

**Background:** Mothers' goals are important for health behavior change, and engagement in child obesity interventions. It is unknown if maternal feeding goals are associated with observed home mealtime or feeding practices. The objective of this study was to examine the association of four common feeding goals (restrict junk food, promote fruit or vegetable intake, promote autonomy in eating, and prevent obesity) with mothers' observed home mealtime and feeding practices.

**Methods:** Low-income mothers (N = 265) of children (mean child age 70.8 months) participated in a semi-structured interview about child feeding. A coding scheme was developed and reliably applied to identify mothers' feeding goals from transcripts. Mothers' observed home mealtime and feeding practices were reliably coded from home mealtimes and a laboratory eating protocol. Mothers completed a questionnaire and reported demographics. Participant weights and heights were obtained. Regression models were used to test the association of each feeding goal with observed maternal practice, controlling for covariates.

**Results:** The goal of restricting junk food was associated with the child always eating at a table (OR 2.87, 95% CI (1.39-5.96)  $p = 0.005$ ), but not with the mother restricting junk food. The goal of promoting fruit or vegetable intake was associated with observationally promoting vegetables (OR 1.41, 95% CI (1.09-1.84),  $p = 0.01$ ). The goals of promoting autonomy and preventing obesity were not associated with any observed maternal home mealtime or feeding practices.

**Conclusions:** While mothers' goals to restrict junk food and promote fruit or vegetable intake were associated with observed home mealtime and feeding practices, promoting autonomy and

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preventing obesity were not. Increased understanding of why low-income mothers may not translate certain feeding goals into practices may inform childhood obesity interventions.

## INTRODUCTION

Mothers are important to childhood obesity prevention and intervention efforts, as they play an important role in child feeding (Jain *et al.* 2001). Mothers' feeding goals, defined as their motivations, intentions and aspirations related to child feeding (Goulding *et al.* 2015), are thought to be important determinants of mothers' feeding practices and their children's diets (Musher-Eizenman and Holub 2007). Goal setting is considered an essential first step toward health behavior change (Locke *et al.* 1981). Once mothers have established feeding goals, the next essential step to accomplish behavior change to prevent childhood obesity is to understand whether and how those feeding goals are translated to action. This process is thought to be important for childhood obesity prevention and intervention programs (Kiefner-Burmeister *et al.* 2014).

Maternal feeding goals have been previously identified and described in low-income United States mothers (Goulding *et al.* 2015). Goulding *et al.* found that over 50% of mothers identified the goals of restricting junk food, promoting fruit or vegetable intake, promoting autonomy around eating, and preventing obesity (Goulding *et al.* 2015). These findings suggest that low-income mothers are hearing public health messages about healthy child feeding practices and obesity prevention. Yet, while these goals have been described, it is unknown

whether having these goals translates to action in the form of mothers' home mealtime or feeding practices.

No prior work, to our knowledge, has investigated whether mother's feeding goals are associated with home mealtime practices, such as eating at the table, having the television off during the meal and eating as a family. Only two prior studies (Kiefner-Burmeister *et al.* 2014, Swanson *et al.* 2011) have investigated the question of whether mothers' feeding goals are associated with their feeding practices. One study (Kiefner-Burmeister *et al.* 2014), using online self-report survey methodology, found that having more self-reported health-related feeding goals was associated with fewer self-reported negative feeding practices. Another study (Swanson *et al.* 2011) found that mothers having greater intention to accomplish a feeding goal predicted the likelihood of that feeding practice, specifically providing the child breakfast, 'cooking from scratch', and eating family meals. These studies, however, leave several gaps. First, these studies (Swanson *et al.* 2011, Kiefner-Burmeister *et al.* 2014) used survey methodology to assess mothers' practices, which may be limited by self-report bias, as there is often low correspondence between mothers' reported and observed feeding practices (Farrow *et al.* 2011). Second, neither study (Kiefner-Burmeister *et al.* 2014, Swanson *et al.* 2011) examined either feeding goals or feeding practices of low-income United States (US) mothers. Understanding goals and practices in this population is essential to inform interventions targeting low-income US children, who are disproportionately affected by obesity (Wang and Beydoun 2007). Third, prior work (Kiefner-Burmeister *et al.* 2014) on the association of feeding goals and

practices has focused on maternal feeding practices that are generally not recommended (e.g., using food as a reward, letting the child take control, using food for emotional regulation). Understanding if mothers' feeding goals translate to engaging in recommended practices may inform interventions by guiding whether to focus on goal development or goal implementation.

Therefore this study sought to test the association of mothers' feeding goals with observed home mealtime and feeding practices in a sample of US low-income mothers. We chose to focus on the feeding goals of restricting junk food, promoting fruit or vegetable intake, promoting autonomy in eating, and preventing obesity, as these were the most commonly stated goals identified in prior work (Goulding *et al.* 2015).

## METHODS

### Participants

Participants were a sample of 265 low-income female primary caregiver-child dyads (mean child age 70.8 months) from Michigan who enrolled in a longitudinal study examining contributors to children's obesity risk in 2009-2011. Participants in the original study (n = 380) were invited through their child's Head Start program (a free, federally subsidized preschool programs for low-income children) to participate in a study about children's eating behaviors. Dyads were followed longitudinally, and invited to participate in a follow-up study, about two years later, which was explained as seeking to, "understand how mothers and caregivers feed their children." Of the 296 female primary caregivers who completed this study, 95% were

biological mothers, with the remaining 5% being grandmothers and adoptive mothers.

Henceforth we refer to the entire group as “mothers”.

For the original study, exclusion criteria included the child having had a gestational age less than 35 weeks, significant neonatal complications, serious medical problems that may affect eating, food allergies, or foster care. Mothers eligible for the original study were fluent in English, and had less than a four-year college degree. For this study, additional exclusion criteria included food allergy or intolerance in the mother or a new food allergy that had developed in the child since recruitment. The sample for this analysis was limited to dyads in which the mother completed the semi-structured interview, those who completed at least one home mealtime video, as well as those with complete anthropometrics and demographic and questionnaire data. This resulted in our final sample size for this analysis of 265 mother-child dyads. The University of Michigan Institutional Review Board approved the study protocol. Mothers provided written informed consent and were compensated \$150 for their participation in the study.

## **Measures**

**Feeding goals.** Mothers participated in a semi-structured interview with a trained interviewer, without the child present. The interviews were conducted in a quiet location in the participant’s home or at a local community center, depending on the mother’s preference. In brief, the semi-structured interview consisted of open-ended questions which ask mothers about their child feeding practices. The full interview guide has been previously published (Goulding *et al.* 2015),

as have details about the development and piloting of the interview (Kalinowski *et al.* 2012, Pesch *et al.* 2011). A maternal feeding goal was defined as, “a current maternal aspiration specifically related to feeding the child enrolled in the study” (Goulding *et al.* 2015). Further detail on conducting the interviews, analysis of the transcripts and the identification and coding of maternal goals has been previously published (Goulding *et al.* 2015). For this analysis, we chose to focus on the four most common maternal feeding goals, which were to: 1) restrict junk food, 2) promote fruit or vegetable intake, 3) promote autonomy around eating, and 4) prevent obesity. Definitions of these goals and prevalence in our sample are presented in Table 1.

**Home mealtime practices.** Observed home mealtime practices were evaluated through coding of home mealtime videos. Families were loaned video cameras and instructed to record the child eating three dinner meals in the same week. Families were instructed to include the child’s head, torso, food and beverage in the camera frame. Each home mealtime video was coded for the following observed maternal feeding practices: 1) whether the child was eating at a kitchen or dining room table (yes vs. no), 2) whether the television was audible during the meal (yes vs. no), and 3) whether the mother sat down to eat or drink anything during the child’s mealtime (yes vs. no). An initial subset of 30 videos were independently coded by two coders (Cohen’s kappa  $\geq 0.70$  for all codes). Once reliability was established the remainder of the videos were coded.

To account for the multiple home mealtime videos that each family submitted, and the variability in feeding practices that may occur across these mealtimes, we created two categories

for each feeding practice: 1) the feeding practice is always present in every video submitted (e.g., the child is eating at the table in every video submitted by the family) and 2) the feeding practice is never or not always present (e.g., the child never eats at the table in any video submitted, or the child does not eat at the table for all the videos submitted). For each dyad, each of the three home mealtime feeding practices (child eats at a table, TV is not audible and mother eats with the child) was categorized as always present vs. never/not always present.

**Maternal feeding practices.** Maternal feeding practices of promoting vegetables and restricting junk food were also measured in a videotaped structured eating protocol (SEP). The SEP is a standardized protocol, described in detail elsewhere (Goulding *et al.* 2014, Lumeng and Burke 2006, Radesky *et al.* 2015, Pesch *et al.* 2016), that examines a mother's and child's responses to different types of foods in a controlled laboratory setting, thereby reducing the variability that occurs during home mealtimes. A total of 209 dyads completed the SEP. The most common reasons for non-completion included food allergy and scheduling difficulty. In brief, the mother and child were videotaped, seated at a table alone in a quiet room, and presented with individual portions of four different types of foods, sequentially in a randomized order by a research assistant. The research assistant invited participants to try the food or not, then left the participants alone for four minutes. The four foods differed in familiarity (familiar or unfamiliar) and sweetness (vegetable or dessert). The food items served to each participant included green beans (familiar vegetable), artichoke hearts (unfamiliar vegetable), cupcakes (familiar dessert) and halva (unfamiliar dessert).

For the analysis, we chose to focus on mothers' practices around the vegetables (green beans and artichokes) and desserts (cupcakes and halva), as we hypothesized that mothers may pressure or restrict their children differently for these different food categories based on their feeding goals.

Counts of maternal encouragement and discouragement were quantified in the SEP using the Bob and Tom's Method of Assessing Nutrition (Klesges *et al.* 1983) coding scheme. For each dyad, the separate segments during which the different foods were presented were coded for counts of verbal encouragement, verbal discouragement, physical encouragement and physical discouragement. Two raters coded 20% of the video segments, with intra-class correlation coefficients exceeding 0.78. Once reliability was established, the remainder of the videos were coded.

Counts of verbal and physical encouragement for the green beans and artichokes were summed to create a variable which we called "mother promotes vegetables". Counts of verbal and physical discouragement for the cupcakes and halva were summed to create a variable which we called "mother restricts junk food".

**Covariates.** Participant heights and weights were obtained according to standardized procedures (Shorr 1986). Mothers reported their child's age and sex, as well as their own age, race/ethnicity, and education level. Family chaos was measured using the Confusion, Hubbub, and Order Scale (Matheny *et al.* 1995), a validated and reliable 15-question instrument that measures noise, crowding, disorganization, and confusion in the home (e.g., "You can't hear yourself think in our



home”, “It’s a real zoo in our home”). Mothers answered “true” or “false” to each item. The number of items answered “true” were summed, creating a total score. Total scores represent the levels of chaos in the home, with higher scores representing more chaos (Cronbach’s  $\alpha= 0.78$ ).

### **Data Analysis**

To analyze the association of maternal feeding goals with maternal home mealtime and feeding practices, we ran five regression models with the goals of restricting junk food, promoting fruit or vegetable intake, promoting autonomy around eating, and preventing obesity entered in simultaneously in each model as the predictors and each maternal home mealtime or feeding practice as a separate outcome, controlling for child sex, child body mass index (BMI) z-score, mother’s BMI, mother’s race/ethnicity (non-Hispanic white vs. other), mother’s education level (high school diploma or less vs. more than a high school diploma), and family chaos score. The decision was made to control for these covariates in our models to avoid confounding, as these covariates have been found in prior works (Anderson and Whitaker 2010, Faith *et al.* 2004, Horodynski *et al.* 2010, Spruijt-Metz *et al.* 2002, Fiese *et al.* 2012) to be associated with mothers’ home mealtime and feeding practices as well as with mothers’ feeding goals (Goulding *et al.* 2015). For binary outcomes we ran logistic regression models, and for count outcomes we ran Poisson regression models. A p-value of less than .05 was considered statistically significant.

## **RESULTS**

Participant characteristics are shown in Table 2. Results of associations between feeding goals and home mealtime and feeding practices are shown in Table 3. The goal of restricting junk food was associated with the child always eating at the table (OR 2.87, 95% CI (1.39-5.96),  $p=0.005$ ). The goal of promoting fruit or vegetable intake was associated with the mother promoting vegetables (OR 1.41, 95% CI (1.09-1.84),  $p=0.01$ ). The goals of promoting autonomy around eating and preventing obesity were not associated with any home mealtime or feeding practice.

## DISCUSSION

This study found that certain feeding goals articulated by low-income mothers are associated with their observed home mealtime and feeding practices, but other feeding goals do not seem to translate to observed practices. Findings may have implications for intervention development.

Mothers who articulated the goal to restrict junk food were more likely to provide mealtime structure, in the form of having the child eat at a table. Of note, these mothers were not more likely to restrict junk food in a laboratory eating task. There are several possible explanations for this. First, mothers may be hesitant to restrict their child's intake due to fear of causing poor self-esteem or maladaptive eating practices (Birch *et al.* 2003). Second, while mothers may have the intention or desire to restrict their child's intake of junk food, they may be hearing the recommendations of professional organizations (Barlow and Committee 2007) not to engage in restrictive practices and therefore refrain from doing so. Instead of overtly restricting,

these mothers may be providing their children with more mealtime structure in a way that may be easiest for families to accomplish (having the child eat at the table). Recent work (Rollins *et al.* 2015) has highlighted the provision of structure as an alternative to overt restriction, however it is unknown if this is effective to decrease a child's intake of unhealthy foods. Third, it is possible that mothers are engaging in other forms of restriction that were not captured in this study. For instance, mothers may be engaging in covert restriction at home (e.g., not serving or buying junk food, or preparing healthful foods for dinner). Finally, it is possible that social desirability bias contributed to mothers avoiding restriction due to the presence of the video camera.

Mothers who articulated the goal of promoting fruit or vegetable intake were more likely to prompt their child to eat vegetables during a laboratory eating task. The promotion of fruit or vegetable intake is a feeding practice that is widely accepted as positive and mothers therefore may not doubt its appropriateness. Articulating this goal was not associated with any other maternal practice. It is possible that telling a child to "eat your green beans" is easier than implementing mealtime structure, which may also increase a child's consumption of fruits or vegetables (Coon *et al.* 2001, Tibbs *et al.* 2001, Cooke *et al.* 2004).

The goal of promoting autonomy in eating was not associated with any observed home mealtime or feeding practice. This may be because the feeding practices measured in this study did not map onto this goal. Mothers may be promoting autonomy in their children in different ways outside and during mealtime, such as involving them in food selection or meal preparation.

Obesity prevention and intervention guidelines recommend that families structure mealtimes to optimize healthy eating habits. For instance, it is recommended that families eat at the table together (Daniels *et al.* 2005, USDA/FNS 2012, USDA 2015) with the TV off (USDA 2015, American Academy of Pediatrics 2015). Parents are also advised to encourage their children to eat fruits and vegetables (Daniels *et al.* 2005, Barlow and Committee 2007) and discourage them from eating too many desserts (Shelov 2009) or junk foods (Barlow and Committee 2007). However, mothers in our study who had the goal of preventing obesity did not exhibit these recommended practices. There are several possible reasons for this. First, mothers may be hearing public health messages about child obesity prevention, but barriers may prevent them from executing these desired practices. These mothers may be in the contemplative stage of behavior change (Prochaska *et al.* 1992) but may need further support to move into the action stage. Second, as others (Sigman-Grant *et al.* 2010) have found, mothers may misinterpret public health messages about obesity prevention. Specifically, they may not perceive the behaviors or practices promoted in these messages as achieving the intended goal. For example, some mothers in prior work (Sigman-Grant *et al.* 2010) perceived eating together as a family to actually increase their child's overeating and weight gain. Alternatively, it is possible that mothers may be questioning the efficacy of these recommendations to prevent obesity in their child, as others (Jain *et al.* 2001) have found that low-income mothers believe that obesity is largely genetically determined, and a child's destiny to become obese is unlikely to be altered by changes in feeding practices.

This study is not without limitations. The study sample was comprised of English speaking, low-income mothers, most of whom were white non-Hispanic, from a single geographical area, therefore results may not be generalizable to other populations. While this study used observational measures of home mealtime and feeding practices, it is possible that we did not capture other practices that may be associated with feeding goals. In addition, it must also be considered that some families did not complete all video recorded mealtimes or the SEP, therefore missing data may have biased our findings. Finally, mothers' feeding practices in the videotaped feeding interactions may have been influenced by social desirability bias.

## **CONCLUSIONS**

Results of this study indicate that low-income mothers' feeding goals are associated with some, but not many, observed home mealtime and feeding practices. Additional work should focus on understanding low-income mothers' barriers and facilitators to implementing their feeding goals. Low-income mothers may benefit from interventions that aid them in translating their feeding goals into home mealtime and child feeding practices that support those goals, such as motivational interviewing. Partnering with mothers around implementing their feeding goals may help to tailor childhood obesity interventions.

## KEY MESSAGES

- Low-income mothers' feeding goals are associated with some, but not many observed maternal home mealtime and feeding practices.
- Mothers with the goal of restricting junk food were more likely to provide more structure during meal time.
- The maternal feeding goal of preventing obesity was not associated with any observed home mealtime or feeding practice.
- Future work is needed to better understand mothers' barriers to implementing their feeding goals.

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**Short title:** Mothers feeding goals predict practices

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