks to reward good behavior. This included rewarding their children for cleaning their room, putting toys away, being a good listener, being respectful or doing what was asked of them.

“Every morning before we put him on the bus, if he’s good, he gets a glazed donut.” – Using food as reward.

Interestingly, 42% of the fathers explicitly mentioned not using pressure to feed their child (*“If she don’t want it, she don’t want it. I don’t force it upon her.”*). A few fathers (17%) also mentioned not incentivizing food intake to get their children to eat (*“I’m against bribing her. I want her to really enjoy the feeding experience.”*).

2.2 Practices indicating permissiveness

Seventy percent of the fathers reported instances in which their child directed all decision making around meals and snacks including when, where and how much they ate with few boundaries or limits imposed by fathers.

“I try to give him what he wants. He’s kind of spoiled.” - Letting child dictate food preferences, timings.

Fathers infrequently (17.5%) resorted to distracting their children into eating food during mealtimes using the TV or other screen-time devices or playing music. One father explained having the TV on while feeding his child:

“He’s looking at it the whole time. I feel like that keeps him focused.” - Using distraction to feed.

In addition, one in five fathers used an eating occasion to bond with their child or used food to show affection. Sugary snacks were most commonly used by fathers to show affection and love to their children.

“I believe chocolate makes me happy. So when I come home from work I’ll bring her a little big piece of chocolate.” - Using food to bond with the child.

3.0 Variation in practices by education levels and residential status of fathers

There was some overlap in the types of food parenting practices used by fathers with a college level education and higher (n = 16) and fathers with less than a college education (n = 24). Looking specifically at responsive practices, about 80% of fathers from both groups had *food rules* while eating, and about 56% *made healthy food available and accessible* to their children. Nearly 50% *encouraged* their children to eat, and *monitored* food intake. Some unresponsive practices were also reported to a similar extent. Sixty percent of fathers from both groups *incentivized food consumption* and about 30% from both groups *pressured* their children to eat.

There were also some noteworthy differences by fathers’ education level. Within responsive food parenting practices, a seemingly higher percentage of fathers with a college education reported *feeding on schedule* (75% vs 50%) and *modeling eating practices* (50% vs 29%) compared with fathers with less than a college education, whereas a greater proportion of fathers with less than college education *educated their children about food* (37% vs 12%). Among unresponsive food parenting practices, more fathers with a college education reported

using distraction to feed (37% vs 4%), while nearly all the fathers with less than a college education *let children dictate food preferences* (92% vs 37%) and *used food to bond with their children* (29% vs 6%) compared to fathers with a college education.

A higher percentage of residential fathers reported the responsive practices of providing *food on schedule* (72% vs 40%) and *modeling eating practices* (48% vs 20%) compared to non-residential fathers, whereas a higher percentage of non-residential fathers *monitored food intake* (60% vs 40%) and *encouraged their child to eat* (60% vs 36%). Among unresponsive feeding practices, non-residential fathers reported *restricting food intake* (20% vs 0%) and *letting children dictate food preferences* (87% vs 60%) to a greater extent than their residential counterparts. All other food parenting practices were reported by a similar proportion of residential and non-residential fathers.

Discussion

The objective of this study was to identify and describe the strategies that fathers used to feed their children aged 2-10 years. A total of 20 food parenting practices were identified in this sample, indicating the diversity of strategies employed by fathers. A greater proportion of these practices were responsive. They either encouraged or supported child autonomy and independence (autonomy support) or helped to organize the feeding environment to improve child competence in choosing and eating meals (structure). A small proportion of practices reported in this sample of fathers indicated the lack of reciprocity between father and child. These unresponsive practices were characterized by the use of excessive control over child feeding by disregarding child's independence, manipulating a situation with food or being indulgent to their child's food requests and demands.

While coercive and permissive practices constituted a minority of the total practices identified, at the individual level, the use of these unresponsive practices was not inconsequential. For instance, a majority of the sample reported using seemingly contradictory food practices of *having food rules* and *letting the child dictate food preferences*. Similarly 60% reported *feeding on schedule* and *making healthy options accessible and available* but the same proportion also *incentivized food consumption with food, play or TV*. The dichotomy in use of practices possibly reflects real-life feeding situations where fathers have to contend with multiple factors including child eating temperaments, food preferences and personal characteristics that often times are at odds with their feeding goals. The existing literature has identified several factors that predict use of food parenting practices. Some of these include parental weight, eating issues, perceptions of child weight, concern for child weight (Francis, Hofer, & Birch, 2001), psychosocial factors (Mitchell, Brennan, Hayes, & Miles, 2009) and child adiposity (Francis, et al., 2001). The complex interactions among these factors in predicting fathers' food parenting practices warrants further assessment. Links between responsive and unresponsive food parenting practices and the circumstances of their use could be explored further in future research.

Differences by fathers' education and residential status were examined to further explore the role that contextual and socio-demographic factors play in the use of food parenting practices. In general, there were many similarities in the practices used for the demographic groups assessed. However, there was some indication of differential use of structural and permissive food parenting practices by education levels of fathers. A recent review suggests that education is positively associated with increased structure and organization of the feeding environment through greater accessibility of fruit and vegetables (Zarnowiecki, Dollman, &

Parletta, 2014). Education might reflect inherent capacity to access, process and interpret nutritional information and use it to inform behavior. High education has also been associated with less permissive practices (Vereecken, Keukelier, & Maes, 2004) and less use of food as a reward (Adnan & Muniandy, 2012).

This is one of the first studies to examine differences in food parenting practices for residential and non-residential fathers. Given the inherent complexity in defining residential status, especially in cases of shared custody, *a priori* categories were created where fathers who resided with their children 100% of the time were identified as residential. There was a suggestion of differential use of structural practices by fathers' residential status – more residential fathers reported using structural practices. No study has examined differences in feeding practices by residential status and prior research is limited to outcomes that are suggestive of mealtime structure (number of family meals eaten) and dietary behaviors in children (breakfast consumption). In these studies, children in single parent families, reconstituted or blended families, or those who live without parents are more likely to have unhealthy eating habits such as irregular breakfast consumption, irregular meal consumption, lower vegetable intake and lower diet quality compared to children living with both parents (Baek, Paik, & Shim, 2014; Jorgensen, Pedersen, Meilstrup, & Rasmussen, 2011; Levin, Kirby, & Currie, 2012; Pearson, Atkin, Biddle, Gorely, & Edwardson, 2010; Sisson, Sheffield-Morris, Spicer, Lora, & Latorre, 2014). However, this pattern has not always been significant (Berge, Meyer, MacLehose, Eisenberg, & Neumark-Sztainer, 2014). Also, nonresident father engagement has been linked to healthier eating patterns, an increased frequency of eating breakfast and lunch and an increased consumption of vegetables among adolescents in single-parent homes (Stewart & Menning, 2009).

All food parenting practices reported by fathers in this sample have been previously identified in the general child feeding literature (De Lauzon-Guillain et al., 2012; Vaughn, Tabak, Bryant, & Ward, 2013). This is an important finding, with several implications. Since research on mothers forms a large part of the current literature base, these results suggest that mothers and fathers use conceptually similar food parenting practices. As previously suggested, any differences between parents likely reflects quantitative (i.e., reflecting differences in frequency of use of specific practices) rather than qualitative (i.e., the types of practices utilized) differences in food parenting (Khandpur, et al., 2014; Pulley, et al., 2014). Finally, results from the study suggest that existing tools measuring food parenting practices that were originally created for and validated in mothers, may be applicable to ethnically similar groups of fathers. When comparing results from this study with prior research, there is insufficient evidence of variance in the food parenting constructs between mothers and fathers to warrant the development of unique father and mother parenting behavior measures. More research however is needed to corroborate this suggestion, especially among ethnically- and geographically-diverse population groups.

This study is one of the first to provide an in-depth assessment of fathers' food parenting practices in a diverse sample of fathers, including residential and non-residential fathers with varying levels of education. Additional strengths include the comparatively large number of interviews completed and the rigorous interview procedures utilized (e.g., use of a piloted interview guide, checking for consistency of responses and the use of neutral probes) to ensure credible and high quality reports from fathers. Moreover, the triangulation techniques used to analyze and interpret the data minimized researcher bias and helped establish descriptive, interpretive and theoretical validity. Weaknesses of the study include self-selection into the study

and the possibility of social desirability in responses. Also, while an enquiry into the socio-demographic differences in practices was attempted to generate hypothesis for further testing, education and residential status in this sample are likely to be confounded by other demographic factors like fathers' age, and income.

Conclusion

This study addresses the dearth of research on paternal food parenting practices to inform policy, programs, and practice. On the whole, this study indicates that fathers are involved in child feeding and use an extensive variety of food parenting practices. Through these practices, fathers influence the foods eaten both at home and at venues outside the house. Continued efforts to elucidate paternal influences on children's eating behaviors are critical to guiding obesity prevention and treatment efforts. The results from this study help identify the different types of food parenting practices used by fathers. Further qualitative research could help describe the goals, values, contexts and motivations for use of such practices as well as differences by child gender. More research is also required to test the differential use of food parenting practices by education levels and living arrangements as suggested by this study. Longitudinal data will help further elucidate temporality, stability and bi-directionality of such practices, effect on child eating patterns and long-term outcomes in children and allow for comparative assessment with mothers. On the policy front, the study highlighted the active role fathers play in child feeding, reiterating the need to include fathers in family based obesity prevention efforts. Social services, food assistance programs, educational campaigns and other community engagement programs could increase their impact by tailoring services to better address the needs of fathers from different education and residential contexts.

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Appendix 1.1. Codebook

#	Feeding practices	Examples of quotes
Responsive feeding practices: Autonomy support		
7.	Being patient and persistent Giving the child time with the food, persisting through initial rejection of the food. Also includes quotes that indicate repeated exposure to the food.	a. I try to be persistent. "If he tells you 'no,' it's 'cause it's an automatic response. Just keep trying. b. I try to give her some wait time too. I know it's a process as well. c. I try to just keep introducing it to him, keep introducing it to him.
11d.	Educating about food Teaching the child about healthy foods, appropriate portion sizes, consequences of eating certain foods.	a. She will keep eating until I tell her, "You cannot cause you'll get sick". b. "Hey, you wanna be smart. You gotta feed your brain. You wanna be strong." I just tell him that to make him see that it's important to eat healthy. c. We talk about serving sizes a lot because she needs to know she could only have the serving size.
2b.	Encouraging the child to eat Verbally encouraging the child's intake of certain foods which may or may not be accompanied by games, reasoning or justification for the action. These strategies are perceived by the child and are milder than 2a.	a. She be like "No, daddy," and I be like, "Come on. We gotta eat a banana or something". b. "You better hurry up or you going to get left behind. You better get to it. You better finish that". c. We'll still encourage them to have a bite. We encourage that, but there's not a consequence, if they don't.
11e.	Involving child in food selection or preparation Giving the child controlled choice, letting the child pick what to purchase at a grocery store or prepare for a meal. Also includes instances where the child assists in meal preparation.	a. When I'm with the children, I try to change the menus up and make events like pizza night. They get to make pizza with me and get the dough. b. We give them the option. We have the school lunch menu in front of us every weekend and we say, "Okay, out of these meals at school, which ones would you like to have this week?" c. We do a family night. We'll let the children choose what we're having for dinner.
11b.	Responding to child cues Being aware of and responsive to child's cues of hunger and satiety. Factoring in child preferences, past foods eaten into decision and anticipating child hunger.	a. "It's dinner time. How do you feel? Do you feel hungry?" Usually, the answer is, "I don't know." It's not until I start cooking, and the aroma starts going through the house that he realizes, "Oh, crap. I'm hungry." That's what I thought. b. I always pack her an extra snack because I know after camp, she's going to be really hungry. c. "Daddy, I'm done." I'm like, "Oh, okay." I saw. He did eat enough.
Responsive feeding practices: Structure		
1.	Feeding on schedule Controlling feeding time. Quotes that indicate regimen, structure, consistency in meal timings or a set routine in eating practices.	a. He has an eating routine, he eats on schedule. b. And they're on a set schedule as far as that (mealtimes). c. I try not to be too on demand, though. I do try to keep a schedule within a timeframe.

Codebook (Continued)

6.	Having food rules	Predictable practices involving food and drink that the child is aware of, that are generally considered non-negotiable. Includes limits set on type, amount and time at which food is eaten, particularly snacks. May also be institutionalized feeding practices or articulated expectations and can be double coded where necessary.	a. She can only have one treat a day. b. She has to take a bite of everything. c. There was definitely no, eating after 8:00. That was like a strict rule.
11c.	Introducing variety in the diet	Exposing the child to a wide variety of food products. Including different food groups at every meal.	a. I switch it up. b. I like to introduce new things to the kids once in a while and open up their minds a little bit to trying new stuff. c. I try to broaden her palate. We've been a couple of times to eat Japanese food, and she gets to have chopsticks.
8c.	Making healthy foods accessible	Making foods available in a form and at a time that facilitates consumption. Changing the presentation, serving size, method of preparation or flavor of the food or drink, to increase the likelihood of being eaten by the children. Also includes instances where father provides appropriate alternatives. These strategies are generally not perceived by the child.	a. We'll try to mix it in other foods, to see if he likes it that way and chop it up and we'll see if he'll eat it with that. b. I suppose there's some vegetables that he still hasn't really become comfortable with, like broccoli, spinach, things like that. I figured out how to make a turkey burger with spinach like a spinach burger with a little bit of turkey, and he eats that. c. I like broccoli, corn, string beans, I'll mix it up in different ways or season it in a different way.
8b.	Making healthy foods available	Making healthy purchases, having healthy foods present at home or when the child is away, in order to increase intake of certain food. Code instances where father exerts control over food eaten away from home (restaurants/school).	a. I try to give him bags of fresh fruit with a few cherries, strawberries, sliced apple, peanut butter. b. If you'll let him, he'll eat the whole package. I try to limit those things around the house cause, if he sees it, that's all he wants. c. I try to keep up with healthy foods and healthy choices. Not to give her a lots of junk.
5b.	Minimizing distraction while feeding	Minimizing distraction to help child focus on food intake.	a. Shut off the TV, physically pick him up, put him in his chair. That works sometimes. b. I let his food distract him. If I have the TV on or anything else other than food it's not going to happen. c. Around the table-time atmosphere, no. We don't like the distraction. Anything that we can do to avoid the distraction, that's how we want to do it at mealtime.
4.	Modeling eating practices	Displaying and role modelling eating practices and behaviors, to influence the child's eating behaviors. This strategy is employed by the father where either he or a family members serves as the model for good eating practices.	a. Mainly we'll show 'em that mommy and daddy like vegetables. The main thing is we try to show 'em that we like it, 'cause that gets him to eat it. b. Go eat your apple, mommy. Daddy gonna eat an apple. I try to teach her to eat an apple. c. It's like if he's not feeling it, I'll eat it with him to show him, "Hey, it's good. It tastes good, you should try it".

Codebook (Continued)

8a.	Monitoring	Keeping track of child's appetite, kinds of food/drink consumed and their portion sizes. Effects subsequent intake of food.	a. She asks, "Dad, I had a healthy snack after lunch, so does that mean I can have a sugar snack now?" I'm like, "You ate healthy before, you had a banana, so yeah. If you want a few cookies or something sugary, that's fine now." b. I'm really conscious of the amount of food me and my son eat, as well, at that time. c. Her eating habits go up and down. I start seeing her play with it like she doesn't want it. Then the next week, she's hungry all the time.
Unresponsive feeding practices: Coercive control			
3a.	Incentivizing food consumption with food, play, TV	Using food, play or TV to stimulate the child to eat. Includes instances where the father withholds these incentives until <u>after</u> the child eats the food in question.	a. We use toys a lot as a thing to say, "Okay, this is your reward for eating your vegetables, which are good for you." b. "If you finish this, then we can go get an ice cream," or, "If you finish this, we'll have movie and snack night tonight." c. I tell her if you finish your food you can watch TV.
2a.	Pressuring the child to eat	Using verbal or physical pressure to increase food intake that may range from stern instruction to forcing or physically making the child eat. May or may not be accompanied by reasoning or justification for the action.	a. You're not budging. I know you want to play a game (but you got to eat your vegetables. b. We'd be more likely to put something on our son's fork and say, "Here, take a bite." Then he'll take a bite. c. Now eat. I'll sit at the table with him. You can't leave this table until you eat.
9.	Restricting consumption of food	Using harsh verbal or physical measures to restrict the child's intake of certain foods and/or beverages which may or may not be accompanied by reasoning or justification for the action.	a. I be just, "You ain't going to get no junk, so get out of here. No. b. I take it away from her and not give it back to her. Then she'll throw a fit. c. She started eating' that, and it was like, "Hold up. Nope. That's it. Wrap it up. Eat that later. Can't eat that right now."
3b.	Using food as reward	Using food to reward the child for behavior that does not involve eating.	a. Every morning before we put him on the bus, if he's good, he gets a glazed donut. b. If I want her to do something, I'll say, "Well, if you want a cookie, you got to clean up your mess." Yeah, I'll bribe her. c. He might want a snack, or want somethin' sweet, and I might say, "Okay. Take your shoes to your room, and I'll get you a snack."
Unresponsive feeding practices: Permissiveness			
10.	Letting child dictate food preferences, timing	Giving in to child's demands for meal timings, choice of meals, snacks or beverages. Having low or no limits on amount of snacks and sugary beverages consumed by the child.	a. I try to give him what he wants. Like I said, he kind of spoiled. b. They pick through their food and then they wake up 12:00 at night and say, "Daddy, I'm hungry." Then which we still always give in to 'em. c. I had to go visit somewhere and we went to Dunkin' Donuts or something'. I had brought her the nuggets and then she wanted sweets.

Codebook (Continued)

5a.	Using distraction to feed Purposefully structuring the child's environment to distract the child <u>during</u> an eating episode to promote intake of food.	a. Sometimes he'll eat by himself, but sometimes he just seems a little active or distracted, so sometimes he'll eat and watch TV. b. Just distract her, you can, "Oh, what's that over there, yeah, let's check that out," done. She loves music, so you can kind of distract her with that. c. He's looking at it the whole time. I feel like that keeps him focused, though.
11a.	Using food to bond with the child Using time spent eating to bond with the child, using food to show affection.	a. She loves when I do stuff like that (bring home treats). I might come home, put my hand behind my back. She like, "What you got, daddy?" She'll start laughing and playing. I say, "I ain't got nothing for you." "Yes, you do." I say, "No, I don't." b. You want a piece of my burger, here I want you to have a piece. c. I do believe chocolate makes me happy. So when I come home from work I'll bring her a little big piece of chocolate you know?

Chapter 2. Fathers' perspectives on co-parenting in the context of child feeding

Neha Khandpur^{1*}, Jo Charles¹, Kirsten Davison^{1, 2}

¹ Department of Nutrition, Harvard T.H. Chan School of Public Health, Harvard University,
Boston, Massachusetts

² Department of Social and Behavioral Sciences, Harvard T.H Chan School of Public Health,
Harvard University, Boston, Massachusetts

*Corresponding author

Abstract

Background: Fathers are increasingly involved in child feeding and it is crucial to understand how mothers and fathers co-parent.

Objectives: To examine (1) how parents managed responsibilities for child feeding tasks; (2) the extent to which fathers' food parenting practices (FPP) were co-operative vs. conflicting with those of the mother.

Methods: Semi-structured interviews were conducted with 37 fathers (38 ± 9.1 years, 48% divorced/separated, 40% non-residential). Thematic analysis, conducted in QSR NVivo 10, identified the following themes: 'Co-parenting approaches in child feeding tasks', 'Co-parenting approaches in food parenting practices', and 'Disagreement resolution'. Variations within themes were examined by fathers' relationship status.

Results: Sixty two percent of the parents used a variety of approaches to manage planning, procuring and preparing food: (a) parents performed the same task together; (b) each parent was responsible for specific tasks; (c) each parent was responsible for the same task on specific days. Eighty three percent of parents were married/in a relationship. In 38%, food parenting tasks were the responsibility of one parent. Co-operative FPP around structuring, monitoring and organizing the child's meals were reported by 46% of fathers. Forty percent (equal number was married/in a relationship or divorced/separated) reported instances of conflicting FPP regarding access to energy-dense, nutrient-poor snacks and introducing variety in the diet. Dissimilarities in practices were driven by differences in parental eating habits, feeding philosophies and

concern for child health. They resulted in the practices of one parent being undermined and in child tantrums or refusal to eat.

Conclusion: This study identifies potential sources of inconsistencies in components of co-parenting that would be important to address in future interventions.

Background

With 23% of preschool-aged children and over 34% of school-aged children overweight or obese between 2011 – 2012 (Ogden, 2014, 2012), the prevalence of overweight and obesity remains high (Pan, 2012). During infancy and early childhood, parents have the largest influence on their children's food and activity behaviors (Nadar, 1993). Parents' knowledge, attitudes, beliefs, food choices and parenting practices directly and indirectly shape their children's food and activity choices which in turn can lead to positive energy balance, weight gain and obesity (Golan, 2004). Elucidating parental influences on child energy regulation is therefore crucial to understanding and addressing childhood obesity.

The existing body of evidence in this field is heavily focused on mothers. Researchers have been slow to recognize fathers as important agents in influencing childhood obesity. Despite the growing involvement of fathers in child rearing (Pew, 2013, Yeung, 2001; Jones, 2013; US Census Bureau, 2011) prompted by important socio-cultural changes, their rates of inclusion in research remain low (Phares, 2005). The literature on food parenting provides some evidence of their underrepresentation (Rasmussen, 2006; Wang, 2011). In a review of determinants of children's fruit and vegetable intake, only 11% of the studies included fathers in their sample (Rasmussen, 2006). Similarly, in a systematic review of the parent-child resemblance in dietary intake only 6 of the 24 studies included fathers (Wang, 2011). Family-based childhood intervention studies have equally low representation of fathers (Panter-Brick, 2014). Moreover, the few studies that have included fathers have small sample sizes, recruit fathers through mothers or children and focus on White, well-educated fathers, cohabiting with the child's mother (Khandpur, 2014). As family structures evolve (Vaughn, 2016) and gender-based parenting roles converge (Kwon, 2012), studying fathers becomes a research priority, not

only to further our understanding of their role in child feeding as it relates to the child but also to the child's mother.

A small emerging literature has begun to uncover fathers' role in food parenting. A recent study has shown that fathers employ a wide variety of food parenting practices (Khandpur, 2016) or strategies to manage how much, when and what their children eat (Gevers, 2014; Hughes, 2013). Similar to mothers, fathers adopt both unresponsive (permissiveness, coercive control) and responsive (autonomy support, structure) food parenting practices (Khandpur, 2016). Differences in the frequency that mothers and fathers use specific food parenting practices have also been examined. While there is suggestion that fathers may use coercive food parenting practices to feed their children more often than mothers (Hendy, 2005; Pulley, 2014; Lloyd, 2014), more research is warranted to confirm these initial findings.

Examining mother-father interactions in the context of food parenting from a co-parenting perspective is an important next step to build upon the growing understanding of individual parental effects on child weight outcomes. Co-parenting is a construct that captures the extent to which mothers and fathers coordinate, support, or undermine each other's parenting efforts (Minuchin, 1974, McHale, 1997) across diverse family structures, including single parents (Van Egeren, 2004). It includes verbal and non-verbal negotiations between parents in and outside the presence of the child (LeRoy, 2013). Co-parenting has been extensively studied in the child development literature which consistently demonstrates the association with co-parenting and cognitive, social and emotional outcomes in children (Marsiglio, 2000). For instance, higher co-parental cooperation is associated with significantly higher levels of self-soothing in children (Feinberg, 2009) Conversely, children display higher levels of aggression and anti-social behaviors in the presence of conflicting or undermining co-parenting (Schoppe,

2001). On the policy front, these findings have also contributed to an increase in support for father involvement in child welfare interventions (Fagan, 2015).

To our knowledge, no previous research has examined how mothers and fathers co-parent in the context of food parenting. The general lack of recognition of fathers in food parenting and the consequent gap in understanding the nature of the co-parenting dynamics hinders our ability to work with the entire family to counter obesity. With the evolution of the family structure and varying mother-father partnerships, from intact unions to shared custody, identifying possible co-operating and conflicting practices between mother and father co-parenting would strengthen the capacity to design and deliver effective family-based interventions. This objective motivated the present study to examine co-parenting dynamics in the context of food parenting. Qualitative methods were employed to unpack the nature of mother-father co-parenting, specifically their approaches in division of responsibilities and the interaction in their food parenting practices. A diverse sample of fathers of children aged 2 to 10 years was interviewed to document their perspectives on:

1. The division of responsibility between both parents for tasks related to child feeding.
2. The extent to which fathers' food parenting practices were consistent and supportive vs. conflicting with those of the mother and, in instances where conflicting practices were identified, the potential sources and perceived consequences of conflicting practices.

Methods

Study design and participant recruitment

In-depth, semi structured interviews were conducted with fathers to elicit information on their experiences feeding their children. Qualitative interviewing is best suited to revealing

important insights about family functioning, inter-parental dynamics and task sharing and the possible effects that could have on child eating behavior and subsequent child weight. This methodology would deepen understanding and generate new avenues for further research. Details on study methodology including study design and participant recruitment can be found elsewhere (Khandpur, 2016). Briefly, participants were recruited using a combination of purposive stratified sampling and snowball sampling techniques. These techniques were used to ensure diversity in the education levels and residential status of the sample. English-speaking, adult US men, who self-identified as fathers to a child between the ages of 2-10 years, were eligible to participate. Fathers were contacted using flyers and emails encouraging them to share their parenting experiences around feeding and physical activity. Fathers were recruited through different avenues including (1) through community based organizations serving fathers (n = 22, 55%), (2) from an existing database developed during an initial phase of the study (n = 11, 27.5%), (3) at local community based events (n=4, 10%), (4) from social networks of participants (n = 3, 7.5%). Data saturation was expected with a sample size of 40 (Teddlie, 2007). All fathers provided written informed consent.

Data collection

Semi-structured interviews were conducted between June and September 2014 using a pre-tested interview guide which was informed by the conceptual model proposed by Faith and colleagues (Faith, 2012). A sample of the neutral, open-ended questions used for these analyses can be found in Table 1. Consistent with the proposed conceptual framework, questions were structured to also probe fathers' food philosophy, child characteristics, and the social setting in which feeding occurred. Fathers who completed phone interviews received \$40 (n = 10, 25%),

while those completing in person interviews were reimbursed \$80 (n = 30, 75%) to cover the cost of travel. All interviews were conducted by trained research assistants (NK, JC) and lasted between 60-90 minutes. Interviews were audio-recorded and transcribed verbatim. The Harvard T.H. Chan School of Public Health, Office of Human Research Administration provided ethical approval for the study.

Table 2.1: Sample questions from the interview guide

Domain	Sample questions
Background questions	• What is your approach to the food you eat? • What role do you think your family history or upbringing has had on your approach to food? • Walk me through a typical weekday. Can you talk about the typical interactions around feeding your child through the day? • Does your child have any pre-existing conditions or allergies that affect her/his food intake? Is there anything that I should know about him/her to help me understand your approach to feeding him/her? • Do you have any concerns about your child's eating patterns or diet?
Questions central to the current study	• Who else is involved in feeding CHILD? How often would that be? • Thinking about (CHILD), what role do you play feeding him/her? What kinds of specific decisions/ tasks do you generally make/ do? What decisions/ tasks do you and your partner split responsibility for? • Do all the adults who feed CHILD (excluding time at child care or preschool) have the same rules about his/her eating? • Do you and CHILD'S mother have similar thoughts on how to feed CHILD and what to feed CHILD? Can you tell me more about this interaction? • Do you and CHILD'S mother have similar concerns about CHILD'S eating? What might these be? • How do you negotiate instances when the both of you think differently?

Data organization and analysis

Thematic analysis, the method of identifying, analyzing and reporting patterns in the data (Braun, 2006), was conducted with the data from this sample. Interview transcripts were organized into conceptual components (themes) or “coded” in QSR NVivo 10.

All passages in the transcript that referred to interactions with the child’s mother and instances of co-parenting were identified. These passages were then examined in further detail to identify all discernable patterns that emerged within the domains of the study objectives. Themes that emerged at this stage of the analysis included ‘Co-parenting approaches in child feeding tasks’, ‘Co-parenting approaches in food parenting practices’, and ‘Disagreement resolution’. In each instance the internal consistency, validity and verifiability of the themes was determined using the iterative process that included expert consultations, peer review, and applicability across transcripts (Tong, 2007; Farmer, 2006). A codebook with precise definitions for each theme provided guidance on how to identify the theme and code excerpts of the transcripts along with examples of quotes, was simultaneously developed (see **Appendix 1**). The finalized codebook was then used to recode all 40 transcripts. The reliability and validity of the coding process was established through non-chance, intercoder agreement. A pooled/ domain specific Kappa coefficient of 0.84 was found for two researchers, working independently.

Variations within each theme were then examined by the relationship status of the father and are presented in the results section. Since the mother was completely absent/uninvolved in three instances, with no paternal or child interaction whatsoever, the sample size was restricted to 37 for these analysis.

Results

Participants

The mean age of the sample was 38 ± 9.1 years. Forty six percent of the fathers were Black, 48% were divorced or separated, and 40% were non-residential (shared custody with the other caregiver, $n = 10$ or child visitation $n = 5$) (see Table 2).

Table 2.2: Participant characteristics

Characteristics	Total sample, N= 37	
Age (mean years, SD)	38.6	(± 9.1)
Age range of target child (n, %)		
2-5	24	64.8
6-10	13	35.1
Sex of target child (n, %)		
Female	17	45.9
Race (n, %)		
Black	17	45.9
White	15	40.6
Other	5	13.5
Education level (n, %)		
High school/GED	11	29.7
Some college	11	29.7
College graduate	5	13.5
Postgraduate	10	27.0
Living arrangement/residential status (n, %)		
Residential, child and partner	19	51.3
Residential, single father	3	8.1
Non-residential, shared custody	10	27.0
Non-residential, visitation only	5	13.5
Relationship status w.r.t mother of target child (n, %)		
Married/ in a relationship	19	51.3
Divorced/ separated	18	48.6
Employment status (n, %)		
Employed / self employed	29	78.3

Co-parenting approaches in child feeding tasks

A variety of tasks were identified in this sample of fathers within the context of child feeding that related to planning, procuring and preparing food. These included meal planning, formulating grocery lists, grocery shopping, calculating grocery-related costs, cooking, cleaning up, and socializing the child around meal times. Slightly more than half of fathers ($n = 23$ out of 37) reported managing these responsibilities with the mother of the child. The vast majority ($n = 19$) of these fathers were either married or in a relationship with the child's mother (82.6%), while a much smaller number ($n = 4$ of 23) were divorced/separated. In 14 of the 37 participants, the food parenting tasks were the responsibility of one parent, with 42.8% fathers reporting that they had sole responsibility for feeding their child ($n = 6$ out of 14). The child's mother was primarily responsible in 8 of the 14 participants (57%). All of these 14 fathers were either divorced or separated from the child's mother and the residential status of the child with respect to the parent strongly determined which parent had primary responsibility, as explained by this father: *"I think she's more or less like the primary parent because he lives with her. He's around her more and she takes him to his doctors' appointments so she knows, what he likes more and what he dislikes more."* – Black, less than college education, non-residential, 50yrs, divorced/separated.

Fathers that managed food parenting with the child's mothers ($n = 23$ out of 37), reported a range of approaches for the division of labor. These approaches included (a) both parents performing the same task together, (b) each parent being responsible for specific tasks and (c) each parent being responsible for the same task on specific days.

Ten fathers reported performing tasks like cooking and grocery shopping, alongside the child's mother ($n = 10$ of 23). As two fathers explain: *"We do the same thing. We either take*

turns or do it at the same time. It's not like she specifically does this and I specifically do that. Sometimes it's a matter of who beats who to the kitchen. We'll both cook for [our children] together, but there is no specifics of who does what as far as feeding and taking care of them." - Black, less than college education, residential, 30yrs, married/in a relationship.

"Me and my wife, we try to split the responsibilities for cooking. Usually, breakfast in the morning, I take care of. Mom usually makes the lunches for the afternoon, and then dinners, we split responsibility. As far as groceries go we both do it together. We don't have a car. It makes it easier if we're both together to help carry stuff in. I enjoy going shopping because I like to introduce new things to the kids once in a while and open up their minds a little bit to trying new stuff." - White, less than college education, residential, 40yrs, married/in a relationship.

A similar number of fathers (n = 9 out of 23) reported dividing tasks with the child's mother and being consistently responsible for specific tasks associated with child feeding. In a few instances, when cooking was primarily the mother's responsibility, fathers reported making the decisions around what to eat or what to cook. Here's what two of the fathers had to say: *"My wife is going to do the majority of the meal planning. She does the majority of [the cooking]. I'm involved at the table, just as far as manners, discipline. Making sure the kids are doing what they're asked to do. That's a big role during mealtime. I do a lot of the cleanup as well."* - White, more than college education, residential, 34yrs, married/in a relationship.

"I'm definitely the primary parent with regards to grocery shopping. My wife is the primary parent on meal planning." - White, more than college education, residential, 33yrs, married/in a relationship.

A comparatively smaller group of fathers (n = 4 out of 23) reported sharing the same tasks with the child's mother, with one parent taking primary responsibility on certain days of the

week when their schedule allowed it while the other parent stepped in on the remaining days of the week. One father reports “*My wife and I split things pretty 50-50, right down the middle. She’s really in charge of Thursday, Friday and Saturdays, and I’m able to be there Monday, Tuesday, Wednesday. I do most of the cooking in the evenings when I’m at home. She takes the day, and I take the night.*” - Asian, more than college education, residential, 37yrs, married/in a relationship.

Co-parenting approaches in food parenting practices

Fathers reported instances of cooperative or conflicting food parenting practices with the child’s mother. Co-operative practices were reported in a greater proportion of married fathers, however, in contrast to the division of responsibilities in food parenting, fathers’ reports of conflicting food parenting practices were less dependent on their marital status. Cooperative food parenting practices with the child’s mother were reported by 12 out of the 19 married fathers and in 5 of the 18 divorced/separated fathers. However, nearly equal numbers of married and divorced/separated fathers reported conflicting practices.

Seventeen of the 37 fathers reported similarities in food parenting practices with the mother (45.9%). Having food rules, structuring the child’s eating environment to avoid distractions, and monitoring child’s food intake were the most commonly cited food parenting practices that were consistent between both parents. Three fathers illustrate co-operative food parenting practices: “*I think mealtime’s huge. Our family is pretty good about doing things together. Food draws us back together. It’s that centering point. We want that. My wife is good about that too and I just really try to support her in that.*” - White, more than college education, residential, 34yrs, married/in a relationship.

“Her mother’s on the same page with me when it comes to fast food, just really don’t do it much at all” - Black, less than college education, non-residential, 44yrs, divorced/separated.

“She had the same concerns as me. She didn’t want him to eat the sweets and whatnot. We both feed him accordingly.” - Black, less than college education, non-residential, 60yrs, divorced/separated.

Fifteen fathers in this sample mentioned high levels of conflicting practices (n = 15 out of 37, 40.5%; married fathers = 7, divorced fathers = 8). A number of noteworthy patterns emerged in the contexts in which conflict occurred, the factors underlying the dissimilarities in practices used and the parent- and child-related consequences of conflicting practices.

Contexts: Of the 15 fathers reporting conflicting practices, 11 fathers reported specific examples around differences in access to energy-dense, nutrient-poor food or in the use of food rules (73.3%), examples of which follow. *“You can’t just give this kid so much refined sugar, stop it already. His mom just loves sweet things, and he loves sweet things and when it becomes an obsession with him, it’s hard to pull in the reins.”* - White, less than college education, non-residential, 40yrs, divorced/separated.

“She would cook things like Doritos salad. It’s an entire bag of Doritos emptied into a bowl, crushed up with lettuce and salad dressing. I’m like that’s not a dinner you feed. Doritos are snacks. This isn’t dinner.” - White, less than college education, non-residential, 32yrs, divorced/separated.

Dissimilarities in ensuring variety in the child’s diet were also found among 4 of the 15 participants as demonstrated by these quotes: *“I called her mother and asked her, “Why doesn’t Jane eat fish?” She said, “Because I never gave her fish.” I said, “Fish is something we’re supposed to give our kids. It’s brain food.” She said, “I didn’t want her to like fish because I*

don't like fish." I [the father] want my daughter to have an open palate of what she likes; not what she can't like because she wasn't given the opportunity to taste it." - Black, less than college education, residential, 38yrs, divorced/separated.

"Sweet potatoes, peanuts, fish, whatever her daddy puts in his mouth, [my daughter] puts in her mouth. Her mom be like, "Oh, you don't eat that." I'm like, "Why are you trying to discourage her from trying different things in life?" - Black, less than college education, residential, 44yrs, married/in a relationship.

Underlying factors: Differences in fathers' and mothers' own eating habits and food and feeding histories (n = 4 out of 15, 27%), in the concern for child health (n = 3 out of 15, 20%), and in their child feeding philosophies (n = 3 out of 15, 20%) seemed to underlie the differences in the practices adopted by fathers and mothers. As a few fathers explain: *"She didn't see the effort [to eat healthy] worth it and to her it was more like if he [the son] wants to grow up fat, let him. That's ridiculous. He's seven—you don't give seven-year-olds choices other than what kind of movie do you want to watch today, or what kind of shirt do you want to wear. Not what do you want to put in your body. I could make them the smoothies, and the shakes, and things like that, but they'd also have chips or cookies in the house."* - White, less than college education, non-residential, 32yrs, divorced/separated.

"She wants to feed him more. For my wife's culture—being thick, and big, means you're healthy. That's what it means. So they would just feed the kids." - White, more than college education, residential, 34yrs, married/in a relationship.

Consequences: Conflicting food parenting practices undermined attempts by one of the two parents to adopt healthier practices and had parent- related and child- related consequences. Eight of the 15 fathers either succumbed to the practices (5 out of 8) of the other parent or over

compensated for them (3 out of 8). The following quotes illustrate this tension: *“I try to avoid [sugary cereals]. She gets that at her mom's house. I have to some degree succumbed to caving in to mirroring what she gets over there because—“Would you rather have Cheerios or a bowl full of marshmallows?” It's not a competition, but it has eroded the healthy habits.”* - White, more than college education, residential, 40yrs, divorced/separated.

The typical kids' food just seems to be high in carbohydrates. I probably have resigned myself to what my wife is comfortable with preparing. We'll do meals together that are different, but I think on a daily basis what they're having is probably what she's used to preparing and having herself. I would like to see less carbohydrates, I would definitely like to challenge our kids with eating more vegetables. I could have a whole meal just based around that and be fine. My wife doesn't eat it, so the kids don't even see it.” - White, more than college education, residential, 32yrs, married/in a relationship.

“I have to be the stricter one. I don't get a chance to break those rules [no fast food] because they've already been broken [by the mother]. So now I got to cram in the veggies” - Black, less than college education, non-residential, 29yrs, divorced/separated.

In 7 of the 15 instances, fathers reported that the dissimilarities in food parenting practices led to child tantrums and refusal to eat. A few noteworthy quotes highlight the child-related consequences of conflicting practices: *“I attempted to do some of these things [cook healthy food] - but he just straight wouldn't eat them because he didn't have to because he would be given whatever he wants on the other side.”* - White, less than college education, non-residential, 32yrs, divorced/separated.

“She’s [daughter] miles ahead of kids her age. She’s smart. She’s manipulative. When she’s throwing a fit and giving in, I don’t give in. Her mother gives in every time.” - White, less than college education, non-residential, 33yrs, divorced/separated.

Since the child was subject to two differing practices it wasn’t surprising that in some cases the child would manipulate the parents to get her/his way. *“If [my son] doesn’t want to hear what I’ve got to say [about restricting junk food] he’ll run straight to his mother. She will say, “Oh, you can get whatever you want.” I say, “Now, why you do that? I tell him one thing, and then he runs to you. He’s playing off of us.” She doesn’t even care.”*- Black, less than college education, residential, 63yrs, married/in a relationship.

Disagreement resolution

Disagreements arising while navigating co-parenting with respect to responsibilities for feeding related tasks or while choosing the most effective strategy to feed the child were addressed in this sample by communicating, or discussing the issue or negotiating to reach a compromise (n = 28, 75.6%). While some fathers explicitly mentioned having these negotiations out of hearing range of the children, in other cases the children were witness to these discussions. In a few instances the dentist or the pediatrician was also consulted, as this father reports *“There hasn’t been a conflict on food other than the snacking, and I think that the dentist drew the line on that one. The way I handle things, when we have a conflict, information [is key].”* - Black, less than college education, residential, 63yrs, married/in a relationship.

Discussion

Given that fathers are increasingly involved in feeding their children, it is crucial to understand how mothers and fathers manage responsibilities for child feeding, the extent to which they support or undermine each other, and of the sources and consequences of conflicting practices in the context of child feeding. This study used qualitative methods to understand these co-parenting components from the perspective of the father. The results indicate that mothers and fathers use a variety of approaches to manage child feeding responsibilities related to planning, procuring and preparing food. There was evidence for the use of supportive food parenting practices between parents around structuring, monitoring and organizing the child's meals. However, fathers also reported instances of conflicting food parenting practices with regards to access to energy-dense, nutrient-poor snacks and introducing variety in the diet. These dissimilarities in practices were driven by differences in parental eating habits, feeding philosophies and concern for child health and resulted in the practices of one parent being undermined by those of the other and in child tantrums or refusal to eat.

Fathers who managed responsibility for food parenting tasks with the child's mother described performing tasks jointly with mothers, or dividing tasks by time of day or day of week. They also divided responsibility by tasks with one parent taking on sole responsibility for specific tasks and the other parent taking responsibility for other tasks. These patterns illustrate that the range of strategies for dividing responsibilities account for parental skills, available resources, time and natural inclination towards certain activities and may also be shaped by socio-cultural beliefs, values, and expectations (Feinberg, 2003). Division of responsibility has been identified as an important trigger of conflict and stress between parents (Feinberg, 2003)

which may moderate child outcomes. While this is shown to be the case for social and behavioral competence in children (Anthony, 2005), research on child weight is currently limited.

Not surprisingly, our understanding of the approaches in the division of responsibilities came largely from the fathers who were married or in a relationship with the child's mother. Similarly, co-operative food parenting practices were largely identified among married fathers. While a majority of separated/divorced fathers were either solely responsible for all tasks related to child feeding or relinquished all responsibility to the mother, a few separated/divorced fathers, did managed to establish a co-operative co-parenting relationship with the mother. In these instances, the division of responsibility for tasks was jointly addressed and both parents employed similar food parenting practices. Identifying the supportive factors at play, particularly within divorced/separated couples, that encourage co-operative co-parenting across food parenting domains would be important to address in family-based interventions. Child development literature suggests that factors beyond custodial arrangements, like parental absence, economic disadvantage, and inter-parental conflict in the spousal role (Feinberg, 2003), may determine the degree of co-operation versus non co-operation between separated parents. It is therefore plausible that these factors may be at play in the food parenting realm as well. More research is warranted to test these hypotheses.

Reports of conflicting food parenting practices used between parents was another noteworthy finding that emerged from this study. Parents used different food parenting practices to address child's access to energy-dense nutrient poor food and for introducing variety in the diet, with one parent being more permissive or less open to experimenting with different flavors. Energy-dense foods have been implicated in contributing to childhood obesity in some contexts (McDonald, 2009) and the differential use of permissive food parenting practice in the access to

such foods might be to the detriment of the child. Differences in the parents' own eating and feeding patterns, concerns about the health of the child and in their feeding philosophies were found to underlie the conflicting practices in this sample. Fathers reported either disengaging, allowing the mothers' food parenting practice to dominate or overcompensated for the difference in practice – exposing the child to two dissimilar feeding practices. Besides creating inconsistencies, conflicting practices and undermining co-parenting have been associated with negative outcomes for the parent including lower relationship quality and higher disagreements (Van Egeren, 2003; 2004). In this study, these conflicting practices were reported by equal numbers of married and separated fathers, highlighting the need for programs to address conflicting co-parenting in both intact and divorced/separated families, stressing the importance of having common feeding goals and targeting non-nutritive food access.

Fathers who reported conflicting food parenting practices also mentioned a number of negative behaviors in their children. These included instances where the child threw a tantrum and either refused to follow one of the two parents, or manipulated the parents to get his/her way. Conflicting practices may also undermine the benefits of a particular practice. A recent study in Dutch adolescents examined adolescents' perceptions of restrictive snacking rules set by their fathers and mothers (Gevers, 2015). The authors found that the differential use in practices across parents attenuated the favorable impact of fathers' rules and nurturance on their children's snacking (Gevers, 2015). Inconsistencies between paternal and maternal food parenting practices have also been shown to be associated with a higher BMI among daughters (Berge, Wall, Neumark-Sztainer, et al., 2010). These patterns are consistent with the child development literature. Low levels of parental congruence characterized by differences in parenting styles has

been associated with child behavioral problems (Panetta, 2014), adolescent adjustment (Simons, 2007) and substance abuse (Trockman, 2012).

Communicating and negotiating in different domains of co-parenting were the most commonly identified strategies for disagreement resolution in this study. A few fathers did mention involving a healthcare professional – a dentist or a pediatrician – to help settle parental arguments. Constructive disagreement resolution, mutually respectful negotiations and effective communication skills contribute to child wellbeing and may serve as a marker for co-operative co-parenting (Gable, 1994). Interventions seeking to improve inter-parental disagreement resolutions may consider involving health care professionals.

A few limitations of the study need mentioning. This study only captures fathers' perspectives. It is possible that mothers would interpret the extent of co-parenting in the context of food parenting differently. In addition, this study focuses only on the interplay between mothers and fathers and does not include extended family members whose contribution may also be substantial. While such questions are important to address, the few reported instances of active co-parenting with extended family members in this sample of fathers did not lend themselves to a thorough analysis. It is likely that the recruited sample was involved in caregiving and perspectives from uninvolved fathers may not have been captured. Despite such limitations this study has multiple strengths. This is the first study to illuminate important co-parenting dynamics in food parenting. It builds on the limited diversity in participants among existing studies by recruiting a heterogeneous sample using strategies that did not involve approaching either the mother or the child. The results from this study have direct relevance in the development of evidence-based child obesity preventive interventions for a diverse range of family contexts.

Conclusion

Existing interventions are stymied by the conventional wisdom that fathers are not involved and evidence on levers of change within the family context that can be targeted in interventions and programs is sparse. With evolving family structures, and the increase in the percentage of children growing up in two homes in case of divorced or separated parents, studying the nature of co-parenting will strengthen the understanding of family functioning and provide empirical evidence for the integral role of fathers in the co-parenting process. It may also increase support for father involvement in programs, improve the capacity to engage both parents and deliver effective family-focused obesity prevention interventions.

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Appendix 2.1. Codebook

1° codes	Example quotes
<u>Co-parenting approaches in child feeding tasks</u> Quotes that indicate division of roles and responsibilities between parents, within the context of child feeding. These might include tasks related to planning, procuring or preparing food (eg. meal planning, grocery shopping, cooking, and cleaning up).	<i>“Me and my wife, we try to split the responsibilities for cooking. Usually, breakfast in the morning, I take care of. Mom usually makes the lunches for the afternoon, and then dinners, we split responsibility. As far as groceries go we both do it together. We don’t have a car. It makes it easier if we’re both together to help carry stuff in. I enjoy going shopping because I like to introduce new things to the kids once in a while and open up their minds a little bit to trying new stuff.”</i> <i>“My wife and I split things pretty 50-50, right down the middle. She’s really in charge of Thursday, Friday and Saturdays, and I’m able to be there Monday, Tuesday, Wednesday. I do most of the cooking in the evenings when I’m at home. She takes the day, and I take the night.”</i>
<u>Co-parenting approaches in food parenting practices</u> Quotes that indicate differences or similarities in the strategies that parents employed to manage how much, when and what their children eat.	<i>“I think mealtime’s huge. Our family is pretty good about doing things together. Food draws us back together. It’s that centering point. We want that. My wife is so good about that too and I just really try to support her in that.”</i> <i>“She would cook things like Doritos salad. It’s an entire bag of Doritos emptied into a bowl, crushed up with lettuce and salad dressing. I’m like that’s not a dinner you feed. Doritos are snacks. This isn’t dinner.”</i>
<u>Disagreement resolution</u> Quotes that indicate how mother and father resolve disagreements pertaining to child food parenting.	<i>“My daughter is more likely to have an unhealthy snack with her mom but I’m way more disciplined on it. I’m more consistent with that. There hasn’t been a conflict on food other than the snacking, and I think that came—the dentist drew the line on that one.”</i>

**Chapter 3. Simplifying mental math: Changing how added sugars are displayed on the
Nutrition Facts Label can improve consumer understanding**

Neha Khandpur, MSc ^{1*}, Daniel Graham, PhD², Christina A. Roberto, PhD ³

¹ Department of Nutrition, Harvard T.H. Chan School of Public Health, Harvard University,
Boston, Massachusetts

² Department of Department of Psychology, Colorado State University, Fort Collins, Colorado

³ Department of Medical Ethics and Health Policy, Perelman School of Medicine, University of
Pennsylvania, Philadelphia, Pennsylvania

* Corresponding author

Abstract

Background: The Food and Drug Administration (FDA) has proposed new changes to the Nutrition Facts Label (NFL) on packaged foods, including the addition of added sugars content. Few studies have examined how this information will influence consumers.

Objectives: The goal of this experimental study was to test the influence of different formats for displaying added sugars on consumer understanding, perceptions, and purchase intentions.

Methods: 2509 U.S adults, recruited through Amazon's Mechanical Turk, were randomized to 1 of 8 study conditions where they viewed product images with either: (1) no label (control); (2) the current NFL (without added sugars); the proposed NFL (3) without added sugars or (4) with added sugars in grams; the proposed NFL with added sugars in grams and (5) teaspoons; (6) % Daily Value (DV); (7) high/medium/low text; or (8) high/medium/low text + % DV. Measures of nutrition understanding, product perceptions, and purchase intentions were assessed for 10 products.

Results: Disclosing added sugars information improved consumer judgments about added sugars content. Displaying added sugars in grams plus high/medium/low text, with and without % DV, led to the most accurate understanding of added sugars content. Percent DV led consumers to make more accurate judgments about product healthfulness than no label, the current NFL, the proposed NFL without added sugars and the proposed NFL with added sugars in grams, but did not differ from the other labeling strategies. Displaying added sugars in teaspoons had little impact. None of the labels impacted purchase intentions.

Conclusion: Displaying added sugars in grams accompanied by high/medium/low text, % DV, or the combination of the two, might be a more effective way to present added sugars information on the NFL than current proposals like grams alone or teaspoons.

Background

Added sugars are caloric sweeteners, syrups and sugars that are not naturally present in foods but are added during food processing or preparation (USDA, 2015). Besides being a source of calories, added sugars have little nutritional value. They are easily metabolized by the body and usually lead to quicker surges in blood sugar levels and insulin spikes compared to unprocessed, naturally occurring sugars (O’Keefe, 2008; Arora, 2005). Overconsumption of added sugars is associated with poor diet quality, excess body weight, Type 2 diabetes and dental caries (Marshall, 2005; Yang, 2014; Malik, 2010; Sheiham, 2014). The adverse effects of added sugars have been recognized by several health agencies like the American Heart Association and the World Health Organization (WHO), which recommend lowering intake levels (Johnson, 2009; WHO 2015). The 2015 Dietary Guidelines for Americans suggests restricting total daily calories from added sugars to less than 10% (DGA, 2015; DGA, 2016). Despite this, added sugars intake continues to exceed recommended levels (Welsh et al., 2011; FDA, 2015b) and accounts for an average of 14.1% of total dietary energy in the U.S. across all age groups (Drewnowski, 2014).

According to one estimate, 73.5% of the 85,541 unique packaged foods and beverages sold in the U.S contain added sugars (Ng, 2012), but the current Nutrition Facts Label (NFL) only displays the amount of “sugars” in a product, which is a combined total of both naturally occurring sugars and added sugars. Although sources of added sugars are listed on the ingredient list, many consumers may not realize that these unfamiliar sounding names (e.g sorghum, anhydrous dextrose, maltose) are actually added sugars (USDA, 2015). To help consumers meet health agency recommendations, the Food and Drug Association (FDA) is considering updating the NFL for the first time since its introduction. If adopted, the proposed NFL will display added

sugars content separately from “sugars” (FDA, 2015b) and will list amounts of added sugars in grams along with an equivalent % Daily Value (% DV) set at a maximum of 10% of total calories (FDA, 2015d).

Few studies have examined how these proposed changes will impact consumer understanding of the NFL and whether other presentation strategies for added sugars might be more effective at communicating this important information. For example, researchers and advocates have suggested that presenting added sugars in more relatable formats such as number of teaspoons or with accompanying “high/medium/low” text may improve consumer understanding (CSPI, 2014; CSPI, 2010; Roberto, 2014), but few studies have tested such formats. One study that randomly assigned 548 shoppers to different front-of-package nutrition labels found that adding high/medium/low text to traffic light or percent daily guidelines on labels increased consumer understanding of nutrient content (Malam, 2009; 2008). Another randomized experiment with 641 Canadians aged 16-24 found that displaying a %DV next to added sugars in grams led to more accurate estimates of added sugars content compared to either grams alone or including an ingredient list (Vanderlee, 2015). However, a randomized experiment with 213 adults found that those who viewed the current NFL for 20 cereals made nutrition judgments that were more highly correlated with an algorithm’s score of overall nutritional quality compared to an NFL with added sugars in grams or an NFL listing added sugars under a “nutrients to avoid” heading (González-Vallejo, 2015).

We sought to improve upon and extend the limited body of research on the FDA proposal to place added sugars on the NFL by conducting a randomized-controlled online experiment that asked a large sample of U.S. adults to make nutrition judgments about a range of food products.

The aim of this study was to examine the degree to which different formats for displaying added sugars influence consumer understanding, perceptions, and purchase intentions.

First, we hypothesized that displaying added sugars separately from total sugars would improve consumer understanding of added sugars content and would decrease perceptions of product healthfulness and purchase intentions. We also hypothesized that displaying added sugars content in more meaningful formats (e.g., in teaspoons or accompanied by high/medium/low text) would increase consumer understanding of added sugars content and decrease perceptions of product healthfulness and purchase intentions relative to displaying added sugars in grams alone.

Methods

Participants

We recruited participants through Amazon's Mechanical Turk (MTurk), an online site where individuals can complete tasks for a small amount of money. All individuals over the age of 18 who were U.S. residents, familiar with using computers, and able to read English were eligible to participate. Data were collected in two waves, the first in January 2015 and the second in April 2015. Participants provided informed consent at the beginning of the survey and were compensated \$1 for completing the survey. A total of 2,992 participants initiated the survey. An entry was considered complete if participants responded to all parts of the survey and provided key demographic information (age, sex, ethnicity, and education status). We excluded 384 participants who failed to complete the survey and 99 participants who either had duplicate/identical IP addresses and/or completed the survey in less than one-third the average time (<7 minutes) because we felt that they could not have provided credible data in such a short

period of time. On average, the survey took 23 ± 25 minutes to complete. Our final sample included 2,509 participants (see Table 2 for description of study sample). All study procedures were approved by the Harvard T.H. Chan School of Public Health Institutional Review Board.

Added sugars conditions

Participants were randomized to one of the following 8 conditions (see Figure 2):

1. No label control.
2. Current NFL, which does not include information on added sugars.
3. NFL without added sugars, but with all other new proposed features including, increased font size for calories and serving size, shifting % DV from the right to the left and displaying Potassium and Vitamin D content in place of Vitamins A and C.

The other five conditions included all the proposed NFL changes combined with different presentations of added sugars information.

4. Added sugars in grams (g)
5. Added sugars in g plus teaspoon text abbreviated as “tsp”
6. Added sugars in g plus % DV
7. Added sugars in g plus high/medium/low text
8. Added sugars in g plus high/medium/low text and % DV

Throughout the study, participants viewed food products with their corresponding NFL displayed next to the product (nutrient information was obtained from manufacturer websites), except for those in the control group who saw the product images without an NFL (See Figure 1).



Nutrition Facts		
12 servings per container		
Serving size		1 cup (59g)
Amount per 1 cup		
Calories		190
% DV*		
2%	Total Fat	1g
0%	Saturated Fat	0g
	Trans Fat	0g
0%	Cholesterol	0mg
9%	Sodium	210mg
15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
	Added Sugars	15g (High)
	Protein	5g
10%	Vitamin D	1mcg
2%	Calcium	20mg
25%	Iron	5mg
6%	Potassium	210mg
* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.		
	Calories:	2,000 2,500
Total Fat	Less than	65g 80g
Sat Fat	Less than	20g 25g
Cholesterol	Less than	300mg 300mg
Sodium	Less than	2,400mg 2,400mg
Total Carbohydrate		300g 375g
Dietary Fiber		25g 30g

Note: The image of the product has been blurred for this publication.

Figure 3.1: Sample survey image of a product with its nutrition facts label

Condition 1 - Product image only (control)



Condition 2 – Current NFL, no added sugars

Total Carbohydrate	46g	15%
Dietary Fiber	7g	28%
Sugars	18g	
Protein	5g	

Condition 3 – Proposed NFL, no added sugars

15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
	Protein	5g

Condition 4 – Proposed NFL, added sugars (g)

15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
	Added Sugars	15g
	Protein	5g

Condition 5 – Proposed NFL, added sugars (g) + teaspoons

15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
	Added Sugars	15g (4tsp)
	Protein	5g

Condition 6 - Proposed NFL, added sugars (g) + %DV

15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
30%	Added Sugars	15g
	Protein	5g

Condition 7 - Proposed NFL, added sugars (g) + high/medium/low text

15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
	Added Sugars	15g (High)
	Protein	5g

Condition 8 - Proposed NFL, added sugars (g) + high/medium/low text+ %DV

15%	Total Carbs	46g
28%	Dietary Fiber	7g
	Sugars	18g
30%	Added Sugars	15g (High)
	Protein	5g

Note: This figure shows sections of the Nutrition Facts Labels (NFL) with different formats for displaying added sugars. In the survey, all images in conditions 2 through 8 included a picture of the product next to an image of the entire NFL.

The %DV for added sugars for each product was calculated based on the recommendations of the Dietary Guidelines for Americans for a 2000 kilocalorie (kcal) diet. This amounted to a DV of 200 kcals or 50 g (FDA, 2015d). The high/medium/low text was based on added sugars content for each product. We defined “low” added sugars as $\leq 5\%$ of DV (or ≤ 2.5 g), “medium” as 6 – 19% of DV (or > 2.5 g ≤ 10 g) and “high” as $\geq 20\%$ of DV (or ≥ 40 g) based on the FDA’s recommendations (FDA, 2015c).

Figure 3.2: Added sugars label images for each study condition

Survey procedure

In the first part of the survey, participants viewed images, one at a time, for four commonly consumed products (Kellogg's Raisin Bran (cereal), Coca Cola (beverage), Cliff Chocolate Brownie Energy Bar (snack bar), and Home Run Inn Classic Cheese Pizza (frozen dinner) accompanied by the NFL they were randomized to. Participants then answered the following five questions per product to assess label understanding: 1) How many total servings do you think this product contains?; 2) If you ate the entire container of this product, how many calories would you have eaten?; 3) If you chose to consume only X g of total carbohydrate in one eating occasion, how many servings of this product could you have? (Nutrient amounts for this question were chosen to be easily divisible by the existing carbohydrate content of each product; 23 g for the cereal, 10 g for the sugar-sweetened beverage, and 15 g for the energy bar and frozen dinner); 4) If you were to consume this entire product in one sitting, what nutrients do you think you would have in excess of the daily recommended amount? (Participants were asked to check all that apply among the following nutrients: calories, total carbohydrates, added sugars, total fat, saturated fat, cholesterol, sodium, vitamin D, Calcium, None); and 5) Do you think this product has a low, medium or high amount of added sugars? Participants were also asked "How likely are you to buy this product this month" [1= extremely unlikely to buy; 7= extremely likely to buy].

The second part of the survey asked participants to view three pairs of products (Soft Family Bread vs. **Whole Grain Honey Oat**; Kellogg's Frosted Flakes vs. **Frosted Cheerios**; Vitaminwater vs. **Gatorade**) (bold items indicate which product is healthier based on algorithm described below) and answered the following three questions for each product pair: 6) For each nutrient listed (total fat, added sugars, sodium, calcium, and iron), please tell us which product

you think has more of the specific nutrient per serving of the product; 7) For each nutrient listed, please tell us which product you think is healthier based only on that specific nutrient, per serving, for the average person; and 8) Please select the product you think is healthier, per 100 grams, for the average adult (participants could select either product or indicate that the products are the same). Participants were also asked “How likely are you to buy this product this month” [1= extremely unlikely to buy; 7= extremely likely to buy] for each of the products in the comparison task. The questions used in this survey were adapted from studies screening for health literacy (Weiss, 2005) or testing consumer understanding of front-of-package (Roberto, 2012; Roberto, 2012b) or back-of-package labels (Lando, 2013).

The final part of the survey assessed participants’ general nutrition label use by asking, “On average, how much do nutrition labels influence your food and drink choices?” and “How often do you look for nutrition information on packaged foods when you are grocery shopping?” Participant’s nutrition knowledge was assessed with the following four questions: What is the average recommended intake of saturated fat for a healthy adult?; What is the current recommendation for daily calorie intake for a normal weight adult?; Is brown sugar a healthier alternative to regular (white) sugar?; Do you think these foods are high or low in added sugars? [Banana, flavored yogurt, ice cream (regular), tomato ketchup, canned fruit in natural fruit juice]. The latter two questions were taken from the validated general nutrition knowledge questionnaire for adults (Parmenter, 1999). Information on age, body mass index (BMI), sex, history of chronic diseases, education, race and ethnicity, employment, income levels, weight, grocery shopping patterns, dieting, and current relationship status was also collected.

Study outcomes

Added sugars understanding quiz. Our primary outcome was consumers' understanding and perceptions of added sugar content. To generate this quiz score, we summed responses to all 14 questions about added sugars (Questions 4, 5, 6, 7 described above) and converted this to a percent correct score out of 100%.

Nutrition label understanding quiz. Our second outcome was consumers' overall understanding of the nutrient content of the products tested. To generate this score, we summed responses to all 92 nutrition questions, including the 14 questions about added sugars (Questions 1 through 7 described above) and converted this to a percent correct score.

Nutrition quiz for other label changes. We were also interested in assessing how the other proposed NFL changes (increased font size for calories and serving size and shifting %DV from the right to the left) impacted overall nutrition understanding relative to the current NFL label. To do this, we summed responses to all 74 nutrition understanding items (questions 1 – 7 described above) excluding questions about the nutrients that did not appear across all label conditions (added sugars, potassium and vitamin D) and converted this to a percent correct score. For this outcome, we only compared the NFL conditions to each other, excluding the control group.

Perceived healthier product quiz. To generate this quiz score we summed all correct responses for the 3 items (question 8 described above) that asked participants to identify the healthier of two products and converted this to a percentage correct score. A response was coded as correct based on the Nutrient Profile Model algorithm, which allocates points for foods based on the amount of kcals, saturated fat, total sugar, sodium, fiber, and protein as well as fruit, vegetable, and nut content per 100 g (Food standards agency, 2009). This scoring system has

been validated with nutritionists (Arambepola, 2007) and is used to determine which foods can be marketed to children during children's television programming in the United Kingdom (Food standards agency, 2010).

Purchase intentions. We averaged responses across all 10 items (for 4 products displayed one at a time and 3 displayed as pairs) that asked participants to rate their likelihood of buying the product in the next month.

Nutrition label opinion. At the end of the survey, participants were asked if the label they were randomized to was easy to read, helpful in deciding what to buy, had too much information (reverse coded), was confusing (reverse coded), or took too much time to read (reverse coded). Responses were averaged across all 5 questions [1 = 'I strongly disagree' to 5 = 'I strongly agree']. These questions have been used by previous studies on nutrient labeling (Lando, 2013; Moser, 2010) and were only asked to participants randomized to a condition that displayed an NFL.

Statistical analysis

Continuous outcomes were compared using one-way ANCOVAs controlling for race, which significantly differed across groups (see results below). Significant omnibus tests were followed by post hoc Tukey HSD tests. Chi-square tests were used to examine categorical variables. All analyses were conducted using SAS 9.4.

Results

Participant characteristics

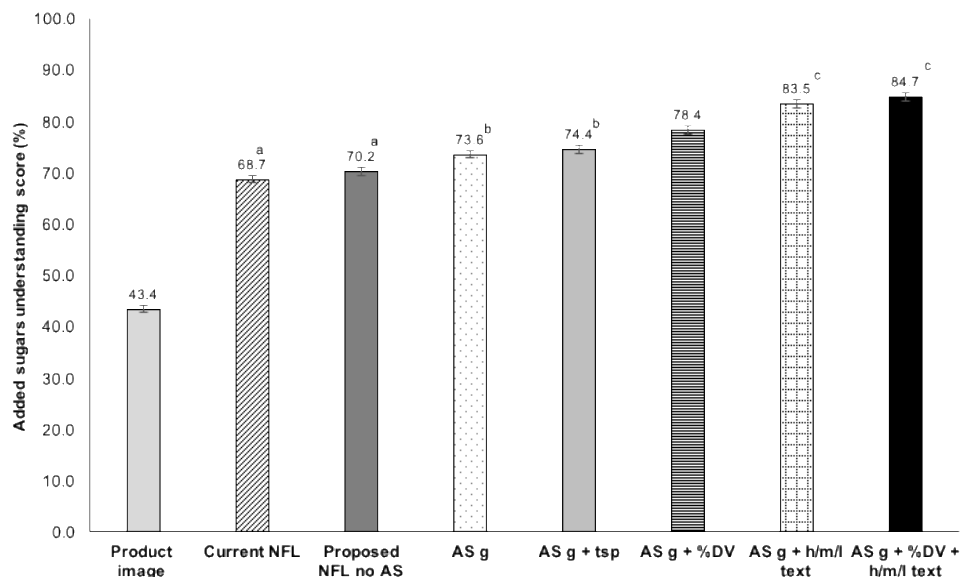
Participant characteristics are summarized in Table 1. Nearly 60% of the final sample was female, 83% was White and 51% had college degrees. Mean participant age was 36.4 ± 12.3 years and mean BMI was 27 ± 6.9 kg/m². Seventy six percent of participants reported doing most or all of the grocery shopping. There were no significant differences across groups on participant characteristics except for race (p-value = 0.04). Although we controlled for race in our analyses, this did not meaningfully change any of our results. Overall, the time spent on the survey varied across study arms (p = <0.001) as those in the control arm, having no labels to read, took the least amount of time (15 ± 10 minutes). None of the label conditions significantly differed from each other (p = 0.64).

Table 3.1: Participant characteristics

Characteristics	Total sample N= 2509	
Age , (mean years, SD)	36.4	12.3
BMI , (mean kg/m ² , SD)	27.0	6.9
Sex , (n, %)		
Male	1018	40.6
Female	1485	59.2
Race , (n, %)		
White	2087	83.2
Black	187	7.4
Asian	137	5.5
Other	98	3.9
Ethnicity , (n, %)		
Hispanic	173	6.9
Education level , (n, %)		
High school/GED	252	10.0
Some college	979	39.0
College graduate	948	37.8
Postgraduate	330	13.2
Relationship status , (n, %)		
Married	963	39.6
In a relationship	582	23.9
Single	678	27.9
Divorced	157	6.5
Annual household income , (n, %)		
<\$50,000	1283	52.8
\$50,001 - \$75,000	554	22.8
\$75,001 - \$100,000	318	13.1
\$100,001 - \$125,000	148	6.1
>\$125,000	127	5.2
Employment , (n, %)		
Employed / self employed	1764	70.3
Unemployed	305	12.2
Retired/ student	440	17.5
Currently dieting , (n, %)		
Yes	1116	44.5
Grocery shopping , (n, %)		
All/ most of the shopping	1924	76.7
Some of the shopping	490	19.5
Little/none of the shopping	95	3.8
Perceived label understanding , (n, %)		
Good	1536	61.2
Fair	911	36.3
Poor	63	2.5
Frequency of nutrition label use , (n, %)		
Always/often	1508	60.1
Sometime/never	1001	39.9
Nutrition label influence , (n, %)		
Large extent	1036	41.3
Small extent	1210	48.2
No influence	263	10.5

Added sugars understanding quiz

All results are summarized in Table 2. There were significant differences across study conditions for the primary outcome of added sugars understanding (see Figure 3). All labels led to significantly higher quiz scores compared to the no label control group and labels displaying added sugars information increased understanding compared to those labels without such information. Both label groups that viewed high/medium/low text significantly outperformed all other study groups, but did not significantly differ from one another. Although displaying added sugars in grams plus % DV was not as effective as including high/medium/low text, it did increase understanding more than displaying added sugars in teaspoons or in grams alone. Contrary to our hypothesis, adding a teaspoons label to added sugars in grams did not significantly improve understanding more than grams alone.



Note: Bars with the same letter do NOT significantly differ at $p < 0.05$; all other comparisons are significant at $p < 0.05$.

AS = Added sugars; g = grams; tsp = teaspoons; h/l/m = high/ medium/ low

Figure 3.3: Percent correct on added sugars understanding quiz (means and standard errors) across study conditions

Nutrition label understanding quiz

As expected, the presence of any NFL led to significantly better nutrition understanding compared to no label. Similar to the results from the added sugars understanding quiz, display formats with added sugars information in grams and high/medium/low text had the highest quiz scores in overall nutrition label understanding and they performed better than displaying the information in grams alone. The two high/medium/low text groups did not differ from one another or from presenting the information in % DV or teaspoons.

Nutrition quiz for other label changes

There were no significant differences between NFL groups when assessing whether the other proposed design changes (increased font size for calories and serving size and moving % DV from the right to the left) promoted better label understanding.

Perceived healthier product quiz

Those who saw added sugars in grams plus % DV were best able to identify the healthier of two products and this group did significantly better than the current NFL, the proposed NFL without added sugars, the proposed NFL with added sugars in grams only and the no label control groups (See **Table 3**). However, grams plus % DV did not significantly differ from labels with teaspoons or high/medium/low text, which scored better than the current label and no label.

Purchase intentions

There were no significant differences in purchase intentions across study arms.

Nutrition label opinion

Across study arms (excluding the no label control participants), there were no significant differences in opinions of the labels participants were randomized too. The mean label opinion score was 3.96 ± 0.68 on a 1- 5 scale, indicating that participants tended to have a favorable opinion of the labels across added sugars formats (See Table 2).

Discussion

The aims of this paper were to assess consumer understanding and perceptions toward displaying added sugars content on NFLs and to compare different formats of added sugars. As expected, we found that the addition of added sugars information to the NFL helped participants better estimate added sugars content. In addition, the format in which added sugars information was displayed on the label mattered. Participants' ability to accurately comprehend added sugars information was increased by adding "high/medium/low" text to the label regardless of whether %DV information was also included. These findings are consistent with front-of-package labeling studies that also found that the addition of high/medium/low text to traffic light or percent daily guideline labels improved consumer understanding (Malam, 2009; 2008). Although adding high/medium/low text helped consumers most, displaying added sugars information as % DV was more helpful than only displaying it in grams or grams and teaspoons. This is consistent with other research that found support for using % DV to increase consumer understanding of added sugars information (CSPI, 2014; Vanderlee, 2015).

Although all the labels helped consumers identify the healthier of two products compared to no label, only the % DV label outperformed added sugars in grams or the label with the other proposed NFL changes that did not include added sugars. However, the % DV label did not perform significantly better than labels with teaspoons or high/medium/low text.

Contrary to our hypothesis, displaying added sugars in grams and teaspoons did not improve consumer understanding of added sugars information or help participants identify the healthier of two products more than listing this information in grams alone. These results are consistent with findings from a similar experiment that randomized 2008 Canadians to one of six label formats. When participants had to determine the amount of sugar in products either high or

low in sugar content, NFLs where total sugar were displayed as % DV led to more correct responses than the current Canadian label or an NFL with added sugars displayed with a teaspoons text label (Vanderlee, 2015). It is possible teaspoons are not a meaningful measurement for most people and that providing information in the context of a recommended daily allowance is more helpful, especially among products where added sugars is not the primary ingredient. However, future research should examine whether presenting added sugars in teaspoons is helpful for products that primarily contain added sugars like sugar-sweetened beverages. Another possibility is that the “tsp” abbreviation we used, although commonplace and recommended in the scientific advisory report for the DGA, (DGA, 2015) may have been confusing. These results suggest that the FDA’s consideration of including teaspoons to help consumers with low literacy levels make healthier purchase decisions (DGA, 2015) may not achieve the desired goal, but this should be studied in lower-income populations.

Finally, none of the labels impacted purchase intentions. This is consistent with another experimental study finding, which also found no effect of NFL formats on purchase intentions (González-Vallejo, 2015). There was also no evidence that the other proposed NFL changes impacted consumer understanding or purchase intentions.

Taken together, our results suggest that the addition of added sugars to the label may improve consumer understanding, but might have very limited impact on behavior. In addition, the other proposed changes to the label might have minimal effects on both understanding and behavior. However, the addition of added sugars to the label might spur industry action to reduce added sugar content, similar to the industry response to the mandate to include trans fats on the label (Mozaffarian, 2010).

This study has several limitations. We recruited a convenience sample of participants from an online community. However, MTurk respondents have been shown to be similar to community samples in age, gender and education (Goodman, 2013; Paolacci, 2010). In addition, we studied label responses in a controlled environment, not in the real-world. Therefore, we do not know if these results would hold in real-world settings where consumers are subject to marketing strategies, have a larger selection of products to choose from, and limited time and attention.

This study also has a number of strengths. These are some of the first data comparing the effectiveness of the FDA proposed NFL changes and other potential labeling strategies. Other strengths include a large sample size, a randomized-controlled design, inclusion of multiple products, and a variety of outcomes.

Conclusion

Nutrition education tools like the NFL have an important role to play in helping consumers understand basic information about what they are eating. Our results suggest the disclosing added sugars on the NFL might increase consumer knowledge of added sugar content and this effect can be increased by displaying such information in conjunction with high/medium/low text, % DV, or the combination of the two. In addition, the common recommendation to display added sugars information in teaspoons may not be an effective way to improve consumer understanding. Future research should examine whether other alterations to the NFL might further improve consumer understanding keeping in mind that policy and/or voluntary industry strategies beyond NFL changes will likely be needed to meaningfully influence behaviors.

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