

The Pennsylvania State University
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**COMPUTER-MEDIATED SOCIAL INFLUENCES ON CHILD FEEDING PRACTICES
AND CHILDHOOD OBESITY RISK: AN EXPLORATORY ANALYSIS OF FOOD
BLOGS PUBLISHED BY MOTHERS OF PRESCHOOL-AGED CHILDREN**

A Thesis in
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by
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ABSTRACT

Objectives: Blogs may be an emerging social context in which mothers learn about what and how to feed their children. Using a sample of 158 blog posts from 13 blogs focused on feeding young children, this study aimed to describe: (1) the types of recipes included in blog posts; (2) the child feeding beliefs and behaviors described; (3) the associations between recipe types and child feeding beliefs and behaviors; and 4) the extent to which blog posts referred to evidence-based content. **Methods:** Directed qualitative content analysis was used to code the text of blog posts for recipe type, child feeding beliefs and behaviors, and mentions of scientific research on child feeding. Coding schemes were developed from existing literature on children's dietary intake and maternal child feeding practices. Code frequency was calculated to describe blog post content and chi-square tests of independence were conducted to examine the associations between recipe types and child feeding beliefs and behaviors. **Results:** Recipes were included in 65.8% of blog posts. Nearly 1-in-3 recipes were for mixed dishes (e.g., sandwiches) and nearly 1-in-5 were for sweets and desserts. Child feeding beliefs were coded in 77.8% of blog posts and primarily reflected beliefs about children's food preferences. Child feeding behaviors were coded in 48.7% of blog posts and most frequently described involving children in food preparation. Recipes for vegetables were more likely to occur in posts that also included codes for encouraging balance and variety in children's diets, $\chi^2(1, N = 104) = 18.54, p < .001$. Only 1 out of 158 blog posts referred to scientific research on child feeding. **Conclusions:** Blogs that are focused on feeding young children appear to convey information that may influence readers' own child feeding practices. Future research should explore how mothers use blogs to consume and disseminate information about child feeding, and examine bloggers' interest in including evidence-based content about child feeding practices and childhood obesity prevention.

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Chapter 1

A call for research exploring social media influences on maternal eating behavior, child feeding practices, and childhood obesity risk.

Background

For the past decade, one-third of adults in the United States and nearly one-in-five children have been classified as obese.¹ Meanwhile, the percent of online adults who use social media platforms, such as Facebook,² Twitter,³ and Instagram,⁴ has increased from 16% in 2006 to nearly 75% in 2014.⁵ In this paper, “social media” are defined as Internet-based platforms that allow users to create unique personal profiles, contribute and access searchable digital content (e.g., text, images, videos, hyperlinks to webpages that are intended to inform, entertain, or sell products), form online relationships with other social media users, and view these social connections.⁶ Social media platforms may be accessed on Internet-connected devices such as computers or smartphones, which are owned by 74% to 83% of adults 18 to 49 years of age.⁷ Although the Internet and social media may influence numerous health behaviors,^{8–10} this commentary serves as a specific call for research on the mechanisms through which social media may influence maternal eating behavior and child feeding practices. Such formative research could be applied to the development and dissemination of evidence-based childhood obesity prevention strategies that utilize social media.

Family, peers, communities, media, and policies are potentially modifiable social and environmental risk factors for obesity.^{11–15} These contexts for social influence may affect social norms and individual-level decisions regarding food intake, physical activity, and body weight.^{16–20} Even though there is increasing interest in leveraging social media to prevent childhood obesity,^{21–23} the evidence base for how social media currently influences behavior and how interventions could be developed for these platforms is lacking.²⁴ Previous research has found that parents use the Internet in general to seek information about parenting and child health,^{25–27} and that many parents express interest in joining online communities focused on child

health.²⁸ It is also known that women are more engaged than men with certain social media platforms, including Facebook (77% vs. 66%), Pinterest (42% vs. 13%), and Instagram (29% vs. 22%),²⁹ and the majority of mothers of young children read blogs³⁰ (i.e. frequently updated personal webpages that are increasingly connected to other social media platforms through hyperlinks^{6,31}). Mothers have significant control over young children's food choices³²⁻³⁴ and spend more time than fathers on average on child feeding tasks (e.g., grocery shopping, food preparation),³⁵ which suggests that mothers are a relevant target audience for social media-based childhood obesity interventions. However, formative research is needed to develop effective, evidence-based interventions.

The objectives of this paper are to: frame social cognitive processes as a mechanism of social influence on maternal eating behavior and child feeding practices in the context of social media; provide evidence that social media is an emerging context for social influence; review studies that demonstrate social media conveys information relevant to maternal eating behavior and child feeding practices; suggest directions for future research.

Social cognitive processes as a mechanism for social influence within social media

Social cognitive processes may be one mechanism through which social and environmental factors, including social media, affect obesity risk.³⁶ Social cognitive theory³⁷ proposes that individuals develop behaviors through selectively observing, remembering, and reproducing behaviors that are modeled by members of their social groups. Individuals may be particularly likely to reproduce behaviors that are modeled by actors who are perceived as similar to themselves (i.e. identifiable), when they believe the outcomes of the behavior will be rewarding, and when they believe they have the skills and resources necessary to reproduce the behavior (i.e. high self-efficacy).³⁷ Mothers may observe the beliefs and behaviors of their online social

groups through the digital content they contribute on social media. The beliefs and behaviors they observe may reinforce existing beliefs and behaviors or motivate the initiation of new and behaviors such that mothers adjust their behavior to more closely resemble their online peers.³⁷⁻

³⁹ Social media may facilitate social cognitive processes in ways that other online contexts do not, such as webpages that do not facilitate relationships or on which the source of information is unclear. Selected functions of social media, their potential mechanisms for social influence through social cognitive processes, and platform specific terminology are described in Table 1-1.

Table 1-1

Select social media functions, potential mechanisms of social influence through social cognitive processes, and platform specific terminology

Function	Potential mechanism of social influence	Platform: Terminology
Form online relationships	Creates opportunities to form online relationships with identifiable social models whose beliefs and behaviors are observable through their social media activity (i.e. content contributions, endorsements, and direct communication)	Facebook: Friend (Profiles); Like (Pages) Twitter: Follow Pinterest: Follow Instagram: Follow Blogs: Follow via direct webpage visitation or Rich Site Summary (RSS) feed
Contribute and categorize content	Social media content may convey beliefs and behaviors that can be observed and endorsed (i.e. rewarded) by members of online social groups	Facebook: Post; Hashtag Twitter: Tweet; Hashtag Pinterest: Pin; Hashtag; Pinboard names Instagram: Share; Hashtag Blogs: Post; Tag or category
Browse and search content	Observing the beliefs and behaviors modeled by identifiable members of online social groups may reinforce existing behaviors or motivate the initiation of new behaviors; Self-efficacy may increase for behaviors that are repeatedly observed	Facebook: News Feed Twitter: Timeline Pinterest: Home Feed Instagram: Home Tab / Feed Blogs: Homepage or RSS Feed
Endorse content	Offers a mechanism to reward the beliefs and behaviors that are modeled in social media content; Receiving or observing endorsements may build self-efficacy or motivation for repeating or initiating a behavior	Facebook: Like, Share Twitter: Favorite; Retweet Pinterest: Heart; Repin Instagram: Like Blogs: Share
Direct Communication	Offers a mechanism to affirm social connections among members of online social groups; Information exchange may build self-efficacy or motivation for repeating or initiating a behavior	Facebook: Comment; Message; Tag people Twitter: Reply; Mention; Direct message Pinterest: Comment; Message Blogs: Comment

Social networks may protect against or promote obesity depending on interactions among the characteristics of the individual and his/her social group.⁴⁰ Thus, understanding the role of social media in creating and maintaining relationships that may influence maternal eating behavior and child feeding practices is important. Often, relationships formed on social media are among individuals who have, or once had, in-person contact (e.g., family members, peers from work, school, or leisure settings).⁴¹ It is also possible to form online relationships with previously unknown individuals, which may be more likely on social media platforms that allow unreciprocated connections such as on Twitter, Pinterest, Instagram, and blogs (i.e. User A can chose to observe User B's content but User B may or may not chose to observe User A's content).⁴¹

As is true of in-person relationships, social media users may form online relationships with individuals who they perceive as having attributes similar to their own (i.e. homophilous relationships).⁴² For example, pregnant women may form online relationships with social media users who are in the same stage of pregnancy. In contrast, social media users may form online relationships with individuals who they perceive as having attributes different from their own, including attributes that are aspirational (i.e. heterophilous relationships). For example, women who are trying to lose weight may form online relationships with social media users who have previously succeeded in losing weight. In an experimental study, Centola and van de Rijt⁴³ found that members of an exercise-focused social media platform established homophilous relationships based on age, gender and body mass index rather than heterophilous relationships, even though these traits were observable only through text (i.e. no photographs were included). Further, users did not form relationships, heterophilous or homophilous, based on health value attributes such exercise goals.⁴³ Research is needed to explore how relationships on social media

form based on maternal demographic characteristics, parenting stage (e.g., pregnancy, infancy, toddlerhood, school-aged), and beliefs about maternal eating behavior and child feeding.

Social media: An emerging context for social influence

Internet use among adults increased from 66% in 2005 to 87% in 2014.⁴⁴ As of January 2014, Internet use did not differ significantly by gender, race, or community type (i.e. urban, suburban, rural), however it was significantly lower among older adults and those with less education and lower incomes.⁴⁵ Younger adults (18 to 49 years of age) were highly engaged with the Internet and mobile technology: 93% to 97% used the Internet⁴⁵ and 74% to 83% used smartphones.⁷ Internet and social media use is likely to become ubiquitous in the coming years because they are increasing integrated into school, work, home, and leisure contexts.⁴⁶

In addition to using social media to maintain and build social relationships,⁴¹ individuals employ social media to gather health information,²⁸ learn about current events,⁴⁷ and for entertainment.⁴¹ Social media platforms are also increasingly used by companies for marketing purposes.^{48,49} In September 2014, the Pew Research Center found that 52% of adult Internet users reported having at least two social media profiles.²⁹ Facebook was the most popular platform, used by 71% of online adults overall and accessed daily by 70% of Facebook users.²⁹ There was evidence of gender and racial and ethnic differences in the use of some social media platforms. As mentioned, women were more likely than men to report using Facebook (77% vs. 66%), Pinterest (42% vs. 13%), and Instagram (29% vs. 22%).²⁹ Twitter use was reported by 27% of Black, non-Hispanic adults, 25% of Hispanic adults, and 21% of White, non-Hispanic adults. In a similar pattern, Instagram use was reported by 38% of Black, non-Hispanic adults, 34% of Hispanic adults, and 21% of White, non-Hispanic adults. Conversely, Pinterest use was reported by 32% of White, non-Hispanic adults, 21% of Hispanic adults, and 12% of Black, non-

Hispanic adults.²⁹ Data collected by the Pew Research Center in 2010 revealed that 34% to 43% of adults 18 to 45 years of age read blogs.⁵⁰ Smaller survey data ($N = 157$) collected from primarily White, college-educated mothers of young children found that 75% of mothers read blogs.³⁰ Because it is clear that mothers are highly engaged with social media, research is needed to describe the content relevant to maternal eating behavior and child feeding practices that mothers are likely to observe on these platforms.^{21,51}

Social media content relevant to maternal eating behavior and child feeding practices

Due to the volume, velocity, and variety of data generated on social media, it is challenging to quantify how much content is relevant to a given topic.⁵² However, there is preliminary evidence to suggest that social media platforms are social contexts in which mothers are exposed to food-related digital content. Examples of food-related digital content that may be shared on social media platforms include: text, images, and/or videos about meals consumed at home or away from home; food or beverage products and/or restaurant endorsements; hyperlinks to recipes found on blogs or other websites that contain recipes. Observing such content may foster the development of perceived social norms about the types and amount of food that mothers should consume and feed to their children.

Pinterest is one social media platform that appears to be particularly relevant to maternal eating behavior and child feeding practices. Pinterest users create categorized groupings of images that are hyperlinked to the original content source. Individually, the hyperlinked images are referred to as “Pins.” As a categorized grouping, they are referred to as “Pinboards.”^{53–57} Hall and Zarro⁵⁵ analyzed a random sample of 1,000 pins collected between February and March 2012 and found that pins depicting food and beverages were the single largest category (15%). Pins depicting home and garden décor were the next largest category (14%), which may have

contained images related to kitchens, plate ware, and dining rooms. Blogs were the original content source for 45% of sampled pins, indicating that these two social media platforms are closely connected.⁵⁵ Ecommerce sites (i.e. webpages that are primarily intended to sell products) were the next most frequent source of original content (10%), which suggests that Pinterest users are often able to easily purchase products that they see are endorsed by other users.

Blogs focused primarily on recipes, food products, and/or restaurant reviews (i.e. “food blogs”) are highly likely to contain content relevant to what and how much mothers should eat and feed their children. In a small study examining the nutrition profiles of 96 recipes found on six food blogs, Schneider et al.⁵⁸ found that recipes were within one-third of the adult dietary reference intake for calories ($M = 516$ calories), but exceeded dietary recommendations for saturated fat and sodium content. Over one-third (38%) of sampled recipes were for vegetarian dishes, and these dishes were significantly lower in calories, saturated fat, and sodium than recipes that contained red meat or poultry.⁵⁸ Additional studies that examine a larger sample of recipes and food blogs, particularly blogs that are created to appeal to mothers feeding young children, would provide further insight into the types of foods and portion sizes that mothers are likely to observe on blogs.

There is preliminary evidence to suggest that Twitter users share food-related content related to the main meals of the day. Fried et al.⁵⁹ collected a sample of over 3.5 million tweets that contained a selection of food-related labels (i.e. “hashtags”) between October 2013 and May 2014. Among the sampled food-related hashtags, the most common was #dinner, found in 32% of collected tweets, followed by #breakfast (27%) and #lunch (26%). Less than 10% of tweets contained the remaining sampled hashtags: #brunch, #snack, #meal, and #supper. Twitter users may be sharing text, images, videos, or hyperlinks to webpages about what they consumed or

plan to prepare for their meals. Future studies should explore the amount of content that is created relevant to maternal eating behavior and child feeding practices by examining more domain specific hashtags such as #breastfeeding, #PickyEater, or #FamilyMeals.

Food companies can use social media, particularly Facebook, to advertise to users by creating company unique profiles (i.e. “pages”), which allow them to form online relationships with other users, contribute content (e.g., images, videos, games, giveaways, polls), and engage with other users (i.e. endorse their content and/or directly communicate).^{48,49} Freeman et al.⁴⁹ found that over 277.5 million Facebook users from across the globe had (i.e. “liked”) a sample of 27 food company pages. Young adults (18- to 24-year-olds) were the most frequent group to endorse the sampled food company pages.⁴⁹ Facebook users can see pages that members of their online social network (i.e. “friends”) have endorsed, which may establish social norms around the food brands and products mothers purchase for themselves and their children. Future studies should examine the role of food advertising across multiple social media platforms, particularly among food companies that market their products to mothers of young children.

Conclusions and Future Directions

Childhood obesity remains a persistent health problem in the United States affecting nearly 20% of children.¹ Children who enter kindergarten overweight or obese are more likely to develop obesity in later childhood,⁶⁰ which underscores the importance of early prevention.⁶¹ To date, there is limited empirical evidence to inform the development of effective interventions that aim to leverage social media to prevent childhood obesity²⁴.

This paper proposes that social media platforms, such as Facebook, Twitter, Instagram, Pinterest, and blogs, are emerging contexts for social influence. Social cognitive processes, in which individuals observe, remember, and reproduce the behaviors that they observe within their

social groups,³⁷ may be one mechanism through which social media impacts maternal eating behavior and child feeding practices. A recent meta-analysis found that observing or having prior knowledge of what other individuals had consumed influenced the types and amount of food consumed by individuals.⁶² This hypothesis has not yet been tested in the context of observing digital food-related content on social media. Given that mothers appear to be highly engaged with social media and that these platforms contain food-related content, future studies should examine whether social media influences maternal eating behavior and child feeding practices through social cognitive processes.

Research is also needed on how mothers form online relationships with other social media users who share food-related content. Previous research on naturally occurring ties on Twitter⁶³ and Pinterest,^{53,54} and experimental research on an online exercise community,⁴³ suggest that individuals form homophilous relationships. Without intervention or incentive, social media users may form online relationships that maintain, rather than change, behavior.

Additional studies are needed on the role of food companies and public health-oriented groups on social media. Even though government and non-profit groups are more likely promote evidence-based content than corporations,⁶⁴ they are less likely to have social media profiles or engage with other social media users (i.e. endorse their content and/or directly communicate) when they are present.⁶⁵ Government, non-profit, and academic groups that are already implementing strategies to prevent childhood obesity using social media could offer insight into how evidence-based information could be disseminated by reporting the strategies they used to form online relationships, format of their content contributions, and the number of content endorsements they have received.^{24,66}

There is growing enthusiasm to use large-scale data, including data collected from social

media platforms, to address public health issues.⁶⁷ Childhood obesity is a research area of public health importance that would benefit from studies using such data. Developmental and nutritional science researchers interested in discovering novel insights about social media as an emerging context for social influence on maternal behavior and child feeding practices that could be applied to childhood obesity prevention should consider forming interdisciplinary partnerships to pursue the lines of research outlined in this commentary.

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Chapter 2

An exploratory analysis of recipe types, child feeding practices, and evidence-based content on food blogs published by mothers of preschool-aged children.

Introduction

There is increasing evidence that child feeding practices play an important role in children's risk for developing obesity, but little is known about how parents develop these practices.¹⁻⁶ In 2011-2012, nearly one-in-four preschool aged children were overweight or obese.⁷ Children who experience rapid or excessive weight during infancy or early childhood are likely to be overweight or obese in later childhood, adolescence, and adulthood.^{8,9} Indeed, a nationally representative, longitudinal study found that nearly one-third of children who entered kindergarten overweight became obese by 14 years of age, compared to less than 10% of children who entered kindergarten at a normal weight.¹⁰ Preventing childhood obesity is important because it is associated with negative health consequences such as Type 2 diabetes, hypertension, and nonalcoholic fatty liver disease.¹¹⁻¹³

To reduce the prevalence of childhood obesity, more research is needed on the risk and protective factors that can be modified during children's first five years of life.¹⁴⁻¹⁶ Child feeding practices are one such modifiable influence, and include decisions about what to feed children (i.e. the types and amount of food and beverages to feed), and more nuanced beliefs and behaviors about how to feed children (i.e. the amount of control exerted over children's eating behavior, offering food to soothe or reward, establishing mealtime/snack routines).^{3,4,17-21} Overtly restrictive and indulgent feeding practices have been found to promote childhood obesity,^{6,22-28} whereas responsive feeding practices may promote children's self-regulation of food intake and reduce the risk of childhood obesity.²⁹⁻³¹

During infancy and early childhood, parents are primarily responsible for child feeding,³²⁻³⁶ and model eating behavior for their children.³⁷⁻⁴⁰ Parenting within the context of food has important implications for children's physical development, as well as their cognitive,

emotional, and social development.^{20,21,41,42} Through their feeding experiences, children learn skills related to fine motor control, sharing, patience, and social interaction, and develop preferences for foods that become familiar.⁴³⁻⁴⁶ The amount of time mothers spend on child feeding tasks (e.g., preparing food, eating with children) may be particularly important for childhood obesity prevention.⁴⁷ In 2012, women living in households with children six years of age or younger spent an average of one hour per day on food preparation and clean up, 0.43 hours per day purchasing consumer goods (including groceries), and an 2.28 hours per day caring for and helping children.⁴⁸ Women spent longer than men on all three tasks,⁴⁸ suggesting that even though fathers also play an important role in influencing children's eating behavior,^{49,50} mothers still tend to take primary responsibility for day-to-day child feeding.

To date, few studies have explored how mothers develop their child feeding practices.⁵ Research that has been conducted has focused on maternal demographic characteristics (e.g., income, education) mental health issues (e.g., depression, eating pathology), and weight status,^{3,51-53} and on children's weight status,^{3,54-56} appetitive traits,^{18,57,58} and temperament.⁵⁹⁻⁶¹ Additional research is needed to explore how broader contextual factors, including social influences, impact mothers' child feeding practices.^{5,62} The purpose of the current study is to begin to explore how social media, specifically food blogs focused on feeding young children, may be a novel context for social influence on the development of child feeding practices.

Social cognitive processes (i.e. selectively observing, remembering, and reproducing behaviors that are modeled within social groups)^{63,64} are one potential mechanism through which mothers may develop their child feeding practices. Mothers may be particularly likely to sustain or initiate child feeding practices that are modeled by mothers of children who are close in age to their own children (i.e. relatable social models), when they believe the outcome of the child

feeding practice will be rewarding (e.g., that their own children will respond favorably to this feeding practice, that it is a belief or behavior that would be endorsed on social media), and when they believe they have the resources and skills necessary to successfully perform the child feeding practice (i.e. high self-efficacy).⁶³ Figure 2-1 illustrates the potential social influences of social media on child feeding practices as mediated by social cognitive processes. There is some evidence to support this theory during the milk feeding period, such that mothers are more likely to breastfeed their own children if they are members of social groups in which breastfeeding is modeled.^{65,66} Additional research is needed to examine social influences on child feeding practices after children transition to solid foods, particularly during the preschool period.^{67,68}

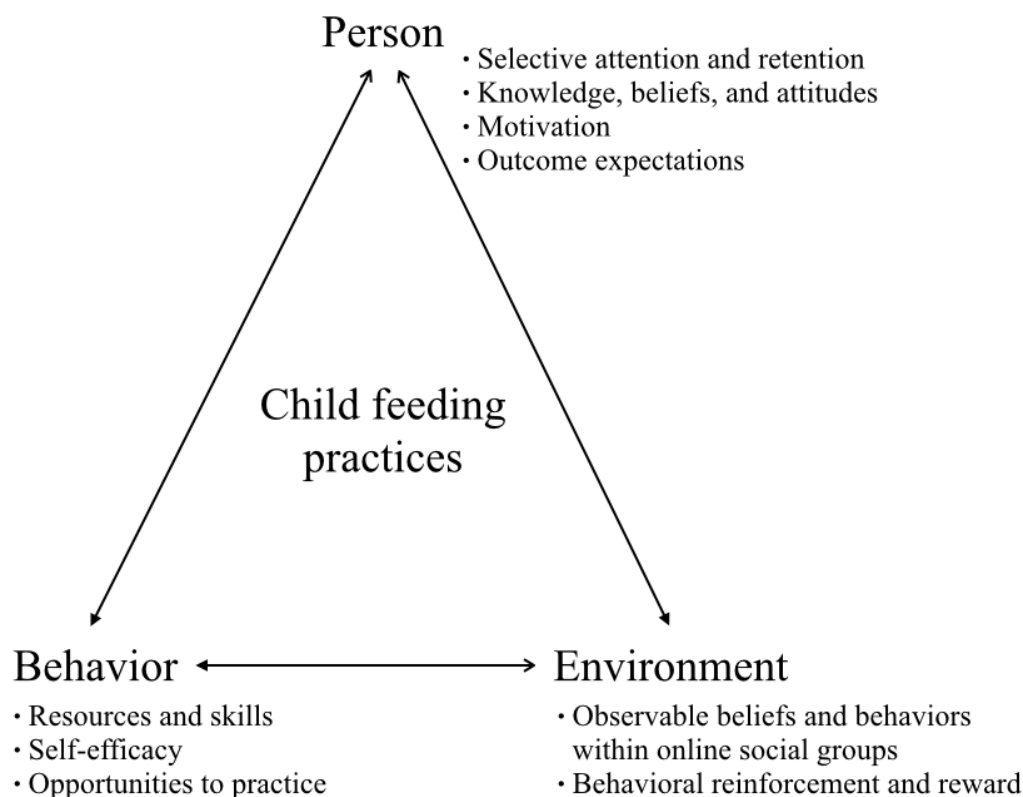


Figure 2-1. Potential social influences of social media on child feeding practices as mediated by social cognitive processes. Adapted from Bandura's model of reciprocal determinism.⁶⁹

The Internet increasingly offers mothers opportunities to observe the beliefs and behaviors of other mothers through social media.⁷⁰⁻⁷⁵ Previous studies have found that mothers use websites and social media to ask questions about parenting and gain social support.⁷⁵⁻⁷⁷ Yet other research has found that nearly 90% of parents of young children used the web for general parenting information,⁷⁸ and over 40% of parents of overweight preschoolers used the web to seek information about child health.⁷⁹ The majority of women of parenting age use the Internet and social media, and have mobile access to websites, social media, and mobile applications through smartphones; According to the Pew Research Center, in 2014, 93-97% of adults 18 to 49 years of age used the Internet, 82-89% used social media, and 74-83% used smartphones.⁸⁰⁻⁸² The Pew Research Center found that in 2010, 34% to 43% of adults 18 to 45 years of age read blogs.⁸³ A smaller survey of primarily White, college-educated mothers of young children found that 75% of mothers read blogs,⁷⁵ indicating that these may be a particularly important source of social information for mothers. Research is needed to explore how online contexts for social interaction, including blogs, may inform maternal child feeding practices.

Blogs are generally defined as publically available, chronologically organized, frequently updated personal webpages.⁸⁴⁻⁸⁶ Blog content (e.g., text, photos, videos, hyperlinks to other webpages) often reflect personal narratives and opinions focused on specific topics,⁸⁶⁻⁸⁸ such as parenting (e.g., “mommy blogging”)^{73,75,77} and food.^{89,90} “Food blogs” are blogs that focus mainly on recipes, but may also incorporate food and beverage product reviews, recipe recommendations, or other life-style posts.^{89,91} Many blogs have social networking features (e.g., comment threads, hyperlinks to the bloggers’ presence on other social media platforms) to socially engage readers and build community.^{72,92} Blog readers may incorporate the parenting and child feeding beliefs and behaviors that they observe on blogs into their own practices.

Schneider, McGovern, and Lynch⁹⁰ analyzed the nutritional content of 96 recipes drawn from six general food blogs (i.e. food blogs that were not necessarily specific to child or family feeding) and found on average, caloric content of dishes were within one-third of the adult dietary reference, but recipes exceeded dietary recommendations for saturated fat and sodium content. More research is needed to examine the types of recipes that mothers are likely to observe on blogs focused on child- and family-“friendly” meals.

Based on the principals of homophily (i.e. the propensity for individuals to form social relationships with others who have similar attributes),^{93,94} mothers of young children are likely to seek advice about child feeding from other mothers parenting children of a similar age. Thus, the current study explored what child feeding practices mothers are likely to observe within food blog posts written by women parenting at least preschool-aged (2- to 5-year-old) child. Specifically, it examined: (1) the types of recipes included in blog posts; (2) the child feeding beliefs and behaviors bloggers endorsed and/or modeled through their writing; (3) the associations between recipe types and child feeding beliefs and behaviors within blog posts; and 4) the extent to which blog posts referred to evidence-based content (i.e. through research summaries, in text references to science or research, and/or including citations of scientific research).

Methods

Study Design

The current study took a mixed-methods approach. First, purposive-snowball sampling^{95,96} was used to identify food blogs published by mothers of preschool-aged children. A similar sampling procedure was used in a previous study of health-related blogs.⁹⁷ A sample of blog posts that included content relevant to child feeding published between March 1, 2013 and

February 28, 2014 was drawn and coded using directed qualitative content analysis^{98,99} for recipe type, child feeding beliefs and behaviors, and references to scientific research on child feeding practices. Secondly, descriptive statistics (i.e. frequencies) and chi-square tests of independence¹⁰⁰ were conducted to further examine the codes assigned to each post and the associations between recipe type and child feeding beliefs and behaviors.

Sampling Procedure

To be eligible for the current study, blogs had to meet the following inclusion criteria: (1) the blog website was publically available and recently updated (i.e. had a post dated within the past month); (2) blog content represented the views of the blogger, not those of a business or other organization; (3) the blog description stated/implied it focused primarily on child and/or family feeding (e.g., “family-friendly” recipes, food/beverage products, and/or feeding recommendations); (4) the blogger was parenting at least one preschool-aged child (2- to 5-years-old) within the year 2013; and (5) blog posts consistently mentioned child feeding during the study period (March 1, 2013 – February 28, 2014). When it was ambiguous whether blog content focused primarily on child and/or family feeding, the posts from the most recent month were screened for topics related to child feeding (e.g., recipe ideas for children, children’s reactions to recipes, school lunches). If child age was not stated in the blog description or the description appeared to be outdated, the first author searched within the blogs for the keywords: “daughter,” “son,” “birthday,” and “years old.” Such searches identified posts that disclosed the child’s date of birth, age in years, or year in school, which was used to estimate their age in years.

The first author identified an initial sample of blogs by entering the keyword phrase “food blogs for moms” into multiple web search engines (i.e. Google, Yahoo, DuckDuckGo) in

May 2013. An article titled, “The Top 100 Mom Food Blogs of 2013!” published in April 2013 by a parenting website owned by the Walt Disney Company, Babble,¹⁰¹ was among the top search results across search engines. The 100 blogs listed in this article were selected as the initial sample because they were likely to be easily accessed by mothers who performed web searches using these basic search terms (i.e. search terms that do not require specialized knowledge about child feeding) in May 2013. Sixteen out of these 100 blogs met inclusion criteria 1 through 4. Six out of the 16 eligible blogs contained blog rolls, (i.e. hyperlinked lists of blog recommendations)¹⁰² which yielded a snowball sample of 169 unique blogs. Eight out of these 169 blogs met inclusion criteria 1-4.

To determine whether blogs met the fifth inclusion criteria, the first author and a trained research assistant coded the text from all blog posts published during the study period ($N = 2345$) and assigned each post a binary code: relevant to child feeding or not relevant to child feeding. Posts that mentioned topics related to children feeding at least once within the post were coded as relevant. Examples of such topics include: descriptions of children’s food preferences; recipe, product, or restaurant suggestions specifically for children or families; and managing mealtime behaviors. Coders looked for child-related keywords such as the bloggers’ children’s names (actual or a pseudonym such as “little one,”) “kids,” and “children” in the same sentence, or in close proximity to, food-related keywords such as “recipe,” “breakfast,” “lunch,” “dinner,” “snack,” “meal,” “treat,” “dessert,” and “eating.” Words and phrases such as “family,” “our house,” “everyone at the table,” and “school” were also considered child-related keywords. Ambiguous pronouns without additional context, such as “we” and “our,” were not considered child-related keywords. All posts from 4 out of 24 blogs ($n = 417$ posts) were double coded and demonstrated high inter-rater reliability (Cohen’s kappa = 0.91). The first author completed a

second round of coding on all posts that were coded as relevant to child feeding by either coder in the first round to determine the final coding assignment. Disagreements were resolved by discussion between the two coders.

Across the 24 blogs, 38.8% of posts ($n = 909$) were relevant to child feeding, however the percentage of blog posts that were relevant to child feed varied across blogs and within blogs over the course of the study period. Consequently, only blogs that met or exceeded the bottom quartile (i.e. 25th percentile) of the percentage of blog posts that were relevant to child feeding across all four quarters of the study period were included. This criteria was established so that the results of this study would represent the blogs that consistently conveyed information that was relevant to, and potentially influential on, readers' child feeding practices. The minimum percentage of blog posts relevant to child feeding required per quarter for inclusion in the present study was as follows: March 2013 to May 2013 = 21%; June 2013 to August 2013 = 28%; September 2013 to November 2013 = 26%; December 2013 to February 2014 = 26%. A total of 13 blogs met this fifth inclusion criteria and were included in the present study. Due to the large number of posts coded relevant to child feeding within this sample of 13 blogs ($n = 681$), a random sample of 20% of posts relevant to child feeding per blog were selected for further analyses, with the exception of two blogs that had few posts during the study period for whom 50% and 100% of posts were included, resulting in a final sample size of 158 blog posts sampled from 13 blogs. All supporting quotes in this manuscript are paraphrased to protect the privacy of bloggers whose content was included in these analyses. This study was reviewed by the Pennsylvania State University Institutional Review Board as not human subjects research.

Measures

Recipes in blog posts (i.e. the portion of the post that contained a distinct recipe title, list

of ingredients, and step-by-step instructions) were coded using the food categorization schema similar to the 2002 and 2008 Feeding Infants and Toddlers Study,^{103,104} which included measures of preschool children's food and beverage intake.⁶⁸ The recipe types included in the current study were: mixed dishes; grains and grain products; meat or other protein sources; vegetables; fruits; sweets and desserts; beverages (including milk; juice; smoothies); salty snacks; condiments (e.g., sandwich spreads, spice mixes); and fats/oils (butter, oils, salad dressing). Each recipe was assigned a single code that best reflected its ingredients. Multiple recipe type codes were assigned if there were multiple distinct recipes (including titles) within a single post. Recipes coded as "mixed dishes" included a substantial portion of food types from multiple food groups (e.g., pasta dishes containing protein and vegetables, rice casseroles, sandwiches). The first author and a trained research assistant completed the recipe type coding. A random sample of ~20% of all recipes were double coded for inter-rater reliability ($n = 54$). Because there were a large number of possible codes and a low frequency of each code assignment, overall percent agreement was calculated (45 out of 54 code agreements; 83.3%). The first author performed a second round of coding on all recipe type codes assigned by either coder in the first round to determine the final coding assignment. Any disagreements were resolved by discussion between the two coders.

To measure child feeding beliefs and behaviors, blog posts were coded using directed qualitative content analysis^{98,99} for text (i.e., phrases, sentences, paragraphs) that conveyed information about child feeding. An a priori coding scheme was developed by the study team from existing qualitative and quantitative survey measures of maternal child feeding beliefs and behaviors.^{20,24,41,105-108} Example belief codes are: maternal responsibility for child feeding, children's health values, and concern for child weight. Example behavior codes are: Involving

children in food preparation, monitoring children's intake, indulgent feeding, and responsive feeding. Open coding was also conducted to capture emergent (i.e. unanticipated) themes by using a constant comparison approach, in which all text was repeatedly read and considered for thematic importance and relevance to child feeding practices; text segments that appeared to be important and relevant to child feeding were first labeled with the code "other," and later assigned a code name when it became clear that numerous text segments within blog posts contained this emergent theme.^{96,99} Only one additional code emerged from the data and was the belief that food is "fun" (i.e. cooking and/or eating is an entertaining, pleasant experience for children and families). Codes were not mutually exclusive, meaning that all child feeding practices that occurred in the post were assigned codes. All posts were read repeatedly and coded by the first author. Ambiguous or challenging text segments were discussed among the study team. Tables 2-1 and 2-2 offer the names, code descriptions, and paraphrased text segment examples for each child feeding belief and behavior code respectively.

Table 2-1

Child feeding beliefs coding scheme: Code names, description, and example text segments

Code	Description	Example (paraphrased)
Children's food preferences	Perceptions of children's likes or dislikes of foods, flavors, or textures	"All of my kids like eggs, so this makes a great afternoon snack."
Health values	Child health and nutrition portrayed as important; Includes health claims	"Avocados are a quick and healthy way to fill up your kids."
Responsibility	Conveys the belief parents/mothers are responsible for child feeding tasks (e.g., cooking and serving food, packing lunch)	"Parents are responsible for teaching children how to get around the kitchen and should model healthy eating."
Food and family	Child feeding viewed a way to show love and create of family memories. Includes mentions of "family meals"	"This is family meal that I hope my kids will look back on fondly make for their own children one day."
Food and fun	Food is portrayed as a source of entertainment or "fun;" Either in consumption or preparation	"We made these cookies as a fun way to pass some time on a snow day."
Food and culture	Frames food as a way to promote/share culture with children and family; Includes mentions of holidays	"It wouldn't really be summer without ending the day with an ice cream sundae."
Picky eating	Perceives children as picky, selective, or difficult-to-please eaters	"My son is a terribly picky eater but he sure gets excited when he hears this dish is for dinner."
Food and indulgence	Food is viewed as decadent, indulgent, rich; a way to "treat" or "spoil" children	"This decadent dessert is reserved for a holiday treat."
Concern for child weight	Expresses worry or concern about a child being overweight or underweight	"My daughter is small for her age, so I try make lunch easy to eat so she can get as much in as she can during their break."

Table 2-2

Child feeding behaviors coding scheme: Code names, description, and example text segments

Code	Description	Example (paraphrased)
Child involvement	Physically or verbally engages children in food preparation (e.g., meal planning, setting the table, selecting ingredients, measuring, stirring)	“Whenever I let the kids pick out their own toppings it’s easier to get them to eat tacos for dinner.”
Encourage balance and variety	Encourages children to eat a balanced and varied diet, particularly including “healthy” foods	“As a mom, I try to offer my kids as many different veggies as possible.”
Responsiveness	Encourages, acknowledges, and responds to children’s hunger and fullness cues and taste preferences in developmentally appropriate ways	“We’ve found a way to serve this veggie so that every one in the family can take a taste.”
Indulgence	Allows children to decide what/when/where food is eaten, even when there are reservations about the nutritional quality; Does not seem to want to spend much time/energy on child feeding	“I make a big batch of this pudding so that my son can take a cup from the fridge whenever he wants instead of asking me all the time.”
Food literacy	Explicitly teaches children about food, nutrition, and ingredients (e.g., seasonality, growing processes)	“We started a garden so that my kids could see where their food comes from.”
Pressure to eat	Attempts to get children to eat more food, regardless of children’s hunger/satiety cues	“All the kids know they have to take at least three bites of everything I’ve put on their plate.”
Modeling eating behavior	Intentionally demonstrates how to eat, particularly healthy, food	“Parents – to be good role models you have to eat your veggies too!”
Overt restriction	Limits children’s intake of a type or amount of food through obvious methods (E.g., tells child to stop eating, won’t serve more of a food, keeps foods visible but out of reach; Child wants something parent says no).	“My son asked for ice cream and I told my son he had enough sugar for the day and could have fruit instead.”
Monitoring	Keeps track of what/when/where and how much children eat, particularly high fat, high sugar foods.	“To avoid feeding your children too much sugar, you have to really look at the labels on certain foods.”

Instrumental feeding	Uses food to reward good behavior or coerce children into doing something, or uses food in an emotional content - such as to soothe negative emotions or encourage positive emotions.	“I’ll bribe my kids for good behavior by telling them we can stop for a treat on the way out of the mall.”
Covert restriction	Limits children’s intake of a type or amount of food through methods that are not perceptible to the child.	“You can cut sugar out of this recipe easily without your little one even noticing.”

To measure the extent to which blog posts incorporated evidence-based content, the first author and a trained research assistant coded posts for summaries of research studies, in-text citations or mentions of research (e.g., “studies show” or “research suggests”), and hyperlinks to primary or secondary sources of scientific information. A random sample of 20% of posts coded as relevant to child feeding were double coded for inter-rater reliability and demonstrated high reliability (Cohen’s kappa = 1.0), however there were no evidence-based content codes assigned in this sample. Content that was coded by either author as evidence-based was discussed among the study team to determine the final coding assignment.

Data analyses

Recipe type, child feeding practices, and evidence-based content coding was conducted with MAXQDA software for qualitative analysis, Version 11 for Mac.¹⁰⁹ A matrix containing one row for each blog post and one column for each code was created to indicate which codes were assigned to each blog post using the code matrix browser feature of MAXQDA. Each code was counted only once per document, meaning it was considered present (1) or absent (0), regardless of the number of text segments that it had been assigned to within the blog post. These data were exported from MAXQDA as a comma separated values file and imported into IBM SPSS for Mac, Version 21¹¹⁰ for quantitative analyses. The frequency of each code was computed and chi-square tests of independence were conducted to explore associations between

recipe type and child feeding beliefs and behaviors codes. Because this study conducted a large number of exploratory analyses, Bonferonni corrections were used to establish the significance level for each chi-square test of independence to avoid type I errors ($p = .05/[N \text{ tests}]$).¹¹¹

Significance levels are noted in the text.

Results

Types of recipes

Recipes were included in 65.8% of blog posts ($n = 104$). Four posts contained two recipes, thus a total of 108 recipe codes were assigned. As shown in Table 2-3, mixed dishes were the most frequent recipe type, comprising nearly one-third of recipe codes. A wide variety of recipes representing numerous food cultures (e.g., North American, Mexican, Italian, Japanese, Chinese, Middle-Eastern) were identified with this code, including pasta- or noodle-based dishes ($n = 7$), Mexican-inspired wrap dishes (e.g., burritos, tacos, and empanadas; $n = 6$), sandwiches ($n = 5$), rice-based dishes (e.g., rice and beans, rice and eggs; $n = 4$), and multi-component salads (e.g., quinoa with vegetables, caprese salad; $n = 4$). Sweets and desserts (e.g., cake, cookies, ice cream) were the second most frequent type of recipe. Approximately one in five recipes were for sweets and desserts. Grains and grain products were the third most frequent recipe type; notably, 14 out of 17 grains and grain products recipes were for more sources of added sugar such as muffins, pancakes, French toast, and fruit-flavored cereal bars. Recipes for vegetables and meat or other protein sources (e.g., chicken, shrimp, yogurt) were the next most frequent. Vegetable recipes often included multiple types of vegetables (e.g., different types of summer squash, tomatoes and cucumbers), and sometimes included fruit, although not a full serving (e.g., mango as a salad topping, apple in soup, apple roasted with squash). Four out of 12 contained a deep yellow vegetable (e.g., carrot, pumpkin, sweet potato, winter squash) and 3 out

of 12 contained a dark green vegetable (e.g., kale, seaweed). Few posts contained recipes for condiments, beverages, added fats or oils, fruits, or salty snacks. Further analyses were limited to only those recipe types that were included in $\geq 10\%$ of recipe codes: mixed dishes, sweets and desserts, grains and grain products, vegetables, and meat or other proteins.

Table 2-3

Recipe type coding results: Frequency and percentages of codes

Code	Frequency (n)	Percent of recipe type codes (%) N = 108	Percent of blog posts (%) N = 158
Mixed dishes ^a	35	32.4%	22.2%
Sweets and desserts ^b	21	19.4%	13.3%
Grains and grain products ^c	17	15.7%	10.8%
Vegetables ^d	12	11.1%	8.2%
Meat or other proteins ^e	12	11.1%	7.6%
Condiments ^f	4	3.7%	2.5%
Beverages ^g	3	2.8%	1.9%
Fat/oils ^h	2	1.9%	1.3%
Fruits ⁱ	1	0.9%	0.6%
Salty snacks ^j	1	0.9%	0.6%

^aCoded recipes included: pasta/noodle-based dishes (e.g., lasagna, stir-fried noodles), Mexican-inspired wrap dishes, sandwiches, rice-based dishes, and multi-component salads, soups (e.g., dairy-based vegetable soups) and breakfast dishes (e.g., quiche, dairy-based oatmeal)

^bCoded recipes included: Cookies, cake, pie, cheesecake, donuts, ice-cream, pudding

^cCoded recipes included: sweetened grains (e.g., muffins, pancakes), rice, biscuits, crackers

^dCoded recipes included: cauliflower, summer and winter squashes, sweet potatoes, kale, asparagus, tomatoes, cucumbers, radishes

^eCoded recipes included: Beef, chicken, seafood, pork, yogurt, cheese

^fCoded recipes included: syrup, jam, dip

^gCoded recipes included: sweetened-milk and fruit-flavored drinks

^hCoded recipes included: flavored-oil and mayonnaise

ⁱCoded recipe included: strawberries

^jCoded recipe included: popcorn

Child feeding beliefs

Codes for child feeding beliefs were present in 77.8% of blog posts ($n = 123$). A total of 199 codes were assigned within these 123 blog posts, indicating that multiple child feeding beliefs were described in some blog posts. Beliefs about children's food preferences were the most frequently occurring child feeding belief code. As seen in Table 2-4, approximately half of all blog posts included text segments related to children's food likes and dislikes. Paraphrased examples of such codes are: "My son loved this dish!" and "This recipe is sure to be a hit with the whole family." Health values were the second most frequent child feeding belief code. These text segments conveyed beliefs that nutrition and child health were important considerations in child feeding. Paraphrased examples are: "This recipe provides kids with their daily dose of vitamin C;" and "This dish is good for developing brains." Text segments that conveyed beliefs that parents and/or mothers specifically are responsible for child feeding were also somewhat common (e.g., "It's hard making kids meals three times per day in the summer, but it's something moms have to do!") Codes for beliefs about food as an important part of family life (e.g., as a way to show love, create family memories, bond with children) also occurred occasionally. Other beliefs codes rarely occurred. Of note, concern for child weight was only coded in one out of 158 sampled posts. Further analyses included only the belief codes that were present in $\geq 10\%$ of all belief codes: child food preferences, health values, and responsibility.

Table 2-4
Child feeding beliefs results: Frequency and percentages of codes

Code	Frequency (<i>n</i>)	Percent of all belief codes (%) <i>N</i> = 199	Percent of blog posts (%) <i>N</i> = 158
Children's food preferences	75	37.7%	47.5%
Health values	35	17.6%	22.2%
Responsibility	22	11.1%	13.9%
Food and family	19	9.5%	12.0%
Food and fun	15	7.5%	9.5%
Food and culture	13	6.5%	8.2%
Picky eating	11	5.5%	7.0%
Food and indulgence	8	4.0%	5.1%
Concern for child weight	1	0.5%	0.6%

Child feeding behaviors

Only 48.7% of blog posts ($n = 77$) contained codes for child feeding behaviors. In total, 100 codes were assigned within these 77 blog posts, indicating that multiple child feeding behaviors were described in some blog posts. As shown in Table 2-5, child involvement in food preparation was the most frequently coded child feeding behavior, occurring in one in four blog posts (e.g., “This one bowl cake is perfect for little hands that want to help stir.”) Encouraging balance and variety was second most frequent child feeding behavior code, in which bloggers modeled or endorsed feeding children an array of foods to expose children to many flavors and to avoid food monotony. Paraphrased examples of the encouraging balance and variety code are: “I make this fruit smoothie to brighten up the lunch box mid-week;” and “As a mom, I do my best to serve my kids all sorts of veggies in each meal.”

Responsiveness was also coded somewhat frequently. The majority of text segments that were assigned this code reflected behaviors about noticing and responding to children's food preferences and requests for food in a developmentally appropriate way. Paraphrased examples are: “I made this salad at the request of my children, who love picking out cucumbers at the

market;” and “I know my daughter loves blueberries, so I was hoping she would love these muffins.” When the text segment suggested child feeding behavior that was primarily motivated by pressure from children or a lack of interest in devoting time to meeting children’s feeding needs, indulgent rather than responsive codes were assigned (e.g., “My kids had already eaten lunch, but they walked back into the kitchen asking for snacks;” and “I wanted to start this year off healthy, but my son begged me for a treat.” Further analyses included only those child feeding behavior codes that occurred in $\geq 10\%$ of all behavior codes: child involvement, encourage balance and variety, and responsiveness.

Table 2-5
Child feeding behaviors results: Frequency and percentages of codes

Code	Frequency (<i>n</i>)	Percent of all behavior codes (%) <i>N</i> = 100	Percent of blog posts (%) <i>N</i> = 158
Child involvement	42	42.0%	26.6%
Encourage balance and variety	22	22.0%	13.9%
Responsiveness	13	13.0%	8.2%
Indulgence	7	7.0%	4.4%
Food literacy	5	5.0%	3.2%
Pressure to eat	3	3.0%	1.9%
Modeling eating behavior	2	2.0%	1.3%
Overt restriction	2	2.0%	1.3%
Monitoring	2	2.0%	1.3%
Instrumental feeding	1	1.0%	0.6%
Covert restriction	1	1.0%	0.6%

Associations between type of recipe and child feeding beliefs and behaviors

Six chi-square tests of independence with a significance value for each test of $p < .008$ were first conducted to explore whether the child feeding beliefs and behaviors codes that were included in recipe posts were significantly different than those that occurred in posts that did not include recipes. Results showed that responsiveness was more likely to occur in blog posts that contained recipes than in those that did not, $X^2(1, N = 158) = 7.36, p = .007, \Phi = 0.22$. There

were no other significant differences.

To explore whether the recipe types included in blog posts were significantly different based on the child feeding belief and behavior codes that were present, chi-square tests of independence were run comparing each recipe type code by the 6 child feeding behavior codes, for a total of 30 tests. Thus, the significance value for each test was $p < .002$. Recipes for vegetables were more likely to occur in posts in which the code for encouraging balance and variety was present, $\chi^2(1, N = 104) = 23.45, p < .001, \text{Phi} = 0.48$. Recipes for vegetables occurred in 50.0% (7 out of 14) of blog posts in which bloggers modeled and/or endorsed feeding children a balance and variety of foods, compared to in 5.6% of posts in which the encourage balance and variety code was not assigned (5 out of 90). Only one other test approached significance. Recipes for sweets and desserts were more likely to occur in posts with child involvement in food preparation codes, $\chi^2(1, N = 104) = 7.85, p = .005, \text{Phi} = 0.28$. Recipes for sweets and desserts occurred in 52.4% (11 out of 29) of blog posts in which bloggers described behaviors around engaging children in food preparation such as selecting ingredients, measuring, and stirring, compared to in 13.3% (10 out of 75) of blog posts in which child involvement in food preparation was not coded.

Evidence-based content

Only one out of 158 posts referred to evidence-based content. This one post included an in-text reference to a research study on children's willingness to access new foods. The paraphrased statement was: "I've been getting him to take one bite of broccoli at each meal to try to reach the 10-15 tastes researchers say it takes for children to enjoy a new food." This post did not include a formal research study citation, nor did it include a hyperlink to any original research. Four additional posts referred to "articles" or included in-text hyperlinks to non-

scientific webpages as citations or resources for readers, but it was not clear that these were references to evidence-based content.

Discussion

Social cognitive theory proposes that individuals develop behaviors by selectively observing, remembering, and reproducing behaviors that are modeled within their social groups.^{63,64} Applying this theory to child feeding practices suggests that mothers may be likely to sustain or initiate child feeding practices that are modeled by other mothers to whom they relate (e.g., mothers parenting children of a similar age to their own), that mothers believe they could successfully implement, and that mothers believe will have a rewarding outcome (e.g., their child will respond well to the feeding practice, they will receive social support for the feeding practice). As mothers become increasingly engaged with social media to consume and disseminate information relevant to parenting and child health,^{73,75,77,79,82} social media, including blogs, may be emerging contexts for social influences on child feeding practices and childhood obesity risk.¹¹² Because the first five years of life are a critical period for obesity prevention,^{15,113} the current study focused on blogs that were written by mothers parenting at least one 2 to 5 year old child and focused on child and family feeding. These blogs may uniquely appeal to other mothers of young children because of a shared demographic trait.^{93,114} This study assessed the types of recipes and child feeding beliefs and behaviors included in blog posts, their association, and the extent to which blog posts included evidence-based content.

Summary of results

Recipes were present in approximately two-thirds of blog posts and were primarily for energy dense foods, such as grain-based mixed dishes, cookies, and muffins. Nearly half of blog posts conveyed the belief that children's taste preferences were an important consideration in

child feeding. Concerns for child weight status were rarely-to-never mentioned. Child feeding behaviors were mentioned in approximately one-quarter of sampled posts and focused on involving children in food preparation. Recipes were more likely to be for dishes featuring vegetables when blog posts described increasing children's balance and variety of food. Recipes for sweets and desserts trended toward being more likely to occur within blog posts that described involving children in food preparation. Only one out of 158 sampled blog posts mentioned evidence-based content and this post did not provide the original scientific source.

Type of recipe

Recipes for mixed dishes were the most frequent, representing nearly one-third of all recipes. Mixed dish recipes included multiple food components (e.g., grain, protein, vegetable) and were highly varied in flavors and textures. Within this category, the most frequent type of dish was pasta or noodle based and Mexican-inspired wrapped dishes (e.g., burritos). Mixed dishes may have been the most frequent type of recipe because there is more opportunity for creativity with multiple food components and they are a convenient way to incorporate multiple food groups into family diets.

Sweets and desserts and grains and grain products were the next most frequent types of recipes. These recipes were primarily for foods that contribute added sugar to children's diets. Together, these two categories represented another approximately one-third of all recipes. Conversely, just over one-in-ten recipes were for dishes that featured vegetables or fruits as the main ingredient. The 2010 USDA Dietary Guidelines recommend that all Americans over the age of two years reduce their consumption of foods that contain refined grains and added sugars and increase their consumption of vegetables and fruits.¹¹⁵ Further analysis of the mixed-dish category revealed that 24 out of 35 (68.8%) mixed dish recipes contained at least ½ cup of

vegetables per recommended serving size. Increasing the amount of vegetables in mixed dish recipes in blog posts may be one strategy to increase children's vegetable consumption while reducing their energy intake.¹¹⁶

The high number of dessert recipes in combination with the low number of vegetable and fruit recipes may represent an opportunity to intervene around the dietary patterns that bloggers model in the content that they contribute to social media. It is possible that blog readers pay attention to the proportion of dessert recipes and the rewards that are associated with desserts (e.g., their children are happy, these recipes get a lot of endorsements on social media) and become motivated to prepare more desserts in their household overall. Survey data is needed to explore bloggers' motivations for posting recipes of various categories, and blog reader interest and demand for recipes from various food categories.

Child feeding beliefs and behaviors

Bloggers conveyed a relatively narrow range of beliefs and behaviors about child feeding. Those that were expressed were primarily focused on children's food preferences and involving children in food preparation. Nearly one-in-two blog posts contained mentioned children's food preferences, suggesting that blog post content was likely to endorse feeding children foods that they enjoy eating. Concerns about child weight were only mentioned in one out of 158 blog posts and was in reference to concerns about the child being small for his age, not concern about childhood overweight or obesity. In combination with the large proportion of recipes for energy dense foods, it appeared that childhood obesity prevention was not an important topic in the sampled blog posts. One encouraging finding, however, was that child feeding behaviors that have been associated with increased obesity risk (i.e. restriction)² and

decreased intake of the target food (i.e. pressuring)¹¹⁷ were rarely-to-never observed in the sampled blog posts.

Previous qualitative research has identified children's food likes and dislikes as a factor that can make mealtimes easy or difficult for mothers.¹⁰⁷ In combination with the other feeding beliefs related to food as a way to connect as a family, have fun, and convey cultural meaning, bloggers appeared to frame child feeding as an opportunity to create positive mealtime environments and family cohesion. Readers may perceive these outcomes as rewarding and prioritize recipes that are likely to appeal to children's taste preferences rather than recipes that may be more nutritious. While positive meal time interactions, such as positive communication, has been associated with reduced risk for childhood obesity,¹¹⁸ indulgent feeding that is overly child-driven has been associated with obesity risk in preschool children, particularly in Hispanic and low-income populations.^{22,24} Thus, future studies should explore whether blog readers perceive social norms that promote indulgent child feeding from blog content.

One child feeding practice that was observed during the code process was asking preschool aged children what they would like to eat for their meals or snacks. Given that food neophobia (i.e. fear of new foods) and picky eating (i.e. rejection of foods that have already been introduced and are familiar) is present in some preschool-aged children,¹¹⁹ asking preschool-aged children what they want to eat without any guidance on food choice may be a developmentally inappropriate child feeding behavior. Future studies should examine how blog post content frames children's input on the types and amounts of food that children consume, and what influence this specific practice has on readers' perceptions of the amount of control children should have in feeding.

Associations between recipe type and child feeding beliefs and behaviors

Responsiveness was more likely to occur in blog posts that contained recipes than in those that did not. In many cases, posts that were coded with the responsive feeding reflected the blogger's response to children's request for a certain food, or the blogger mentioning that she knew her child liked a certain food. Since children's food preferences were a prevailing child feeding belief, bloggers may be motivated to share recipes that they believe children will enjoy.

Recipes for vegetables were more likely to occur in posts in which the code for encouraging balance and variety was present. Given that this code was assigned to text segments in which mothers described feeding their children healthy foods and/or a variety of foods, it is encouraging that recipes went on to reflect these narrative statements. Future studies should explore how cohesion in the main body of text from blog posts and the recipe influences the social norms that readers perceive from blog posts. The relationship between sweets and desserts recipes and child involvement in food preparation approached significance, suggesting that bloggers may be modeling behaviors related to engaging children in preparing foods that they already easily accept. One point of intervention may be to encourage bloggers to model children's involvement in the preparation of foods that are lower in energy density, such as selecting vegetables at the grocery store or mixing vegetable-based salads, so that readers may observe children's active engagement with healthier foods. That no other relationships between recipe type and child feeding beliefs or behaviors were significant suggests that the frequency of their co-occurrence was too low to discover a significant difference, or that bloggers are inconsistent in the extent to which a specific child feeding belief or behavior aligns with a recipe type. Future studies may consider doing a purposive sampling of blog posts to ensure that a large

number of blog posts reflecting a diversity of child feeding beliefs and behaviors are selected so that the study is adequately powered to detect differences if they are there.

Evidence-based content

Only one post contained a direct mention of evidence-based content related to food exposure and children's developing taste preferences. This text segment did not include a link or citation for the original research,¹²⁰ or more recent research specific to preschoolers.¹²¹ Thus, it is unlikely that blog readers would perceive social norms about the importance of scientific research or evidence-based content in informing child feeding decisions. There were many opportunities for scientific research to be included, which may be an opportunity for future intervention research. For example, statements about the importance of family meals for child development^{118,43,122,46} and strategies to increase children's consumption of vegetables^{116,123} could have been strengthened by scientific evidence from research summaries, references, or citations.

Limitations

This study provides foundational research on blogs as a novel social context that may influence child feeding practices and childhood obesity risk through the types of recipes, child feeding practices, and sources of content that readers are likely to observe.¹²⁴ However, there are some limitations to this study. First, these results may not generalize to the general population of blogs focused on child and family feeding because it focused primarily on mothers parenting at least one preschool-aged child. Additionally, our findings may only generalize to content that was shared on the sampled blogs during the study period as bloggers may have since changed their style of blogging. Inter-rater reliability was not available for child feeding beliefs and behaviors, thus those results in particular need to be replicated. Photos, videos, advertisements,

and comments were not included in the analyses, which may contain other information that is crucial for conveying social norms on food blogs (e.g., pictures displaying children and families eating together, comments agreeing with the blogger's endorsement of a food product). Only six out of 16 blogs in the initial sample contained blog rolls. Future studies on blogs should consider using hyperlink network analysis¹²⁵ to gather a more accurate and current reflection of the other blogs that bloggers are directing their readers.

Future directions

Although the current study offers important descriptive information about the content relevant to child feeding that mothers may observe on blogs focused on feeding young children, little is known about how mothers actually use blogs and other social media platforms to learn about what and how to feed their children. Blog content also plays an important role as a source of content for other social networking sites such as Pinterest.¹²⁶ Thus, even mothers who do not identify as “blog readers” may still be exposed to blog post content on other social media sites. Previous research suggests that there are individual difference in motivations for social media use, and that the specific features of social media may elicit different types of use.^{127,128} One study that assessed teenagers and young adults (16 to 24 years of age) found that blogs were most commonly used for entertainment, learning something about someone, and gaining skills.¹²⁸ Both qualitative and quantitative research is needed to learn about how mothers use blogs and other social media platforms in the context of child feeding (e.g., as a source of meal ideas, to learn how to cook new foods, to gain social support for child feeding).

Given the evidence that dietary patterns are more predictive of health outcomes than any single source of food,¹²⁹ it is possible that any one recipe in isolation would not have an effect on childhood obesity prevalence. However, if mothers regularly read blogs, particularly the same

blog over time, they may form social norms about the types and amounts of foods that are appropriate to serve to young children. Additional research on blog readers is needed to test whether they actually perceive social norms from blog post content.

Although food blogs seem to encourage cooking at home, the amount and quality of research on interventions specifically designed to improve cooking skills and associated health behaviors is quite limited.¹³⁰ This is particularly true of conveying cooking information in digital formats. One study on this subject found that cooks expressed a preference for recipes that contained many of the features that bloggers include in their posts, such as step-by-step recipes that list the quantity of the ingredient needed within each step, photos of the recipe at varying stages of the preparation process, videos of the recipe preparation, and videos demonstrating the use of various utensils.¹³¹ Future research should explore how the common factors of behavior change¹³² and context specific behavioral strategies (e.g., recipe layout) that occur within blog posts influence the likelihood that blog readers create the recipes that they observe.

Conclusion

Food blogs written by mothers of young children may be a novel social context in which mothers learn what and how to feed their children. The results of this study revealed that some blog post content promoted feeding practices that are likely to increase the risk for childhood obesity. In particular, the types of recipes shared within the sampled blog posts were most frequently for foods that are high in energy density, such as burritos, cookies, and cakes. Blog posts rarely described child feeding beliefs and behaviors aside from feeding children foods that they like and involving them in food preparation. Thus, blog readers may not observe beliefs and behaviors related to responding to children's hunger and satiety cues, or monitoring children's intake for weight purposes. Blog post content rarely-to-never contained evidence-based

information, which limits the translational potential of the growing amount of research conducted on childhood obesity prevention.¹³³

That said, some blog posts did convey information that may be protective against childhood obesity. For example, blog posts that endorsed the belief that child health is an important component of child feeding, that mothers' are responsible for child feeding (as opposed to relying on convenience or restaurant foods), and behaviors related to encouraging children to eat a balance and variety of foods. Indeed, when blog posts endorsed behaviors around feeding children a balance and variety of foods, these posts were more likely to include a recipe for a vegetable dish, which may be particularly influential on readers' perceptions of social norms around child feeding. However, when blog posts described involving children in food preparation, they were somewhat more likely to include recipes for desserts.

Together, these results suggest that without intervention, blog readers may be learning to feed children diets that promote the development of childhood obesity. Additional research is needed to replicate these findings using a larger sample of blogs and blog posts. Studies are also needed to examine bloggers' motivations for including content relevant to child feeding in their blog posts and to assess their interest in including evidence-based content about child feeding practices and childhood obesity prevention.

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