PARENTS’ INFORMATION SEEKING AND USE REGARDING INFANT AND TODDLER FEEDING

A Dissertation in
Human Development and Family Studies

by

Allison D. Hepworth

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The dissertation of Allison D. Hepworth was reviewed and approved* by the following:

Timothy Brick  
Assistant Professor of Human Development and Family Studies  
Dissertation Co-Adviser  
Co-Chair of Committee

Meg Small  
Director of Social Innovation, Edna Bennett Pierce Prevention Research Center  
Dissertation Co-Adviser  
Co-Chair of Committee

Leann Birch  
Distinguished Professor of Human Development and Family Studies and Nutritional Sciences

Eun Kyoung Choe  
Assistant Professor of Information Sciences and Technology

Kathleen Keller  
Associate Professor of Nutritional Sciences and Food Science

Lisa M. Gatzke-Kopp  
Associate Professor of Human Development and Family Studies  
Professor-in-Charge of the Graduate Program

*Signatures are on file in the Graduate School.
ABSTRACT

The ultimate aim of translational research in the prevention sciences is to establish evidence-based programs and services that facilitate the adoption or maintenance of positive health behaviors. Success is indicated by reductions in the incidence of mental and behavioral health disorders at the individual and population levels, and universal support of evidence-based prevention policies. One barrier to realizing the translational research agenda is a limited understanding of how individuals naturally find and apply information related to preventive health behaviors. Such formative research could guide the development and adaption of evidence-based programs and services by offering insight into the content and delivery characteristics that promote information exposure, satisfaction, and application.

Childhood obesity is an especially urgent public health problem that would benefit from research that supports translation. Recent estimates suggest that nearly one-in-five children have obesity, and over half of today’s children will have obesity by age 35 without intervention. Parents of infants under 2 years of age have been identified as promising targets for childhood obesity prevention because of their proximal influence on children’s eating behavior and growth trajectories. Research is rapidly accumulating across the translational research spectrum on the association between parents’ child feeding behavior and later obesity risk. To ensure this research develops into evidence-based programs and services that improve public health, formative research is needed.

The purpose of this dissertation is to inform the translational research process in the field of childhood obesity prevention by providing formative research on parents’ information seeking and use regarding infant and toddler feeding. I first present a new conceptual model of information seeking and use (the ISU model) constructed from existing theories of health
behavior, information behavior, and health information seeking that provides the foundation for the research questions addressed in the dissertation (Chapter 1). I then explore how parents’ satisfaction with information about infant and toddler feeding is associated with their information seeking aptitude and information acquisition characteristics using data from a cross-sectional, parent-reported online survey ($N = 423$) regarding a naturally occurring information seeking occasion (Chapter 2). I use the same dataset to explore how parents’ behavioral application of the information they obtain is associated with their information seeking aptitude, information integration, and behavioral capacity and intent characteristics (Chapter 3). Lastly, I synthesize the information presented in Chapters 1 through 3 and present recommendations for future research regarding the design and adaptation of evidence-based programs for childhood obesity prevention (Chapter 4).

The results presented in Chapter 2 suggest that parents’ satisfaction with infant and toddler feeding information was strongly and positively associated with their perceptions of information utility and trust in the information. Ease of information acquisition and clarity also showed positive and significant associations with satisfaction, however the effects were smaller in comparison to utility and trust. The results presented in Chapter 3 demonstrate that behavioral application of infant feeding information was classified best by feeling motivated by the information and moderate-to-high ratings of information satisfaction. Including demographic and socioeconomic characteristics did not improve the classification of behavioral application above and beyond information seeking aptitude, integration, and behavioral capacity and intent characteristics. Future research can use the ISU model and the empirical findings presented in this dissertation to guide the measurement and manipulation of variables across the information seeking and use process to optimize the reach and impact of evidence-based information.
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Introduction

Evidence-based prevention programs could dramatically improve public health by reducing the prevalence of mental, emotional, and behavioral health disorders if implemented on a large scale (O’Connell, Boat, & Warner, 2009; Rotheram-Borus, Swendeman, & Chorpita, 2012). Prevention programs that promote positive parenting practices and the development of self-regulation during infancy and early childhood are especially promising for reducing the prevalence of negative mental and physical health outcomes throughout the lifespan (Jones Harden, Buhler, & Parra, 2016; Mercy & Saul, 2009; Miller, 2015). One challenge to realizing the public health benefits of early childhood prevention is the limited reach of existing evidence-based information and programs. There is great need for translational research that moves basic scientific discoveries and intervention efficacy and effectiveness research into evidence-based practices and policies that are widespread, satisfactory, and lead to the adoption and maintenance of positive health behaviors (Fishbein, Ridenour, Stahl, & Sussman, 2016; Woolf, 2008).

In this dissertation, I aim to inform the translational research process, with a specific focus on the context of childhood obesity prevention, by first presenting a conceptual model of information seeking and use that provides the foundation for the research questions addressed in the dissertation (Chapter 1). I then use data from a cross-sectional, parent-reported survey ($N = 423$) on a naturally occurring information seeking occasion to explore factors associated with parents’ satisfaction with information about infant and toddler feeding (Chapter 2), and their behavioral application of information (Chapter 3). Lastly, I discuss the cumulative findings and their implications for future research to inform the design and adaptation of evidence-based programs and services for childhood obesity (Chapter 4).
Defining the Full Translational Spectrum of Prevention Research

Prevention programs aim to reduce the likelihood of negative outcomes, whereas treatment programs aim to modify established behaviors (O’Connell et al., 2009). Prevention programs can be classified as universal (i.e., beneficial to everyone in a population regardless of their risk factors for the targeted outcome(s); selective (i.e., beneficial to individuals with increased risk factors for the targeted outcome(s); or indicated (i.e., beneficial to individuals with increased risk factors and demonstrate early symptoms or warning signs for the targeted outcome(s) (O’Connell et al., 2009). Prevention research takes place across a translational spectrum with the overarching aim of creating sustainable, cost-effective systems for offering evidence-based services at a scale that is likely to impact public health (Biglan, 2018; Fishbein et al., 2016; Spoth et al., 2013; Woolf, 2007, 2008).

Fishbein and colleagues (2016) recently outlined a six-stage model of the full translational spectrum of prevention science. The stages are ordered sequentially and empirical findings from each stage should inform the adjacent stages (i.e., back translation; Fishbein et al., 2016). The stages include: T0 Discovery Science; T1 Methods and Program Development; T2 Implementation and Effectiveness; T3 “Real-World” Applications; T4 Scaling and Policy Reform; and T5 Globalization and Opinion. If scientists frame their research along the translational research spectrum, evidence-based prevention programs should see a decrease in the amount of time it takes to achieve public health impacts (Fishbein et al., 2016). This dissertation aims to inform the translational research process between T0 through T2 within the context of childhood obesity prevention by providing formative research on parents' naturally occurring information seeking and use behavior regarding infant and toddler feeding.
Research that Informs T0 to T2 Translation Can Improve the Reach and Effectiveness of Evidence-based Prevention Programs and Services

Research to inform the T0, T1, and T2 stages has been limited to date across the prevention sciences, and especially in the field of childhood obesity prevention (Bentley et al., 2014; Spoth et al., 2013). This is problematic because evidence-based prevention and treatment programs currently have limited reach, particularly among high-need groups such as children from lower-income families (Boyle, Perrin, & Moyer, 2014). When individuals do not engage with evidence-based prevention or treatment options, the overall effectiveness of these programs or services is diminished (Heymann, Sell, & Brewer, 1998; Sims & Crump, in press; Spoth & Redmond, 2000). Recent estimates suggest that nearly one-in-four adults in the United States would benefit from psychosocial prevention or treatment in a given year, yet only 30% of individuals with indicated needs report receiving any treatment (Kazdin, 2017; Ronald Kessler et al., 2005). The extent to which psychosocial treatment is evidence-based is largely unknown, but is likely to be quite low (Kazdin, 2017). For evidence-based prevention programs to have a public health impact, awareness of, demand for, and access to these services needs to increase (Buscemi et al., 2017; Rotheram-Borus et al., 2012; Spoth et al., 2013).

There is a relatively small but growing body of research on predictors of parental engagement with prevention programs (Sims & Crump, in press; Spoth & Redmond, 2000). For example, Hughes and Wingard (2008) found that children of parents who had accurate beliefs regarding the recommended timing of well child visits were more likely to have received routine healthcare in the past year. Findings on the associations between parents’ demographic characteristics and their interest in participating in evidence-based prevention has been mixed (Corso, Fang, Begle, & Dumas, 2010; Dumas, Nissley-Tsiopinis, & Moreland, 2007; Muzik et
Identifying parents’ existing needs, preferences, and resources can inform the content and delivery mechanisms of preventive programs and increase the likelihood that these programs will be in demand when they are offered (Arthur & Blitz, 2000; Glasgow, Lichtenstein, & Marcus, 2003; Rodger Kessler & Glasgow, 2011; Young et al., 2006).

Although parents’ participation in evidence-based programs may be limited, there is evidence to suggest that self-initiated information seeking is a common behavior among parents, particularly during pregnancy and infancy (Chilukuri et al., 2015; Khoo, Bolt, Babl, Jury, & Goldman, 2008; Kraschnewski et al., 2014; Rotheram-Borus et al., 2012; Sayakhot & Carolan-Olah, 2016). Many existing studies of parents’ information behavior have focused on describing the prevalence of information seeking, the information channels parents access (e.g., websites, friends), and the available information (Lee, 2016; Matvienko-Sikar et al., 2018). For example, in one of the first studies of parents’ use of multiple sources (i.e. channels) of parenting information after the internet became widely accessed, Radey and Randolph (2009) conducted a large self-report survey ($N = 1,270$) among parents of children less than 10 years of age. They found that parents reported using an average of 5 to 6 channels of general parenting information and some demographic differences in where parents obtained information; mothers and younger parents were more likely to use the internet during their search (Radey & Randolph, 2009).

Several studies have describe the information that is available in parenting books regarding common prevention targets, such as infant sleep, injury prevention, education, and child safety (Connell-Carrick, 2006; Hunter, Helou, Saluja, Runyan, & Coyne-Beasley, 2005; Ramos & Youngclarke, 2006). A few studies have also documented the information available through Internet-based channels (e.g., blogs, social media; Ammari & Schoenebeck, 2015; Doub, Small, & Birch, 2016a; Morris, 2014; Schoenebeck, 2013; Suárez-Perdomo, Byrne, & Rodrigo,
Collectively, these results generally suggest that the information parents obtain through self-initiated information seeking varies widely in terms of the evidence-base and quality.

Fewer studies have explored factors that motivate individuals to seek information, parents’ perceptions of the information they obtain, or how they apply information to their health-related behaviors (Lee, 2016; Pluye et al., 2015; Shieh, McDaniel, & Ke, 2009). Formative research on parents’ experiences with information they obtained outside of the context of research-based programs or services is especially limited (Ajzen, 2015; Spoth et al., 2013). Additional research on parents’ naturally occurring information seeking and use behavior regarding normative topics that influence health outcomes is needed to inform the design and revision of universal prevention programs (Shelton, Cooper, & Stirman, 2018; Spoth & Redmond, 2000).

**Overview of the Problem: Childhood Obesity**

Childhood obesity is one public health challenge that is especially in need of effective, broadly disseminated evidence-based prevention programs and services (Kleinert & Horton, 2015; Rodgers & Collins, 2012). Recent population-level data on infant weight status suggests that 8.1% of infants under 2 years of age exceed the 95th percentile for weight-for-length (Ogden, Carroll, Kit, & Flegal, 2014). Among 2 to 5 year old children, 11.4 to 16.0% exceed the standard 95th percentile in body mass index (Skinner, Ravanbakht, Skelton, Perrin, & Armstrong, 2018). A simulation study of growth trajectories recently estimated that 58% of children who were 2 to 19 years of age in 2016 are predicted to be obese at age 35 (Ward et al., 2017). This estimate is approximately 1.5-times higher than the current prevalence of adult obesity, which was 38% in 2013-2014 (Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016).
Childhood obesity is an urgent public health problem because it has negative implications for individual- and population-level health indicators. At the individual-level, childhood obesity is associated with negative physical and mental health outcomes, such as diabetes, heart disease, bullying, weight stigma, and adult obesity (Daniels et al., 2005; Pont et al., 2017; Quek, Tam, Zhang, & Ho, 2017). At the population-level, childhood obesity also has societal costs such as direct health care costs during childhood, reduced workforce productivity, and premature mortality as obesity continues into adulthood (Gollust, Niederdeppe, & Barry, 2013; Lightwood et al., 2009). Contrary to some speculation, there is no evidence to suggest the incidence or prevalence of obesity has significantly declined nor stabilized (Roberto et al., 2015; Skinner, Ravanbakht, Skelton, Perrin, & Armstrong, 2018). Rather, it appears that childhood obesity has increased at a national level, especially severe obesity among children 2 to 5 years of age (Skinner et al., 2018). Prevention scientists and public health officials need to continually engage in concerted efforts to identify effective evidence-based practices and policies for childhood obesity prevention because of these individual and population-level health challenges (Ludwig, 2018).

Current evidence suggests that the earlier the onset of overweight or obesity, the more likely it is to persist throughout the lifespan (Cunningham, Kramer, & Narayan, 2014; Deshmukh-Taskar et al., 2006; Dugan, Mukhopadhyay, Carroll, & Downs, 2015; Z. Ward et al., 2017). Rapid weight gain during infancy, particularly the first year of life, is a strong predictor of childhood and adult obesity (Woo Baidal et al., 2016; Zheng et al., 2018). Therefore, infancy has been identified as a particularly important developmental period for obesity prevention (Birch & Ventura, 2009; Paul et al., 2009). Parents of infants under 2 years of age have been identified as especially promising targets for childhood obesity prevention because of their proximal influence.
on children’s eating behavior and growth trajectories (Birch & Ventura, 2009; Dattilo et al., 2012; Lumeng, Taveras, Birch, & Yanovski, 2015; Paul et al., 2009; Saavedra, Deming, Dattilo, & Reidy, 2013; Savage, Fisher, & Birch, 2007).

**Parents’ Influence on Childhood Obesity Risk**

The evidence base for parents’ infant and toddler feeding behavior is rapidly growing, but gaps remain regarding how parents develop the knowledge, attitudes, and beliefs that contribute to their behavior (Bentley et al., 2014; Khandpur, Blaine, Fisher, & Davison, 2014; McPhie, Skouteris, Daniels, & Jansen, 2014; Vaughn et al., 2016). Parents (i.e., primary caregivers) influence the majority of young children’s weight-related behaviors, including determining their opportunities to eat, sleep, learn, and play (Davison & Birch, 2001; Davison, Jurkowski, & Lawson, 2013; Faith, Scanlon, Birch, Francis, & Sherry, 2004; Savage et al., 2007). Despite dramatic changes in the food environment over the past century, “traditional” child feeding behaviors that evolved to protect children from scarce food environments persist among many parents (Anzman, Rollins, & Birch, 2010). Traditional feeding practices generally include feeding children preferred foods (i.e., foods with sweet and salty flavors), offering food frequently and in large portions, and using food as a first response to negative emotions (Beauchamp & Mennella, 2011; Birch, 1999, 2016; LeVine, 1988). While promoting healthy physical and cognitive development in children remains the primary objective of child feeding, today’s food environment poses a new threat: Children are now at higher risk of over-nutrition and obesity than under-nutrition and underweight (Popkin, 2001). In an abundant food environment, traditional feeding behaviors are likely to promote childhood obesity risk because
they limit children’s opportunities to self-regulate their own eating behavior and emphasize consumption of palatable, energy dense foods (Anzman et al., 2010).

Scholars in the developmental and nutritional sciences have identified responsive parenting and feeding behaviors as a promising alternative to traditional feeding behaviors (Daniels, Magarey, Battistutta, & Nicholson, 2009; Eshel, Daelmans, de Mello, & Martines, 2006; Paul et al., 2014). Responsive feeding entails displaying developmentally appropriate expectations (e.g., offering age appropriate portion sizes), creating structure and routines around feeding, responding to children’s hunger and fullness cues, and the division of feeding responsibility (i.e., allowing children to decide how much to eat within a context of nutritious, diverse options (DiSantis, Hodges, Johnson, & Fisher, 2011; Hurley, Cross, & Hughes, 2011; Paul et al., 2014; Rollins, Savage, Fisher, & Birch, 2015). Although responsive feeding behaviors are more likely to promote healthy growth in today’s food environment, traditional feeding behavior may come still more naturally to parents because of their evolutionary underpinnings and/or parents’ exposure to traditional feeding practices during their own childhood eating experiences (Birch, 2016; Mena et al., 2015).

To disrupt the intergenerational transmission of traditional feeding behaviors, parents need to be exposed to information about responsive feeding. One way parents may be exposed to information about responsive feeding is through their participation in formal childhood obesity prevention programs (Mitchell, Farrow, Haycraft, & Meyer, 2013). Intervention efficacy and effectiveness research regarding childhood obesity prevention during infancy is underway (Blake-Lamb, Locks, Perkins, Woo Baidal, et al., 2016; Redsell et al., 2016). Promising results have emerged from randomized controlled trials of home visiting programs that aim to decrease the risk of childhood obesity by promoting responsive parenting and feeding behaviors during
infancy. Two such programs have demonstrated efficacy in reducing the risk of rapid weight gain and overweight status during the first year of life (Savage, Birch, Marini, Anzman-Frasca, & Paul, 2016) and reducing the risk of obesity at age 2 (Ordway et al., 2018). These results may be driven in part by positive intervention effects on children’s dietary quality (Hohman, Paul, Birch, & Savage, 2017). However, evidence-based prevention and intervention programs across behavioral and mental health domains tend to have limited reach (Bumbarger & Perkins, 2008; Fishbein, Ridenour, Stahl, & Sussman, 2016). As mentioned, there is currently limited research available to align the content and delivery of prevention programming to parents’ current interests, needs, and wants, which could improve the potential reach of formal evidence-based childhood obesity prevention programs (Bentley et al., 2014).

Another way that parents can learn about alternatives to traditional child feeding behaviors is through their self-initiated information seeking. The USDA Dietary Guidelines for Americans are not applicable until children are 2 years of age and older, which leaves parents largely on their own to determine what and how to feed their young children (Raiten, Raghavan, Porter, Obbagy, & Spahn, 2014). A few previous research studies have examined parents’ infant and toddler feeding information preferences. In general, these studies found that parents receive sometimes conflicting advice from relatives, friends, health professionals, and media (see Carruth & Skinner, 2001; Hoddinott, Craig, Britten, & McInnes, 2012; McInnes, Hoddinott, Britten, Darwent, & Craig, 2013; Savage, Neshteruk, Balantekin, & Birch, 2016). A clear picture has yet to emerge regarding parents’ satisfaction with the information they obtain or how they apply information to their parenting and feeding behavior. New research on parents’ information seeking and use behavior is particularly important in light of the rapid development of novel digital delivery mechanisms such as social media (Doub, Small, & Birch, 2016b). Given the
recent calls for incorporating technology into behavior change interventions, research on parents’ satisfaction with and use of infant and toddler feeding information from various channels is urgently needed (Hall & Bierman, 2015; Mitchell et al., 2013; Pagoto & Bennett, 2013).

**Dissertation Papers**

In this dissertation, I present the information seeking and use (ISU) model (Chapter 1) and provide initial validation of the ISU model through exploring proposed associations among variables explaining information integration (Chapter 2), and information use (Chapter 3). The ISU model presented in Chapter 1 combines existing theories of health behavior, information behavior, and information seeking to make testable predictions about the information seeking and use process as a whole. In addition to providing a framework for the empirical studies presented in this dissertation, the ISU model could be broadly tested across diverse health behaviors.

To provide initial validation for the model, I conducted an online survey of first-time parents of children less than 2 years of age ($N = 423$). Parents reported on their experiences during their most recent information seeking occasion regarding infant and toddler feeding. Select results from this survey are presented in Chapters 2 and 3. In Chapter 2, I explored how parents’ satisfaction with the information they obtained about infant and toddler feeding was associated with their information seeking aptitude (e.g., topic interest) and information acquisition (e.g., perceived utility) characteristics. I used linear mixed models, specifically random intercept models, to account for interdependence in repeated measures data and to explore the extent to which satisfaction could be attributed to between-person versus within person differences.
In Chapter 3, I explored how parents’ behavioral application of the information they obtained was associated with their information seeking aptitude, information integration (e.g., affective responses), and behavioral capacity and intent characteristics. I used decision tree modeling to construct a model that best classifies behavioral application based on the most salient features (i.e., individual measurable properties; variables) in the data.

Lastly, in Chapter 4, I synthesized the information presented in Chapters 1 through 3. I present recommendations for future research on the design and revision of evidence-based programs and services for childhood obesity prevention. Novel contributions to the fields of human development and family studies (including prevention science), information sciences and technology, and nutritional sciences are noted within each chapter.
References


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Chapter 1
A New Conceptual Model of Information Seeking and Use (ISU Model):
A Synthesis and Expansion of Existing Health Behavior and Information Theories

An outstanding challenge in prevention science is to improve the translation of basic discoveries regarding the prevention of mental and behavioral health disorders into wide-reaching and effective evidence-based programs, services, and policies (Fishbein, Ridenour, Stahl, & Sussman, 2016; Spoth et al., 2013). Theories that specifically aim to inform the translational research agenda could help to address this challenge (Mitchell, Fisher, Hastings, Silverman, & Wallen, 2010). To be impactful in research and applied healthcare settings, such theories need to offer practical, testable, and relevant predictions about outcomes across the translational research spectrum (Wendler, Kirkbride, Wade, & Ferrell, 2013). The purpose of this chapter is to introduce a new conceptual model of information seeking and use (the ISU model), which combines and expands existing theories to make predictions about what motivates individuals to obtain and apply information that is likely to impact their health behavior.

Numerous theories that predict behavioral outcomes have been applied and tested in the prevention sciences (Glanz & Bishop, 2010). Some of the most commonly used models of health behavior that informed the development of the ISU model include: the health belief model (Rosenstock, 1974); social cognitive theory (Bandura, 1985); the theory of reasoned action (Fishbein & Ajzen, 2011); the theory of planned behavior (Ajzen, 2012), and the transtheoretical model (Prochaska & Velicer, 1997). Although originally developed to inform the design of new technology, the Fogg behavioral model also offers useful predictions regarding health behavior (Fogg, 2009).

A limitation of existing theories of health behavior, or at least of their common applications (Ajzen, 2015), is that they do not make predictions about the conditions that
facilitate engagement with or exposure to information that is likely to impact their health behavior (e.g., enrollment in evidence-based prevention program; contacting a healthcare provider, bringing a topic up among a group of friends). Further, the cognitive and affective processes through which individuals perceive information they obtain and how they integrate novel information into their existing knowledge, beliefs, and skills are not fully articulated in commonly applied models of health behavior (Schwarzer, 2001). Specifying factors and processes that drive engagement and exposure to information that are likely to influence health behavior would help to inform the design and dissemination of evidence-based information (Coatsworth, Hemady, & George, in press; Hackworth et al., in press; Spoth & Redmond, 2000).

At the same time, there are numerous theories of information behavior that make predictions about whether individuals are likely to engage with information, programs, products and/or services. Information behavior is a term that refers to the entirety of the information seeking and use process (Case & Given, 2016, pp. 5–7; Spink & Cole, 2006; Wilson, 2000). Some widely applied theories of information behavior that influenced the ISU model include: the technology acceptance model (TAM; Davis, 1989); a TAM extension - the Unified Theory of Acceptance and Use of Technology (UTAT2; Venkatesh, Thong, & Xu, 2016); Dervin’s sense making theory (Dervin, 2015); Uses and gratifications theory (Ruggiero, 2000); Expectation-confirmation theory (Oliver, 1977, 1980); the Information search process model (Kuhlthau, 1991); and the Satisficing principle (Caplin, Dean, & Martin, 2011; Simon, 1967). Toyama’s amplification theory (Toyama, 2011) is an emerging theory that also makes relevant predictions about individual-level and contextual predictors of product adoption and use.

A limitation of existing theories of information behavior, or at least of the way they have been applied (Dervin, 2015), is that many do not make predictions about whether and/or how
individuals use or apply the information they obtained from a program or service (Case & O’Connor, 2016). Potential uses of information can include cognitive uses (e.g., learning something new) or behavioral application (e.g., making a purchase, exercising). This is a critical gap because behavioral outcomes are often the ultimate target of interest in both the prevention and information sciences (Case & O’Connor, 2016; Greyson & Johnson, 2016).

Health information seeking behavior is at the intersection of health behavior and information behavior, and refers specifically to individuals’ pursuit and application of information about the prevention or treatment of disease (Lambert & Loiselle, 2007). Previous scholars have reviewed the numerous and diverse theoretical models that have been developed to address health information seeking behavior (Lalazaryan & Zare-Farashbandi, 2014; Christine Marton & Wei Choo, 2012). One widely used theory that informed the ISU model is the Comprehensive Model of Health Information Seeking (Johnson & Case, 2012; Johnson & Meischke, 1993). Additionally, Nahl’s (2007) conceptual framework of social-biological information technology makes a novel contribution to this field of research by highlighting the role of cognitions and emotions in the health information seeking and use process.

A limitation of existing health information seeking theories is that they are often intended to explain information behavior related to clinical disease outcomes (e.g., cancer). Prevention science is more concerned with eliminating mental and behavioral health issues by reducing risk factors and increasing protective factors before a problematic outcome arises. To improve public health through prevention, additional theoretical and empirical consideration of the role of information in health-promoting behaviors is needed (Greyson & Johnson, 2016).
A New Conceptual Model of Information Seeking and Use to Inform Translational Research across the T0 to T2 stages

Information flow, meaning the way that information is communicated and shared across various stakeholders, is a critical aspect of translational research (Field, Booth, Ilott, & Gerrish, 2014; Ward, House, & Hamer, 2009; Wendler et al., 2013). A conceptual framework that specifically aims to address translational research topics across the T0 (Discovery Science); T1 (Methods and Program Development); and T2 (Implementation and Effectiveness) stages of the full translational spectrum of prevention science could decrease the amount of time it takes for basic research to develop into effective evidence-based prevention programs (Fishbein et al., 2016). The new conceptual model of information seeking and use proposed in this chapter aims to inform future research that can address the “top 10 dissemination mistakes” that currently inhibit the flow of evidence based information (Dearing, 2009, p. 509). Many of the ten dissemination mistakes outlined by Dearing (2009) lie within the T0, T1, and T2 research stages and indicate numerous untested assumptions of variables in the following domains: Information and channel factors; Information seeking aptitude; Information acquisition (information seeking behavior and perceptions of information); and Information use.

The conceptual model of information seeking and use identifies key variables within each of these domains and makes a series of testable predictions about how they are associated with two primary outcomes of interest to information flow in the translational research process – information acquisition and information use. In doing so, the ISU model addresses critical gaps in many health behavior and information behavior theories by bridging information seeking and use processes and connecting them to behavioral health outcomes.
Whetten (1989) proposes that theories need to provide information about *what* variables explain an outcome, *how* those variables are associated with each other and the outcome, *why* the variables and their associations are important, and *for whom, where, and when* the theory applies. The same can be said of conceptual frameworks, which integrate and expand multiple existing theories to explain and justify a novel area of research (Maxwell, 2013; Ravitch & Riggan, 2012). The conceptual model is presented next using Whetten’s (1989) model specification requirements.

**What.** The proposed variables and associations in the ISU model are presented in Figure 1. The conceptual domains and variables in the ISU model are presented and defined in Table 1. The key outcomes of interest in the model relevant to translational research are information acquisition (e.g., topic of search, channel selection, search frequency), and information use.

**How.** The proposed associations in the ISU model are presented in Figure 1. An arrow from box X to box y indicates a proposed predictor (box X) and outcome (box Y) association. The information seeking and use cycle for a specific information need is assumed to continue until the search is evaluated as complete during the information integration stage.

**Why.** The ISU model bridges existing theories of health behavior, information behavior, and health information seeking behavior to resolve the independent limitations mentioned above. The association between existing theories and the ISU model is outlined in Table 1. In the introduction sections of the empirical papers in this dissertation (Chapter 2 and Chapter 3), I reference specific theories and provide more granular details regarding how they informed both the ISU model and the specific research questions addressed in those studies.

**For whom, where, when.** The ISU model was developed to explain singular information needs among typically developing adult populations. Specifically, it was developed to explain
the information seeking and use process that parents of young children engage in (or do not engage in) regarding topics related to childhood obesity prevention. Therefore, this model may apply to both self and surrogate information seeking needs (Cutrona et al., 2015). Research is needed to test how the model applies to individuals with clinical mental or physical health disorders, and across developmental stages (e.g., childhood, adolescence, aging populations). Additionally, research is needed to explore how this process is modified when an information need is extremely urgent (e.g., in the case of a health emergency). The demographic and socioeconomic and information seeking aptitude domains should capture these individual and search-level differences, however these populations were not explicitly considered when developing the model.

The variables and associations proposed in the ISU model are intended to explain intentional information seeking behavior. As a process model, the ISU makes predictions about information behavior over time (Savolainen, 2018). Factors within the model can be measured and manipulated across the longitudinal process. Although theory and research regarding information avoidance and serendipitous exposure to information are also important (Case & Given, 2016, pp. 102–103; 110–113), the ISU model does not attempt to explain these processes.
Figure 1. The conceptual model of information seeking and use (ISU model). Boxes indicate construct domains. Bullet points indicate example variables. Arrows indicate proposed associations between construct domains. Additional interactions within and between construct domains are possible although not depicted.
Table 1

*Constructs, Definitions, Example Variables, and Existing Theories Represented in the Conceptual Model of Information Seeking and Use (ISU Model)*

<table>
<thead>
<tr>
<th>Construct domain</th>
<th>Definition</th>
<th>Example variables</th>
<th>Select existing theories that address similar constructs and variables*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic and socioeconomic characteristics</td>
<td>Personal characteristics and indicators of social position</td>
<td>• Age</td>
<td>• Fogg’s behavioral model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Gender</td>
<td>• Toyama’s amplification theory</td>
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<td></td>
<td></td>
<td>• Race</td>
<td>• UTAT2</td>
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<td></td>
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<td>• Ethnicity</td>
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<td></td>
<td></td>
<td>• Marital status</td>
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<td>• Employment</td>
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<td>• Income</td>
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<tr>
<td></td>
<td></td>
<td>• Household composition</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Health indicators</td>
<td></td>
</tr>
</tbody>
</table>
| Behavioral capacity and intent | Individual, intrapersonal, and environmental influences an individuals’ ability and intent to take action on a behavioral target | **Intrapersonal:**  
- Knowledge  
- Beliefs  
- Skills  
- Stage of behavior change  
- Self-concept  
- Perceived barriers  
- Experience  
**Interpersonal:**  
- Social norms  
- Child characteristics  
- Co-parenting  
**Environmental:**  
- Policies  
- Resources  
- Cultural norms | **Information and channel factors**  
- Health belief model  
- Fogg’s Behavioral Model  
- Theory of Reasoned Action  
- Toyama’s amplification theory |
| Information and channel factors | Objective aspects of information channels, the information provided, and information delivery approaches | **Channel:**  
- Relationship to consumer  
- Information availability  
**Information:**  
- Framing  
- Skill building  
- Connections to resources  
**Delivery:**  
- User experience  
- Communication mode |  
- Theory of planned behavior  
- Comprehensive model of health information seeking |
| Information seeking aptitude | Likelihood of engaging in an intentional search for information based on personal capacity and tendencies | **Access to information:**  
- Technology access  
- Social network composition  
- Education opportunities  
- Healthcare network  
**Motivation to seek topic specific information:**  
- Topic interest  
- Concerns  
- Curiosity  
- Entertainment  
**Capacity:**  
- Health literacy  
- Computer literacy  
- Openness to new information  
- Time to search  
- Time to apply information | **• Comprehensive model of health information seeking**  
**• Health belief model**  
**• Social cognitive theory**  
**• Toyama’s amplification theory** |
| Information acquisition | Enacted and cognitive processes related to intentional searches for information | **Information seeking behavior:**  
- Topic selection  
- Selected access of information channels  
- Timing and duration of search  
**Perceptions of information (information and channel specific):**  
- Utility  
- Trust  
- Intent | **Comprehensive model of health information seeking**  
**Dervin’s sense making theory** |
| --- | --- | --- | --- |
| Information integration | Cognitive processes related to the comparison and synthesis of information obtained across time and information channels | **Satisfaction**  
**Comprehension**  
**Integration**  
**Affective responses**  
**Search status evaluation** | **Information search process model**  
**Social cognitive theory**  
**Nahl’s conceptual model of social-biological information technology** |
| Information use | Cognitive and behavioral applications of information | **Decision making**  
**Planning**  
**Behavioral application**  
**Learning**  
**Feeling (e.g., reassurance)**  
**Updating**  
**Sharing** | **Fogg’s Behavioral Model**  
**Theory of Reasoned Action**  
**Theory of Planned Behavior**  
**Transtheoretical model of behavior change** |
| Evaluation | Reflections on information use process and outcomes | • Goal attainment  
• Short-term outcomes  
• Expected long-term outcomes  
• Sustainability | • Information search process model  
• Nahl’s conceptual model of social-biological information technology  
• Theory of planned behavior |

*Note. *The selected theories listed in this column are not exhaustive but rather a selection of existing theories that were especially informative in the development of the information seeking and use model for that domain.*
Conclusion

Research that supports the translation of basic science and intervention effectiveness and efficacy studies into actionable solutions to public health challenges is urgently needed (Anderson Steeves, Martins, & Gittelsohn, 2014; Institute of Medicine (IOM), 2012; Rodgers & Collins, 2012). The information seeking and use (ISU) model makes a series of testable predictions regarding factors that motivate individuals to engage with and apply information that is likely to impact their health behavior. Importantly, the ISU model addresses existing theoretical gaps in health behavior and information research by connecting information seeking and use processes to behavioral outcomes.

The ISU model can be broadly applied and is valence free, meaning it makes predictions about information behaviors that may lead to negative behavioral health outcomes as well as positive behavioral health outcomes. For example, the ISU model is equally suited to make predictions about the likelihood of accessing evidence-based information as for inaccurate or misleading information. The ISU model also includes modifiable factors that prevention scientists can measure and manipulate to inform the development and revision of evidence-based programs and services. Existing prevention programs could use this model to identify and address barriers to enrollment and compliance among their target audience. The next two chapters offer an initial validation of select variables and processes within this model in the context of parents’ naturally occurring information seeking and use behavior regarding infant and toddler feeding.
References


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Chapter 2
A Repeated Measures Analysis of Parents’ Satisfaction with Infant and Toddler Feeding Information: Associations with Information Seeking Aptitude and Information Acquisition Characteristics

Satisfaction is a key construct in many fields concerned with the influences of information and perceived experiences on human behavior. In prevention science, satisfaction is an essential component of program acceptability and efficacy (Bowen et al., 2009; Glasgow, Vogt, & Boles, 1999). Although satisfaction is a central construct in prevention science, few studies have fully explored how satisfaction is influenced by information content and delivery characteristics (Supplee, Parekh, & Johnson, in press). Additionally, few studies have examined how individual-level factors interact with information content and delivery characteristics to predict intervention outcomes, including satisfaction (Fishbein & Dariotis, 2017). Understanding factors associated with information satisfaction could inform the design and adaptation of evidence-based prevention programs and services to optimize their potential reach and effectiveness (Dehar, Casswell, & Duignan, 1993; Rotheram-Borus, Swendeman, & Chorpita, 2012).

In this chapter, satisfaction is defined as an individual-level cognitive evaluation of the extent to which information channels individually address information needs, and the extent to which they do so in positive (i.e. enjoyable) ways. Satisfaction is proposed to occur within the information integration domain in the information seeking and use (ISU model). This definition aligns with that proposed by Oliver (2014, p. 8), the originator of expectation-confirmation theory (1977, 1980). As defined in this chapter, satisfaction refers to an evaluation of the information acquisition process with an information channel, which differs from an evaluation of the information need (i.e., satisficing; Simon, 1967). Said another way, individuals can be satisfied with information they obtain from an information channel and still have remaining questions or interests. Scholars have long called for increased empirical attention to the
assessment of satisfaction to facilitate the intended outcomes of programs and services (e.g., Melone, 1990; Ware, Davies-Avery, & Stewart, 1978). Recent studies on satisfaction have strived to establish context-specific measures, such as satisfaction with tourism experiences (Park, Hahn, Lee, & Jun, 2018), video games (Phan, Keebler, & Chaparro, 2016), and contraceptive counseling (Dehlendorf, Henderson, Vittinghoff, Steinauer, & Hessler, 2018).

Research on the predictors of parents’ satisfaction with an information acquisition process that is likely to influence behavior is especially needed to inform childhood obesity prevention (Bentley et al., 2014). Program acceptability has been proposed to play a role in the viability and sustainability of prevention programs, however there is limited research to indicate which aspects are important to measure, and how to measure them (Heymann, Sell, & Brewer, 1998; Shelton, Cooper, & Stirman, 2018). At present, few studies have been published on process evaluations of obesity prevention programs, including information about parents’ satisfaction with the information they obtained (Kozica, Lombard, Harrison, & Teede, 2016). As research on obesity prevention moves from efficacy to effectiveness trial, information on parents’ preferences for information is critical to promote the reach of evidence-based information, programs, and services (Glasgow, Lichtenstein, & Marcus, 2003). Using the conceptual model of information seeking and use as a guiding framework (Chapter 1), the current study explored how information seeking aptitude and acquisition characteristics were associated with parents’ satisfaction with information they obtained regarding infant and toddler feeding during a naturally occurring information seeking occasion.

Existing Research on Parents’ Information Preferences and Satisfaction

For many parents in the United States, the arrival of their first child is the first time they are entirely responsible for the care and feeding of an infant. Fewer natural opportunities exist in the United States to participate in and observe childcare than they do in non-Western countries.
(e.g., Tanzenia; Hadley, Patil, & Gulas, 2010). This means that parents often develop and/or refine their beliefs, attitudes, and behaviors related to child feeding as they prepare for and begin to raise their first child. Numerous studies have explored parents’ information needs regarding their children’s clinical health issues (e.g., neonatal intensive care, autism; De Rouck & Leys, 2011; Gates, Shulhan, Featherstone, Scott, & Hartling, 2018; Gibson & Kaplan, 2015). However, these findings may not extend to the preventive health and/or normative information needs that arise during the first years of parenting.

A number of studies have described information needs during pregnancy and the early postnatal period (Brett, Staniszewska, Newburn, Jones, & Taylor, 2011; Entsieh & Hallström, 2016; Huberty, Dinkel, Beets, & Coleman, 2012; Kraschnewski et al., 2014; Sayakhot & Carolan-Olah, 2016). For example, Entsieh & Hallström (2016) reviewed qualitative studies on parents’ experiences with formal prenatal education programs. They reported that parents’ information needs included practical guidance about how to meet infants basic needs, enduring emotional and practical support from health professionals, and co-parenting strategies (Entsieh & Hallström, 2016). Parents’ satisfaction with learning was briefly addressed in this review. The authors reported that across studies, parents were generally interested in more engaging, hands on training in addition to a more typical lecture format (Entsieh & Hallström, 2016). More research is needed to determine which aspects of information content and delivery are associated with parents’ satisfaction with infant and toddler feeding information beyond formal education programs.

Fewer studies have explored parents’ information needs and perceptions regarding infant feeding during the first two years of life. A recent review of existing qualitative research regarding parents’ experiences with complementary feeding (i.e., the introduction and transition to solid foods) reported that many parents reported feeling confused and frustrated by
information regarding the when to introduce solid food and what foods to introduce (Matvienko-Sikar et al., 2018). Additionally, parents reported feeling like their personal instincts and experiences with infant feeding were not acknowledged in the information they received about complementary feeding (Matvienko-Sikar et al., 2018). Similar findings have been reported in research on parents’ perceptions breastfeeding information (Kervin, Kemp, & Pulver, 2010).

**Individual- and Channel-level Differences in Satisfaction**

An emerging area of research regarding information satisfaction focuses on individual differences. There evidence to suggest there are individual differences in when information needs are satisfied. For example, Schwartz and colleagues (2002) distinguished “maximizers” (i.e., individuals who seek an optimal outcome from their search) from “satisficiers” (i.e., individuals who seek to reach a given threshold). Although research on individual-level differences in information outcomes, including satisfaction, is rapidly accumulating, a recent review of existing literature concluded that most studies to date have focused on demographic characteristics (O’Brien, Dickinson, & Askin, 2017). Additional research is needed to explore the extent to which information satisfaction varies between and within individuals, especially with regard to infant and toddler feeding information.

Existing information behavior theories offer some predictions regarding the individual characteristics that are likely to influence satisfaction. For example, expectation-confirmation theory specifically predicts information satisfaction from performance expectancies and evaluations (Oliver, 1977, 1980). In the context of satisfaction with infant and toddler feeding information (Chapter 1), performance expectations are measured as information seeking aptitude characteristics, specifically information seeking motivation. In the current study, information seeking motivation is operationalized as parents’ including the urgency of their information need as well as their topic-specific interest. Performance expectations may also include perceived trust.
of information (Shin, Lee, & Hwang, 2017). In the ISU model, trust is considered an information acquisition characteristic and is assessed in the current study.

The technology acceptance model (TAM; Davis, 1989) and its extension, the unified theory of technology acceptance and use of technology (UTAT2; Venkatesh, Thong, & Xu, 2016) offer further insight into what variables may differentiate individuals in their satisfaction with information. Perceived effort (e.g., difficulty to obtain information in terms of time or physical resources required) and usefulness (e.g., the extent to which the program or service meets an information need) are considered key predictors of behavioral intent to engage with a product or service. Although these theoretical frameworks do not predict satisfaction directly, behavioral intent is a closely related construct. In the ISU model, perceptions of information and perceived effort and utility are included within the information acquisition domain. The current study assessed parents’ evaluations of the perceived ease of acquisition, utility, and clarity of information regarding infant and toddler feeding.

Satisfaction may also demonstrate systematic differences by information channel. In this research, information channel refers to where information was obtained such as from a website, book, or friend. The use of the phrase, ‘information channel’ is recommended over the term, ‘source’ to be explicit that individuals may access information channels without successfully obtaining information (Kuhlthau, 1991). Further, the channel and original content creator of the information shard may differ (e.g., a friend may share information from a book she read). A study conducted by the Pew Research Center on parents’ use of social media for parenting information found that while nearly 80% of parents endorsed that they got information from social media, only 32% strongly agreed that the information was useful (Duggan, Lenhart, Lampe, & Ellison, 2015). Comparatively, in a study regarding autism treatment, 80% of parents were satisfied or very satisfied with the educational and therapeutic services their children
received, even though the number of services hours fell below the evidence-based recommendations (McIntyre & Zemantic, 2017). The current study began to explore the potential for individual- and channel-specific differences in information satisfaction using a repeated measures design of parents’ satisfaction with information regarding infant and toddler feeding.

**Current Study**

The primary purpose of this study was to explore how parents’ satisfaction with infant and toddler feeding information was associated with their information seeking aptitude and information acquisition characteristics. The research questions tested the portions of the ISU model shown in Figure 1. Using a repeated measures approach, the first aim of this study was to explore the amount of variance in satisfaction that could be attributed to between- versus within-person differences. The second aim was to explore the amount of variance in satisfaction that could be attributed to differences between- versus within-information channel differences. In both cases, I expected the amount of variance explained would be non-zero. Theoretically, non-zero findings would imply that both individual and channel-level factors contribute to satisfaction.

The third aim was to explore how select information seeking aptitude variables (information urgency and topic interest) and information acquisition variables (perceived ease of acquisition, information clarity, utility, and trust in the information) were independently associated with information satisfaction. I expected that these variables would be positively associated with satisfaction. The fourth aim was to explore how information satisfaction was associated with the interaction between ease of information acquisition and information urgency and ease of information acquisition and topic interest. I expected that when information urgency was high, more difficulty obtaining information would be associated with lower levels of
satisfaction. I expected that when topic interest was low, more difficulty obtaining information would be associated with lower levels of satisfaction.

Figure 1. Potential associations with parents’ satisfaction with infant and toddler feeding information tested in the current study within the context of the ISU model. Solid lines indicate expected direct effects. Dashed lines indicate expected indirect effects. Grayed out areas were not examined in the current study.
Methods

Procedure

First-time parents ($N = 423$) whose only or oldest child was 24 months of age or younger at the time of survey administration participated in a ~20-minute online survey on individual- and family-level characteristics and infant and toddler feeding experiences. All child-specific survey questions prompted participants to report on their specific experiences with their only or oldest child. A commercial participant recruitment service, Research Now Survey Sampling International, LLC (Research Now SSI), recruited participants from an adult (18 years of age or older only), volunteer, United States, English language speaking online survey panel database between February 6th through February 22nd, 2018 (Research Now SSI, 2018). To be eligible to participate in the current study, individuals had to consent to participation, self-identify as a first-time parent of an only or oldest child who was 24 months of age or younger at the time of survey administration, and endorse that they remembered trying to get advice or information regarding infant or toddler feeding topics in the past 30 days. Participants who completed the survey received an incentive from Research Now SSI according to their individualized incentive structure. The online survey was programmed and delivered in Qualtrics (Qualtrics, 2013). All study procedures were reviewed by the Pennsylvania State University Office for Research Protections and were determined to be exempt (Study 00008530).

Data collected from commercially-maintained online survey panel participants is comparable to data collected via telephone or mail surveys (Ansolabehere & Schaffner, 2014). Commercially-maintained survey panel data has demonstrated higher data quality compared to data collected through crowd-sourced participant recruitment methods (Smith, Roster, Golden, & Albaum, 2016) and lower self-selection bias compared to data collected through Internet-based snowball recruitment methods (Szolnoki & Hoffmann, 2013). Survey research studies conducted using Research Now SSI on health-related information behavior have been published in...
reputable, peer-reviewed academic journals such as the *Journal of Medical Internet Research* (Witteman, Zikmund-Fisher, Waters, Gavaruzzi, & Fagerlin, 2011; Zikmund-Fisher, Dickson, & Witteman, 2011; Zikmund-Fisher et al., 2012), *Journal of Obesity* (Segar, Updegraff, Zikmund-Fisher, & Richardson, 2012), and *Appetite* (Doub, Small, Levin, LeVangie, & Brick, 2016). A total of 1069 participated in the survey. Participants were excluded if they did not meet the inclusion criteria (n = 84), did not finish the survey (n = 182), or provided invalid responses (e.g., nonsense answers to the open-ended questions; n = 380). This resulted in a final sample size of 423 participants.

**Participant recruitment approach**

A purposive sampling method was employed to promote diversity in representation by child age, annual household income, and parent gender. Recruitment was purposively targeted to promote an equitable representation of parents with infants from the following age ranges: 0 to 5 months, 6 to 11 months, 12 to 17 months, 18 to 24 months. These age ranges respectively correspond to the following developmental feeding stages: milk feeding period, introduction to solid foods, transition to the “adult” diet, and transition to structured meals and snacks (Birch & Doub, 2014; Black & Aboud, 2011; Pérez-Escamilla, Segura-Pérez, & Lott, 2017).

Recruitment was also purposively targeted to promote an equitable representation of annual household income across the following income ranges: Less than $25,000, $25,000 to $44,999, $45,000 and $74,999, $75,000 to $119,999 and over $120,000. These income ranges reflect the annual household income quintiles identified by the U.S. Census Bureau 2017 Current Population Survey (CPS) Annual Social and Economic Supplement (Semega, Fontenot, & Kollar, 2017). Annual household income was identified as a key socioeconomic characteristic for purposive sampling because there is longitudinal evidence to suggest children living in lower-income households prior to 2 years of age have a higher risk of childhood and adolescent obesity.
(Lee, Andrew, Gebremariam, Lumeng, & Lee, 2014). The association between socioeconomic status and childhood obesity risk may be driven in part by differences in infant and toddler feeding behavior, which further supports the importance of recruiting a sample that is diverse with regard to both child age and annual household income (Davis, Koleilat, Shearrer, & Whaley, 2014; Gibbs & Forste, 2014; Rose, Savage, & Birch, 2016; Wen, Kong, Eiden, Sharma, & Xie, 2014; Wijlaars, Johnson, van Jaarsveld, & Wardle, 2011).

Lastly, women and men were recruited with a goal of recruiting a sample that included both mothers (75% of the total recruitment goal) and fathers (25% of the total recruitment goal). Fathers have been underrepresented in research on child feeding behavior and childhood obesity research to date, with an average representation of 17% (Davison et al., 2016; Khandpur, Blaine, Fisher, & Davison, 2014). The 25% recruitment goal for fathers in the current study reflected balancing an interest in including fathers with budget and time considerations for survey administration given pilot research for the current study suggested recruiting fathers would be challenging.

**Participant demographic and socioeconomic characteristics**

Descriptive statistics on participant demographic and socioeconomic characteristics are presented in Table 1. Participants ranged in age from 18 to 54 years old, and had a mean age of 28.36 years. Despite efforts to achieve a balanced sample on gender and household income, few fathers (11%) or parents with household incomes greater than $120,000 (7%) participated in this study. Approximately one-quarter of participants were actively enrolled in the WIC program (26%). Nearly all participants were biologically related to the child they were reporting on (98%) and all but one participant were full-time residential parents. Most participants had one child (92%) and reported there was a co-parent involved in their child’s care (91%). The majority of participants self-identified as White (75%) followed by black or African American (12%),
Hispanic, Latino, or Spanish (10%), and Asian (7%). Few participants reported other races and/or ethnicities including American Indian or Alaska Native (4%), Middle Eastern or North African (1%), Native Hawaiian or Pacific Islander (0.5%), some other race, ethnicity, or origin (2%), and one participant preferred not to disclose their self-identified race and/or ethnicity. Child race and/or ethnicity reflected a similar distribution to parent race and/or ethnicity. With regard to weight status, less than half of participants described their current weight as overweight or very overweight (41%), and few participants endorsed that their child’s current weight was high or very high (3%).
Table 1

**Participant Demographic and Socioeconomic Characteristics (N = 423)**

<table>
<thead>
<tr>
<th></th>
<th>n(%)</th>
<th>M(SD)</th>
</tr>
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<tbody>
<tr>
<td><strong>Parent gender</strong></td>
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<tr>
<td>Female</td>
<td>375 (89%)</td>
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<tr>
<td><strong>Parent age in years</strong></td>
<td>28.36 (5.54)</td>
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</tr>
<tr>
<td><strong>Household size</strong></td>
<td>3.27 (0.83)</td>
<td></td>
</tr>
<tr>
<td><strong>Number of children</strong></td>
<td>1.08 (0.27)</td>
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</tr>
<tr>
<td><strong>Pregnant/Expecting</strong></td>
<td>36 (9%)</td>
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<tr>
<td><strong>Parent race and/or ethnicity</strong>*</td>
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<tr>
<td>Asian</td>
<td>28 (7%)</td>
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</tr>
<tr>
<td>Black or African American</td>
<td>51 (12%)</td>
<td></td>
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<tr>
<td>White</td>
<td>320 (75%)</td>
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<tr>
<td>Hispanic, Latino, or Spanish</td>
<td>43 (10%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20 (5%)</td>
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<tr>
<td><strong>Annual household income</strong></td>
<td></td>
<td></td>
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<tr>
<td>Less than $24,999</td>
<td>81 (19%)</td>
<td></td>
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<tr>
<td>$25,000 to $44,999</td>
<td>126 (30%)</td>
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<tr>
<td>$45,000 to $74,999</td>
<td>110 (26%)</td>
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</tr>
<tr>
<td>$75,000 to $119,999</td>
<td>75 (18%)</td>
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<tr>
<td>Over $120,000</td>
<td>31 (7%)</td>
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<tr>
<td><strong>Marital status</strong></td>
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</tr>
<tr>
<td>Married</td>
<td>270 (64%)</td>
<td></td>
</tr>
<tr>
<td>Single, living with romantic partner</td>
<td>106 (25%)</td>
<td></td>
</tr>
<tr>
<td>Single (never married, divorced, separated, widowed)</td>
<td>47 (11%)</td>
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<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
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<tr>
<td>Less than high school</td>
<td>9 (2%)</td>
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</tr>
<tr>
<td>High school diploma or GED</td>
<td>78 (18%)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>104 (25%)</td>
<td></td>
</tr>
<tr>
<td>Associate’s or Bachelor’s degree</td>
<td>175 (41%)</td>
<td></td>
</tr>
<tr>
<td>Graduate or advanced professional degree</td>
<td>57 (14%)</td>
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<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed, full-time</td>
<td>157 (37%)</td>
<td></td>
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<tr>
<td>Employed, part-time</td>
<td>60 (14%)</td>
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</tr>
<tr>
<td>Stay-at-home parent</td>
<td>170 (40%)</td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>14 (3%)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>19 (5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Childcare</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No regular non-parental childcare</td>
<td>174 (41%)</td>
<td></td>
</tr>
<tr>
<td>1 to 10 hours per week</td>
<td>136 (32%)</td>
<td></td>
</tr>
<tr>
<td>11 to 20 hours per week</td>
<td>52 (12%)</td>
<td></td>
</tr>
<tr>
<td>21 to 40 hours per week</td>
<td>50 (12%)</td>
<td></td>
</tr>
<tr>
<td>41 or more hours per week</td>
<td>11 (3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Child gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>195 (46%)</td>
<td></td>
</tr>
<tr>
<td><strong>Child age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 5 months</td>
<td>97 (23%)</td>
<td></td>
</tr>
<tr>
<td>6 to 11 months</td>
<td>95 (23%)</td>
<td></td>
</tr>
<tr>
<td>12 to 17 months</td>
<td>118 (28%)</td>
<td></td>
</tr>
<tr>
<td>18 to 24 months</td>
<td>113 (27%)</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Percentages may not add to 100 because multiple categories could be endorsed*
Measure Development Pilot Research

Prior to conducting the current study, I developed and tested study-specific measures in a two-phase pilot study that included qualitative semi-structured interviews (Whiting, 2008) and cognitive interviewing (Beatty & Willis, 2007) methods. This qualitative approach to survey item development has been recommended by previous scholars to enhance measurement validity (Lohse, Satter, & Arnold, 2014; O’Brien & McCay-Peet, 2017; Ramirez et al., 2013; Rattray & Jones, 2007). Study procedures for the qualitative pilot study (Study 00007973) and the cognitive interviewing pilot study (Study 00008524), were reviewed by the Penn State University Office of Research Protections and determined to be exempt.

In the first pilot study, I conducted qualitative, semi-structured interviews with 7 pilot participants who were parents of children less than two years of age (5 mothers, 2 fathers). The interviews qualitative explored parents’ terminology regarding topics addressed in the conceptual model of information seeking and use presented in Chapter 1. Each one-on-one interview took an average of 60-minutes to complete. Participants received a $10 Amazon digital gift card for their time. Results informed the topics and phrasing of measures included in the survey. The complete interview guide is presented in Appendix A.

Following the qualitative pilot study, I tested and iteratively modified survey measures with 14 participants who were parents of children less than 2 years of age (13 mothers, 1 father) in a cognitive interviewing pilot study (Beatty & Willis, 2007). With the first pilot participant, I conducted the online survey measures as a qualitative interview, which involved reading each survey item and response option aloud and listening to the participant’s response. Any questions or clarification requests from the interviewer or the participant were immediately addressed. The remaining 13 pilot participants completed the full online survey independently prior to a semi-
structured telephone interview within 24-hours of completing the survey. I used the participant responses on the online survey to guide the cognitive interviewing questions related to their comprehension of the items and the response options. I also elicited their opinions on whether they felt the survey measures captured their lived experience finding and applying information related to infant and toddler feeding. The cognitive interviewing probes used in this phase of the pilot study are presented in Appendix B. The pilot version of the online survey took approximately 30 minutes to complete and the one-on-one cognitive interviews took an average of 25 minutes to complete. Participants received a $14.50 Amazon digital gift card code for their time. Results led to further refinement of the question items and response options presented in the final data collection instrument, as well as the overall length of the survey. The following section details the finalized measures administered in the current study.

**Measures**

The following measures were collected to address the study aims. Unless specifically mentioned, there were no missing values in the variables described below.

**Information seeking and use context variables.** Descriptive and contextual aspects of the naturally occurring information seeking occasion were assessed.

**Topic and timing.** Pilot research suggested that parents often engaged in frequent, ongoing searches for parenting information. I implemented personalized question prompts to focus survey responses on participants’ most recent search for a specific infant and toddler feeding topic in reference to their only or oldest child. Early in the survey, participants shared the first name or a nickname of their only or oldest child. This name was populated throughout the survey as appropriate to orient the participant to reporting only on their experiences with that child (indicated in this document as [piped text: child]).
To orient participant responses to a specific topic, participants were first asked, “What topics related to feeding [piped text: child] have you tried to get advice or information about in the last 30 days? Check all that apply.” Responses options were presented as checkboxes and included: breastfeeding; pumping breast milk; formula feeding; bottle feeding; adding cereal to the bottle; weaning from milk; food allergies or sensitivities; introducing solid foods; baby-led weaning; recipe or food preparation ideas; picky eating; child behavior at meal times; family meals; food or beverage product; special occasion food or drink ideas; weight or growth; child nutritional needs; or other. In a later question, participants indicated the topic for which they had most recently sought advice or information among those they previously selected. This response was used to orient the participant to the topic of their most recent information seeking occasion (indicated in this document as [piped text: topic]).

Parents were then asked, “When did you most recently seek advice or information about [piped text: topic] from any sources – in-person and/or online? Note: Seeking advice or information includes asking a quick question through spending multiple days trying to get advice or information about the same topic.” Response options included: today; yesterday; earlier this week; one week ago; two weeks ago; three weeks ago; four weeks ago. Responses to this item served to orient participants to the timing of their most recent information seeking occasion (indicated in this document as [piped text: timing of most recent search]). At regular intervals throughout the survey, participants were oriented to their most recent search for a given infant and toddler feeding topic. For example, participants saw the prompt, “Thinking only about when you tried to get advice or information about [piped text: topic] [piped text: timing of most recent search]…” prior to responding to questions about their information seeking and use experiences.
**Information channels.** Participants responded to the question, “What sources did you try to get advice or information from about [piped text: topic] [piped text: timing of most recent search]? Check all that you clearly remember. Responses options were presented as checkboxes and included: co-parent; family relatives; friends; co-workers; pediatrician; hospital or other health care professional; childcare provider(s); Women, Infants, and Children (WIC); Books (e.g., parenting books, cookbooks); handout from healthcare setting; search engines (e.g., Google, Siri Alexa); websites (e.g., Baby Center, WebMD); social media (e.g., Facebook, Pinterest, Reddit); blogs (e.g., parenting blogs, food blogs); Apps (e.g., What to Expect, Yummly); Online forums; or other source. Participants who endorsed search engines were asked a follow-up question to clarify whether they used the search engine to obtain information via a featured search result or if they followed a link to another website(s) listed within the results. Participants who endorsed social media were asked to indicate which of the following platforms they used: Facebook; Pinterest; Instagram; Reddit; Twitter; Other. Participants were then randomly assigned to report on their experience obtaining advice or information from up to two of the information channels they endorsed, which constituted the repeated measures aspect of the study.

**Education.** Participants reported their highest level of completed education in the following categories: Less than high school; High school diploma or GED; Some college; Associate’s degree; Bachelor’s Degree; Master’s degree; Professional degree (e.g., JD); or Doctorate degree (e.g., MD, PhD). For the purposes of analyses, the Associate’s and Bachelor’s degree categories were combined to indicate a terminal, undergraduate degree, and the Master’s, professional, and doctorate degrees were combined to indicate a terminal graduate or
professional degree. Education was treated as a continuous variable in the analyses ranging from 1 = Less than high school to 5 = Graduate or professional degree.

**Information seeking aptitude variables.** Topic interest and information urgency were assessed as indicators of information seeking aptitude.

**Topic interest.** Parent interest in the topic of their most recent information seeking occasion was assessed using a single-item measure. This item was developed based on preliminary pilot research and existing research on topical interest (Dervin, 1998; Silvia & Kashdan, 2009; Wigfield & Cambria, 2010). Participants responded to the question, “How personally interested were you in [piped text: topic] before getting advice or information?” on a 7-point scale ranging from 1 = Not at all interested to 7 = Very interested. This single-item measure demonstrated predictive validity; topic interest was positively correlated with the amount of time the individual spent on the search ($r = 0.11, p = .03$) and overall frequency of information seeking regarding information seeking in the past 30 days ($r = .13, p < .01$).

**Information urgency.** Information urgency was assessed by a single item measure. Participants responded to the question, “How urgent was your need for advice or information about [piped text: topic]?” on a 7-point scale ranging from 1 = Not urgent to 7 = Very urgent. There were no missing values for this item. This item was developed for the project based on preliminary pilot research and an existing measure of information urgency in a health information seeking context (Pian, Khoo, & Chi, 2017). The single-item measure demonstrated predictive validity; Information urgency was higher among parents who reported they were seeking information because of a concern ($n = 142; M = 4.00, SD = 1.66$) compared to parents who were seeking information because they were curious ($n = 258; M = 3.07, SD = 1.68; t(399) = -5.36, p < .001$).
**Information acquisition characteristics: Perceptions of information.** Participants completed the following measures of their experiences obtaining infant and toddler feeding information from up to two channels.

*Ease of acquisition.* A 4-item scale assessed parents’ perceived ease of information acquisition from a specific information channel. These items were developed specifically for this study based on pilot research and existing measures of perceived ease of use (Davis, Bagozzi, & Warshaw, 1989) and effort expectancy (Venkatesh, Thong, & Xu, 2012; Venkatesh et al., 2016). Participants first responded to a global item, “How much effort did it take you to get advice or information about [piped text: topic] from [piped text: information channel] [piped text: timing of most recent search]. Participants rated their perceived effort on a 7-point scale ranging from 1 = No effort at all to 7 = A lot of effort. Response values were reversed prior to conducting an analysis of internal consistency.

Participants then responded to three items with the overarching prompt, “To what extent was your experience obtaining advice or information about [piped text: topic] from [information channel]: 1) Convenient; 2) Timely; 3) Enjoyable. Participants rated their acquisition experience on a 7-point scale ranging from 1 = Not at all to 7 = Very. Items were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005). An analysis of the internal consistency of the scale revealed that the global item of ease of acquisition, which was the only reversed item in the entirety of the online survey, negatively impacted the Cronbach’s alpha (α with global acquisition item = .57). Therefore, the global item was omitted from the scale. The internal consistency of the ease of acquisition scale including the remaining three items was acceptable (α = 0.76).
Construct validity for ease of acquisition scale, combined with the clarity, utility and trust scales (described later), was established by testing a single four-factor model of parents’ perceptions of information using confirmatory factory analysis (CFA). The confirmatory factor analysis was conducted using the lavaan package (version 0.5-23.1097; Rosseel, 2012) in R version 3.5.0 (R Core Team, 2018). For the purposes of the confirmatory factor analysis, data regarding participants’ experiences with their first randomly-assigned information channel only were included. I tested whether the items that were intended to measure each construct loaded on to four pre-determined latent factors using the maximum likelihood estimation approach with a standardized latent factor score. Prior to conducting the CFA, I verified that the response distributions for each item appeared to meet normality assumptions (i.e., skewness and kurtosis values less than +/- 2.0). Across all items for the four scales, missing values were present in <1% of the sample (n = 2), with any given item missing one value. Prior to conducting the CFA, these missing values were replaced with the scale mid-point value (4). This was the default option for this item in the online survey, which participants may have interpreted as an endorsement.

The CFA results generally supported the proposed four-factor model. Model fit statistics were within acceptable, although not ideal, ranges: Comparative Fit Index (CFI) = 0.91; Tucker-Lewis Index (TLI) = 0.89; Root mean square error of approximation (RMSEA) = 0.09; Standardized root mean square residual (SRMR) = 0.05 (Brown, 2015; Jackson, Gillaspy, & Purc-Stephenson, 2009). The standardized factor loadings for the three items measuring ease of acquisition were uniformly positive and significant, ranging from 0.64 to .79 (p < .001).

**Clarity.** Perceived clarity of the information participants obtained from a given information channel was assessed using a 4-item scale. Items were developed specifically for this project based on pilot research and the comprehensibility of medical information subscale of the
Comprehensibility of Health Education Programs (COHEP) questionnaire (Farin, Nagl, & Ullrich, 2013). The COHEP is one of few validated measures of contextual aspects of information that contribute to health literacy (Farin et al., 2013). Participants first responded to the global item, “How clear was the advice or information you got about [piped text: topic] from [piped text: information channel]?” Participants rated clarity on a 7-point scale ranging from 1 = Not at all to 7 = Very clear. Participants then responded to three items under the overarching prompt: “To what extent was the advice or information you got about [piped text: topic] from [piped text: information channel]… 1) Understandable; 2) Practical; and 3) Presented in simple language. Participants rated their perceptions on a 7-point scale ranging from 1 = Not at all to 7 = Completely. Items were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005).

The clarity scale demonstrated strong internal consistency ($\alpha = 0.88$). Construct validity for the clarity scale was established through a four-factor confirmatory factor analysis as described above. The standardized factor loadings for the four items measuring clarity were uniformly positive and significant, ranging from 0.70 to 0.85 ($p < .001$).

**Utility.** Participants perceived utility of the information they obtained from an information channel was assessed using a 6-item scale. Items were based on pilot research and existing research on the common factors of effective evidence-based prevention programs (Rotheram-Borus et al., 2009). Participants first responded to a global item, “How helpful was the advice or information you got about [piped text: topic] from [piped text: information channel]?” Helpfulness was rated on a 7-point scale ranging from 1 = Not at all to 7 = Very helpful. Participants then responded to 5-items with the overarching prompt: “To what extent did the advice or information you got about [piped text: topic] from [piped text: information
channel]…1) Address your specific question or interest; 2) teach or reinforce skills related to [piped text: topic]; 3) Describe how you could use or apply the information; 4) Address challenges related to [piped text: topic]; and 5) Connect you to other resources regarding [piped text: topic].” Items were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005).

The utility scale demonstrated strong internal consistency (α = 0.86). Construct validity was established through a four-factor confirmatory factor analysis as described above. The standardized factor loadings for the six items measuring utility were uniformly positive and significant, ranging from 0.49 to 0.85 (p < .001). The item with the lowest factor loading was “Connect you to other resources regarding [piped text: topic].” The internal consistency analysis did not suggest this item negatively impact the Cronbach’s alpha.

**Trust.** Participants’ level of trust in the advice or information they obtained from an information channel was assessed using a 5-item scale. Items were based on pilot research and existing research on cognitive evaluations of trust and credibility (Metzger & Flanagan, 2013). Participants first responded to a global item, “How much did you trust the advice or information you got about [piped text: topic] from [piped text: information channel]? Participants rated their level of trust on a 7-point scale ranging from 1 = Not at all to 7 = Completely. Participants then responded to four items under the overarching prompt: “To what extent was the advice you got about [piped text: topic] from [piped text: information channel]…1) Credible; 2) Well-meaning; 3) Consistent with other sources; 4) Supportive of your beliefs. Items were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005).

The trust scale demonstrated strong internal consistency (α = 0.88). Construct validity was established through a four-factor confirmatory factor analysis as described above. The
standardized factor loadings for the five items measuring trust were uniformly positive and significant, ranging from 0.69 to 0.84 ($p < .001$).

**Information integration variable.** Satisfaction at the information channel level (as opposed to global satisfaction) was assessed as the key outcome variable within the domain of information integration in this study.

**Satisfaction.** Participants’ satisfaction with the information they obtained from an information channel was assessed using a 5-item scale. Items were based on pilot research and existing research on parent perceptions of information regarding infant and toddler feeding (Matvienko-Sikar et al., 2018). Participants first responded to a global item, “Overall, how satisfied were you with the advice or information you got about [piped text: topic] from [piped text: information channel] [piped text: timing of most recent search]?” Participants rated their satisfaction on a 7-point scale ranging from 1 = Not at all to 7 = Completely satisfied. Participants then responded to four items under the overarching prompt: “How satisfied were you with the following aspects of the advice or information you got about [piped text: topic] from [piped text: information channel]?: 1) Amount; 2) Level of detail; 3) Personalization; 4) Action-ability. Items were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005). Participant responses were averaged to create a mean score for each channel-specific information satisfaction.

Scale metrics were calculated using the first information channel responses only. The satisfaction scale demonstrated strong internal consistency ($\alpha = 0.90$). Construct validity for the satisfaction scale was assessed using a one-factor confirmatory factor analysis (first channel response options only). I tested whether the items that were intended to measure satisfaction loaded on to a single latent factor using the maximum likelihood estimation approach with a
standardized latent factor score. Prior to conducting the CFA, I checked that the response distributions for each item appeared to meet normality assumptions (i.e., skewness and kurtosis values less than +/- 2.0). The global satisfaction item slightly exceeded recommended values for kurtosis \( \text{Kurtosis} = 3.08, \ SE = 0.24 \), however, I elected to retain it in its original scale of measurement for consistency with the other items (which did not deviate from normality assumptions) and because the full range of values were endorsed (range = 1 – 7). There were no missing values in the items assessing satisfaction. The results of the CFA indicated a one-factor solution was a good fit for the data: Comparative Fit Index (CFI) = 0.99; Tucker-Lewis Index (TLI) = 0.97; Root mean square error of approximation (RMSEA) = 0.09; Standardized root mean square residual (SRMR) = 0.02 (Brown, 2015; Jackson et al., 2009). The standardized factor loadings for the five items measuring satisfaction were uniformly positive and significant ranging from 0.69 to 0.85 \( ( p < .001 ) \).

**Analytic Approach**

I estimated parents’ satisfaction with infant and toddler feeding information using linear mixed models, specifically random intercept models. I selected random intercept models because I had up to two repeated measurements of a continuous dependent variable. Random intercept models account for interdependence in repeated measures data by fitting an individual intercept for each subject (Palta, 2003; Singer & Willett, 2003; Snijders & Bosker, 2011a). Additional random intercepts can be fit as needed to account for other potential sources of interdependence (e.g., information channel). Random intercept models are appropriate for repeated measures data with missing values because each subject has an individual intercept (Edwards, 2000; Krueger & Tian, 2004). This is especially relevant to the current study, in which 25% of the sample \( ( n = 104 ) \) did not have a second measurement occasion.
The dependent variable in a random intercepts model is estimated by a combination of the random effects, which are the random (assumed) baseline differences between subjects, and fixed effects, which are the independent variables whose systematic association with the dependent variable that are of importance to the research question. Statistical results of random intercept models include variance estimates (between-group(s) and residual variance), estimates of the fixed effects (omnibus $F$ tests and slope estimates), and indicators of model fit (e.g., $-2 \log$ likelihood, Akaike information criterion (AIC)). The variance components estimates are of critical importance to the estimation of random intercept models and are described next.

Random intercept models divide the total model variance into two components: between-subjects variance ($u_i$) and within-subjects (i.e., residual) variance ($\epsilon_{ij}$). In this section, ‘subject’ indicates a unit of clustering or interdependence. Between-subjects variance is the distance between an individual data point along the subject-specific trajectory and the overall average model trajectory. High between-subject variance is observed when subjects are uniquely consistent in their responses on the dependent variable (e.g., Subject A consistently reports a high level of satisfaction across information channels while Subject B consistently reports a low-level of satisfaction across information channels). Within-subjects (i.e., residual variance) $\epsilon_{ij}$ is the distance between an individual data point from a given subject and his/her own subject-specific trajectory. The ratio of the between-subjects variance to the total variance in the model is captured by the intraclass correlation (ICC). The ICC value indicates 1) the extent to which variance in the dependent variable can be accounted for by subject interdependence; and 2) whether it is important to include subject as a random effect in the model (Grace-Martin, 2018; Snijders & Bosker, 2011b; Vajargah & Nikbakht, 2015). The current study used the ICC to
determine whether to include subject and/or information channel, two potential sources of interdependence in the data, as random effects in the model.

**Software.** All analyses related to mixed models were conducted in SPSS for Macintosh (version 24.0.0.1; IBM Corporation, 2016). Scatterplot visualizations were created using the ggplot2 package version 2.1.1 (Wickham, 2009) in the R programming language (version 3.5.0; R Core Team, 2018) in the RStudio environment (version 1.1.383; RStudio Team, 2016).

**Model selection process.** All independent variables were mean centered prior to analyses. I used the following approach to specify a baseline and final random intercept model. In all models, satisfaction was specified as the dependent variable, fixed effects were centered, and the covariance structure was variance components. I used the -2 Log Likelihood, AIC, and Schwarz’s Bayesian Criterion (BIC) to assess the model fit (see Table 2). To compare models estimated using restricted maximum likelihood (REML), I conducted a likelihood-ratio test to test whether the models were significantly different (Bolker et al., 2009). I also calculated the ICC for the baseline and final models (Snijders & Bosker, 2011b).

To determine which random intercept(s) to include in the baseline model, I first estimated a model using REML that included subject as the only random effect (Model 1). I then estimated a model using REML that included both subject and information channel as random effects (Model 2). The results of the likelihood-ratio test indicated Model 2 was a significantly better fit for the data based on the \( \chi^2(1) = 17.21, p < .001 \) and the ICC values were non-zero (subject ICC = .3504; information channel ICC = .0533), indicating that ~35% of the variance in satisfaction could be attributed to interdependence in the data by subject, and ~5% of the variance in satisfaction could be attributed to interdependence in the data by information channel. Although some research suggests random effects with an ICC of < .10 could be
removed (Vajargah & Nikbakht, 2015), I decided to retain information channel as a random effect given the significant improvement in model fit (Brauer & Curtin, 2017).

After identifying the random intercepts, I then used a step-up strategy to identify the fixed effects for the final model. To begin, I estimated another model with subject and information channel as random effects using maximum likelihood so that I could compare model fit statistics based on changes to the fixed effects (Model 3; Bolker et al., 2009). I then added fixed effects of interest in steps, starting with education as a potential covariate (Model 4), followed by topic interest and information urgency (Model 5), Ease of acquisition, ease of application, trust, and utility (Model 6), and two interaction terms, ease of acquisition by information topic interest and ease of acquisition by information urgency (Model 7). I then compared the information criterion across Models 3 through 7 and selected Model 7 as my final model. Lastly, I estimated the same random and fixed effects included in Model 7 using REML to estimate the final model (Model 8) so that I could compare it to the baseline model (Model 2). The equation for the final random intercepts model was as follows:

\[
\text{Satisfaction}_{ij} = \gamma_0 + \gamma_1 \text{Education} + \gamma_2 \text{Ease of Aquisition} + \gamma_3 \text{Ease of Application} + \gamma_4 \text{Trust} + \gamma_5 \text{Utility} + \gamma_6 \text{Topic Interest} + \gamma_7 \text{Information Urgency} + u_{1i} + u_{2i} + \epsilon_{ij};
\]

\(\gamma_0\) is the overall intercept, \(\gamma_{1-7}\) are the fixed effects, \(u_{1i}\) is the random effect of subject, \(u_{2i}\) is the random effect of information channel, and \(\epsilon_{ij}\) is the residual variance.
Table 2

Estimation Method and Information Criterion for Each Estimated Random Intercepts Model During the Model Selection Process

<table>
<thead>
<tr>
<th>Model</th>
<th>Method</th>
<th>-2LL</th>
<th>AIC</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>REML</td>
<td>2162.58</td>
<td>2166.58</td>
<td>2175.79</td>
</tr>
<tr>
<td>Model 2</td>
<td>REML</td>
<td>2145.36</td>
<td>2151.36</td>
<td>2165.19</td>
</tr>
<tr>
<td>Model 3</td>
<td>ML</td>
<td>2142.09</td>
<td>2150.09</td>
<td>2168.52</td>
</tr>
<tr>
<td>Model 4</td>
<td>ML</td>
<td>2137.70</td>
<td>2147.70</td>
<td>2170.75</td>
</tr>
<tr>
<td>Model 5</td>
<td>ML</td>
<td>2107.19</td>
<td>2121.19</td>
<td>2153.45</td>
</tr>
<tr>
<td>Model 6</td>
<td>ML</td>
<td>1026.17</td>
<td>1048.17</td>
<td>1098.87</td>
</tr>
<tr>
<td>Model 7</td>
<td>ML</td>
<td>1024.12</td>
<td>1050.12</td>
<td>1110.04</td>
</tr>
<tr>
<td>Model 8</td>
<td>REML</td>
<td>1073.27</td>
<td>1079.27</td>
<td>1093.06</td>
</tr>
</tbody>
</table>

Note. -2LL indicates -2 log likelihood. REML indicates restricted maximum likelihood; ML indicates maximum likelihood. Lower values indicate a better model fit. Information criterion cannot be directly compared across different estimation methods.

Model assumptions. Before interpreting the results, I checked two key model assumptions (normality of the residuals and normality of the random effects) through a visual inspection of q-q plots, histograms, and scatter plots of the residuals. I did not detect violations of these assumptions. I then interpreted the significance of the fixed effects using the parameter estimates, standard deviations, and omnibus $F$ test results.

Results

Descriptive information on search context. Descriptive statistics on the search context variables are included in Table 3 and Table 4. Participants were primarily reporting on an information seeking occasion that occurred within one week of completing the survey. Participants tended to spend less than 45 minutes trying to obtain advice or information, with nearly one-quarter reporting they spent zero to 15 minutes. Nearly half of participants conducted their search in multiple sessions over one day or multiple days rather than all at once. Milk
feeding, feeding concerns (e.g., food allergies, picky eating), and table foods (e.g., recipes) were the most frequent search topics. Fewer participants searched specifically for child health topics (e.g., weight or growth, nutritional needs). Websites, family relatives, pediatricians, friends, social media, blogs, and co-parents were among the most frequently reported channels of information.

Table 3

Descriptive Statistics on Search Context Variables: Timing and Search Topics

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timing of information seeking occasion relative to survey participation</strong></td>
<td></td>
</tr>
<tr>
<td>Same day</td>
<td>35 (8%)</td>
</tr>
<tr>
<td>One day prior</td>
<td>88 (21%)</td>
</tr>
<tr>
<td>Two to 6 days prior</td>
<td>145 (34%)</td>
</tr>
<tr>
<td>One week prior</td>
<td>68 (16%)</td>
</tr>
<tr>
<td>Two weeks prior</td>
<td>43 (10%)</td>
</tr>
<tr>
<td>Three weeks prior</td>
<td>24 (6%)</td>
</tr>
<tr>
<td>Four weeks prior</td>
<td>20 (5%)</td>
</tr>
<tr>
<td><strong>Time on search</strong></td>
<td></td>
</tr>
<tr>
<td>0 to 14 minutes</td>
<td>92 (22%)</td>
</tr>
<tr>
<td>15 to 29 minutes</td>
<td>134 (32%)</td>
</tr>
<tr>
<td>30 to 45 minutes</td>
<td>116 (27%)</td>
</tr>
<tr>
<td>45 to 59 minutes</td>
<td>35 (8%)</td>
</tr>
<tr>
<td>60 minutes or more</td>
<td>46 (11%)</td>
</tr>
<tr>
<td><strong>Time division</strong></td>
<td></td>
</tr>
<tr>
<td>All at once</td>
<td>223 (53%)</td>
</tr>
<tr>
<td>Over one day</td>
<td>149 (35%)</td>
</tr>
<tr>
<td>Over multiple days</td>
<td>50 (12%)</td>
</tr>
<tr>
<td><strong>Search topics</strong></td>
<td></td>
</tr>
<tr>
<td>Milk feeding</td>
<td>119 (28%)</td>
</tr>
<tr>
<td>Table foods (e.g., recipes, products)</td>
<td>99 (23%)</td>
</tr>
<tr>
<td>Feeding concerns (e.g., allergies, picky eating)</td>
<td>93 (22%)</td>
</tr>
<tr>
<td>Solid food introduction</td>
<td>61 (14%)</td>
</tr>
<tr>
<td>Child health (e.g., weight, nutritional needs)</td>
<td>51 (12%)</td>
</tr>
</tbody>
</table>
Table 4

*Descriptive Statistics on Search Context Variables: Channels*

<table>
<thead>
<tr>
<th>Information Channel</th>
<th>n (%)</th>
<th>M (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of channels accessed during search</td>
<td>3.43 (2.15)</td>
<td>1 – 12</td>
<td></td>
</tr>
<tr>
<td><strong>Search engine (e.g., Google)</strong></td>
<td>225 (53%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Website from search engine</strong></td>
<td>169 (38%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Featured search result</strong></td>
<td>56 (13%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Websites</strong></td>
<td>221 (52%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family relative(s)</strong></td>
<td>190 (45%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pediatrician</strong></td>
<td>134 (32%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Friend(s)</strong></td>
<td>120 (28%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social media</strong></td>
<td>113 (27%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Facebook</strong></td>
<td>81 (19%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pinterest</strong></td>
<td>61 (14%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instagram</strong></td>
<td>11 (3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reddit</strong></td>
<td>4 (1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Twitter</strong></td>
<td>2 (0.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Blogs</strong></td>
<td>105 (25%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Co-parent</strong></td>
<td>94 (22%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Books (e.g., parenting books, cookbooks)</strong></td>
<td>51 (12%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Women, Infants, and Children (WIC)</strong></td>
<td>34 (8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hospital or other health care professional</strong></td>
<td>30 (7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Online forums</strong></td>
<td>29 (7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Apps</strong></td>
<td>25 (6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Co-worker(s)</strong></td>
<td>20 (5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Childcare provider(s)</strong></td>
<td>14 (4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Handout from healthcare setting</strong></td>
<td>10 (2%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Response options were not mutually exclusive.
Descriptive information on primary study variables. Descriptive statistics on the primary study variables are presented in Table 5. Participants reported moderate information urgency and relatively high levels of interest in the topic of their most recent information search. Reports of ease of acquisition, information clarity, utility, trust, and satisfaction were uniformly high. Although information channels were randomly presented in the survey, a reduced range of responses suggested that participants tended to rate their second channel slightly more favorably than the first channel they reported on.

Table 5

<table>
<thead>
<tr>
<th>Descriptive Statistics on Primary Study Variables</th>
<th>M (SD)</th>
<th>Range</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>3.46 (1.01)</td>
<td>1-5</td>
<td>423</td>
</tr>
<tr>
<td>Information urgency</td>
<td>3.38 (1.73)</td>
<td>1-7</td>
<td>423</td>
</tr>
<tr>
<td>Topic interest</td>
<td>5.66 (1.26)</td>
<td>1-7</td>
<td>423</td>
</tr>
<tr>
<td><strong>Channel 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ease of acquisition</td>
<td>5.62 (1.08)</td>
<td>1.00-7.00</td>
<td>423</td>
</tr>
<tr>
<td>Clarity</td>
<td>5.92 (0.97)</td>
<td>1.50-7.00</td>
<td>423</td>
</tr>
<tr>
<td>Utility</td>
<td>5.41 (1.12)</td>
<td>1.00-7.00</td>
<td>423</td>
</tr>
<tr>
<td>Trust</td>
<td>5.79 (1.00)</td>
<td>1.00-7.00</td>
<td>423</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>5.64 (1.12)</td>
<td>1.00-7.00</td>
<td>423</td>
</tr>
<tr>
<td><strong>Channel 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ease of acquisition</td>
<td>5.49 (1.06)</td>
<td>1.00-7.00</td>
<td>319</td>
</tr>
<tr>
<td>Clarity</td>
<td>5.82 (0.93)</td>
<td>1.75-7.00</td>
<td>319</td>
</tr>
<tr>
<td>Utility</td>
<td>5.48 (0.94)</td>
<td>2.00 – 7.00</td>
<td>319</td>
</tr>
<tr>
<td>Trust</td>
<td>5.74 (0.91)</td>
<td>2.20 – 7.00</td>
<td>319</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>5.53 (0.99)</td>
<td>1.80 – 7.00</td>
<td>319</td>
</tr>
</tbody>
</table>

Note. The sample size for channel 2 measures is reduced because 103 participants reported using only one information channel. 1 additional participant only had data on one channel because their second channel of information was ‘Other,’ which was excluded from the analyses.
Satisfaction variance by subject and information channel. As mentioned, approximately 35% of the variance in information satisfaction was due to between-subject differences (subject ICC = .350). An additional 5% was due to systematic between-channel differences (information channel ICC = .053).

Information seeking aptitude and acquisition results. Parameters for the final model estimating information satisfaction are presented in Table 6. Perceived utility of information had the strongest association with information satisfaction, followed by trust, clarity, and ease of acquisition. Each of these information acquisition variables had a positive association with information satisfaction. Scatterplots visualizing the association between utility and satisfaction and trust and satisfaction are shown in Figure 2 and Figure 3 respectively. The information seeking aptitude variables were not significantly associated with satisfaction. Parent education demonstrated a negative trend, such that higher levels of education were associated with lower levels of satisfaction.

Table 6

Results of the Final Model Estimating Satisfaction with Infant and Toddler Feeding Information

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Standard error</th>
<th>F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.59</td>
<td>0.04</td>
<td>23696.52</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Education</td>
<td>-0.03</td>
<td>0.02</td>
<td>3.48</td>
<td>.063</td>
</tr>
<tr>
<td>Topic interest</td>
<td>-0.03</td>
<td>0.02</td>
<td>2.71</td>
<td>.100</td>
</tr>
<tr>
<td>Information urgency</td>
<td>0.02</td>
<td>0.01</td>
<td>2.34</td>
<td>.127</td>
</tr>
<tr>
<td>Ease of acquisition</td>
<td>0.08</td>
<td>0.03</td>
<td>12.26</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Clarity</td>
<td>0.15</td>
<td>0.03</td>
<td>20.03</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Utility</td>
<td>0.47</td>
<td>0.03</td>
<td>263.75</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Trust</td>
<td>0.35</td>
<td>0.03</td>
<td>116.93</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>
Figure 2. Participants’ satisfaction with infant and toddler feeding information (raw value) by perceived utility of the information (mean-centered values). Graph includes only those participants who had two measures of satisfaction \( (n = 319) \).
Discussion

The purpose of this study was to explore how parents’ satisfaction with the information they obtained about infant and toddler feeding was associated with their information seeking aptitude and information acquisition characteristics. This research is important because identifying factors that are associated with information satisfaction can guide the development and adaptation of evidence-based programs and services (Alkuwaiti, Maruthamuthu, & Akgun, 2018). Over one-third of the variance in satisfaction could be accounted for by between-person differences. This finding adds to the growing literature on individual-level differences in information behavior to support that individuals have unique thresholds and cognitive processes that influence the ways they integrate information (O’Brien et al., 2017). This finding aligned

Figure 3. Participants’ satisfaction with infant and toddler feeding information (raw value) by perceived trust in the information (mean-centered values). Graph includes only those participants who had two measures of satisfaction ($n = 319$).
with my expectation that between-person variance would be non-zero, indicating that ratings of satisfaction are uniquely consistent by subject across information channels. Future studies should continue to explore between- versus within-person variance in information satisfaction using approaches such as structural equation modeling (Curran & Bauer, 2011; Rush & Hofer, 2014).

A smaller percentage of variance in satisfaction, approximately 5%, was accounted for by systematic differences between information channels. This exploratory research question was a novel contribution to the field based on existing qualitative research to suggest parents may evaluate information they get from specific information channels differently (Davis, Cole, McKenney-Shubert, Jones, & Peterson, 2017; Duggan et al., 2015). This finding supported my expectation that between-channel variance would be non-zero, indicating that ratings of satisfaction are uniquely consistent by information channel across subjects. However, the extent to which this was a meaningful finding is debatable. Although the model fit statistics indicated that accounting for between-channel variance improved the model, some research suggests that between-group differences that account for less than 10% of the variance in the outcome variable could be ignored (Vajargah & Nikbakht, 2015). Future research should use experimental, repeated measures designs to differentiate between group differences by information channel (Aguirre-Urreta, 2014).

With regard to the association between information seeking and information satisfaction, my expectations were partially supported. Perceived utility of the information and trust of the information had strong and positive associations with information satisfaction. Shin and colleagues (2017) reported similar findings in their study of the influence of trust and utility on satisfaction with health information services.
Notably, the measure of utility included in the current study was based on research findings regarding common factors of effective interventions (Rotheram-Borus et al., 2009). Future studies should further explore how measures of perceived utility that are based on common factors of effective interventions are associated with satisfaction ratings, as well as behavior change outcomes (Abraham & Michie, 2008; Nation et al., 2003; Rotheram-Borus et al., 2009). Measurement development research is urgently needed across the prevention and implementation sciences to improve the speed of translation (Fixsen, Blase, Naoom, & Wallace, 2009).

The interactions between ease of acquisition by topic interest and ease of acquisition by information urgency were found to be non-significant during the model selection process. Although the ease of acquisition variable was normally distributed, participants generally reported relatively high levels of ease of acquisition. This may imply that individuals avoid getting information from channels they perceive as difficult to access, or did not report using channels that did not yield information despite the survey instructions. Future studies could further test this expectation by experimentally manipulating these variables (e.g., varying the amount of time a participant has to obtain an answer to a question and varying the user experience of the information system). Additionally, the two interaction terms tested in the current study represent a small selection of potential interactions. Future research should continue to explore potential interactions among variables within and between construct domains identified in the ISU model.

Lastly, education was not significantly associated with satisfaction. This finding is consistent with previous research on parents’ satisfaction with prevention and treatment services for children with autism (McIntyre & Zemantic, 2017). However, there was a slight negative
trend, indicating that parents with higher levels of education were more likely to report lower levels of satisfaction with the information they obtained. Following from expectation-confirmation theory (Oliver, 1977, 1980), future research should explore whether there are demographic differences in the quality of information that parents expect to find regarding infant and toddler feeding. Studies can then test whether those expectations mediate the association between education and information satisfaction. This research should be combined with objective evaluations of the quality of evidence that is available to parents regarding infant and toddler feeding through the information channels they naturally access.

Limitations and Future Directions

The results of this study should be interpreted along its limitations. The most important limitation to this study is the use of a cross-sectional design assessing a single information seeking occasion. To fully test the process and causal structure proposed in the ISU model, both longitudinal modeling and experimental design are required. Studies that use longitudinal methods to accurately test the predictions processed by process models of information behavior, such as those proposed in the ISU model, are a critical next step in disciplines that aim to understand associations between information and human behavior (Savolainen, 2018). Clear thresholds for evaluating results that would support or reject the mechanisms proposed in these theories are also required to ensure that research moves toward impactful, translational research outcomes (Head & Noar, 2014; Rhodes, 2014).

The current study explored a small set of potential variables that could predict information satisfaction among the many that are proposed by existing theories and existing literature. For example, previous research on satisfaction with user suggests that experience with information systems positively influences satisfaction (Borsci, Federici, Bacci, Gnaldi, &
Bartolucci, 2015). The current study did not measure participants’ previous experience trying to obtain advice or information from the channels they reported accessing during their most recent search. The residual variance in the final model in the current study was 21%, which suggests additional variables could be identified beyond those that were included in this study to fully account for parents’ satisfaction with infant and toddler feeding information. Future studies should continue to explore the key variables that are important to measure and include in models of predicting health and information behavior outcomes using feature selection approaches (Brick, Koffer, Gerstorf, & Ram, 2017).

Although parents may have been moderately-to-highly satisfied with the information they obtained on average, the actual content of the information is unknown. Previous research suggests that parents may report high levels of engagement with information but have limited recall of specific information (Asiodu, Waters, Dailey, Lee, & Lyndon, 2015). Future studies should explore how parent satisfaction and perceptions of information align with the actual content they consume.

Lastly, the categorization of information channels was vague. For example, the information channel, “Pediatrician,” captured parents’ experiences with their unique family doctor, rather than consistent experiences with the same pediatrician across all participants. Similarly, “Websites” could be referring to any website that the participant selected (e.g., an article from a digital magazine, an article in a scientific journal). This aggregate grouping may overgeneralize important differences between information channels and explain why such a small percentage of the variance in satisfaction was accounted for by between channel differences. Existing research on parents’ information behavior tends to use similarly broad, if not broader, categorizations of information channels (e.g., asking about “social media” channels;
Radey & Randolph, 2009). Future studies should aim to be more specific in the definition and measurement of the information channels individuals access to draw conclusions about how interactions with specific channels influence what parents learn and how they apply information.

Conclusion

The results of this study add to the body of literature on parents’ satisfaction with infant nutrition information during the first two years of life. Such formative research is a critical step in informing the development and revision of user-centered prevention programs that aim to promote responsive parenting and positive infant feeding practices during the first two years of life (Entsieh & Hallström, 2016; Sigman-Grant, Rye, Loesch-Griffin, & Mitchell, 2008). Results suggest that about a third of variance in satisfaction with infant and toddler feeding information can be explained by between person differences, with the remaining two-thirds accounted for by within-person differences. Perceived utility of the information provided, as assessed by a measure based on common factors of effective intervention programs, had the strongest association with information satisfaction. Future research should continue to explore how parents’ perceptions of the information they obtain about child health topics, especially infant feeding information, influences their satisfaction.
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Chapter 3
Exploring Features of Parents’ Behavioral Application of Infant and Toddler Feeding Information with Decision Tree Classification

An underlying assumption in many studies of information acquisition, here defined to mean the topics individuals search for, the channels they access, and how they perceive information, is that individuals use (i.e., apply) the information they obtained. In the absence of resultant behavioral outcomes, research on information acquisition is largely limited to conceptual rather than practical significance (Case & Given, 2016, pp. 57–61). Behavioral applications of information such as making a purchase or using a new parenting approach, are of particular importance in the prevention and health sciences (Greyson & Johnson, 2016; Lambert & Loiselle, 2007). Research that extends beyond information acquisition factors to examine who applies information, in what ways, and under what circumstances, is relatively limited to date (Case & O’Connor, 2016; Greyson & Johnson, 2016; Kari, 2007). Theoretically grounded research that identifies features (i.e., individual measureable properties) of behavioral applications of information is a critical next step in the information and prevention sciences (Case & O’Connor, 2016; Greyson & Johnson, 2016; Kari, 2007; Sheeran, Klein, & Rothman, 2017).

Research is especially needed on parents’ application of information about infant and toddler feeding. There is conceptual and empirical evidence to suggest that parental exposure to information about responsive parenting and feeding practices is associated with positive child feeding behaviors and lower childhood obesity risk (Birch & Ventura, 2009; Black & Aboud, 2011; Blake-Lamb et al., 2016; Daniels et al., 2012; DiSantis, Hodges, Johnson, & Fisher, 2011; Hohman, Paul, Birch, & Savage, 2017; Paul et al., 2009; Savage, Birch, Marini, Anzman-Frasca, & Paul, 2016). However, few formative research studies have been conducted regarding parents’
natural acquisition and application of information regarding infant and toddler feeding (Bentley et al., 2014). More research is needed to understand how parents apply information about infant and toddler feeding to enhance the reach and efficacy of evidence-based programs and services for childhood obesity prevention (Hagger & Luszczynska, 2014; Lumeng, Taveras, Birch, & Yanovski, 2015). The current study begins to address this gap by exploring features of parents’ behavioral application of information about infant and toddler feeding they intentionally obtained during a naturally occurring information seeking occasion.

**Existing Research on the Role of Information in Parents’ Child Feeding Behavior**

Many parents have feeding goals that, if realized, would promote healthy growth in infants and toddlers, such as initiating and sustaining breastfeeding or providing nutritious foods and beverages (Hoffmann, Marx, Kiefner-Burmeister, & Musher-Eizenman, 2016; Kiefner-Burmeister, Hoffmann, Meers, Koball, & Musher-Eizenman, 2014). However, previous research has revealed parents’ child feeding goals and behavior are frequently disconnected (Heinig et al., 2006; Larsen et al., 2018; Pesch et al., 2016). There is strong evidence to suggest that parental socioeconomic and demographic characteristics are associated with childhood obesity risk, including lower levels of education, lower household income, or identifying as Hispanic or Latino, or Black or African American (Skinner et al., 2018; Taveras, Gillman, Kleinman, Rich-Edwards, & Rifas-Shiman, 2013). There is also evidence to suggest infant feeding practices mediate the relationship between socioeconomic status and childhood obesity risk (Gibbs & Forste, 2014). Differences in parents’ information behavior (e.g., information seeking aptitude and integration), combined with factors associated with demographic and socioeconomic characteristics (e.g., behavioral capacity and intent) may partially explain the disconnect between goals and behavior (Heinig et al., 2006). Research is needed to explore socioeconomic and
demographic characteristics as independent and interactive features of behavioral application of infant and toddler feeding information.

There is a small body of existing research on parents’ information behavior specific to infant and toddler feeding. A number of studies on parents’ information behavior regarding infant and toddler feeding have used qualitative methods. For example, Carruth and Skinner (2001) conducted structured interviews with 62 primarily white, high socioeconomic status mothers, over half of which were not first-time parents. Savage and colleagues (2016) conducted focus groups and semi-structured interviews with a total of 68 mothers. The results of Carruth and Skinner (2001) demonstrated the child feeding topics and channels of information mothers accessed prior to the widespread adoption of the Internet and mobile technology (e.g., smartphones). Child age emerged as a significant demographic characteristic that was associated with the channels of information parents accessed. The current study expands on this research by exploring child age and other demographic and socioeconomic characteristics as potential features of parents’ behavioral application of infant and toddler feeding information.

The results of Savage and colleagues (2016) offer insight into how mothers participating in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) perceived and integrated information about infant and toddler feeding. WIC is a government-funded program that provides financial support for food, nutrition education (e.g., breastfeeding support), and coordinated access to healthcare services (e.g., immunization screening and referral) for pregnant women, infants, and children up to 5 years of age (Black et al., 2004; United States Department of Agriculture Food and Nutrition Service, 2018). Parents reported receiving conflicting information across WIC, medical care providers, and family members (Savage, Neshteruk, et al., 2016). Some parents also reported feeling frustrated or
judged when information was not personalized or did not align with their chosen feeding approach (Savage, Neshteruk, et al., 2016). The current study builds on this research by exploring variables associated with information integration, including cognitive and affective responses to information, as potential features of parents’ behavioral application of infant and toddler feeding information.

Woelfel and colleagues (2004) conducted a large ($N = 3,167$) survey research study that specifically examined infant and toddler feeding information use, namely caregiver redemption of WIC benefits. This study found that logistical aspects of WIC services, such as difficulty re-scheduling appointments and bringing children to appointments, were the most salient features of WIC benefit redemption. However, factors related to information integration, including perceiving WIC nutrition education as repetitive (33%) or boring (27%) were also among the most frequently reported barriers to redeeming WIC benefits. Following from this prior research, the current study explored demographic and socioeconomic characteristics, information seeking aptitude, information integration, and behavioral capacity and intent as potential independent and interactive features of parents’ application of infant and toddler feeding information.

**Conceptual Underpinnings of Information Use**

The conceptual model of information seeking and use (ISU model; Chapter 1) combines several existing theories to make predictions about processes associated with finding and applying information. Relevant to the current study, the ISU model proposes that information use, which includes behavioral application, is most proximally predicted by information integration and behavioral capacity and intent. One existing theory in which information integration predicts behavioral outcomes is Dervin’s sense-making methodology (Dervin, 1998). Dervin proposes a human-centered model in which individuals have dynamic information needs
(i.e., gaps) and engage in the acquisition and integration of information to achieve desired outcomes (Agarwal, 2012; Case & Given, 2016, pp. 86–87; Dervin, 2015; Savolainen, 1993, 2006). As individuals attempt to meet their information needs, they engage in a “sense-making” process that involves a dynamic interplay between information acquisition and information integration. Factors associated with information integration such as changes in affect (e.g., feeling empowered, overwhelmed, helpless) and cognition (e.g., knowledge, attitudes, beliefs) predict behavior.

The satisficing principal (Simon, 1967) suggests that the information acquisition and integration cycle ends when individuals believe their information needs have been sufficiently addressed according to their own standards. Searches may also terminate for other reasons, such as changing information needs or a lack of topic-specific information. According to the satisficing principal, both information seeking aptitude (e.g., topic interest, information urgency) and factors related to information integration (e.g., feeling informed, feeling confused) predict search termination. Individuals may be more likely to apply information when they believe their search is complete rather than on-going (Winter, 2000). Despite the theoretical relevance of information seeking aptitude and information integration in determining information use, few existing studies have fully explored factors within these domains (Case & O’Connor, 2016; Savolainen, 2015). The current study explores factors in the information acquisition and integration domains as potential features of parents’ behavioral application of infant and toddler feeding information.

Prior theories have also considered the role of behavioral capacity and intent and predicting behavioral outcomes, most notably the theory of planned behavior, (Ajzen, 1985, 1991). The theory of planned behavior proposes that individual-level attitudes toward a behavior,
perceived social norms, and perceived behavioral control (e.g., self-efficacy) predict behavioral intent, which in-turn predicts behavior. The theory of planned behavior has been widely applied in the field of prevention science, including in the context of parents’ child feeding behavior and childhood obesity prevention (e.g., Andrews, Silk, & Eneli, 2010; Duncanson, Burrows, Holman, & Collins, 2013). While there is general support for the explanatory utility of the theory of planned behavior, a meta-analysis of findings across behavioral outcomes found that the theory variables explained 27% of the variance in behavior (Armitage & Conner, 2001). Ajzen (2015) proposed there may be intermediary factors that occur between traditional measurements of intent and action that explain the observed limitations in explanatory power. The current study explores behavioral capacity and intent and information integration as potential independent and interactive features of parents’ behavioral application of infant and toddler feeding information.

**Decision Tree Classification Modeling**

Machine learning is a useful methodological approach for exploratory research questions that aim to identify how a large number of independent variables and their interactions are associated with a specified outcome (Jordan & Mitchell, 2015). Although results derived from machine learning approaches are often data driven, machine learning can still be appropriate for theoretically grounded research (Karpatne et al., 2017; Monroe, Pan, Roberts, Sen, & Sinclair, 2015). There has been a recent call for research that uses machine learning methods to advance the understanding of obesity prevention (DeGregory et al., 2018). Decision tree modeling, also known as binary recursive partitioning or CART (i.e., classification and regression trees), is a machine-learning approach to identifying how independent variables and their interactions discriminate the value of a dependent variable (Breiman, Friedman, Stone, & Olshen, 1984). Decision tree classification modeling has been applied in other obesity-related studies, such as
classifying children’s weight status (Dugan, Mukhopadhyay, Carroll, & Downs, 2015), WIC benefit redemption (Woelfel et al., 2004), and Type 2 diabetes (Ramezankhani et al., 2016).

As described in a foundational text (Breiman et al., 1984), decision tree classification modeling uses a hierarchical algorithm to iteratively generate decision rules that divide (i.e., split) data into homogenous nodes or classes representing the possible binary dependent variable values. The splits are determined by the values of the independent variables and their interactions that minimize classification error using a given splitting criteria (e.g., Gini index or information gain). Decision tree classification modeling uses a greedy algorithm, meaning decision rules are based on local (i.e., presently available) data. Decision tree classification models are a particularly useful machine learning technique because they test all possible interactions among independent variables when determining possible splits, identify the most discriminatory features of the dependent variable in the data, and produce highly interpretable results (Stiglic, Kocbek, Pernek, & Kokol, 2012). The current study used decision tree classification modeling to explore potential features of parents’ behavioral application of infant and toddler feeding information.

**Current Study**

The purpose of the current study was to explore features of parents’ behavioral application of information about infant and toddler feeding they intentionally obtained during a naturally occurring information seeking occasion. The potential features were drawn from the ISU model and included variables from the following domains: Demographic and socioeconomic characteristics; Information seeking aptitude; Behavioral capacity and intent; and Information integration (see Figure 1).
Figure 1. Potential features of parents’ application of infant and toddler feeding information within the context of the ISU model. Solid lines indicate expected direct effects. Dashed lines indicate expected indirect effects. Grayed out areas were not examined in the current study.
**Expected outcomes.** I had three expected outcomes for this study. First, I expected that the potential features would collectively classify behavioral application at or above a chosen model evaluation metric value. I selected the area under the receiver operating curve (AUC) as the chosen model evaluation metric. The AUC value indicates the extent to which the classification algorithm differentiates the class values of the dependent variable by plotting sensitivity (i.e., the true positive rate) against specificity (the true negative rate) across multiple data value thresholds (Bradley, 1997). Rice and Harris (2005) suggest that an AUC value of 0.556 indicates a small effect size of the selected features on the dependent variable. Therefore, I expected that the AUC for the decision classification model would be at or above 0.556.

Secondly, I expected that variables within the information integration, and behavioral capacity and intent, domains would be the most salient features of information application, followed by information seeking aptitude. A decision tree classification model that first splits on variables within the information integration and behavioral capacity and intent domains and includes at least one later split involving a variable within information seeking aptitude would support this expectation. Lastly, I expected that demographic and socioeconomic characteristic variables would not emerge as salient features because their indirect effect would be fully accounted for by information seeking aptitude, integration, and behavioral capacity and intent. A decision tree classification model that does not include demographic or socioeconomic characteristic variables would support this expectation.
Methods

Procedure

Complete study procedures are reported in Chapter 2. In brief, first-time parents ($N = 423$) whose only or oldest child was 24 months of age or younger at the time of survey administration were recruited to participate in a ~20-minute online survey on individual- and family-level characteristics and infant and toddler feeding experiences. To be eligible to participate, individuals had to provide consent, self-identify as a first-time parent of an only or oldest child who was 24 months of age or younger, and endorse that they remembered trying to get advice or information regarding infant or toddler feeding topics in the past 30 days. A purposive sampling method was employed to promote diversity in representation by child age, annual household income, and parent gender. Descriptive statistics on participant demographic and socioeconomic characteristics are presented in Table 1. All study procedures were reviewed by the Pennsylvania State University Office for Research Protections and were determined to be exempt (Study 00008530).
Table 1

*Participant Demographic and Socioeconomic Characteristics (N = 423)*

<table>
<thead>
<tr>
<th></th>
<th>n(%)</th>
<th>M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>375 (89%)</td>
<td></td>
</tr>
<tr>
<td><strong>Parent age in years</strong></td>
<td>28.36 (5.54)</td>
<td></td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td>3.27 (0.83)</td>
<td></td>
</tr>
<tr>
<td><strong>Number of children</strong></td>
<td>1.08 (0.27)</td>
<td></td>
</tr>
<tr>
<td><strong>Pregnant/Expecting</strong></td>
<td>36 (9%)</td>
<td></td>
</tr>
<tr>
<td><strong>Parent race and/or ethnicity</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>28 (7%)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>51 (12%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>320 (75%)</td>
<td></td>
</tr>
<tr>
<td>Hispanic, Latino, or Spanish</td>
<td>43 (10%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20 (5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Annual household income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $24,999</td>
<td>81 (19%)</td>
<td></td>
</tr>
<tr>
<td>$25,000 to $44,999</td>
<td>126 (30%)</td>
<td></td>
</tr>
<tr>
<td>$45,000 and $74,999</td>
<td>110 (26%)</td>
<td></td>
</tr>
<tr>
<td>$75,000 to $119,999</td>
<td>75 (18%)</td>
<td></td>
</tr>
<tr>
<td>Over $120,000</td>
<td>31 (7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>270 (64%)</td>
<td></td>
</tr>
<tr>
<td>Single, living with romantic partner</td>
<td>106 (25%)</td>
<td></td>
</tr>
<tr>
<td>Single (never married, divorced, separated, widowed)</td>
<td>47 (11%)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>9 (2%)</td>
<td></td>
</tr>
<tr>
<td>High school diploma or GED</td>
<td>78 (18%)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>104 (25%)</td>
<td></td>
</tr>
<tr>
<td>Associate’s or Bachelor’s degree</td>
<td>175 (41%)</td>
<td></td>
</tr>
<tr>
<td>Graduate or advanced professional degree</td>
<td>57 (14%)</td>
<td></td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed, full-time</td>
<td>157 (37%)</td>
<td></td>
</tr>
<tr>
<td>Employed, part-time</td>
<td>60 (14%)</td>
<td></td>
</tr>
<tr>
<td>Stay-at-home parent</td>
<td>170 (40%)</td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>14 (3%)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>19 (5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Childcare</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No regular non-parental childcare</td>
<td>174 (41%)</td>
<td></td>
</tr>
<tr>
<td>1 to 10 hours per week</td>
<td>136 (32%)</td>
<td></td>
</tr>
<tr>
<td>11 to 20 hours per week</td>
<td>52 (12%)</td>
<td></td>
</tr>
<tr>
<td>21 to 40 hours per week</td>
<td>50 (12%)</td>
<td></td>
</tr>
<tr>
<td>41 or more hours per week</td>
<td>11 (3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Child gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>195 (46%)</td>
<td></td>
</tr>
<tr>
<td><strong>Child age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 5 months</td>
<td>97 (23%)</td>
<td></td>
</tr>
<tr>
<td>6 to 11 months</td>
<td>95 (23%)</td>
<td></td>
</tr>
<tr>
<td>12 to 17 months</td>
<td>118 (28%)</td>
<td></td>
</tr>
<tr>
<td>18 to 24 months</td>
<td>113 (27%)</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Percentages may not add to 100 because multiple categories could be endorsed.*
Measures

The following measures were collected to address the study aims. The pilot research procedures that contributed to measure development are described in Chapter 2. Unless specifically mentioned, there were no missing values in the variables described below.

**Demographic and socioeconomic characteristics.** The following individual, child, and family-level demographic and socioeconomic variables were assessed.

*Parent age.* Participants reported their current age in years. Parent age was treated as an integer variable in the analyses.

*Parent gender.* Participants reported the gender they most closely identified with (woman or man). Although parents may have identified more closely with another gender option, the binary option was implemented to facilitate participant recruitment. Gender was treated as a binary variable in the analyses.

*Parent race and/or ethnicity.* Parents self-identified their race and/or ethnicity in a single question as suggested by the United States Census 2015 National Content Test: Race and Ethnicity Analysis Report (United States Census Bureau, 2017). The race and/or ethnicity categories included: American Indian or Alaska native; Asian; Black or African American; Hispanic, Latino, or Spanish; Middle Eastern or North African; Middle Eastern or North African; Native Hawaiian or other Pacific Islander; White; Some other race, ethnicity, or origin; or Prefer not to answer. The following categories were excluded from the analyses due to low frequency: American Indian or Alaska native (2%); Middle Eastern or North African (1%); Native Hawaiian or other Pacific Islander (1%); Some other race, ethnicity, or origin (1%); and prefer not to answer (<0.5%). The remaining race and/or ethnicity categories were treated as binary variables in the analyses.
**Parent education.** Participants reported their highest level of completed education in the following categories: Less than high school; High school diploma or GED; Some college; Associate’s degree; Bachelor’s Degree; Master’s degree; Professional degree (e.g., JD); or Doctorate degree (e.g., MD, PhD). For the purposes of analyses, the Associate’s and Bachelor’s degree categories were combined to indicate a terminal, undergraduate degree, and the Master’s, professional, and doctorate degrees were combined to indicate a terminal graduate or professional degree. Each education category was treated as a binary variable in the analyses.

**Employment.** Employment status was reported in the following categories: Employed, full-time; Employed, part-time, Stay-at-home parent; Student; Unemployed; and Other. Due to low frequency (<1 %) the ‘Other’ category was excluded from analyses. Each employment category was treated as a binary variable in the analyses.

**Parent weight status.** To assess parent perception of their own weight status, participants responded to the question, “How would you describe your weight during the following times in your life? At present” Response options included: Very underweight; Underweight; Normal weight; Overweight; and Very overweight. This question was drawn from the Child Feeding Questionnaire (Birch et al., 2001). In the analyses, the categories very underweight; underweight; and normal weight were combined to indicate not overweight or very overweight. The categories overweight and very overweight were combined to indicate overweight or very overweight. There was one missing value that was treated as missing in the analyses. Parent overweight was treated as a binary variable in the analyses.

**Annual household income.** Participants reported their annual household income in the following categories: Less than $25,000; $25,000 to $45,000; $45,000 and $75,000; $75,000 to $120,000; and over $120,000. As mentioned, this reflects the annual household income quintiles
identified by the U.S. Census Bureau 2017 Current Population Survey (CPS) Annual Social and Economic Supplement (Semega et al., 2017). Household income was treated as a integer value in the analyses.

**Marital status.** Marital status was reported in the following categories: Married; Single, living with a romantic partner; Single, never married; Single, divorced; Single, separated; Single, widowed. In the analyses, the Single, never married; Single, divorced; Single, separated; and Single, widowed categories were combined to indicate a single, non-cohabitating marital status. Marital status was treated as a three-level factor in the analyses.

**Number of children.** Participants also reported on the number of children that were under their care as a parent. Number of children was treated as an integer value in the analyses.

**WIC participation.** Participants who indicated an annual household income less than $75,000 were asked to indicate whether they were currently participating in the WIC program. Response options included: Yes; No; and Don’t know or unsure. For the purposes of the analyses, participants who endorsed ‘Yes’ were considered WIC participants with all others considered non-participants. WIC is an income-based nutrition assistance program that requires participants be at or below 185% of the federal poverty guidelines (United States Department of Agriculture Food and Nutrition Service, 2018), which is why this question was targeted by income. WIC participation was treated as a binary variable in the analyses.

**Childcare.** Participants reported whether their child was regularly cared for by someone other than a parent in the last 30 days. If yes, they indicated whether the child was in non-parental care for 1 to 10 hours; 11 to 20 hours; 21 to 40 hours; or 41 hours per week or more. Hours per week in childcare was treated as an integer variable in the analyses.
**Child gender.** Participants reported the gender of their child. Response options included: Girl; Boy; and Prefer not to answer. Child gender was treated as a three-level factor variable in the analyses (one participant indicated prefer not to answer).

**Child age in months.** Participants reported their only or oldest child’s current age in months. Response options included: 0 to 5 months; 6 to 11 months; 12 to 17 months; and 18 to 24 months. As mentioned, these age ranges correspond to developmental feeding stages (Birch & Doub, 2014; Black & Aboud, 2011; Pérez-Escamilla et al., 2017). Each age category was treated as a binary variable in the analyses.

**Information seeking aptitude variables.** Topic interest and information urgency were assessed as indicators of information seeking aptitude.

**Topic interest.** Parent interest in the topic of their most recent information seeking occasion was assessed using a single-item measure. This item was developed based on preliminary pilot research and existing research on topical interest (Dervin, 1998; Silvia & Kashdan, 2009; Wigfield & Cambria, 2010). Participants responded to the question, “How personally interested were you in [piped text: topic] before getting advice or information?” on a 7-point scale ranging from 1 = Not at all interested to 7 = Very interested. This single-item measure demonstrated predictive validity; topic interest was positively correlated with the amount of time the individual spent on the search ($r = 0.11, p = .03$) and overall frequency of information seeking regarding information seeking in the past 30 days ($r = .13, p < .01$). This variable was treated as an integer value in the analyses.

**Information urgency.** Information urgency was assessed by a single item measure. Participants responded to the question, “How urgent was your need for advice or information about [piped text: topic]?” on a 7-point scale ranging from 1 = Not urgent to 7 = Very urgent.
There were no missing values for this item. This item was developed for the project based on preliminary pilot research and a prior measure of information urgency in a health information seeking context (Pian, Khoo, & Chi, 2017). The single-item measure demonstrated predictive validity; Information urgency was higher among parents who reported they were seeking information because of a concern ($n = 142; M = 4.00, SD = 1.66$) compared to parents who were seeking information because they were curious ($n = 258; M = 3.07, SD = 1.68; t(399) = -5.36, p < .001$). This variable was treated as an integer value in the analyses.

**Information integration variables.** Information integration was operationalized as search status, overall information satisfaction, and cognitive and affective responses.

**Search status.** Parent’s perception of the completeness of their search was assessed using a single item. The item and response options were informed by preliminary pilot research and existing research on search termination and goal attainment. Participants responded to the prompt, “Is your search for advice or information about [piped text: topic]…” The three response options were: Complete - You have all of the advice or information you want and do not plan to seek more; Ongoing - You will to continue to seek advice or information about [piped text: topic]; or Unsure - You don't know yet if you will seek additional advice or information about [piped text: topic]. There were no missing values for this variable. This variable was treated as a three-level factor in the analyses.

**Overall information satisfaction.** A 5-item scale assessed parents’ overall satisfaction with the information they obtained during their most recent search. Items were developed specifically for this project based on pilot research and existing measures of satisfaction with online and off-line channels of information (Bailey et al., 1998; Jiang, Hassan Awadallah, Shi, & White, 2015; McKinney, Yoon, & Zahedi, 2002; McNaughton, 1994; Muylle, Moenaert, &
Despontin, 2004). Participants first responded to an item assessing global satisfaction: “Overall, how satisfied were you with the advice or information you got about [piped text: topic] considering all of the sources you tried?” Participants then reported on their overall satisfaction with four specific aspects of the advice or information they obtained: amount of information; Level of detail; Personalization; and Action-ability. Parents rated all five items on a 7-point scale ranging from 1 = Not at all satisfied to 7 = Completely satisfied. Participant responses were averaged to create a single mean score indicating overall information satisfaction with a potential range of 1.0 to 7.0. Missing values, which impacted 1 to 2 cases (<1% of the data) for any given item, were replaced with the scale mid-point value (4). This was the default option for this item in the online survey, which participants may have interpreted as an endorsement. This variable was treated as numeric in the analyses.

The overall information satisfaction scale demonstrated strong internal consistency (α = 0.90). Construct validity for overall information satisfaction was established using a two-factor CFA as described above. The standardized factor loadings for overall information satisfaction were uniformly positive and significant, ranging from 0.71 to 0.86 (p < .001).

**Cognitive and affective responses.** Participants responded to 10 individual items that assessed cognitions and affective responses to the advice or information obtained. Items were developed specifically for this project based on preliminary pilot research and existing research on the role of cognitions and emotions in information processing (Lemerise & Arsenio, 2000; Savolainen, 2015; Simon, 1967). The overarching prompt for the 10 items was, “How did the advice or information you got about [piped text: topic] [piped text: timing of most recent search] make you feel? Check all that apply.” Responses options were presented as checkboxes and included: Informed; Reassured; Empowered; Motivated; Overwhelmed; Confused; Frustrated;
Worried; Disappointed; and Other. Due to low frequency (<1%), the ‘Other’ category was excluded from the analyses. Each cognitive and affective item was treated as a binary variable in the analyses.

**Information use.** This study operationalized behavioral application of information as an indicator of information use. Although cognitive information uses are also possible (e.g., using information to make a decision or plan; Case & O’Connor, 2016), the current study sought to classify behavioral application. Therefore, cognitive uses were excluded from the analyses.

**Behavioral application.** Behavioral application of the advice or information obtained was assessed through 4 individual items that measured different ways parents might apply infant or toddler feeding information depending on the topic of their search. Possible uses were based on preliminary pilot research and existing literature on information use (Case & Given, 2016; Case & O’Connor, 2016, pp. 63–65). The overarching prompt was, “Have you used any of the advice or information you got about [piped text: topic] [piped text: timing of most recent search] to…” Possible behavioral applications included: Make a purchase; Prepare a recipe; Use a new feeding approach; Use a new parenting approach; and Other. Potential information uses were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005). Response options were: Yes; No; Not yet, but I plan to; and N/A. For the purposes of analyses, the No; Not yet, but I plan to; and N/A responses were combined to indicate no application to date. The “Other,” response option was excluded from the analyses due to low frequency (<1%). Item responses were treated as binary values in the analyses.

**Behavioral capacity and intent variables.** Prior knowledge, current knowledge, and strength of behavioral intent were included as measures of behavioral capacity and intent.
**Prior knowledge.** Parents’ prior knowledge regarding the topic of their most recent search was assessed using a single item, “How much did you know about [piped text: topic] before getting advice or information?” Responses were on a 7-point scale ranging from 1 = Nothing to 7 = Everything. There was one missing value on this variable that was replaced with the scale mid-point value. This was the default option for this item in the online survey, which participants may have interpreted as an endorsement. This variable was treated as an integer value in the analyses.

**Current knowledge.** To assess current knowledge of the topic of their most recent information seeking occasion, participants responded to the single item, “How much do you know about [piped text: topic] now, after getting advice or information? Responses were on a 7-point scale ranging from 1 = Nothing to 7 = Everything. This variable was treated as an integer value in the analyses.

**Strength of behavioral intent.** Strength of behavioral intent was assessed using a 7-item scale. The seven items reflected potential intra-personal, inter-personal, and environmental barriers that may challenge parents’ intent to follow based on pilot research and existing literature on parents’ child feeding behavior (Dwyer, Needham, Simpson, & Heeney, 2008; Heinig et al., 2006; Larson & Story, 2015; Roberto et al., 2015) and a process model of goal intentions (Gollwitzer & Sheeran, 2006). Although parents’ intentions or goals are likely to vary depending on their information need (Case & Given, 2016, pp. 66–67), pilot work revealed that parents readily associated a specific parenting or child feeding intention to their most recent information search.

Parents first read the prompt: “Feeding infants and toddlers can be a challenging part of parenting. How much do you agree with the following statements? I am likely to follow through
on my intentions related to...” Parents then responded to seven potential barriers to following through on their child feeding intentions: I am tired; I am stressed; It would take a lot of time; It would be expensive; I feel unsupported; [child’s name] is fussy or in a bad mood; When [child] resists. Response options ranged from 1 = Never to 7 = Absolutely. There was also a ‘Not Applicable’ option, which was treated as missing data in the analyses. The seven items were randomly presented to reduce order effects (Perreault, 1975; Wright, 2005). Participant responses were averaged to create a single mean score representing their strength of behavioral intent with a potential range of 1.0 to 7.0. Missing values, which impacted 5 to 12 participants (<5% of the data) for any given item in the scale, were treated as missing in the calculation. Two participants had complete missing data for this variable, which were not replaced because there was no default value for this question. The scale demonstrated strong internal consistency (α = 0.88). This variable was treated as continuous in the analyses.

Construct validity for strength of behavioral intent and overall information satisfaction (described later) was established a two-factor confirmatory factory analysis (CFA) using the lavaan package (version 0.5-23.1097; Rosseel, 2012) in R version 3.5.0 (R Core Team, 2018). I tested whether the seven items that were intended to measure strength of behavioral capacity loaded onto a pre-determined latent factor using the maximum likelihood estimation approach with a standardized latent factor score. Prior to conducting the CFA, I verified that the response distributions for each item appeared to meet normality assumptions (i.e., skewness and kurtosis values less than +/- 2.0). Missing data were present in 7% of the cases (n = 29), with any given item missing between 1 to 12 values. Missing data were handled in the CFA using full information maximum likelihood. The CFA results generally supported the proposed two-factor
model. The standardized factor loadings for the hypothesized strength of behavioral intent items were uniformly positive and significant, ranging from 0.60 to .82 ($p < .001$). Model fit statistics were within acceptable, although not ideal, ranges: Comparative Fit Index (CFI) = 0.92; Tucker-Lewis Index (TLI) = 0.89; Root mean square error of approximation (RMSEA) = 0.10; Standardized root mean square residual (SRMR) = 0.04 (Brown, 2015; Jackson, Gillaspy, & Purc-Stephenson, 2009).

**Analytic Plan**

I first conducted descriptive analyses to assess the frequency and/or means and distributions of the study variables. I then randomly divided the full dataset into a training set (80%) and holdout (i.e., test) set (20%) to construct and test decision tree classification models. Descriptive statistics were conducted in SPSS for Macintosh (version 24.0.0.1; IBM Corporation, 2016). Decision tree classification analyses and visualizations were conducted using the specified packages in the R programming language (version 3.5.0; R Core Team, 2018) in the RStudio environment (version 1.1.383; RStudio Team, 2016).

**Data balancing.** Preliminary analyses revealed that the class values of the dependent variable, behavioral application, were unbalanced; 72% of participants applied information. When class values are unbalanced, decision tree classification algorithms tend to favor splits that best classify the majority class, which makes classification of the minority class less accurate (Sun, Wong, & Kamel, 2009). Balancing strategies such as simple oversampling (with replacement) of the minority class, simple under sampling (without replacement) of the majority class, and random over-sampling examples (ROSE) have demonstrated improved classification performance compared to models trained on unbalanced data (Lee, 2014; Lunardon, Menardi, & Torelli, 2014). However, the classification performance of each balancing technique has varied
Therefore, I then created 4 separate training sets (unbalanced, simple oversampling, simple under sampling, and ROSE) and compared the AUC values using the pROC package (version 1.12.1; Robin et al., 2011).

The pruned decision tree classification model constructed using the ROSE training data had a significantly higher AUC than the other models (p < .01). Therefore, only the results of the analyses conducted using the ROSE training data are presented. The ROSE approach generates a simulated, artificially balanced dataset based on the properties of the observed class values using a smoothed bootstrap re-sampling technique (Lunardon et al., 2014; Menardi & Torelli, 2014).

To generate the ROSE training data in this study, I used the ROSE package (version 0.0-3; Lunardon et al., 2014) with the default sample size (i.e., the size of the unbalanced training data; n = 338) and balancing criteria (0.5).

**Decision tree classification modeling.** To construct decision tree classification models, I used the rpart package (version 4.1-13) implementation of classification and regression tree (CART) algorithms (Therneua, Atkinson, & Ripley, 2015). I constructed decision tree classification models using a two-step growth and pruning process as recommended in the literature to reduce the risk of over fitting to the training data (Breiman et al., 1984; Hastie, Tibshirani, & Friedman, 2009). First, I generated an initial, large model using limited growth constraints. To generate this initial model, I used the ‘class’ method to specify a classification model. I used the default settings for the splitting criteria (Gini index), and pre-pruning criteria (complexity parameter = 0.1; minsplit = 20). I used the default cross-validation value (10-fold) to generate the cross-validation error estimates for each model of a given complexity parameter.

I then pruned this larger model to select a final, smaller model. There are numerous approaches to pruning decision tree classification models (Esposito, Malerba, Semeraro, & Kay,
1997). I selected the model with the lowest cross-validated error rate as suggested by Hastie and colleagues (Hastie et al., 2009, p. 308). To visualize the results of the final decision tree classification model, I used the rpart.plot package (version 2.1.2; Milborrow, 2016).

**Decision tree classification model evaluation.** To assess the performance of the final decision tree classification model, I used the algorithm that was trained on the ROSE data to classify behavioral application in the holdout (i.e., test) dataset. I calculated the overall classification accuracy rate using the `metric()` function of the rminer package (version 1.4.2; Cortez, 2016). I calculated the AUC and its standard error using the pROC package (version 1.12.1; Robin et al., 2011).

**Comparing models based on potential features.** I first modeled the information seeking aptitude, information integration, and behavioral capacity and intent variables as potential features of behavioral application. I then added the demographic and socioeconomic characteristics variables as additional potential features and repeated the modeling process. To explore whether the modeled that included demographic and socioeconomic characteristics improved upon the base model, I compared the AUC values of the two models using pROC (Robin et al., 2011).

**Results**

**Descriptive Analyses**

Descriptive statistics regarding participant demographic and socioeconomic characteristics are reported in Table 1. As mentioned, in Chapter 1, the sample was primarily female, white or Caucasian, and partnered through marriage or cohabitation. The majority of parents had one child. By design, child age was evenly represented across the 0 to 5 month, 6 to 11 month, 12 to 17 month, and 18 to 24 month categories. Most participants had completed some
college or earned an Associate’s or Bachelor’s degree and had an annual household income of less than $75,000. Regarding employment, the majority of participants reported being stay-at-home parents or working full-time in nearly equal proportion.

Descriptive statistics on the information seeking aptitude, information integration, and behavioral capacity and intent variables are presented in Table 2. Regarding information seeking aptitude, participants reported their information need was moderately urgent and a moderate-to-high level of personal interest in the topic on average. Regarding information integration, many participants endorsed positive cognitive and affective responses to the information they obtained. Over three-quarters of the sample reported their search made them feel informed, and over half reported feeling reassured or motivated by the information they obtained. Fewer participants (≤10%) reported negative affective responses to the information they obtained, such as feeling overwhelmed or frustrated. Similarly, participants reported a moderately high level of satisfaction with the information they obtained. Nearly two-thirds of participants evaluated their search as ongoing.

Regarding behavioral capacity and intent, participants reported a moderate amount of prior knowledge about their search topic. Participants reported a higher level of current knowledge in light of their most recent search. Participants endorsed a moderate level of strength of behavioral intent to follow through on the child feeding behavior that was associated with their search.

Descriptive statistics on the dependent variable, behavioral application are included in Table 2. Regarding behavioral application, nearly three-quarters of the sample applied the information they obtained in some way. Using a new feeding approach, making a purchase, and
preparing a recipe were nearly evenly represented as the most frequent behavioral applications of information, followed closely by using a new parenting approach.
Table 2

Descriptive Statistics on Potential Feature Domains: Information Seeking Aptitude, Information Integration, and Behavioral Capacity and Intent; and the Dependent Variable: Behavioral Application

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
<th>M (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information seeking aptitude</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information urgency</td>
<td>3.38 (1.73)</td>
<td>1 – 7</td>
<td></td>
</tr>
<tr>
<td>Topic interest</td>
<td>5.66 (1.26)</td>
<td>1 – 7</td>
<td></td>
</tr>
<tr>
<td><strong>Information integration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive and affective responses*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt informed</td>
<td>321 (76%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt reassured</td>
<td>253 (60%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt motivated</td>
<td>214 (51%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt empowered</td>
<td>100 (24%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt overwhelmed</td>
<td>44 (10%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt worried</td>
<td>25 (6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt confused</td>
<td>19 (5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt frustrated</td>
<td>22 (5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt disappointed</td>
<td>9 (2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information satisfaction</td>
<td>5.27 (0.96)</td>
<td>1 – 7</td>
<td></td>
</tr>
<tr>
<td><strong>Search status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search complete</td>
<td>147 (35%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search ongoing</td>
<td>262 (62%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search status unsure</td>
<td>14 (3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Behavioral capacity and intent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior knowledge</td>
<td>4.27 (1.34)</td>
<td>1- 7</td>
<td></td>
</tr>
<tr>
<td>Current knowledge</td>
<td>5.49 (0.94)</td>
<td>2 – 7</td>
<td></td>
</tr>
<tr>
<td>Strength of behavioral intent</td>
<td>4.35 (1.28)</td>
<td>1 – 7</td>
<td></td>
</tr>
<tr>
<td><strong>Behavioral Application</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied (any behavioral application)</td>
<td>306 (72%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific behavioral application*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used a new feeding approach</td>
<td>181 (43%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made a purchase</td>
<td>177 (42%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared a recipe</td>
<td>161 (38%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used a new parenting approach</td>
<td>121 (29%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Response options were not mutually exclusive.
**Decision tree classification results.** The first decision tree classification model was constructed using information seeking aptitude, information integration, and behavioral capacity and intent variables as potential features. The largest decision tree generated within the growth parameters included 14 terminal nodes (13 splits). The relative importance of each potential feature variable in determining the splits in the full model is presented in Table 3. Information integration variables, specifically feeling motivated by the information obtained, information satisfaction, and search status evaluation were among the most salient features of behavioral application. Behavioral capacity and intent variables also emerged as salient features, specifically current and prior knowledge of search topic, and information urgency.

The sub-tree with 9 terminal nodes (8 splits) had the lowest cross-validated error value (see Figure 2) and was selected as the pruned model (see Figure 3). The pruned model had an accuracy of 62.4% and an AUC value of 0.740 (see Figure 4). The standard error of the AUC was 0.059, which suggests a 95% confidence interval of 0.681 to 0.800. Using Rice and Harris’ (2005) effect size metrics, this AUC range suggests the features that collectively contributed to the pruned model had a medium to large effect size in classifying behavioral application of infant and toddler feeding information. Decision rules that classified at least 5% of the sample are described next.

**Classifying endorsement of behavioral application (Applied).** As shown in Figure 3, in a two-way interaction, behavioral application was classified among participants (ROSE simulated; RS) who 1) Felt motivated by information and 2) Reported being at least a moderate-to-high level of satisfaction with the information they obtained (≥ 5.6 on a 7-point scale; 26% of the sample; probability = 0.78). In a five-way interaction, behavioral application was classified among participants (RS) who 1) Did not feel motivated by the information they obtained; 2) Did
not evaluate their search as ongoing (typically indicating a complete search); 3) Reported at least a low-to-moderate level of current knowledge (≥ 2.7 on a 7-point scale); 4) Reported at least a low-to-moderate level of prior knowledge (≥ 3.4 on a 7-point scale); and 5) Reported at least moderate satisfaction with the information they obtained (≥ 4.5 on a 7-point scale; 12% of the sample; probability = 0.80). In a three-way interaction, behavioral application was classified among participants (RS) who 1) Felt motivated; 2) Reported a less than moderate-to-high level of satisfaction with the information they obtained (< 5.6 on a 7-point scale); 3) Reported at least a moderately urgent information need (≥ 4.5 on a 7-point scale; 6% of the sample; probability = .70).

**Classifying non-endorsement of behavioral application (No).** In a two-way interaction, participants (RS) who 1) Did not feel motivated by the information they obtained and 2) Evaluated their search as ongoing were classified as have not applied the information they obtained (30% of the sample; probability = 0.73). Non-application was also classified in a four-way interaction, such that participants (RS) who 1) Did not feel motivated; 2) Did not endorse that their search was on-going; 3) Reported a low-to-moderate level of current knowledge (≥ 2.7 on a 7-point scale); and 4) Reported a low-to-moderate level of prior knowledge (< 3.4 on a 7-point scale); 8% of the sample; probability = 0.63). A counter-intuitive finding emerged in the following four-way interaction: Participants (RS) were classified as having not applied the information they obtained if they 1) Felt motivated; 2) Reported a less than moderate-to-high level of satisfaction with the information they obtained (< 5.6 on a 7-point scale); 3) Reported a less than a moderately urgent information need (< 4.5 on a 7-point scale); and 4) Felt informed (8% of the sample; probability = 0.74).
Table 3

*Potential Features and Their Relative Importance in Determining the Splits of the Decision Tree Model Classifying Parents’ Behavioral Application of Infant and Toddler Feeding Information*

<table>
<thead>
<tr>
<th>Construct Domain</th>
<th>Feature</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information integration</td>
<td>Felt motivated</td>
<td>18</td>
</tr>
<tr>
<td>Information integration</td>
<td>Information satisfaction</td>
<td>18</td>
</tr>
<tr>
<td>Behavioral capacity and intent</td>
<td>Current knowledge</td>
<td>13</td>
</tr>
<tr>
<td>Behavioral capacity and intent</td>
<td>Prior knowledge</td>
<td>10</td>
</tr>
<tr>
<td>Information seeking aptitude</td>
<td>Information urgency</td>
<td>8</td>
</tr>
<tr>
<td>Information integration</td>
<td>Search status: Ongoing</td>
<td>8</td>
</tr>
<tr>
<td>Information integration</td>
<td>Search status: Complete</td>
<td>7</td>
</tr>
<tr>
<td>Information integration</td>
<td>Felt informed</td>
<td>5</td>
</tr>
<tr>
<td>Information seeking aptitude</td>
<td>Topic interest</td>
<td>4</td>
</tr>
<tr>
<td>Information integration</td>
<td>Felt frustrated</td>
<td>2</td>
</tr>
<tr>
<td>Information integration</td>
<td>Felt empowered</td>
<td>2</td>
</tr>
<tr>
<td>Information integration</td>
<td>Strength of behavioral intent</td>
<td>2</td>
</tr>
<tr>
<td>Information integration</td>
<td>Felt confused</td>
<td>1</td>
</tr>
<tr>
<td>Information integration</td>
<td>Felt reassured</td>
<td>1</td>
</tr>
<tr>
<td>Information integration</td>
<td>Felt overwhelmed</td>
<td>1</td>
</tr>
<tr>
<td>Information integration</td>
<td>Search status: Unsure</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* Importance values assigned to all potential features and divided out of a possible 100 within the rpart package (Therneua et al., 2015); May not add to 100 due to rounding.
Figure 2. The size of tree (i.e., number of nodes) for the given complexity parameter is indicated at the top of the graph. The algorithm that produced the classification model with the lowest cross-validated error was selected as the final model (circled).
Figure 3. Pruned decision tree model classifying parents’ behavioral application of infant and toddler feeding information. Potential features included integration seeking aptitude, information integration, and behavioral capacity and intent variables. The terminal nodes depict (top to bottom): the classification, the observed probability of the class given the decision rule, and the percent of the sample that was classified into the terminal node for each decision rule.
Figure 4. Plot of the area under the receiver operating characteristic curve for the final decision tree model classifying parents’ behavioral application of infant and toddler feeding information. The black line indicates performance of the final model algorithm. The gray line indicates the theoretical performance of a purely random classifier.
Demographic and socioeconomic characteristic feature results. Including demographic and socioeconomic characteristics variables as potential features did not significantly improve classification of behavioral application. With demographic and socioeconomic characteristics included, the decision tree classification model with the lowest cross-validated error rate included 2 nodes (1 split). The single split was on the information integration variable, felt motivated; Behavioral application was classified among participants (RS) who endorsed feeling motivated by the information they obtained (45% of the sample; probability = 0.67). The overall accuracy of the model algorithm was 52.9%. The AUC value was 0.528 with a standard error of +/- 0.067, indicating a 95% confidence interval of 0.462 to 0.595. This AUC range suggests the features that collectively contributed to the model had a null or small effect size in classifying behavioral application of infant and toddler feeding information (Rice & Harris, 2005). The AUC value of the model that did not include demographic and socioeconomic characteristic variables was significantly lower than the model that included them ($D = -3.21$, $p < .001$), indicating reduced classification performance.
Discussion

Formative research on the features of information use is needed to increase the reach and efficacy of evidence-based programs and services that aim to improve public health (Greyson & Johnson, 2016). Childhood obesity is one particularly urgent public health problem that needs more evidence regarding parents’ natural experiences with information seeking and use to guide translational research efforts (Bentley et al., 2014; Lumeng et al., 2015). Using the conceptual model of information seeking and use (ISU model) as the grounding framework, this study explored how information seeking aptitude, information seeking integration, and behavioral capacity and intent independently and interactively classified behavioral application. This study also explored whether demographic and socioeconomic characteristics improved classification performance.

**Overall model performance.** The pruned decision tree classification model that included information seeking aptitude, information integration, and behavioral capacity and intent variables as potential features had a moderate to large effect size in classifying behavioral application. The AUC value (.740; $SE = 0.059$) exceeded my a priori expectations (0.556), which was based on the small effect size equivalent presented in Rice and Harris (2005). However, an optimal model would have an AUC of 1.0 (Bradley, 1997). This result suggests that although variables from information seeking aptitude, information integration, and behavioral capacity and intent collectively contributed to the classification of behavioral intent, classification performance could be further improved. Observing an overall classification accuracy of 62% also supports that additional and/or alternative features could improve the classification of parents’ behavioral application of infant and toddler feeding information.
The pruned decision tree classification model constructed in this study performed similarly to other models classifying obesity and related outcomes. Woelfel and colleagues (2004) did not report model performance evaluation metrics in their study on barriers to WIC benefit redemption, so there is not a direct comparison with a study classifying infant and toddler feeding information use. Dugan and colleagues (2015) reported an overall accuracy of 85% in predicting children’s obesity status at age 2. AUC was not formally reported as an evaluation metric. Ramezankhani and colleagues (2016) reported AUC values of 0.78 to 0.81 and classification accuracy values of 72 to 78% in their CART decision tree classifying Type 2 diabetes.

The current study differed from those conducted by Dugan and colleagues (2015) and Ramezankhani and colleagues (2016) in that they had longitudinal data on larger samples (N = 7,519 and 6,647 respectively). Although Dugan and colleagues constructed their model with many more potential features (n = 167) and Ramezankhani and colleagues (2016) achieved their classification performance with a small set of features that were selected using data-driven variable selection methods (n = 15 to 20). Given the information seeking and use process is also proposed to be a longitudinal process in the ISU model, future studies should explore potential features of parents’ behavioral application of infant and toddler feeding information with longitudinal data. Studies should also compare classification performance among models that are constructed with potential features that were selected using data-driven and theoretically grounded approaches consistent with recent recommendations for theory guided data science (Karpatne et al., 2017)

Salience of information seeking aptitude, information integration, and behavioral capacity and intent. I expected that variables within the information integration and behavioral
capacity and intent domains would be the most salient features of information application. I found partial support for this expectation. Two information integration variables, feeling motivated by information and information satisfaction, were equally ranked as the most important features in classifying behavioral application.

The second and third most important features were behavioral capacity and intent variables: current knowledge and prior knowledge. Previous research has found a positive association between parents’ nutrition knowledge and children’s dietary quality (Gibson & Kaplan, 2015; Variyam, Blaylock, Lin, Ralston, & Smallwood, 1999). Nutrition knowledge has also been found to be lower among lower-income and racial and ethnic minority groups. Differences in nutrition knowledge may also be a factor that underlies continued economic disparities in childhood obesity risk (Cluss et al., 2013; Wojcicki, Gugig, Kathiravan, Holbrook, & Heyman, 2009). Intervention programs should be responsive to potential differences in participants prior content knowledge to ensure that prevention programs do not further increase observed disparities in obesity (Backholer et al., 2014; Backholer & Peeters, 2017).

Previous conceptual and empirical work has explored the association between motivation and breastfeeding (Stockdale, Sinclair, Kernohan, & Lavender, 2010). Fewer studies have considered the role of motivation beyond the milk feeding period, such as motivations to offer children repeated tastes of a food to increase liking (Anzman-Frasca, Ventura, Ehrenberg, & Myers, 2018). A qualitative study of parents’ child feeding behavior among Asian Indian mothers living in the United States found that parents targeted their feeding approach to promote children’s consumption of foods that parents were highly motivated for children to consume, especially fruits, vegetables, milk, and culturally-based dishes (Momin, Chung, & Olson, 2014). The vast majority of commercial infant and toddler foods do not currently support children’s
learned acceptance of more nutritious, less energy-dense vegetables (e.g., dark green vegetables; Moding et al., 2018). Additionally, desserts and sweets are over represented in food-related social media directed toward parents of infants and toddlers (Doub, Small, & Birch, 2016a). Understanding motivational factors that drive parental purchasing and food preparation behaviors could inform obesity prevention programs and services that target these factors and shift them towards healthier child feeding behaviors.

Motivation plays a key role in numerous long-standing theories of human behavior, including Maslow’s hierarchy of needs (Maslow, 1943), self-determination theory (Ryan & Deci, 2000), and social cognitive theory (Bandura, 2001). Motivation is experiencing a resurgence of empirical attention in the social sciences (Ryan, 2012). Many behaviors related to the prevention of obesity may be driven by automatic, responsive cognitive responses rather than overtly controlled, (Anderson Steeves, Martins, & Gittelsohn, 2014; Backholer & Peeters, 2017; Marteau, Hollands, & Fletcher, 2012). However, motivation may allow individuals to persevere to achieve their desired outcome despite challenges (Petri & Govern, 2012). Building motivation is an overt goal in the motivational interviewing approach to behavioral change (Magill et al., 2018; Rubak, Sandbæk, Lauritzen, & Christensen, 2005) and in the concept of the gamification of health behavior change (Alahäivälä & Oinas-Kukkonen, 2016; Deterding, Dixon, Khaled, & Nacke, 2011). The concept of “stealth” interventions also leverages motivation to engage individuals in obesity prevention programs by matching their existing interests and activities to prevention strategies (Robinson, 2010). Additional research is needed that continues to explore how motivation allows individuals to navigate challenges and enact their intended behavior (Larsen et al., 2018; Renninger, 2000). More research is needed on the individual and
information-level factors that contribute to motivation to engage in positive child feeding behaviors, including social cognitive processes (Doub, Small, & Birch, 2016b).

Information urgency (information seeking aptitude variable) was tied with evaluating the search (information integration) as on-going as the fourth most important feature. This finding also supported my expectation that information seeking aptitude would appear as an important classifier following information integration and behavioral capacity and intent. One unexpected finding was the following four-way interaction predicting non-application: Non-application was classified in cases where motivation and feeling informed were endorsed, but satisfaction and urgency were lower. The Fogg Behavioral Model (Fogg, 2009) proposes that motivation and behavioral capacity and intent interact to predict behavior when there is a trigger. It may be that these cases lacked a trigger to cue action. Future studies should assess contextual factors that may contribute to behavioral application (e.g., opportunity to apply; child behavior).

Although select variables from each construct domain aligned with my expectations regarding the relative importance of each construct in predicting behavioral application, other variables within these domains did not classify behavioral application as expected. For example, strength of behavioral intent was among the least important features. In a conceptual model of food parenting intentions to food parenting behaviors, Larsen and colleagues (2018) hypothesized that parents who have formed implementation intentions (i.e., specific ‘if-then’ plans to enact a health behavior) may have unconscious cognitive processes that increase the likelihood of engaging in that behavior. The current study assumed that parents had some intention regarding infant and toddler feeding related to their search, and assessed the strength of that intention in light of potential barriers (e.g., expense, time, child response). In this parent-reported, cross-sectional survey, strength of behavioral intent did not classify behavioral
application of information as well as more direct measures of parents’ information integration and even behavioral capacity and intent related to topic knowledge. Future studies should continue to explore the role of behavioral intention and strength of behavioral intent in interacting with information integration variables to classify child feeding behavior.

**Salience of demographic and socioeconomic characteristics.** Lastly, I expected that demographic and socioeconomic characteristic variables would not emerge as salient features because their indirect effect would be fully accounted for by information seeking aptitude, integration, and behavioral capacity and intent. This expectation was supported in that the pruned model that included these variables as potential features did not demonstrate superior classification performance compared to the model that did not include these variables.

**Implications for the translational research on childhood obesity prevention.** The results of this study suggest that future translational research on the dissemination and efficacy of evidence-based infant and toddler feeding information should carefully consider the motivational aspects of information content and delivery. Parents’ satisfaction with the information content and delivery should also be carefully considered. In the current study, satisfaction was evaluated as an overall measure across all information parents had obtained. Given that parents accessed an average of 3 to 4 channels, individual programs and services should also consider asking parents to report on how well the information they present aligns with other information they have obtained.

Future studies should aim to improve upon the classification performance of this model by considering other variables that might classify parents’ behavioral application of infant and toddler feeding information. For example, this study did not assess boredom or judgment as potential cognitive or affective responses to information, which have been associated with non-
application of infant and toddler feeding information in previous studies (Savage, Neshteruk, et al., 2016; Woelfel et al., 2004). In addition, future studies should also explore alternative measurement approaches to the variables included as potential features in the current study.

Limitations and Future Directions

These findings must be interpreted in light of the limitation that the study was cross-sectional in design and assessed a single information seeking occasion. The use of single-item measures to assess select constructs in this research study may be a limitation. There is some evidence to suggest that single-item measures are more vulnerable to measurement error compared to multi-item measures (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). However, there is also some evidence to suggest that single-item measures may be an empirically and practically acceptable approach (Bergkvist, 2015; Bergkvist & Rossiter, 2007; Fisher, Matthews, & Gibbons, 2016; Wanous & Hudy, 2001). The current study was an exploratory investigation that sought to identify salient classifiers of information application. Additional research is needed to further develop and test the constructs that were assessed in this study, which may include more robust, multi-item self-report measurements.

Another potential limitation is my interpretation of items that were assessed using checkboxes. I assumed that items that were left unchecked indicated intentional non-endorsement rather than a missing value. Check boxes were selectively used to reduce participant response burden, however future studies should consider forcing participants to report all possible outcomes (e.g., ‘Yes’ or ‘No’).

Future studies should assess additional individual and environmental variables within the domain of behavioral capacity and intent that may influence the relationships proposed in the information seeking and use model. At the individual level, parental mental health is an
important variable that would benefit from additional empirical attention. Previous research found differences in infant feeding practices from 0 to 6 months of age by maternal mental health symptoms, such as stress, depression, and anxiety among a sample of mothers participating in WIC (Hurley, Black, Merry, & Caulfield, 2015). Future studies should test how the relationship between parental mental health and infant feeding practices is mediated by variables within the information seeking aptitude and information integration domains.

Future formative research studies should consider using purposive sampling to gain insight into their specific population of interest. The race and/or ethnicity of the participants in the current study generally reflected the United State census distribution (U.S. Census Bureau, 2018). Parent employment also generally reflected the distribution found in a previous research survey research study of parenting (Pew Research Center, 2015). Although samples that reflect the census distribution may be proportionally representative, in smaller research studies, they may limit the ability to detect differences between groups (Cohen, 1988).

**Conclusion**

This study makes a significant contribution to the literature by providing initial validation for a novel conceptual model of information seeking and use, which is an understudied area the information sciences (Case & O’Connor, 2016; Savolainen, 2015) and prevention and health sciences (Ajzen, 2015; Greyson & Johnson, 2016). In addition, the use of a machine learning approach is a novel and recommended direction in the field of obesity (DeGregory et al., 2018). The results of this cross-sectional, decision tree classification modeling study indicated that behavioral application was more likely when motivation and moderate-to-high levels of satisfaction were endorsed. Non-application was more likely when motivation was not endorsed and when the search was evaluated as ongoing. In cases where motivation was not endorsed and
the search was evaluated as complete or uncertain, current knowledge, prior knowledge, and information satisfaction further classified behavioral application. Future research should explore whether these features and others proposed in the ISU model have longitudinal associations with behavioral application of information. Such research is needed not only in the context of infant feeding information, but also across other behaviors that are relevant to public health outcomes, to inform the large-scale dissemination and implementation of evidence-based information.
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Chapter 4
Discussion

The purpose of this dissertation was to inform the translational research process in the field of childhood obesity prevention by providing formative evidence on parents’ information seeking and use behavior regarding infant and toddler feeding. I first constructed a new conceptual model of information seeking and use (the ISU model) that provided a foundation for the research questions addressed in the dissertation (Chapter 1). I then explored how parents’ satisfaction with information about infant and toddler feeding was associated with their information seeking aptitude and information acquisition characteristics using data from a cross-sectional, parent-reported survey (Chapter 2). I used this same data to explore how parents’ behavioral application of the information they obtained was associated with their information seeking aptitude, information integration, and behavioral capacity and intent characteristics (Chapter 3). In this discussion, I synthesize the information presented in Chapters 1 through 3, and present recommendations for future research on the design and adaptation of evidence-based programs and services for childhood obesity prevention.

Overall Research Significance

Health-related information seeking and use behaviors have been a topic of growing theoretical and empirical interest in recent decades (Lambert & Loiselle, 2007). Numerous theories and research studies have explored the prevalence of health information seeking, the information channels individuals access, and the quality of information that individuals are likely to obtain (Anker, Reinhart, & Feeley, 2011; Anker et al., 2011; Eysenbach, Powell, Kuss, & Sa, 2002; Lalazaryan & Zare-Farashbandi, 2014). Questions remain regarding the associations between contextualized information acquisition and integration experiences and health-related outcomes (Greyson & Johnson, 2016). Addressing this gap in the literature is critical to
advancing the translational research agenda (Biglan, 2018; Fishbein, Ridenour, Stahl, & Sussman, 2016; Woolf, 2008).

Research that specifically addresses parents’ information seeking and use behavior reflects the broader field of health information research (Lee, 2016). With regard to childhood obesity prevention during infancy, research on parents’ information seeking and use behaviors is even more limited (Bentley et al., 2014; Doub, Small, & Birch, 2016). This is problematic because early prevention efforts are urgently needed to address the childhood obesity epidemic in the United States (Ludwig, 2018; Swinburn, Gill, & Kumanyika, 2005). This dissertation began to address the gap in formative research that could direct future childhood obesity prevention efforts by exploring parents’ satisfaction with, and application of, information about infant and toddler feeding behavior they obtained during a naturally occurring information seeking occasion.

The research presented in this dissertation is relevant to public health researchers and professionals who aim to improve the dissemination and effectiveness of evidence-based information. Although the results of the empirical studies presented in this dissertation do not offer causal explanations, the ISU model and overall research objectives presented offer useful directions for future research and practice considerations. In addition to researchers across the fields of prevention science, information sciences, and nutritional sciences, the research presented in this dissertation may be of interest to care coordination professionals (McDonald et al., 2007), WIC educators (Morris et al., 2018), maternal and child health policy officials (Bradley & Martin, 1994; Hillemeier et al., 2015), and pediatric healthcare professionals (McAllister, Presler, & Cooley, 2007).

Chapter Summaries
In Chapter 1, I presented a new conceptual model of information seeking and use that can be broadly applied across health behaviors. This process model includes individual-level, information channel-level, and environmental predictors of information acquisition and application. This dynamic model can be used to inform future research on the development and adaption of evidence-based intervention programs within the context of modern influence on health behaviors and information exposure opportunities (Riley et al., 2011). The ISU model is a significant contribution across the fields of human development and family studies, nutritional sciences, and information sciences and technology because it addresses existing theoretical gaps in these fields by connecting information seeking and use processes to behavioral outcomes.

In Chapter 2, I explored how parents’ satisfaction with infant and toddler feeding information was associated with their information seeking aptitude and information acquisition characteristics. I also examined the extent to which information satisfaction could be accounted for by between-subject and between-channel differences. The results suggested that perceived utility of the information was strongly and positively associated with parents’ satisfaction with infant and toddler feeding information, as was trust in the information. Ease of information acquisition and clarity also showed positive and significant results, however the effect sizes were smaller in comparison to utility and trust. These findings suggest evidence-based information dissemination efforts should carefully plan for, and evaluate, utility and trust based on established standards of effective components of evidence-based interventions (Michie et al., 2013; Nation et al., 2003; Rotheram-Borus et al., 2009) and cognitive heuristics (i.e., evaluation mechanisms) of trust (Metzger & Flanagin, 2013).

A direct association between information seeking aptitude and information integration is proposed in the ISU model. However, the results in Chapter 2 revealed that two measures of
information seeking motivation, topic interest and information urgency, were not significantly associated with parents’ satisfaction with information about infant and toddler feeding. This finding may be due to the cross sectional nature of the data. Future studies should use longitudinal designs to examine information seeking aptitude prior to information gathering instead of a retrospective measure.

In Chapter 3, I explored features of parents’ behavioral application of the information about infant and toddler feeding they obtained across all information channels during their most recent information seeking occasion. I included variables within the demographic and socioeconomic characteristics; information seeking aptitude; behavioral capacity and intent; and Information integration domains of the ISU model. Results showed that behavioral application of infant feeding information was best classified by feeling motivated by information and ratings of information satisfaction. Including demographic variables did not improve classification above and beyond information seeking aptitude, integration, and behavioral capacity and intent variables. Identifying features of behavioral application is an important step toward helping childhood obesity prevention programs and services achieve their intended outcomes (e.g., increasing breastfeeding rates; Bunik, Krebs, Beaty, McClatchey, & Olds, 2009).

The results in Chapter 3 generally supported the proposed associations in the tested portions of the ISU model. In particular, there was strong support for the direct association between information integration and information use. However, behavioral intent did not emerge as a salient feature, possibly due to reporting biases. Future studies should use objective (e.g., geo-coded data on environmental capacity) and time-specific measures (e.g., intent measured in close proximity to a potential opportunity to apply information) to test the direct association between behavioral capacity and intent and information use.
Collective Implications for Future Research

**Theory testing and updates.** The ISU model offers testable predictions about information behavior that should be tested using longitudinal and experimental research designs. To advance the field of translational science, studies need to explicitly test the associations proposed in theoretical models and update them based on these findings (Head & Noar, 2014). To date, this iterative process has been limited for health behavior change theories. For example, in a meta-analysis of interventions that aimed to improve medication adherence, Jones and colleagues (2014) found that only 28% of studies that evaluated the effectiveness of interventions based on the health belief model reported measures of health beliefs (e.g., perceived severity). Kok and colleagues (2004) offer a useful guide for prevention sciences on how to map theories onto intervention planning to address this gap.

**Formative research on positive predictors of information satisfaction and use.** Much existing research on parents’ information behavior has focused on negative appraisals of existing resources (e.g., barriers, dislikes). However, previous theory and empirical research suggests that positive attributes of information, products, and services, are associated with engagement, such as topic interest and hedonic motivation (Renninger, 2000; Venkatesh, Thong, & Xu, 2012, 2016). Results presented in this dissertation suggest that positive aspects of information seeking aptitude and perceptions of information are associated with parents’ satisfaction with and use of infant and toddler feeding information. As previously recommended by other scholars (Maibach, Van Duyn, & Bloodgood, 2006; Rotheram-Borus, Swendeman, & Chorpita, 2012), prevention scientists should draw on market research and positive psychology approaches to identify opportunities to create delight while delivering evidence-based information (Crotts, Pan, & Raschid, 2008; Seligman, Steen, Park, & Peterson, 2005).
Timing of information delivery and behavioral application. Additional research is needed to explore how the timing of information delivery relative to the need to apply information is associated with behavioral application. This association was not explored in the empirical studies presented in this dissertation. However, there is evidence to suggest information timing plays a role in predicting behavior application. For example, Kervin and colleagues (2010) found that breastfeeding initiation was more strongly predicted by receiving breastfeeding support within half-an-hour of birth compared to having attended antenatal breastfeeding classes. Similar findings may be observed for information related to later child feeding behaviors, such as point-of-purchase advertising for food products or recipe searches that are conducted immediately prior to grocery shopping. Previous research has shown that access to mobile technology decreases the amount of time it takes to meet an information need (Sumita & Zuo, 2010), and scholars suggest technology as a way to deliver “just-in-time” interventions (Nahum-Shani et al., 2017). Future research should explore how information channel affordances facilitate the timely delivery of evidence-based information.

Novel information channels for evidence-based information dissemination. Relying on professionally trained prevention scientists to deliver evidence-based information may limit dissemination potential (Dearing, 2009). In the current study, family relatives (45%), friends (27%), and co-parents (22%) were frequently reported information channels. Similar findings have been reported in other recent studies of parents’ access of information channels for information about infant feeding topics (Davis, Cole, McKenney-Shubert, Jones, & Peterson, 2017; Matvienko-Sikar et al., 2018). To date, few interventions have leveraged existing social networks to promote protective factors and reduce risk factors for childhood obesity (Li, Barnett, Goodman, Wasserman, & Kemper, 2013; Zhang et al., 2015). Several interventions that aim to
influence parenting behaviors through peer approaches have created new social networks, such as asking parents to join new online groups (Fiks et al., 2017; Schoenebeck & Bruckman, 2013) or assigning novel peer counselors to WIC participants (Reeder, Joyce, Sibley, Arnold, & Altindag, 2014). While programs that form new social networks can be efficacious, it is typically more difficult to build something entirely new than it does to reinforce and support existing informal support structures (Jack, 2000; Schoenebeck & Bruckman, 2013). Future studies should explore the acceptability and feasibility of training known social network members to deliver evidence-based infant and toddler feeding information (Abbass-Dick & Dennis, 2018; Duncanson, Burrows, & Collins, 2014).

**Continued efforts to engage fathers in obesity prevention research, programs, and services.** Increasing fathers’ participation in research and prevention efforts for childhood obesity is important to support a holistic approach to obesity prevention (Morgan et al., 2017). While the current study included fathers, the participation rate was below the recruitment goal at 11%. Research that focuses specifically on men’s health information behavior (see Cramer, 2018) and father’s own perceptions of their involvement in childhood obesity prevention (see Khandpur, Charles, & Davison, 2016) should continue to grow. In a study of co-parenting around infant feeding, Thullen and colleagues (2016) found that some fathers viewed their role as motivating and supporting mothers in their infant feeding goals (e.g., duration of breastfeeding). Highlighting the importance of motivation in supporting maternal feeding behavior, a finding presenting in Chapter 3, may be a way to increase fathers’ interest in participating in childhood obesity prevention programs during infancy.

**Research on interpersonal and environmental predictors of parents’ information behavior regarding infant and toddler feeding.** The empirical studies presented in this
dissertation focused primarily on individual-level variables that may influence information satisfaction and behavioral application. However, information behavior takes place in a broader ecology of influences (Pettigrew, Segrott, Ray, & Littlecott, in press). Future research should explore information and channel factors and interpersonal and environmental variables within the behavioral capacity and intent domains proposed in the ISU model (e.g., child characteristics, social norms, policies).

**Conclusion**

This dissertation contributes theoretical and empirical knowledge that can be used to inform research conducted across the T0 Basic Discovery; T1 Methods and Program Development; and T2 Efficacy and Effectiveness Trials stages of the full translational spectrum of prevention sciences, particularly with regard to childhood obesity prevention. Although increasing parents’ participation in traditional, in-person preventive health services is an important goal, increasing the overall reach and impact of evidence-based infant and toddler feeding information will require innovative delivery systems that extend beyond traditional, in-person settings (Rodríguez, Garcia, Blizzard, Barroso, & Bagner, in press; Sigman-Grant, Rye, Loesch-Griffin, & Mitchell, 2008). This research contributes data regarding parents’ naturally occurring access of information channels for information regarding infant and toddler feeding. Findings regarding the predictors of satisfaction and use of information from these channels should direct future formative research initiatives. Relatively low-cost formative research that allows prevention scientists to capitalize on existing knowledge (i.e., improve the reach and impact of existing evidence-based information, programs, and services) may be especially beneficial in an uncertain funding climate for childhood prevention research (Hoagwood et al., 2018; Olds et al., 2013; Shelton, Cooper, & Stirman, 2018).
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Appendix A

Finding Infant Feeding Information Pilot Study Phase 1: Qualitative Interview Guide

Note: The order of questions may change depending on the nature of the interview. Some questions may not be asked directly if the participant spontaneously shares the information necessary to address the question. Questions marked with a bullet point are optional probes that will be asked only if the participant does not spontaneously share information that addresses that topic.

Before beginning the recording:

- Greet the participant and ask if it is still a good time
- Remind them of their rights as a research participant
- Remind them that they should avoid saying any identifying information during the recorded portion of the interview
- Tell them that they will hear an automated message when the recording begins

Grand Tour Question

1. Thank you for taking time to participate in this research study. As we discussed, the purpose of this study is to learn more about how parents find and apply information about feeding their infants and toddlers. In our last conversation I heard you have [a child of this age] named, [first name of child]. A lot of parents of children this age have questions, concerns, or interests related to feeding their children. I’d like to know: When you have a question about feeding your child, how do you go about finding an answer?
   - What do you look for in an information source?
• How do you choose among those sources?
• Why do you choose one source over another?

**Information Seeking Aptitude**

1. How are you currently feeding your child?
2. What prior experience do you have with feeding children under 2 years of age?
3. How interested are you in general in this topic?
4. Parents have to manage a lot of priorities when it comes to raising children. How much of a priority is child feeding compared to other parenting concerns you may have?
5. How much influence do you think you as a parent have over your child’s eating behavior?
   • How confident are you in your ability to have an impact on this issue?
6. Have you ever or do you ever intend to specifically look for information related to child feeding?
7. What informational resources do you have access to?
8. How much time do you have to search for information?
9. How easy or difficult is it for you to understand the information you receive about child feeding?
10. How open are you to incorporating new information into your child feeding routines?
**Behavioral Capacity**

1. How much would you say you know about what and how to feed children less than two years of age?
2. What goals do you have for feeding your child?
3. How confident are you in your ability to achieve these goals?
4. What are some skills or resources that you have that you think will help you navigate infant feeding?
   - What personal resources do you have?
   - What intrapersonal resources do you have (e.g., friends, family)
   - What environmental resources do you have (e.g., community supports)
5. What challenges might get in the way of these goals?

**Information Seeking Behavior**

1. Now I’d like to hear about some of the specific topics you’ve looked for in the past. Can you think of some questions about child feeding that you have looked for answers to?
2. I heard you say [List each topic one by one]. When did this question first come up for you?
   - How old was your child when you first had this question?
   - When did you start searching for information?
3. I’d like to talk more about your most recent search for child feeding information. It sounds like that was [Name most recent topic based on the timeline covered in question 2]. Is that correct?
4. What information were you looking for?
5. How much time would you say you put into this search?

6. How much effort did you have to put in?

7. How did you compare and integrate the information you received across sources?

8. Where are you in your search process regarding this topic?

9. I’d like to hear more about the specific resources you used in your search for [most recent child feeding topic]. What resources did you access to try to answer this question?

**Perceptions of Information Sources**

1. I heard you mention [List resources participant cited in previous question.] Of these, which resource did you like the most?

3. What did you like about this resource?
   - What do you think this resource did best?

4. What didn’t you like about this resource?
   - Is there anything you think could have been done better?

For both 3 and 4, note when/if the following topics are addressed:

- How useful is [resource] to obtain feeding information?
  - What makes it useful?

- How timely is [resource] for feeding information?
  - What makes it timely?

- What do you think the intent of [resource] is with regard to providing child feeding information?
  - How could you tell that is the intent?
• Do you think your friends would recommend using [resource] for feeding information?
  o Why or why not?

• Do you think [resource] has the child feeding information you need?
  o Why or why not?

• What do you think informs the information you get from [resource]?
  o How can you tell that is the source?

5. How about [ask about another resource they listed]? Repeat questions 3-4 for as many resources as time allows.

Possible resources include:

• Face-to-face communication
  o Family
  o Friends
  o Doctors
  o Peers
  o Co-workers
  o Day care providers
  o Preschool teachers
  o Parenting class

• Physical resources
  o Books
  o Magazines
• Websites
  o Search engines (ask which ones)
  o Specific websites (ask which ones)

• Social media
  o Ask which platforms
  o Ask who they follow for this information

• Other media
  o TV shows
  o Movies
  o Advertisements

If the resource is not mentioned, ask participants if they have used this and if not, why?
**Information Use**

1. Thinking about your overall search regarding [child feeding topic], how did you use the information you got from your search?

   • What did you learn from this search?
   • How did this search influence the way you feel?
   • How did this search influence your decision-making?
   • How did this search influence your planning?
   • What actions, if any, did you take as a result of this search?
   • How did this search update any previous ideas you had about this topic?
   • Did you share any information from this search with anyone?
     ○ If yes, who did you tell and how did you share the information?

2. It sounds like you used the information to influence your [insert use category or multiple categories as applicable]. Do you agree with that categorization or is there another way you would put that?

   Possible use categories include: Thinking, learning, feeling, decision-making, planning, acting, updating, and sharing
**Information Seeking and Use Process Evaluation**

1. How satisfied are you with this search?
   - Did you achieve your goal?
   - What were the short-term outcomes?
   - What are the expected long-term outcomes?
   - How did the costs of the search compare to the benefits?

2. If you have another question that was similar, would you approach your search in the same way?
   - What would you do the same?
   - What would you do differently?

3. Compared other searches you have done, how easy or difficult was this search?
   - What made the search easy?
   - What made the search hard?

Repeat questions starting with *Information Seeking Behavior Q3* regarding the next most recent child feeding topic as time allows.

**Closing questions**

1. What would be the ideal way for you to get information about feeding your infant and toddler? You can suggest anything you think would be helpful, even if it might not currently exist.

2. Is there anything else that we didn’t cover today that you thought we would discuss?

Stop recording. End of interview. Confirm email address to send Amazon gift card.
Appendix B

Finding Infant Feeding Information Pilot Study Phase 2: Cognitive Interview Questions

The PI will address each question from the online survey with the participant and use probes as time allows. The probes will include those suggested by (Collins, 2003):

- How did you go about answering that question?
- Tell me what you were thinking?
- I noticed you spent a long time on this question – what were you thinking about?
- How easy or difficult did you find this question to answer? Why do you say that?
- What does the term X mean to you? What did you understand by X? How did you remember that?
- Did you have a particular time period in mind?
- How did you calculate your answer?
- How well do you remember this?
- How sure of your answer are you?
- How did you feel about answering this question?
- Were you able to find your first answer to the question from the response option shown?

Reference

Vita
Allison Doub Hepworth

EDUCATION

Ph.D. Human Development and Family Studies, Pennsylvania State University 2018
Minors: Information Sciences and Technology and Nutritional Sciences

M.S. Human Development and Family Studies, Pennsylvania State University 2015

B.S. Human Development and Family Studies, Pennsylvania State University 2010
Minor: Psychology

AWARDS

The Obesity Society Health Services Research Poster Competition Award 2017
Ruth W. Ayres-Givens Scholarship, Penn State University 2016
The Obesity Society Pediatric Obesity Poster Competition Award 2015
The Obesity Society eHealth/mHealth Poster Competition Award 2014
Graham Endowed Fellowship, Penn State University 2012-2013

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MANUSCRIPTS


