EXAMINING THE RELATIONSHIPS BETWEEN PARENTAL MENTAL HEALTH, FEEDING STYLES, AND WEIGHT IN FORMULA-FED INFANTS

By

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Formula-fed infants are at greater risk for obesity compared to breastfed infants; however, some families are not able to or choose not to breastfeed. Parental feeding styles have been associated with infant weight, and parents of infants experience stress, depression, and anxiety for a variety of reasons. The first year of life is a critical period for establishing optimal nutrition, and little is known about the relationships between parental mental health and feeding styles during infancy especially among formula-feeding families. Guided by El-Behadli and colleagues' Extended UNICEF Care Model, this study used a descriptive cross-sectional survey design to examine relationships between parental mental health and feeding styles in parents of healthy, term formula-fed infants residing in the United States.

In this study, 306 parents were recruited from parenting and infant feeding-related Facebook groups and local pediatricians' offices. Participants completed demographic and infant feeding background information, Infant Feeding Style Questionnaire (IFSQ), Patient Health Questionnaire Depression Module (PHQ-9), Generalized Anxiety Disorder Assessment (GAD-7), and Perceived Stress Scale (PSS-10). Descriptive statistics were used to analyze demographic data and determine prevalence of feeding styles. Sequential logistic regression was used to examine how well stress, depression, and anxiety predicted whether parents predominantly exhibited the non-responsive feeding style based on self-report. Findings concluded that reduced time spent on infant feeding and high levels of depressive symptoms along with low levels of anxiety and stress were the strongest predictors of non-responsive

feeding. Most of our sample (56.5%) predominantly exhibited non-responsive feeding styles. Additionally, fathers more commonly exhibited non-responsive feeding styles compared to mothers, and there was a significant relationship between participants who were enrolled in WIC and non-responsive feeding styles.

Our findings indicate a need for increased infant feeding support for parents, especially those experiencing depressive symptoms. Additionally, infant feeding support by healthcare professionals and in WIC programs is warranted for all parents, including those who formula-feed. Finally, there is a need to include fathers in infant feeding education and future research studies.

EXAMINING THE RELATIONSHIPS BETWEEN PARENTAL MENTAL HEALTH, FEEDING STYLES, AND WEIGHT IN FORMULA-FED INFANTS

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DEDICATION

This dissertation is dedicated to my dad, who left this Earth too soon, almost 17 years ago. Thank you for watching over me. I have worked hard over the years in hopes of making you proud. I miss you so much. I love you, my guardian angel.

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Finally, I would like to acknowledge and thank the individuals who took the time to share the survey or participate in the study. I hope this is the start of building knowledge on mental health and feeding style relationships and supporting all parents in their infant feeding journeys.

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CHAPTER 1: INTRODUCTION

Background

There is currently an obesity epidemic in the United States (US) that is affecting individuals of all ages and contributing to a steep rise the nation's healthcare costs (Biener et al., 2018). Twenty percent of children in the US are overweight or obese, increasing their risk of developing chronic illness (Geng et al., 2018; Hales et al., 2017; Skinner et al., 2018). Breastfeeding has many protective benefits, including decreasing childhood obesity risk (Anderson et al., 2020; Yan et al., 2014), and the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) recommend exclusive breastfeeding for the first six months of life (WHO, 2021). While breastfeeding is the healthiest option for infant feeding, many women choose not to or are unable to breastfeed for various reasons (Abrams & Daniels, 2019).

In the US, 75% of infants receive nutrition from sources other than breastmilk as primary sources of nutrition during the first six months of life (Centers for Disease Control and Prevention [CDC], 2020a). Gibbs and Forste (2013) found that formula-fed infants were 2.5 times more likely to be obese at 24 months than breastfed infants. Other studies have shown that exclusively formula-fed infants are more likely to be obese in their early childhood years than breastfed infants, especially when overfed (Watchmaker et al., 2020; Whaley et al., 2017). Further, formula-fed infants experience rapid weight gain more often than breastfed infants, which may increase their odds up to 3.7 times for being overweight or obese in adulthood (Appleton et al., 2018b; Savage et al., 2007; Zheng et al., 2018).

Parental depression and anxiety have been positively correlated with obesity in children from birth through adolescence (Marco et al., 2020), and parental feeding styles have been associated with infant weight (Spill et al., 2019). Infants are dependent upon their caregivers and fully rely on them to provide adequate nutrition. Therefore, it is critical to understand factors that influence parents' feeding styles, including the impact of mental health on feeding styles, to

foster optimal infant feeding environments and reduce childhood obesity risk in formula-fed infants. The purpose of this study was to investigate the influence of parental mental health following birth on feeding styles and weight in healthy, term, formula-fed infants during the first year of life. Chapter 1 will provide an overview of parental mental health and feeding styles, the significance of the research, and research questions. The Extended UNICEF Care Model that guided the study, conceptual and operational definitions, and philosophical underpinnings will also be discussed.

Parental Mental Health

Parents of infants experience stress, depression, and anxiety for a variety of reasons. Systematic reviews have revealed a postnatal anxiety prevalence rate of up to 18% among men (Leach et al., 2016) and up to 43% among women (Fallon et al., 2016a). Stress is also common in the perinatal period, with up to 30% of women experiencing stress during pregnancy and up to two years after birth (Matvienko-Sikar et al., 2021). Mothers identify stressors related to juggling responsibilities of a new infant, infant health issues, pressure to breastfeed, and changing family dynamics (Ayers et al., 2019). Fathers also experience stress when their children are infants and identify work and childcare restrictions as contributors to stress during this time (Johansson et al., 2020). When examining parental mental health, the effect of the COVID-19 pandemic must be considered. From August 2020 to February 2021, symptoms of anxiety or depression increased from 36.4% to 41.5% in adults, with the largest increases in adults ages 18 to 29 years, which includes those of childbearing age (Vahratian et al., 2021). This is concerning because parental stress, depression, and anxiety have been associated with non-responsive feeding styles in infancy (Barrett et al., 2016; Gaffney et al., 2018; Hurley et al., 2008; Savage & Birch, 2017). Further, formula-feeding mothers experience greater stress, depression, and anxiety compared to breastfeeding mothers (Penniston et al., 2021; Shuman et al., 2022). Formula feeding stigma, which will be discussed in the following section, is a contributing factor to mental health symptoms experienced by formula-feeding parents.

Formula Feeding Stigma

There is stigma associated with formula feeding that may contribute to parental mental health issues during infancy. Formula-feeding mothers report feeling guilty and shamed for their feeding choice (Fahlquist, 2016; Jackson et al., 2021; Hvatum & Glavin, 2017; Thomson et al., 2015), isolated (Thomson et al., 2015), inadequate as mothers (Fahlquist, 2016; Jackson et al., 2020; Thomson et al., 2015) and unsupported by healthcare professionals (HCP; Appleton et al., 2018a; Jackson et al., 2021; Thomson et al., 2015). In a sample of parents in high-income countries, 64% of formula-feeding mothers experienced guilt resulting from interactions with HCP, and 76% felt obligated to defend their feeding method choice (Fallon et al, 2016b). Formula-feeding stigma likely originates from judgment of feeding intention rather than the superiority of breastmilk to formula because mothers who intended to formula-feed were perceived more negatively than mothers who intended to breastfeed but were unsuccessful (Moss-Racusin et al., 2020). It is possible that some of the stress, depression, and anxiety experienced by parents stems from feeling unsupported in their feeding choice or being pressured to breastfeed (Penniston et al., 2021).

Parental Feeding Styles

Parental feeding styles encompass *"*the overall attitude and emotional climate that a parent creates with his or her child during eating episodes" (El-Behadli et al., 2015, p. S59). Feeding styles are different from feeding practices in that "parental feeding practices are specific behaviors that parents use to influence the amount and/or type of food a child eats" (Lindsay et al., 2017, p. 2). In other words, parental feeding practices make up feeding styles in infancy, which describe overarching tendencies of how parents engage in feeding sessions. The terminology in infant feeding and obesity prevention literature is inconsistent, so it is important to explicitly define feeding styles and practices to clarify terms in this research area for the purposes of this study (Hughes et al., 2013). There are two main types of feeding styles: responsive and non-responsive.

Responsive

Advisory agencies such as the American Academy of Pediatrics (AAP; 2017), Institute of Medicine (IOM; Birch et al., 2011), UNICEF, WHO, and the United States Department of Agriculture (USDA) recommend responsive feeding (Engle & Pelto, 2011), which refers to caregivers providing a pleasant feeding environment and being in tune with and attentive to infant hunger and satiety cues (El-Behadli et al., 2015; National Academies of Sciences, Engineering, and Medicine, 2020; Pérez-Escamilla et al., 2017; Thompson et al., 2009). According to agency guidelines, caregivers should be encouraged to provide a nurturing environment and remain attentive and responsive to their infants' hunger and satiety cues during feeding sessions (Pérez-Escamilla et al., 2021). Consistent with the responsive feeding style, Ellyn Satter, a dietitian and family therapist internationally recognized for her expertise in pediatric nutrition, coined the concept of Division of Responsibility. This concept posits that "Parents are responsible for the *what*, *when*, and *where* of *feeding*; children are responsible for the *how much* and *whether* of *eating*" (Satter, 2000, p. 3).

Non-Responsive

Non-responsive feeding styles encompass all types of feeding styles that deviate from the recommended responsive feeding style. With each of the non-responsive feeding styles, parents exhibit characteristics that are the opposite of responsive feeding, including not being in tune with and attentive to infant hunger and satiety cues (Pérez-Escamilla et al., 2017). Thompson et al. (2009) divides non-responsive feeding styles into four categories: indulgent, laissez-faire, restrictive, and pressuring. These four non-responsive feeding styles are defined in the Conceptual and Operational Definitions section of this chapter.

Significance

There are several areas of significance that support infant feeding research, particularly as it is related to parental mental health and infant weight. In the following section, infant self-regulation and health disparities in perinatal mental health and childhood obesity are discussed.

Infant Self-Regulation

Self-regulation of feeding in infancy is related to the infant's ability to self-regulate their energy intake based on internal hunger and satiety cues (Birch & Davison, 2001). Infants possess the innate ability to self-regulate their energy intake; however, parents can potentially override an infant's self-regulation ability during bottle feeding sessions if infant feeding cues are not acknowledged or recognized (Hughes et al., 2013; Johnson & Birch, 1994; Savage et al., 2007). Infant self-regulation ability "is viewed as the extent to which feeding environments and interactions allow the biological potential of the child for self-regulation to be actualized" (DiSantis et al., 2011, p. 481). Studies have shown that non-responsive feeding styles can disrupt children's appetite regulation by compromising their abilities to recognize internal satiety cues (Birch & Fisher, 1998; Birch et al., 2003; Hodges et al., 2020; Rollins et al., 2014; Ventura & Birch, 2008). In a secondary analysis of the Infant Feeding Practices II national survey data, Li et al. (2010) found that infants who were primarily bottle-fed during the first six months of life were twice as likely to empty the bottle or cup from six to 12 months than infants who were primarily breastfed during their first six months of life; results were similar for infants bottle-fed with formula compared to those bottle-fed with expressed milk. Additionally, in a sample of Hispanic maternal-infant dyads in California, mothers' non-responsive, restrictive feeding practices were associated with overeating at 12 months of age, indicating a disruption in infant self-regulation (Schneider-Worthington et al., 2021). Further, in a systematic review, Samdan et al. (2020) reported that research suggests that infants of parents who exhibit pressuring feeding styles have more food refusal behaviors and less appetite from ages birth to four months. Because parental feeding practices influence feeding self-regulation, it is important to understand how factors such as parental stress, depression, and anxiety contribute to non-responsive feeding styles in infancy. Parental mental health after birth may influence the way mothers and fathers feed their infants, which can impact their child's long-term eating habits.

Health Disparities

Health disparities related to parental mental health and infant and childhood obesity in the US are clearly documented in the literature. In this study, attempts to address disparities were incorporated in the research design, specifically in the recruitment of underrepresented groups and formula-feeding parents to develop future interventions that support optimal mental health and safe formula-feeding practices during infancy. In this section, disparities in mental health and obesity, including how they relate to feeding method choice are discussed.

Mental Health

Parents of infants who are people of color experience disproportionately higher rates of mental health disorders compared to White parents of infants. Koning and Ehrenthal (2019) found that non-Hispanic Black, Hispanic, American Indian, and Alaska Native mothers were disproportionately exposed to toxic stressors such as inter-partner violence, divorce, incarceration, or homelessness. Additionally, non-Hispanic Black and Hispanic women more commonly report experiencing postpartum depressive symptoms compared to non-Hispanic White women (Howell et al., 2005; Pao et al., 2019). Not only do non-Hispanic Black and Hispanic women have increased risk of perinatal mental health disorders, they also have lower rates of treatment engagement than their non-Hispanic White counterparts (Dagher et al., 2021; Kozhimannil et al., 2011; Lara-Cinisomo et al., 2021).

Research suggests that women who experience postpartum anxiety are more likely to formula-feed than breastfeed their infants (Fallon et al., 2016a; Sun et al., 2020). Chih et al. (2021) found that women with postpartum depressive symptoms had a 51% increased likelihood of exclusively formula feeding their infants at hospital discharge than women not experiencing depressive symptoms. Penniston et al. (2021) found that mothers who were not breastfeeding experienced increased levels of distress, depression, and anxiety compared to their breastfeeding counterparts. Therefore, there is a critical need to provide mental health support to parents of infants, including support of feeding choice, to foster optimal health outcomes.

Obesity

Breastfeeding in infancy is associated with decreased risk for later childhood obesity (Wang et al., 2017). However, breastfeeding rates are disproportionate across ethnic groups in the US. Non-Hispanic Black infants were significantly less likely to be breastfed than White infants at three months (58% vs 73%) and six months (45% vs 62%; Beauregard et al., 2019). Of those who initiate breastfeeding, non-Hispanic Black (32%) and Hispanic (33%) parents are more likely than other underrepresented groups to supplement their infants with formula during the first two days of life (Jones et al., 2015). While Hispanic mothers have the highest rate of breastfeeding initiation and continuation among all mothers, most engage in the cultural practice of "*las dos cosas*," where they concurrently breast and formula-feed their infants (Gaffney et al., 2018; Jones et al. 2015; Sloand et al., 2016). Further, Hispanic mothers are more likely to pressure their infant to finish the bottle compared to non-Hispanic Black or non-Hispanic White mothers, which may contribute to increased weight gain in infancy (Cheney et al., 2019; Perrin et al., 2014).

Obesity rates also reflect disparate outcomes by race and ethnicity. Obesity prevalence in the US is higher across the lifespan in non-Hispanic Black and Hispanic individuals compared to their non-Hispanic White counterparts (Akinbami et al., 2017; Ogden et al., 2020). Specifically, rapid weight gain in infancy is more common among non-Hispanic Black and Hispanic infants compared to White infants (Taveras et al., 2010), and as of 2018 US childhood obesity rates were highest among Hispanic (25.6%) and non-Hispanic Black (24.2%) children compared to non-Hispanic White (16.1%) children (Fryar et al., 2021).

These disparities highlight the need to examine potential contributing factors of childhood obesity in the early stages of life including parental mental health and feeding styles in formula-fed infants. The following sections will discuss the purpose of the study and research questions respectively.

Purpose

The purpose of this study was to investigate the influence of parental mental health

following birth on feeding styles and weight in healthy, term, formula-fed infants during the first year of life.

Research Question

The goal of this research study was to address the following research question:

What is the relationship between parental mental health, parental feeding styles, and infant weight? The sub-research questions are:

a. What is the relationship between stress, depression, anxiety, and feeding styles in parents of formula-fed infants?
b. Is there a difference in stress, depression, anxiety, and parental feeding styles in mothers compared to fathers?
c. What is the relationship between parental stress, depression, anxiety, and infant weight?
d. What is the relationship between parental feeding styles and infant weight?

Conceptual Model

UNICEF (1991) developed a conceptual model depicting a strategy for improving nutrition for women and children in developing countries. Since its conception, this model has been expanded upon and modified to provide a framework for supporting optimal maternal-child nutrition globally. The original UNICEF (1991) model of care was developed to conceptualize factors that influence malnutrition, including insufficient household security, inadequate maternal and childcare, insufficient health services, and unhealthy environment. Since its development, researchers have extended the model to include factors that influence nutrition in infants and children including economic, caregiver, and community health resources, as well as certain demographics and child characteristics (Engle et al., 1997a; Engle et al., 1997b; Engle et al., 1999; Wachs et al., 2008). The UNICEF care model extensions have primarily focused on childhood nutritional deficiencies.

The Original UNICEF Care Model

The original UNICEF Care Model focuses on causes of malnutrition related to undernourishment. It is based on the premise that food insecurity, unsanitary environment, and inadequate maternal and childcare contribute to insufficient dietary intake and disease, which ultimately leads to malnutrition and death (UNICEF, 1991). Further, actions that address these causes of malnutrition include promoting immunizations to combat infectious diseases, health and nutrition education dissemination, family planning to prevent short-interval births, breastfeeding for up to two years and beyond, universal access to clean water supply, and community childcare for children so mothers can experience opportunities for improving their family's financial status and ability to be freed from food insecurity (UNICEF, 1991). This conceptual framework highlights the complexity of malnutrition by depicting its multifactorial nature, and it provides a foundational springboard for the development of extended models for various contexts in the realm of child nutrition.

Wachs' Revised Extended UNICEF Care Model

Wachs' (2008) revised UNICEF Extended Care Model encompasses a systems perspective by depicting moderating and mediating relationships between identified elements influencing child nutrition. It is based on the premise that factors beyond just food availability and economic resources contribute to child nutrition status. Child nutrition is influenced by three main types of resources: economic resources, caregiver resources, and community health resources. Wachs' (2008) revised caregiver resources include maternal intelligence, education, and depression. Wachs (2008) defines maternal intelligence as an "individual's ability to both modify and adapt to their environment" (p. 51). Additionally, this model introduces child characteristics as factors contributing to child nutrition status including child health, gender, age, and temperament (Wachs, 2008). This model does not include cultural influences on child nutrition. Further, it omits some influencing factors from the original model such as maternal work status and age, spousal mental health, and family size due to inconsistent evidence that these factors influence child nutrition (Wachs, 2008). The goal of this model was to depict "that

the relation of the adequacy of child nutrition to family economic resources, caregiver resources and child characteristics is best described in system terms, where the influence of any one variable depends to some degree on the nature and level of other variables in the system" (Wachs, 2008, p. 53). This model is focuses on addressing nutritional deficiencies in children; however, Wachs (2008) suggests the model may be similarly applied to childhood obesity.

El-Behadli and Colleagues' Extended UNICEF Care Model

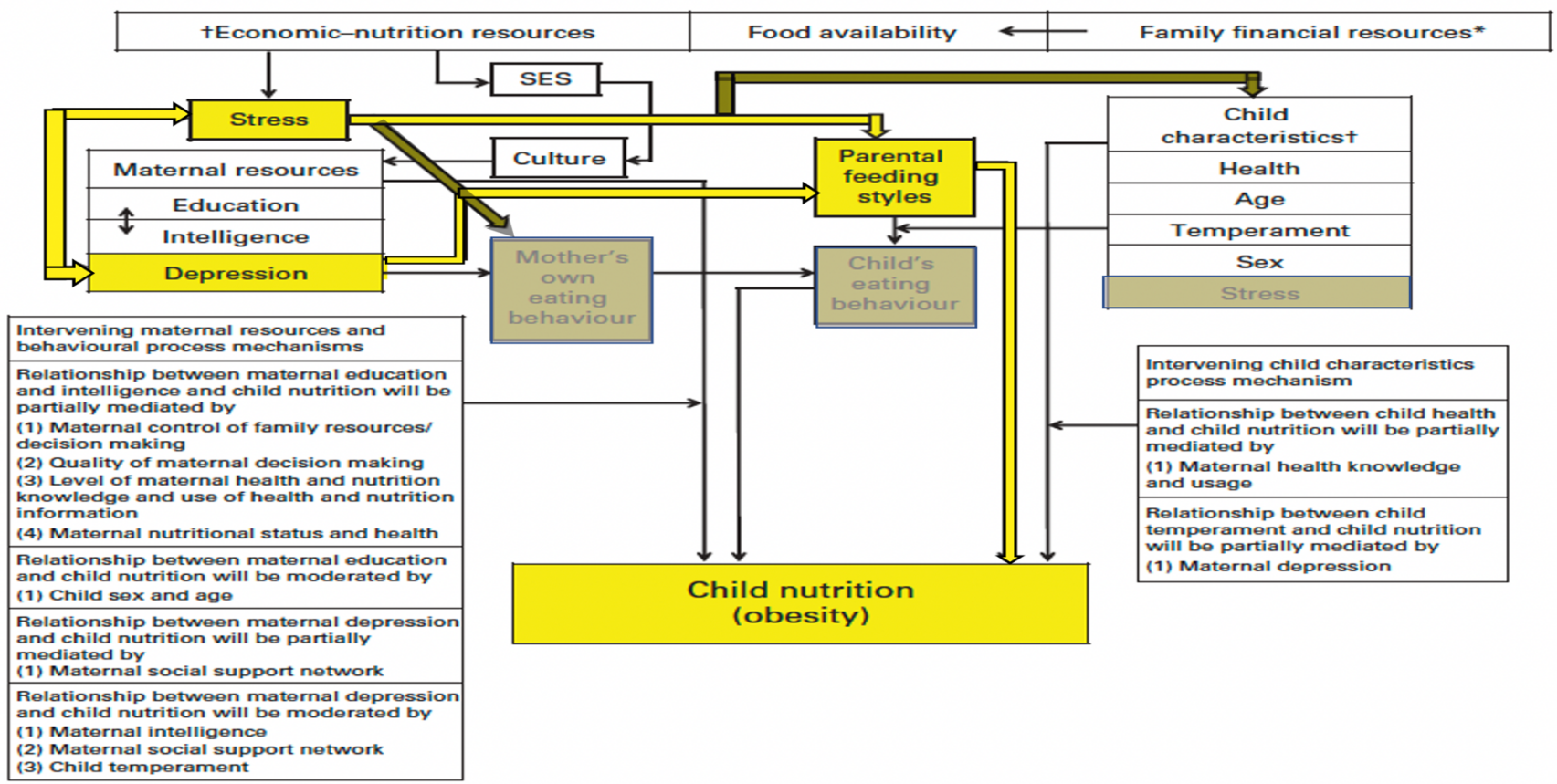
El-Behadli et al. (2015) modified Wachs' revised UNICEF Extended Care Model (2008) to focus on factors influencing childhood obesity "with an emphasis on the emotional climate of the parent-child relationship within the family" (p. S57). While the revised model still includes financial resources and food availability as contributing to child nutrition, it uses a systems approach to highlight that beyond economic factors, the emotional climate of the parent-child relationship, including mental health elements such as parental stress and depression, impacts feeding interactions. This model indicates a bidirectional influence between parental stress and depression and a unidirectional influence of parental stress and depression on feeding styles (El-Behadli et al., 2015). While anxiety is not a concept included in this model, it was explored as a mental health concept in this study because anxiety commonly occurs with depression, specifically during the perinatal period and in general (Chinchilla-Ochoa et al., 2019; Nakić Radoš et al., 2018; Salcedo, 2018). The model also depicts a unidirectional relationship between parental feeding styles and child nutrition (El-Behadli et al., 2015).

El-Behadli and colleagues' (2015) Extended UNICEF Care Model that guided this study is shown in Figure 1. The authors' expanded concepts and relationships are shaded and highlighted; the highlighted concepts and relationships were explored in this study. In addition to the relationships previously described, El-Behadli et al. (2015) proposed that parental depression directly affects a mother's own eating behavior, which impacts child eating behaviors and subsequently child nutrition. The authors discuss child eating behavior related to diet quality and food preferences such as fast-food cuisine, sweetened snack and beverage, and fruit and

vegetable consumption in preschool and school-aged children (El-Behadli et al., 2015). Because infants are dependent upon their caregivers and do not make food choices, this study was based on the hypothesis that parental feeding styles would directly influence infant nutrition and weight in formula-fed infants.

Figure 1

El-Behadli and Colleague's Extended UNICEF Care Model



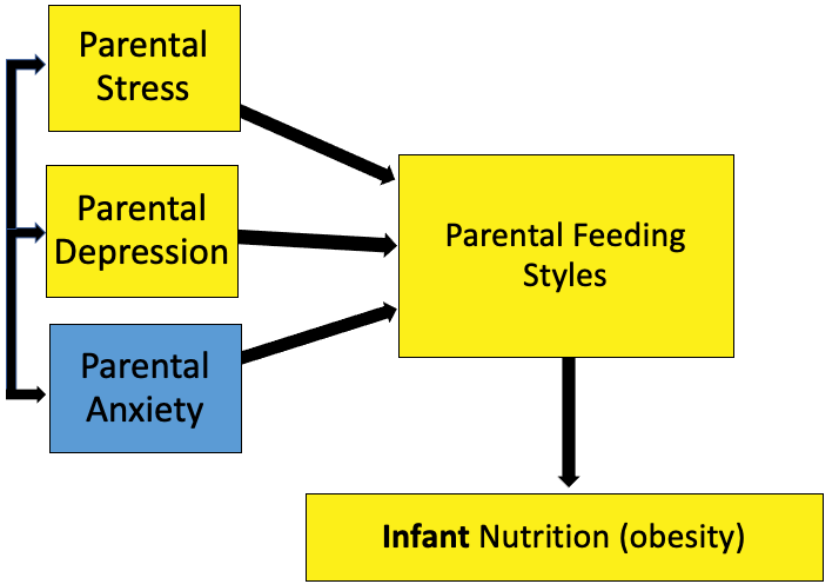
*Note. * Family financial resources will mediate the influence of maternal education and moderate the influence of social support. † Child age may moderate the influence of family economic–nutrition resources. Double-headed arrows indicate bidirectional influences and arrows intersecting other arrows indicate mediation of moderation processes.*

Research Study Model

This study was guided by El-Behadli and Colleagues' (2015) Extended UNICEF Care Model; however, the purpose of this study was limited to the investigation of the influence of parental mental health following birth on feeding styles and weight in formula-fed infants. In addition to stress and depression, anxiety was examined as a parental mental health variable because anxiety commonly occurs with depression (Chinchilla-Ochoa et al., 2019; Nakić Radoš et al., 2018; Salcedo, 2018). Figure 2 illustrates the variables that were examined in this study including the additional parental mental health factor, anxiety, and the focus on infant nutrition.

Figure 2

Research Study Model



Note. The blue-colored box indicates that parental anxiety is a mental health variable that was not included in the original model but was added in this study, and the bolded "infant" text indicates that the focus shifted from child nutrition in the original model to infant nutrition in this study.

Conceptual and Operational Definitions

Family Structure

Due to the need to further investigate the tendencies for men to engage in non-responsive feeding styles that has been found in a few studies (Barrett et al., 2018; Benjamin-Neelon & Neelon, 2020; Daniels et al., 2020), this study examined mental health and feeding styles in cisgender male and female primary caregivers of infants in heterosexual-parent families. However, it is acknowledged that there are a variety of family structures including self-identified gender-diverse parents, and therefore parental mental health and infant feeding styles should be examined in these family structures in future studies.

Parent

For the purposes of this study, parents are defined as primary male and female caregivers of infants less than one year of age.

Mother

In the context of this study, mothers are persons who self-identify as the infant's primary female caregiver.

Father

In the context of this study, fathers are persons who self-identify as the infant's primary male caregiver.

Healthy Infant

For the purposes of this study, a healthy infant is defined as a child less than one year of age who was born full-term and is has not been diagnosed with a health condition that may impact appetite and nutritional needs such as prematurity, Down Syndrome, Prader-Willi Syndrome, epilepsy, cleft lip or palate, cerebral palsy, failure to thrive, or severe food allergies (Thompson et al., 2009).

Parental Mental Health

In the context of this study, parental mental health encompasses symptoms of stress, depression, and anxiety experienced by parents of infants less than one year of age.

Stress

Stress is “a person's discomfort when exposed to difficult and uncontrollable circumstances” (Engle et al., 1999, p. 1317). Stress involves mental tension or discomfort in parents of infants less than one year of age that may impact infant feeding. In this study, parental stress was measured using the ten-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988).

Depression

Depression is “a lack of positive affect, energy, and optimism that appears to be excessive, given the situation” (Engle et al., 1999, p. 1317). In the context of infant feeding, depression involves excessive negative affect and energy in parents of infants less than one year of age. In this study, parental depression was measured using the nine-item Patient Health Questionnaire Depression Module (PHQ-9; Kroenke et al., 2003).

Anxiety

Anxiety is *“*an emotion characterized by feelings of tension, worried thoughts and physical changes” (American Psychological Association, n.d.). Anxiety involves apprehensiveness, nervousness, and worried feelings exhibited by parents that may have an impact on infant feeding. While anxiety is not a concept included in El-Behadli and Colleagues’ (2015) Extended UNICEF Care Model, it was explored as a mental health concept related to parental feeding styles in this study since anxiety commonly occurs with depression in general and specifically during the perinatal period (Chinchilla-Ochoa et al., 2019; Nakić Radoš et al., 2018; Salcedo, 2018). In this study, parental anxiety was measured using the seven-item Generalized Anxiety Disorder Assessment (GAD-7; Spitzer et al., 2006).

Parental Feeding Styles

Parental feeding styles encompass *“*the overall attitude and emotional climate that a parent creates with his or her child during eating episodes” (El-Behadli et al., 2015, p. S59). In the context of infant feeding, specific feeding styles have been identified in the literature, which

are laissez-faire, pressuring, restrictive, responsive, and indulgent (Thompson et al., 2009). Parental feeding styles in infancy were measured using the Infant Feeding Style Questionnaire to identify feeding styles as self-reported by parents (IFSQ; Thompson et al., 2009).

Laissez-Faire

Parents exhibiting laissez-faire feeding styles do not limit formula quantity and show little or no interaction with the infant during feeding (Thompson et al., 2009). Feeding practices associated with the laissez-faire feeding style include propping a bottle or watching television while feeding the infant (Thompson et al., 2009).

Pressuring

Parents exhibiting pressuring feeding styles are concerned with increasing the amount of formula the infant consumes and use formula to soothe the infant (Thompson et al., 2009). Feeding practices associated with the pressuring feeding style include trying to get the infant to finish the bottle, feeding the infant in the absence of hunger cues, or continuing to feed when satiety cues are exhibited by the infant. Additionally, adding cereal to an infant's bottle and feeding the infant to make them stop crying are practices consistent with the pressuring feeding style (Thompson et al., 2009).

Restrictive

Parents exhibiting restrictive feeding styles limit the quantity of formula consumed even if the infant continues exhibiting hunger cues (Thompson et al., 2009). Feeding practices associated with the restrictive feeding style include not feeding the infant when hunger cues are exhibited and carefully controlling the amount of formula the infant consumes (Thompson et al., 2009).

Responsive

The AAP (2017), IOM (Birch et al., 2011), UNICEF, WHO, and USDA recommend responsive feeding (Engle & Pelto, 2011), which refers to caregivers providing a pleasant feeding environment and being in tune with and attentive to infant hunger and satiety cues (El-

Behadli et al., 2015; Pérez-Escamilla et al., 2017; Thompson et al., 2009). Infant hunger cues include rooting, smacking lips, moving hands to mouth, and clenching hands. Infant satiety cues include, spitting out the bottle, falling asleep while feeding, turning head away from the bottle, and relaxing hands (CDC, 2020b). Parents exhibiting the responsive feeding style are not distracted and remain focused on the infant during feeding sessions.

Indulgent

Parents exhibiting the indulgent feeding style "do not set limits on the quantity or quality of the food consumed" (Thompson et al., 2009, p. 211). Feeding practices in the indulgent feeding construct are described in terms of toddlers; examples include providing the toddler desserts to keep them happy or allowing the toddler to watch television while eating to ensure they eat enough (Thompson et al., 2009). In infancy, the indulgent feeding style can be exhibited when introducing solid foods. Feeding styles that are most applicable to bottle-feeding include laissez-faire, pressuring, restrictive, and responsive. Therefore, the indulgent feeding style was not examined in this study.

Infant Weight

Infant weight is the mass or quantity of heaviness of an infant (National Library of Medicine, n.d.). The CDC (2010) and WHO (2020) recommend classifying infant weight status by calculating weight-for-length z-scores (WFL-Z) and using the WHO growth standards charts. Infant overweight was defined as WFL-Z greater than two standard deviations above the median, and infant obesity was defined as WFL-Z greater than three standard deviations above the median according to the WHO (2006) growth standards charts for children ages birth to five years.

Philosophical Underpinnings

The underpinnings of El-Behadli and Colleague's (2015) adaptation of the Extended UNICEF Care Model, which also underpin this study, include post-positivism, pragmatism, and systems theory.

Post-Positivism

The Extended UNICEF Care Model is based on empirical studies aimed at explaining relationships and seeking predictions; it is therefore underpinned by the scientific paradigm encompassing the ontological position of critical realism and the epistemological position of modified objectivity (Lincoln et al., 2011; Ryan, 2019; Scotland, 2012). The scientific method is being used to understand associations between variables related to a social phenomenon (Corry et al., 2019). In post-positivism, scientific precision is valued but acquiring knowledge is not limited to what is directly observable; evidence can be discovered through instruments such as self-reported questionnaires (Clark, 1998). The post-positivism philosophical framework guides research to gain approximation of the truth; post-positivism supports that studying these concepts and their relationships gets researchers closer to the truth, but science does not uncover absolute truth (Clark, 1998; Mack, 2010). Further, knowledge is subject to falsification (Corry et al., 2019; Ryan, 2019). For example, the relationships depicted in this conceptual framework are informed by several iterations of the model developed over time based on current published literature. Societal factors may impact parental feeding styles across time, and the post-positivistic philosophy acknowledges that these depicted relationships between parental mental health, parental feeding styles, and infant weight may be falsified through future research.

Pragmatism

The foundation of pragmatism is the pursuit of knowledge to guide action toward necessary practice change (Goldkuhl, 2012). In other words, knowledge for the sake of knowledge is pointless; to have meaning, knowledge must alter existence. Human action drives change for societal good (Goldkuhl, 2012). Pragmatist thought “assumes that interaction is inherently dynamic and interpretive and addresses how people create, enact, and change meanings and actions” (Charmaz, 2014, p. 9). The pragmatic, purposeful pursuit of knowledge guided by this philosophical perspective is to inform the development of interventions for

improving parental mental health in infancy and to support parents who choose to formula feed their infants by providing education on appropriate formula-feeding practices and the responsive feeding style to ultimately decrease infant rapid weight gain and childhood obesity rates.

Systems Theory

Ecological Systems Theory is based on the premise that development occurs through complex relationships within a child's environment (Bronfenbrenner, 2005). Consistent with a systems framework, a change in any element in the model can lead to change in another element and the system as a whole (Shelton, 2018). Just as environmental factors within the system impact infant feeding, the infant also contributes to this relationship. For example, infant temperament and clarity of hunger and satiety cues impact the parent's ability to engage in responsive feeding (DiSantis et al., 2011; El-Behadli et al., 2015; Stifter & Moding, 2018; Ventura et al., 2019). The parent-child relationship is placed in the microsystem, which is the most proximal influence on child development (Bronfenbrenner, 2005). Therefore, this underpinning supports that while all parts of the environmental system contribute to infant nutrition, the parent-infant relationship, including feeding styles, makes the most immediate impact on the development of overweight and obesity (Bergmeier et al., 2020).

Descriptions of Manuscripts

The dissertation presented follows the Manuscript Option Dissertation. Two manuscripts are presented in lieu of Chapters 4 and 5 of the traditional dissertation.

Manuscript One is an integrative review examining the state of the science related to anxiety, depression, and feeding styles in parents of bottle-fed infants. The findings of this integrative review support the need to conduct our study. The second manuscript answers the research questions proposed in this dissertation.

Manuscript Two presents the findings of the study examining the relationships between stress, depression, anxiety, and feeding styles in parents of healthy, term formula-fed infants residing in the US.

Summary

The purpose of this study was to investigate the influence of parental mental health following birth on feeding styles and weight in healthy, term, formula-fed infants during the first year of life. The El-Behadli et al. (2015) extended UNICEF care model provided a guiding framework for this study. The philosophical underpinnings of this study include post-positivism, pragmatism, and systems theory. The outcomes of this study may inform policies and educational interventions for clinicians and parents of infants related to supporting parents to appropriately formula-feed through parental mental health challenges during the infant's first year of life with the ultimate intent to mitigate childhood obesity.

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CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this study was to investigate the influence of parental mental health following birth on feeding styles and weight in healthy, term, formula-fed infants during the first year of life. Consistent with the purpose of the study, the review of the literature will address the following: (a) theoretical perspectives of parental mental health and feeding styles, (b) historical influences of infant formula feeding, (c) experiences of formula-feeding parents, (d) infant formula feeding guidelines, (e) parental mental health and infant obesity, (f) modifiable contributors to weight status in formula-fed infants, (g) parental mental health and feeding styles in infancy, (h) long term health implications, (i) gaps and limitations, and (j) nursing research, practice, and policy considerations.

Theoretical Perspectives of Parental Mental Health and Feeding Styles

The United Nations Children's Fund (UNICEF; 1991) developed a conceptual model depicting a strategy for improving nutrition for women and children in developing countries. Since its conception, this model has been expanded upon and modified to provide a framework for supporting optimal maternal-child nutrition globally. The original UNICEF (1991) model of care was developed to conceptualize factors that influence malnutrition. Since its development, researchers have extended the model to include factors that influence nutrition in infants and children including economic, caregiver, and community health resources and child characteristics (Engle et al., 1997a; Engle et al., 1997b; Engle et al., 1999; Wachs et al., 2008). These UNICEF care model extensions have primarily focused on childhood nutritional deficiencies. El-Behadli et al. (2015) modified Wachs' (2008) extended care model to develop a conceptual framework that illustrates factors that influence childhood obesity "with an emphasis on the emotional climate of the parent-child relationship within the family" (p. S57). The authors proposed that the emotional climate and factors such as stress and depression may impact parent-child feeding interactions, and subsequently, child weight (El-Behadli et al., 2015).

The original UNICEF (1991) conceptual model identified three underlying determinants of child nutrition: household food security, health services and environment, and care. The concept of care is the focal point of the model and has since been defined as “the practices of caregivers that affect nutrient intake, health, and the cognitive and psychosocial development of the child” (Engle et al., 1999, p. 1310). The models of care provide frameworks for assessing the capacity of caregivers to provide care. Parents’ abilities to engage in care practices are impacted by the following six categories of resources: (1) appropriate education, knowledge, and beliefs; (2) health and good nutritional status; (3) mental health, lack of stress, and self-confidence; (4) autonomy, control of resources, and control of intrahousehold allocation; (5) reasonable workloads and adequate time available; and (6) social support from family members and the community (Engle et al., 1999). Engle et al. (1999) also described two specific care practices that are associated with child outcomes: feeding and psychosocial care. The feeding care practice includes “caregiver practices that could affect the child’s nutrient intake” (p. 1322), and the psychosocial care practice encompasses “the provision of affection and warmth, responsiveness to the child, and the encouragement of autonomy and exploration” (Engle et al., 1999, p. 1327).

Parental Mental Health

Caregiver mental health, specifically parental stress, depression, and anxiety have been demonstrated to impact infant feeding. The El-Behadli et al. (2015) Extended UNICEF Care Model includes stress and depression as parental mental health concepts. The theoretical definition of depression is “a lack of positive affect, energy, and optimism that appears to be excessive” (Engle et al., 1999, p. 1317). The theoretical definition of stress is “a person’s discomfort when exposed to difficult and uncontrollable circumstances” (Engle et al., 1999, p. 1317). While anxiety is not a concept included in this model, it was explored as a mental health concept related to parental feeding styles in this study because anxiety commonly occurs with depression in general and specifically during the perinatal period (Chinchilla-Ochoa et al., 2019;

Nakić Radoš et al., 2018; Salcedo, 2018). Negative effects on mental health are likely to impede the parent's ability to provide appropriate care to the infant even if they are physically present (El-Behadli et al., 2015; Engle et al., 1999; Wachs, 2008). An aspect of this appropriate care includes engaging in optimal feeding interactions; the theoretical perspectives of parental feeding styles will be discussed in the following section.

Parental Feeding Styles

The feeding care practice, specifically parental feeding styles, was examined in the context of infant formula-feeding. Most of the literature used to inform the UNICEF care model and its extensions includes preschool and school-aged children (El-Behadli et al., 2015; Engle et al., 1997a; Engle et al., 1997b; Engle et al., 1999; Wachs et al., 2008; UNICEF, 1991). However, this study applied the El-Behadli et al. (2015) extended UNICEF care model to parent-infant dyads because during this early life stage of rapid development, infants begin adopting food preferences and eating behaviors (Birch & Doub, 2014). Further, parental feeding styles in infancy are associated with child weight outcomes (Spill et al., 2019).

Parental feeding styles emerged out of the concept of general parenting styles, which are "the overall attitude and emotional climate that a parent creates with his or her child" (El-Behadli et al., 2015, p. S59). In the 1960s, Diana Baumrind theorized three general parenting styles: authoritative, authoritarian, and permissive (Baumrind, 1966). Within the three parenting styles are also two dimensions of general parenting styles: demandingness and responsiveness. Demandingness refers to "the extent to which parents show control, maturity demands, and supervision in their parenting" (Hughes et al., 2005, p. 84). In contrast, responsiveness refers to "the extent to which parents show affective warmth, acceptance, and involvement" (Hughes et al., 2005, p. 84). The authoritarian parenting style (high demandingness/ low responsiveness) is characterized by strict rules, high expectations and severe punishments. The authoritative parenting style (high demandingness/ high responsiveness) is characterized by appropriate boundaries, guidance, and responsiveness,

and it is the desirable parenting style. The permissive parenting style (low demandingness/ low responsiveness) is characterized by few limitations, and parents having a peer relationship with their child. Later, Maccoby and Martin (1983) added a fourth parenting style, the uninvolved parenting style (low demandingness/ low responsiveness), which is characterized by little interaction, no limitations, and failure to meet the child's needs (Power, 2013; Vollmer & Mobley, 2013).

To better understand parental influence on child nutrition and weight status, parental feeding styles have been derived from general parenting styles (Hughes et al., 2005). Similarly, parental feeding styles refer to "the overall attitude and emotional climate that a parent creates with his or her child during eating episodes" (El-Behadli et al., 2015, p. S59). Parental feeding styles are also related to the demandingness and responsiveness dimensions; however, the concept meanings differ slightly. Related to feeding styles, demandingness refers to "how much the parent encourages eating," and responsiveness refers to "how the parents encourage eating," either in a responsive or non-responsive manner (Hughes et al., 2005, p. 84). Hughes et al. (2005) developed the Caregiver's Feeding Styles Questionnaire (CFSQ) as a tool to measure similar dimensions (demandingness and responsiveness) and styles (authoritarian, authoritative, indulgent, and uninvolved) specific to parental feeding; however, the sample population was parents of three to five-year-old children. Thompson et al. (2009) developed the Infant Feeding Style Questionnaire (IFSQ) to measure parental feeding styles in parents of infants. These parental feeding styles in infancy (responsive, pressuring, restrictive, laissez-faire, and indulgent) are described in Chapter One. General parenting styles have been studied related to childhood obesity, with the authoritative general parenting style being associated with lower child weight than authoritarian, permissive, and uninvolved styles (Power et al., 2021). However, because of the broadness of general parenting styles, it is recommended to focus on feeding styles when studying parental influence on child nutrition and weight status (El-Behadli et al., 2015; Vollmer & Mobley, 2013). Theoretical perspectives of feeding styles in infancy have

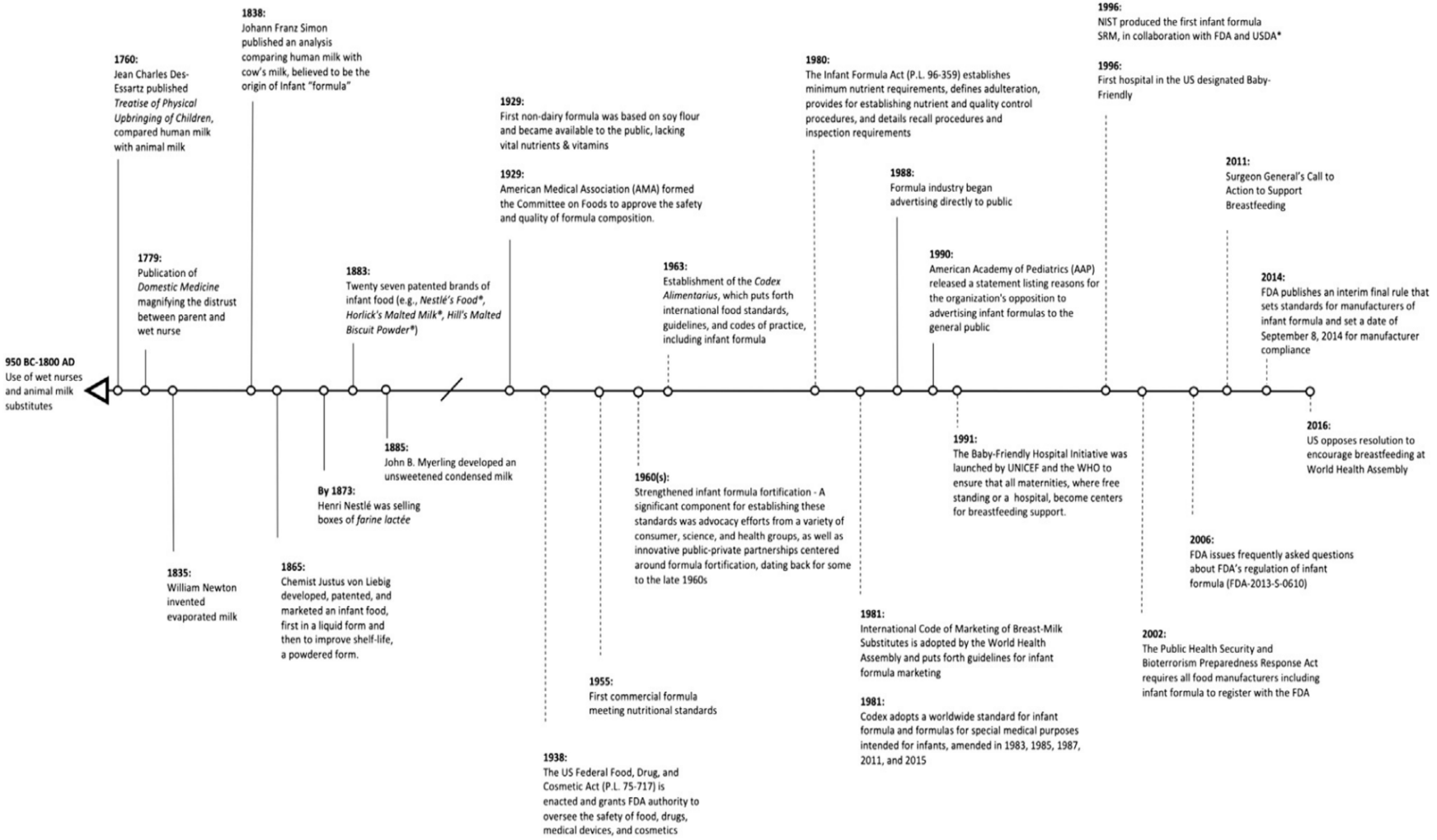
been influenced by the history of infant formula feeding, which will be discussed in the following section.

Historical Influences of Infant Formula Feeding

Historically, trends in infant feeding have been governed by scientific advancements and social norms. Figure 1 depicts a timeline of the evolution of infant formula (Bertmann et al., 2021). Cultural norms and policies that have influenced infant formula feeding include wet nursing, formula marketing, and the Baby-Friendly Hospital Initiative (BFHI).

Figure 1

Evolution of Infant Formula Timeline (Bertmann et al., 2021)



Wet Nursing

Wet nursing refers to the practice of a woman breastfeeding another's child, and it was historically considered a safe alternative to the birth mother's breastmilk when the mother did not produce enough breastmilk or was unable to breastfeed (Stevens et al., 2009). Wet nursing began as early as 2000 B.C. and extended until the 20th century; however, societal views of wet nursing fluctuated throughout this time. Wet nursing became embedded within slavery whereby wealthy people purchased inexpensive, abandoned infants for future slave use, and wet nurses, who were also slaves, fed the infants until they reached toddlerhood (Stevens et al., 2009). Women of high societal class also expected wet nurses to breastfeed their own children in addition to the enslaved infants (Stevens et al., 2009). During the Middle Ages, it was believed that breastmilk had magical properties and transferred physical and psychological qualities of the wet nurse to the infant; therefore, it became undesirable to hire wet nurses to feed infants due to the worry that the characteristics of the wet nurse would be transferred to the infant (Stevens et al., 2009). The preference for infant feeding included mothers breastfeeding their own children, and this trend continued throughout the Renaissance period (Stevens et al., 2009). During the Industrial Revolution, wet nursing shifted from being prevalent in wealthy families to poor families (Stevens et al., 2009). Many women had to work due to the higher cost of living in urban areas where families relocated, and these working women were unable to breastfeed. During the 19th century, human milk substitute feeding became available with the uptake of the use of animal milk and the development of the bottle. In 1865, the first infant food was created, and in 1955 the first commercial formula that met the US Food and Drug Administration (USFDA) standards became available (Bertmann et al., 2021; Stevens et al., 2009). By the beginning of the 20th century, the practice of wet nursing had been mostly abolished, and the use of commercial formula became socially acceptable (Stevens et al., 2009; Thulier, 2009). Wet nursing remains linked to slavery and the unjust treatment endured by African American women; this generational trauma may impact a woman's infant feeding

decisions today (Green et al., 2021; West & Knight, 2017). In addition to wet nursing, formula marketing has also historically influenced infant feeding trends.

Formula Marketing

In the 1940s medical providers and the public accepted formula as a safe alternative for breastmilk, which led to a decline in breastfeeding rates until the 1970s when there was a movement in the US to promote breastfeeding (Stevens et al., 2009). Previously, formula companies were permitted to advertise only to medical personnel; however, in 1988, the formula industry began soliciting to the public, which contributed to decreased breastfeeding rates (Stevens et al., 2009). Subsequently, in 1990, the AAP released a statement opposing the advertisement of infant formula to the public because it hindered physicians' abilities to council their patients on infant feeding, confused parents, and increased the cost of formula (Greer & Apple, 1991; Stevens et al., 2009). Further, in 1991 the BFHI was launched by the UNICEF and the WHO to encourage breastfeeding support in maternity care centers.

Baby-Friendly Hospital Initiative

The BFHI is a program designed by the UNICEF and the WHO that was launched in 1991 to increase exclusive breastfeeding initiation and duration rates (Fahlquist, 2016; Howe-Heyman & Lutenbacher, 2016). The program includes "10 steps to successful breastfeeding." Hospitals meeting these 10 steps can earn a Baby-Friendly designation signifying that they are committed to promoting, protecting, and supporting breastfeeding. These steps were revised and updated in 2018 and reflect more inclusive language than previously; the original and updated steps are listed in Table 1 (WHO, 2018). The BFHI has been successful in increasing breastfeeding rates, and continuation of this support for breastfeeding families is warranted (Pérez-Escamilla et al., 2016). However, the revised Step 6 states that "mothers who are feeding breastmilk substitutes, by necessity or by choice, must be taught about safe preparation and storage of formula and how to respond adequately to their child's feeding cues" (WHO, 2018, p. 25). This revision includes helping mothers who choose to formula-feed do so safely;

however, there is a lack of emphasis on this support in clinical practice, which has been expressed by formula-feeding parents. Experiences of formula-feeding parents will be discussed in the following section.

Table 1

BFHI 10 Steps to Successful Breastfeeding (WHO, 2018)

Step	Original	Updated
1	Have a written breastfeeding policy that is routinely communicated to all health care staff.	Have a written breastfeeding policy that is routinely communicated to all staff and parents.
2	Train all health care staff in skills necessary to implement this policy.	Ensure that staff have sufficient knowledge, competence, and skills to support breastfeeding.
3	Inform all pregnant women about the benefits and management of breastfeeding.	Discuss the importance and management of breastfeeding with pregnant women and their families.
4	Help mothers initiate breastfeeding within one hour of birth.	Facilitate immediate and uninterrupted skin-to-skin contact and support mothers to initiate breastfeeding as soon as possible after birth.
5	Show mothers how to breastfeed and how to maintain lactation, even if they are separated from their infants.	Support mothers to initiate and maintain breastfeeding and manage common difficulties.
6	Give infants no food or drink other than breastmilk, unless medically indicated.	Do not provide breastfed newborns any food or fluids other than breast milk, unless medically indicated.
7	Practice rooming in: allow mothers and newborns to remain together 24 hours a day.	Enable mothers and their infants to remain together and to practice rooming-in 24 hours a day.
8	Encourage breastfeeding on demand.	Support mothers to recognize and respond to their infants' cues for feeding.
9	Give no pacifiers or artificial nipples to breastfeeding infants.	Counsel mothers on the use and risks of feeding bottles, teats and pacifiers.
10	Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.	Coordinate discharge so that parents and their infants have timely access to ongoing support and care.

Experiences of Formula-Feeding Parents

Autonomy, which refers to "patients' right to choose and health care professionals' obligation to respect the patients' choices," is one of the four main principles of nursing ethics (King, 2017, p. 549). In the context of infant feeding, nurses have an ethical obligation to provide information for parents to make informed choices related to breastfeeding and formula-feeding and to respect the decisions they make. However, formula-feeding parents report experiencing stigma and lack of healthcare professional (HCP) support associated with their feeding method of choice.

Stigma

There is a stigma associated with formula-feeding. Formula-feeding mothers report feeling guilty and shamed (Fahlquist, 2016; Hvatum & Glavin, 2017; Jackson et al., 2021; Lagan et al., 2014; Thomson et al., 2015), isolated (Thomson et al., 2015), and inadequate as mothers (Fahlquist, 2016; Jackson et al., 2021; Lakshman et al., 2009; Thomson et al., 2015). In a survey of mothers in high-income countries, 68% of mothers who elected to formula-feed felt stigmatized about their choice of feeding method (Fallon et al., 2016b). The most reported sources of stigma were other mothers (62%), HCP (59%), and the internet (56%; Fallon et al., 2016b). In a qualitative study, mothers who formula-fed their infants reported feeling stereotyped by their HCP, communities, and general society (Appleton et al., 2018a). Formula-feeding stigma likely originates from judgment of feeding intention rather than the superiority of breastmilk to formula because mothers who intended to formula-feed were perceived more negatively than mothers who intended to breastfeed but were unsuccessful (Moss-Racusin et al., 2020). In addition to stigma, formula-feeding parents also report experiencing a lack of HCP support.

Lack of HCP Support

Parents who formula-feed express feeling unsupported by HCP (Appleton et al., 2018a; Jackson et al., 2021; Lagan et al., 2014; Thomson et al., 2015). Specifically, formula-feeding

parents report receiving a lack of informational and emotional support from HCP related to infant feeding, which may yield poor infant health outcomes.

Informational Support

There is a lack of informational support for formula-feeding parents. Formula-feeding mothers report receiving inadequate information and conflicting advice from HCP about how to feed their infants (Appleton et al., 2018a; Dattilo et al., 2020; Fahlquist, 2016; Fallon et al., 2016b; Hvatum & Glavin, 2016; Jackson et al., 2021; Lagan et al., 2014; Lakshman et al., 2009; Thomson et al., 2015). As a result, they more commonly seek infant feeding information from the internet (31%) than from HCP (23%; Fallon et al., 2016b). Similarly, in a qualitative study, Appleton et al. (2018a) found that friends, family, and the internet were key resources for formula-feeding information as opposed to HCP. Lack of informational support from HCP can lead to unsafe formula-feeding practices and can be detrimental to infant health (Abrams & Daniels, 2019; Lakshman et al., 2009). In addition to experiencing a lack of informational support, formula-feeding parents also report experiencing a lack of emotional support from HCP related to infant feeding.

Emotional Support

There is a lack of emotional support for formula-feeding parents, and many women feel pressured to breastfeed (Fahlquist, 2016; Lagan et al., 2014; Lakshman et al., 2009; Moss-Racusin et al., 2020). In a sample of parents in high-income countries, 64% of formula-feeding mothers experienced feeling guilt following interactions with HCPs. Further, 76% felt obligated to defend their feeding method choice most commonly to HCP (58%) and other mothers (69%; Fallon et al, 2016b). Reasons for feeding decisions are multifactorial (Moran-Lev et al., 2021; Moss et al., 2021; Roll & Cheater, 2016), and there is a need to support parents' informed choices. Lack of emotional support for formula-feeding parents may contribute to mental health issues, nonresponsive feeding styles, and negative health outcomes. Parents who formula-feed should be supported and encouraged to follow formula feeding guidelines.

Infant Formula Feeding Guidelines

Formula-feeding is an acceptable alternative to breastfeeding as a primary source of nutrition for infants up to 12 months of age in high-income countries where clean water is not an issue (Dewey et al., 2020). Infants should consume about 75 mL of formula per day for every pound of body weight; however, feeding “on demand”, whenever the infant is exhibiting hunger cues rather than feeding set amounts on a rigid schedule, is recommended (American Academy of Pediatrics [AAP], 2018; DiMaggio et al., 2017). In addition to the AAP, feeding “on demand” is consistently recommended by other advisory agencies such as the IOM (Birch et al., 2011), UNICEF, WHO, and USDA (Dewey et al., 2020; Engle & Pelto, 2011) and aligns with the responsive feeding style (DiSantis et al., 2011; Thompson et al., 2009;). All infants are unique and require caregivers to be in tune with and sensitive to their feeding cues to promote self-regulation and healthy weight outcomes (AAP, 2018; DiSantis et al., 2011). Additionally, evidence-based guidance recommends against propping bottles, adding cereal to bottles without medical reasons, and putting infants to bed with bottles (AAP, 2019; Dewey et al., 2020). These practices are consistent with non-responsive feeding styles (Thompson et al., 2009), which may contribute to obesity in formula-fed infants.

Parental Mental Health and Infant Obesity

A limited number of studies have examined the association between parental mental health and infant overweight or obesity. In a cross-sectional study of 589 maternal-infant dyads in Brazil, children of mothers with high depressive symptoms who were ages six to 24 months had 1.7 and 2.3 higher odds of being overweight or obese, respectively, compared to infants of mothers without high depressive symptoms (Surkan et al., 2008). Other studies have found no association between maternal depressive symptoms and infant overweight or obesity (Brentani & Fink, 2016; Echevarria-Castro et al., 2020; Lima et al., 2017). While results are inconsistent, a recent systematic review examining the association between symptoms of parental depression and anxiety and childhood overweight condition found an overall positive relationship between

parental depression and anxiety and obesity in children ages birth through adolescence (Marco et al., 2020). Additionally, maternal perceived stress during infancy has been associated with increased weight in children ages birth to five years (Leppert et al., 2018). Similarly, Watt et al. (2013) found an association between maternal stress and increased risk of infant overweight in a low-income Hispanic population. However, a recent systematic review examining the relationship between maternal stress during the first two years of life and childhood obesity found conflicting results related to weight outcomes, and most studies included in the review examined stress during the prenatal period (Matvienko-Sikar et al., 2021). Therefore, there is a need to further examine the relationship between postnatal parental stress and infant weight. These mental health symptoms may influence modifiable contributors to weight status in formula-fed infants, which will be discussed in the following section.

Modifiable Contributors to Weight Status in Formula-Fed Infants

Formula-fed infants are more likely to experience rapid weight gain (RWG) and are at greater risk for obesity than breastfed infants (Appleton et al., 2018b; Gibbs & Forste, 2013; Lindholm et al., 2020). In a secondary analysis of longitudinal trials of infants who experienced RWG, defined as weight-for-length z-score (WFL-Z) change of >0.67, at one year of age, the WFL-Z of formula-fed infants was twice that of breastfed infants (Trabulsi et al., 2020). Similarly, in a longitudinal cohort study of 1,780 infants, bottle-feeding with formula at birth and at three to four months was positively associated with RWG during birth to six months (Lindholm et al., 2020). Increased obesity risk in formula-fed infants is multifactorial and has been linked to modifiable contributors including formula nutrient composition and parental feeding styles.

Formula Nutrient Composition

Formula has a lower fat content but higher energy and protein composition than breastmilk, with protein content of 50-80% more than breastmilk (Mameli et al., 2016). Protein content of formula is a main factor contributing to weight differences among breastfed and formula-fed infants (Ahrens et al., 2018; Appleton et al., 2018b). Agencies are consistent in

recommending consumption of cow milk-based formulas for formula-fed infants (Dewey et al., 2020). In the US, cow milk-based formulas contain an average of 50% more protein content than human milk (Kleinman & Greer, 2013). Hydrolyzed formulas are used to prevent allergies, and these formulas with lower protein content have been shown to yield normal growth compared to hydrolyzed formulas with higher protein content (Ahrens et al., 2018). In a sample of healthy, term formula-fed infants, 56% of infants fed cow milk-based formula experienced RWG compared to 25% infants fed extensively hydrolyzed protein formula ($p=0.003$; Mennella et al., 2019). Similarly, Graulau et al. (2019) found a three-fold increase of RWG in infants consuming cow milk-based formula compared to infants consuming hydrolyzed formula. In addition to formula protein content contributing to weight gain in infancy, sucrose-containing formula has been associated with increased WFL-Z and soy-protein formulas have been associated with lower WFL-Z in infancy (Young, 2020). Therefore, variation of ingredients in formula milk contributes to infant weight. In addition to commercial infant formulas, there is a recent, dangerous trend toward homemade and imported infant formulas, which contain different compositions.

Homemade and Imported Infant Formulas

There has been a five-fold increase in online searches for “homemade formula” over the past year from previous years (Bertmann et al., 2021), and Davis et al. (2020) found 59 online blogs that contained at least one homemade infant formula recipe. Reasons for parents utilizing homemade infant formula include the desire to pursue an all-natural diet, low socioeconomic status, food insecurity especially during natural disasters, and cultural practices (Bertmann et al., 2021). The USFDA (2021) recently released an advisory warning against parents making and feeding homemade formula to their infants due to it not being regulated by the FDA and potentially lacking necessary nutrients (Bertmann et al., 2021). In addition to homemade formulas lacking necessary nutrients, there is also increased risk of bacterial contamination and errors with mixing appropriate ratios (Abrams & Daniels, 2019). There is also a trend for

caregivers to choose to use formulas manufactured outside of the US, especially those imported from Europe; these infant formulas are not regulated by the FDA either, so the safety of these formula ingredients cannot be guaranteed (Abrams & Daniels, 2019). It is important to council parents against making and feeding their infants homemade and imported formulas due to the altered nutrient composition and the risks they pose on infant health (Abrams & Daniels, 2019; Bertmann et al., 2021; Davis et al., 2020).

Parental Feeding Styles

In addition to formula nutrient composition, parental feeding styles also contribute to infant weight (Hurley et al., 2011). The responsive feeding style is optimal and refers to parents having the capacity to recognize infant feeding cues and respond appropriately. Specific feeding practices make up feeding styles, which encompass *"*the overall attitude and emotional climate that a parent creates with his or her child during eating episodes" (El-Behadli et al., 2015, p. S59). Feeding practices contributing to RWG in infancy such as adding cereal to bottle (Appleton et al., 2018b) and putting infant to bed with bottle (Appleton et al., 2018b; Gibbs & Forste, 2013) are associated with non-responsive feeding styles.

Responsive

Advisory agencies such as the AAP (2017), IOM (Birch et al., 2011), UNICEF, WHO, and USDA (Engle & Pelto, 2011) recommend responsive feeding which refers to caregivers providing a pleasant feeding environment and being in tune with and attentive to infant hunger and satiety cues (El-Behadli et al., 2015; Pérez-Escamilla et al., 2017; Thompson et al., 2009). Hunger cues in infancy include restlessness, sucking on hands, smacking lips, and rooting. Satiety cues in infancy include turning the head away from the bottle, decreasing or stopping sucking, spitting out the nipple, or falling asleep during the feed (Pérez-Escamilla et al., 2017). In a systematic review, DiSantis et al. (2011) found an association between parents exhibiting low responsiveness to infants' feeding cues and increased infant weight gain. Similarly, Worobey et al. (2009) found a negative association between responsive feeding and infant

weight gain from six to 12 months but found no association from three to six months of age. Contrarily, Cartagena et al. (2016), Mennella et al. (2019), Thompson et al. (2013), and four other studies cited in the Spill et al. (2019) systematic review (Gubbels et al., 2011; Ma et al., 2015; Morris et al., 1982; Saxon et al., 2002) found no significant associations between the responsive feeding style and infant weight.

Non-Responsive

Non-responsive feeding styles encompass all types of feeding styles that deviate from the recommended responsive feeding style. With each of the non-responsive feeding styles, parents exhibit characteristics that are the opposite of responsive feeding, including not being in tune with and attentive to infant hunger and satiety cues (Pérez-Escamilla et al., 2017). Thompson et al. (2009) divides non-responsive feeding styles in infancy into four subcategories: laissez-faire, pressuring, restrictive, and indulgent. Feeding practices in the indulgent feeding construct are described in terms of toddlers; examples include providing the toddler desserts to keep them happy or allowing the toddler to watch television while eating to ensure they eat enough (Thompson et al., 2009). In infancy, the indulgent feeding style can be exhibited when introducing solid foods. The indulgent feeding style is not applicable to bottle-feeding, and therefore were not examined in this study. The non-responsive subcategories applicable to bottle-feeding that were considered in this study are laissez-faire, restrictive, and pressuring.

Laissez-Faire. Parents exhibiting laissez-faire feeding styles do not limit formula quantity and show little or no interaction with the infant during feeding (Thompson et al., 2009). Cartegena et al. (2016) and Menella et al. (2019) found no significant association between laissez-faire feeding styles and infant weight. However, Golen and Ventura (2015) found that infants consumed higher milk volumes when fed by distracted mothers who showed little interaction with the infant during the feeding, which is consistent with the laissez-faire feeding style.

Restrictive. Parents exhibiting restrictive feeding styles limit the quantity of formula

consumed even if the infant continues exhibiting hunger cues (Thompson et al., 2009). Several studies have found an association between restrictive feeding styles and higher infant weight (Dinkevich et al., 2015; Rifas-Shiman et al., 2011; Spill et al., 2019; Taveras et al., 2006; Thompson et al., 2013). Contrarily, Farrow and Blissett (2008) found that restrictive feeding styles were associated with lower infant weight, and Cartagena et al. (2016), Gregory et al. (2011), and Mennella et al. (2019) found no significant association between restrictive feeding styles and infant weight.

Pressuring. Parents exhibiting pressuring feeding styles are concerned with increasing the amount of formula the infant consumes and use formula to soothe the infant (Thompson et al., 2009). Thompson et al. (2013) and Ventura and Thompson (2019) found an association between pressuring feeding styles and lower infant weight. Similarly, Spill et al. (2019) noted that 63% of studies in their systematic review that examined the relationship between pressuring and infant weight identified an association between pressuring feeding styles and lower infant weight outcomes. Contrarily, Stifter and Moding (2015) and Stifter et al. (2011) noted an association between pressuring feeding styles and increased infant weight gain. Further, several studies found no significant association between pressuring feeding styles and weight in infants and toddlers up to 36 months old (Cartagena et al., 2016; Gregory et al., 2011; Lumeng et al., 2012; Ma et al., 2015; Mennella et al., 2019; Stough et al., 2018). Factors that may influence these feeding styles in infancy include parental depression, stress, and anxiety; parental mental health and feeding styles in infancy will be discussed in the following section.

Parental Mental Health and Feeding Styles in Infancy

Because parental feeding styles in infancy have been associated with weight status in formula-fed infants, it is crucial to understand factors that may contribute to non-responsive feeding styles, such as mental health symptoms, to determine points of intervention to improve parent-child feeding interactions and health outcomes. Therefore, the following section will discuss parental depression, stress, and anxiety and feeding styles in infancy.

Parental Depression and Feeding Styles

There has been an association found between maternal depressive symptoms and pressuring feeding styles such as forcing the infant to finish a bottle or distracting the infant to get them to eat (Barrett et al., 2016; Gaffney et al., 2018; Hurley et al., 2008; Savage & Birch, 2017). The practice of adding cereal to an infant's bottle is also a practice associated with the pressuring feeding style (Thompson et al., 2009), and some studies have found an association between maternal depressive symptoms and adding cereal to an infant's bottle (Gaffney et al., 2014; Lucas et al., 2017; Savage & Birch, 2017; Wasser at al., 2011). Additionally, a relationship has been detected between maternal depressive symptoms and restrictive feeding styles such as making the infant wait until feeding time even if hunger cues are exhibited sooner or worrying about others feeding the infant too much (Gaffney et al., 2018; Hurley et al., 2008). Similarly, Chen et al. (2020) and Thompson et al. (2021) found that depressed mothers exhibited less responsiveness during infant feeding compared to mothers without depressive symptoms. Contrarily, Hellin and Waller (1992) found that maternal depression did not predict feeding responsiveness. Farrow and Blissett (2005) did not find significant associations between maternal depressive symptoms and pressuring or restrictive feeding styles, and Karp et al. (2010) did not find a significant association between maternal depressive symptoms and feeding to soothe. Feeding to soothe is a practice in which the parent uses food "to quiet or manage a distressed child" (Savage & Birch, 2017, p. 157), and it is associated with the pressuring feeding style (Thompson et al., 2009). Hurley et al. (2008) found an association between depressive symptoms and laissez-faire feeding styles such as watching television while feeding the infant.

Parental Stress and Feeding Styles

Hurley et al. (2008) found an association between maternal stress and pressuring and laissez-faire feeding styles. Similarly, Hurley et al. (2015) found an association between parental stress and adding cereal to the infant's bottle, which is consistent with the pressuring feeding

style. Gross et al. (2018) specifically examined neighborhood stress and found an association between feeling unsafe to leave or return to their neighborhood and pressuring feeding style or feeding to soothe.

Parental Anxiety and Feeding Styles

Hurley et al. (2008) found an association between maternal anxiety and pressuring, restrictive, and laissez-faire feeding styles. Contrarily, Hellin and Waller (1992) found that maternal anxiety did not predict feeding responsiveness, and Sun et al. (2020) found no significant association between feeding-specific anxiety and feeding responsiveness in infancy.

Long-Term Health Implications

Feeding styles in infancy can have long-term implications on health outcomes (Thompson, 2012). Formula feeding in infancy has been associated with increased risk for RWG (Appleton et al., 2018b) and higher BMI in childhood (Flores-Barrantes et al., 2020). Goodell et al. (2009) found that children who experienced RWG during infancy were nine times more likely to be obese in toddlerhood than those who did not. A review article revealed that accelerated weight grain in infancy has been associated with greater risk for obesity later in life in more than 30 studies (Singhal, 2016). Additionally, a systematic review concluded that increased infant weight gain was consistently associated with later childhood obesity in 45 studies (Woo Baidal et al., 2016). Further, in a meta-analysis of data on 47,661 individuals, Druet et al. (2012) found that for each one unit increase in weight standard deviation score during infancy, there was a doubled risk of childhood obesity and a 23% higher risk of adult obesity. Finally, in a recent systematic review and meta-analysis, Zheng et al. (2018) found that children under age two who experienced RWG had 3.7 times greater odds of obesity later in life than those who did not. Obesity in childhood and adulthood has been linked to several health consequences including hypertension, type 2 diabetes, cardiac disease, cerebrovascular accidents, osteoarthritis, sleep apnea, cancers, and psychological issues (CDC, 2021a; CDC, 2021b). Therefore, it is critical to understand parental mental health factors, such as stress,

depression, and anxiety which likely influence feeding styles in infancy, potentially contributing to early weight gain and later health consequences.

Gaps and Limitations

Stress and Anxiety

This literature review revealed that there has been a greater focus on the relationship between depression and parental feeding styles compared to anxiety or stress. Systematic reviews have revealed a postnatal anxiety prevalence rate of up to 18% among men (Leach et al., 2016) and up to 43% among women (Fallon et al., 2016a). Stress is also common in the perinatal period, with up to 30% of women experiencing stress during pregnancy and up to two years after birth (Matvienko-Sikar et al., 2021). Mothers identify stressors related to juggling responsibilities of a new infant, infant health issues, pressure to breastfeed, and changing family dynamics (Ayers et al., 2019). Similarly, in a qualitative study including mothers and fathers, mothers identified internal factors such as domestic responsibility and spousal relationship, and fathers identified external factors such as work and childcare restrictions as contributing to postpartum stress (Johansson et al., 2020). Therefore, stress is an important concept to explore related to influencing parental feeding styles in infancy. In addition to the apparent lack of published literature on stress and anxiety related to feeding styles, there are few studies examining paternal involvement in infant feeding.

Paternal Involvement

Parental feeding styles have been studied, but largely through the maternal view (Golen & Ventura, 2015; Harrison et al., 2018; Ventura et al., 2019; Ventura & Teitelbaum, 2017). The amount of time fathers report caring for their children has nearly tripled over the last half-century, yet they are significantly underrepresented in pediatric feeding and obesity prevention research (Davison et al., 2016; Khandpur et al., 2014; Pew Research Center, 2013). Fathers have been included in few infant feeding studies, and researchers have mostly explored their roles in decisions of whether to breast or formula feed their infants, or in supporting their

partners in breastfeeding (Earle & Hadley, 2018; Wang et al., 2018). There is a gap in understanding fathers' feeding styles and practices in formula-fed infants (Davison et al., 2016; Hughes et al., 2013; Khandpur et al., 2014). The few studies that have examined paternal feeding styles in infancy have found that fathers exhibit more laissez-faire, pressuring, and restrictive feeding styles compared to mothers (Barrett et al., 2018; Benjamin-Neelon & Neelon, 2020; Daniels et al., 2020). Therefore, it is imperative to understand if factors such as increased stress, depression, or anxiety contribute to fathers' non-responsive feeding styles.

Inconsistent Terminology

There is inconsistent terminology utilized across infant nutrition literature, making it difficult to compare studies and draw conclusions. For example, theoretical and operational definitions for constructs such as feeding styles, dimensions, practices, and behaviors are inconsistent across studies and are sometimes used interchangeably (Hughes et al., 2013; Jansen et al., 2012). It is also common for researchers to discuss "bottle-feeding" and not describe what infant feeding substance is in the bottle (Gaffney et al., 2018; Lucas et al., 2017; Paulson et al., 2006). Recommended infant foods to be fed via bottle include formula or breastmilk (Kotowski et al., 2020). Generalization of the broad categories of "breastfeeding" versus "bottle-feeding" makes interpreting results difficult (Wasser et al., 2011). Because breastmilk and formula have different nutrient compositions, it is important to specify which substances are being studied. There is a priority need to clearly define and conceptualize these terms in manuscripts to develop consistent terminology in the infant nutrition literature.

Unclear Relationships

The relationships between parental mental health, feeding styles, and weight, particularly in formula-fed infants less than one year of age, are not well-established. Most researchers that have examined these relationships have focused on toddler and school-aged populations (El-Behadli et al., 2015). This study sought to address this gap to understand these relationships during infancy, a critical period for establishing optimal nutrition (Scott, 2020).

Nursing Research, Practice, and Policy Considerations

The previously discussed historical influences on infant feeding provide a foundation for understanding parents' infant feeding choices. Researchers should be aware of these influences and sensitive to them as they continue to study this population and strengthen the state of the science in infant nutrition. Practicing nurses also have an ethical obligation to consider these influences and support all parents regardless of their feeding method choice. Nurses are at the bedside educating new parents about postpartum mental health and infant feeding. Maternal-newborn nurses are well-positioned to implement evidence-based practices related to parental mental health and safe formula feeding in infancy. Nurses remain ranked as the most trusted professionals (Gaines, 2021), yet many formula-feeding parents seek infant feeding advice and support from sources such as the internet and friends because they do not feel supported by HCP (Appleton et al., 2018a; Fallon et al., 2016b). Nurses should have knowledge about safe formula feeding to provide sufficient, consistent information to parents (Abrams & Daniels, 2019; Hvatum & Glavin, 2016). It is critical for nurses to support parents' infant feeding decisions during a vulnerable time and educate them on optimal feeding styles to improve health outcomes.

Additionally, hospital policies should include guidelines for safe and responsive formula-feeding in families who choose to do so and support the WHO BFHI Step 6 that "mothers who are feeding breastmilk substitutes, by necessity or by choice, must be taught about safe preparation and storage of formula and how to respond adequately to their child's feeding cues" (WHO, 2018, p. 25). It should also be acknowledged that many infants are cared for by individuals other than their parents, including daycare workers. In the state of North Carolina, daycare facilities must have a written feeding plan from parents stating type and amount of milk and frequency of feedings, and this plan must be posted in the childcare room for staff to reference (North Carolina Department of Health and Human Services, 2020). As such, this policy impacts infant feeding in a way that yields strict schedules for feedings, which is

consistent with non-responsive feeding styles (Thompson et al., 2009). Hospital and state policies should reflect support of all families, including those who choose to formula-feed their infants, and encourage responsive feeding to promote infant self-regulation. The findings from this study will inform future policy development in the hospital and community settings.

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CHAPTER 3: METHODS

Introduction

Chapter 3 provides an overview of the methods used in this study, which examined the influence of parental mental health following birth on parental feeding styles and infant weight in healthy, term, formula-fed infants during the first year of life. This chapter includes methodological choices for the research design, sample, setting, recruitment, protection of human subjects, instruments, procedures, and statistical analysis. Strengths and limitations of these methods will also be discussed. Research questions guiding this dissertation study include:

What is the relationship between parental mental health, parental feeding styles, and infant weight? The sub-research questions are:

a. What is the relationship between stress, depression, anxiety, and feeding styles in parents of formula-fed infants?
b. Is there a difference in stress, depression, anxiety, and parental feeding styles in mothers compared to fathers?
c. What is the relationship between parental stress, depression, anxiety, and infant weight?
d. What is the relationship between parental feeding styles and infant weight?

Design

A cross-sectional descriptive correlational design was employed using online surveys to examine relationships between parental mental health, parental feeding styles, and infant weight. An online survey is a favorable method for studying a national US popular tion sample because of its reach, cost-effectiveness, flexibility, and speed. Further, participants across the country received the survey questions identically (Ball et al., 2019). This design is also consistent with the research questions because the purpose of descriptive correlational studies

is to describe relationships among variables (Curtis et al., 2016; Polit & Beck, 2017). The relationships studied were guided by the El-Behadli et al. (2015) extended UNICEF care model.

The online survey was administered through REDCap® and included the screening questions, demographic questionnaire, Perceived Stress Scale (PSS-10), 9-item Patient Health Questionnaire (PHQ-9), 7-item Generalized Anxiety Disorder Assessment (GAD-7), and Infant Feeding Style Questionnaire (IFSQ). This study was cross-sectional, and Facebook was used as the primary recruitment strategy. We anticipated that fathers would be underrepresented compared to mothers. Therefore, Facebook groups related to infant fatherhood were targeted to sample this population.

Sample

This study includes convenience sample of US mothers and fathers of infants less than one year of age who were exclusively formula-feeding their infants at the time of the survey. Individuals were excluded from participating in the study if they did not speak English or comprehend written communication in English, did not currently have a child less than 12 months of age, were breastfeeding, live outside of the US, currently had an infant with a pre-existing health condition that might impact feeding such as Down Syndrome, Prader-Willi Syndrome, epilepsy, cleft lip or palate, cerebral palsy, failure to thrive, or severe food allergies, or currently had an infant that was born preterm. The World Health Organization (WHO) defines preterm as gestational age less than 37 weeks (WHO, 2018); parents of preterm infants were excluded from the study because these infants often have complex feeding needs (Gennattasio et al., 2014; Stevens et al., 2014). A power analysis for estimating sample size for logistic regression using seven predictor variables and a ratio of .4 between outcome to total sample suggested a total sample size of at least 200.

Setting

A social media setting was used as participants were recruited through an online platform. This innovative method was selected because it provided the potential to yield a

diverse sample. Facebook is the most used social media platform with about 69% of US adults using it and 70% of those adults accessing their profiles daily (Pew Research Center, 2021). Additionally, 70% of adults ages 18 to 49 use Facebook, which includes those during childbearing years, and is consistent with our target population (Pew Research Center, 2021). Further, Facebook is equally utilized by varying races and ethnicities (White 67%, Black 74%, Hispanic 72%), and it is a particularly useful strategy for reaching populations that may otherwise be difficult to access (Pew Research Center, 2021; Thornton et al., 2016). Facebook is an optimal recruitment strategy for capturing a diverse, inclusive sample representative of the US infant parent population because it is feasible, efficient, and cost-effective (Ryan, 2013; Thornton et al., 2016).

Purposive sampling techniques were utilized to recruit fathers as they were expected to be underrepresented (Thornton et al., 2016). Facebook groups specifically related to fathers of infants were pursued in addition to general parent groups because it is known that father-focused advertisements are far more successful at recruiting fathers through Facebook than gender-neutral parent advertisements (Leach et al., 2019). Snowball sampling was utilized as a recruitment strategy by encouraging individuals to share the recruitment post. In addition to inviting individuals to participate within specific groups, the Principal Investigator (PI) also posted the recruitment image to her personal Facebook page and encouraged sharing of the image by those who viewed it to attempt to reach individuals meeting inclusion criteria (Polit & Beck, 2017; Thornton et al., 2016). Figure 1 is a sample of the image and text that was included in recruitment posts on Facebook. Posts like this sample were made to the study Facebook page and targeted parenting groups with administrator approval. This post was made sharable to facilitate snowball sampling.

Lastly, Ryan (2013) suggests using a mixed recruitment approach including online and traditional methods. Therefore, in addition to using Facebook as a means of recruitment, the PI also recruited parents in Pitt County, North Carolina by placing flyers (Figure 2) in local

pediatricians' offices. The PI has an established relationship with the local pediatricians as she is a maternal-newborn nurse at the local academic medical center and works closely with them. Written permission to distribute the flyer was obtained from the pediatrician offices. To minimize the threat of coercion or undue inducement, the researcher did not participate directly in the recruitment of participants from the pediatrician offices, but instead, relied on the distribution of flyers by office personnel.

Figure 1

Facebook Recruitment Image

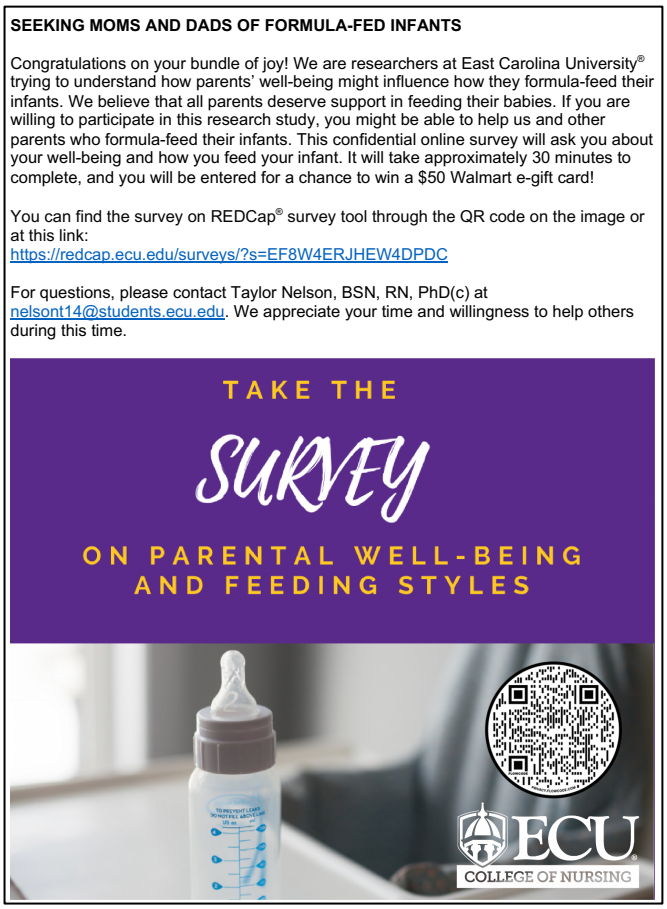

Figure 2

Physical Flyer for Local Pediatricians' Offices

Human Subjects Protection

Approval for this study was obtained from the University and Medical Center Institutional Review Board (IRB) at East Carolina University. From the point of recruitment, participants were prompted to click on a link to a survey in REDCap®, a secure web-based data management program (Harris et al., 2009). All survey responses were anonymous. Respondents were assigned a unique numerical identifier in the survey. The initial page described the purpose of the study and include details related to the research. The PI's contact information was provided; questions from participants were welcomed and promptly addressed. The second page included a form that was used to screen for inclusion and exclusion criteria. If inclusion criteria were met and the individual agreed to participate in the study, written informed consent was obtained through REDCap®. There were minimal risks to participants since this is

not an interventional study. However, some surveys may cause emotional reactions from participants when completing questionnaires (Labott et al., 2013). Specifically, because participants were screened for stress, depression, and anxiety symptoms, emotional responses could be triggered; therefore, a hotline number for individuals to call if the surveys triggered an emotional response was provided. Participants were informed that they were permitted to withdraw from the study at any time with no penalty. Data will be stored for three years in REDCap® and will be backed up to an encrypted Pirate Drive through ECU, and only the PI (student researcher), Dr. Pamela Reis (faculty advisor), and the statistician (faculty) will have access to the raw data to protect participants' privacy.

Individuals who wished to be entered into a drawing for a $50 Walmart e-gift card were asked to provide their email address and phone number in a separate window from the survey so that winners of the drawing could be contacted. Participants who won were notified via telephone and were emailed the e-gift cards at the provided email addresses.

Instruments

In addition to the demographic questionnaire, including parental self-report of infant weight and length, survey data were collected to measure parental stress, depression, anxiety, and feeding styles using the following instruments: screening questions, demographic questionnaire, PSS-10, PHQ-9, GAD-7, and IFSQ. All tools were administered to participants through REDCap®.

Screening Questions

Screening questions for inclusion and exclusion criteria were presented to the participant directly before providing survey consent. Inclusion criteria were parent of healthy infant less than one year of age, living in US, and exclusively formula-feeding at the time of survey completion. Exclusion criteria were individuals who: (1) did not speak English or comprehend written communication in English, (2) did not currently have a child less than 12 months of age, (3) were breastfeeding, (4) lived outside of the US, (5) currently had an infant with a pre-existing

health condition that might impact feeding such as Down Syndrome, Prader-Willi Syndrome, epilepsy, cleft lip or palate, cerebral palsy, failure to thrive, or severe food allergies, or (6) currently had an infant that was born preterm (<37 weeks' gestation).

Demographic and Background Questionnaire

Demographic and background data were collected through self-report. Participants were asked to provide state of residence, zip code, age, race, ethnicity, marital status, level of education, employment status, average household income, WIC enrollment status, number of children living in the household and their ages, type of infant formula they used (i.e., soy, cow, goat, homemade, other), what percentage of time they fed their infant, and who else fed their infant. Respondents were also asked to indicate their main source for infant feeding information (i.e., healthcare professionals, friends/family, internet), if they felt shamed for their feeding method choice, if they were a biological or adoptive parent, and how they found out about the study.

PSS-10

The original version of the Cohen Perceived Stress Scale was 14 items and was designed to measure how stressful one's life has been over the past month as perceived by that individual. This valid and reliable self-report measure accounts for the fact that stress is individualized and emotional responses to situations vary depending on how one appraises them (Cohen et al., 1983). This five-point Likert-type instrument was designed for use in community samples and is written at a middle-school literacy level (Cohen et al., 1983). Cohen et al. (1983) initially reported good reliability and validity with the 14-item scale in a sample of individuals participating in a smoking cessation program but later found that four items poorly measured the construct, so those items were dropped to create the 10-item scale (Cohen & Williamson, 1988; Taylor, 2015). Deleting those four items slightly increased the internal consistency (α=.78) compared to the 14-item scale (α= .75) in a large US population sample (Cohen & Williamson, 1988). Regarding validity, the PSS-14 and PSS-10 had similar

correlations with other stress measures such as amount of stress in an average week (PSS-14 *r* = .36, PSS-10 *r* = .39) and amount of stress currently experienced compared to one year prior (PSS-14 *r* =.26, PSS-10 *r* = .26). In the PSS-10, each item is scored zero to four with total scores ranging from zero to 40, with higher sums of scores indicate greater perceived stress (Cohen et al., 1983). A cutoff score of ≥14 on the PSS-10 was used to detect moderate to high perceived stress as suggested by other researchers studying the perinatal population (Suárez-Rico et al., 2021; Tanpradit & Kaewkiattikin, 2020). This tool has been used to measure stress in the postpartum period among mothers and fathers, with Cronbach's alpha ranging from .75 to .83 (Gao et al., 2009; Kamalifard et al., 2014; Suárez-Rico et al., 2021). The PSS-10 was selected for use because it is less of a burden to respondents due to fewer questions than the PSS-14, has been validated in the target population, and a systematic review of the literature notes that it is the optimal version to use in practice and research (Lee, 2012).

PHQ-9

The Patient Health Questionnaire Depression Module is a four-point Likert-type scale that assesses the frequency of experiences with depressed mood and lack of pleasure in the past two weeks (Kroenke & Spitzer, 2002). A ≥10 cutoff on the PHQ-9 was used to detect moderate depression severity (Kroenke & Spitzer, 2002; Levis et al., 2019). In a meta-analysis of the use of the PHQ-9 in the perinatal population, Wang et al. (2021) detected a pool sensitivity of 0.84 and specificity of 0.81. The median sensitivity and specificity of the PHQ-9 and the Edinburgh Postnatal Depression Scale (EPDS) were similar (0.81 vs 0.82 and 0.75 vs 0.73 respectively; Wang et al., 2021). One study detected a higher test-retest reliability in the PHQ-9 compared to the EPDS (0.75 vs 0.51; Weobong et al., 2009). While the PHQ-9 has not been specifically validated in the paternal population, it has been validated in primary care populations including men of varying ages (Arroll et al., 2010; Costantini et al., 2021; El-Den et al., 2018).

GAD-7

The 7-item Generalized Anxiety Disorder Assessment is a four-point Likert-type scale that assesses the frequency of experiences with worrying, nervousness, or anxiousness in the past two weeks (Spitzer et al., 2006). An optimal cut-off score of ≥13 has been established for the perinatal population with a sensitivity of 61.3% and a specificity of 72.7% (Simpson et al., 2014). The GAD-7 differentiates comorbid anxiety and depressive symptoms as separate manifestations (Lutkiewicz et al., 2020) and displays greater accuracy in detecting generalized anxiety in perinatal women with comorbid depression compared to the EPDS and EPDS Anxiety Subscale (Simpson et al., 2014). The GAD-7 has demonstrated acceptable reliabilities for measuring anxiety in maternal (α =0.86; Lutkiewicz et al., 2020) and paternal (α =0.85; Beesley et al., 2019) populations during the perinatal period.

IFSQ

The Infant Feeding Style Questionnaire is a 63-item instrument, excluding items pertaining to solid foods feeding, that measures the beliefs parents have about feeding and behaviors parents exhibit when feeding their infants (Thompson et al., 2009). Feeding styles are separated into five constructs: laissez-faire, pressuring, restrictive, responsive, and indulgent. However, the indulgent construct was not measured in this study since it is not applicable to bottle-feeding. Excluding the indulgent feeding style construct, 43 items of the IFSQ were measured in this study. The full scale contains 13 feeding style sub-constructs, with good internal reliability (α = 0.75-.95) for each sub-construct (Heller & Mobley, 2019; Thompson et al., 2009. Items are coded on a five-point scale (never, seldom, half of the time, most of the time, always); of the items assessed in this study, two laissez-faire diet quality items were inversely coded. The laissez-faire feeding style is characterized by parents who have little interaction with the infant during feeding. The laissez-faire feeding style is assessed through two sub-constructs: (1) laissez-faire in attentiveness to the child and (2) laissez-faire with respect to diet quality. Related to behavior, laissez-faire diet quality items assessed whether parents kept track of what and how much the infant consumed. For measuring belief, laissez-faire diet quality

items examined whether a parent thought a toddler should be able to eat whatever they want for snack or when eating out. The pressuring feeding style involves parents concerned with increasing the amount of food the infant consumes and who use food to soothe the infant. Pressuring is assessed through three sub-constructs: (1) pressuring to finish, (2) pressuring with cereal, and (3) pressuring as soothing. The restrictive feeding style involves parents who limit the infant to healthful foods and limit the amount of food consumed. Restriction is assessed through two sub-contracts: (1) restriction to the amount of formula consumed and (2) restriction with respect to diet quality. There were no behavior items measured for the restriction construct related to diet quality because behavior items related to solid foods feeding were omitted. Examples of belief items to measure restriction with respect to diet quality were, “A toddler should never eat fast food” and “A toddler should only eat health food.” The responsive feeding style involves parents who are attentive to child hunger and satiety cues. Responsive feeding is assessed with two sub-constructs: (1) responsiveness to satiety and hunger and (2) responsive attention and interaction with the infant. In this study, each parent had a score for each infant feeding style, and the highest score was considered the predominant feeding style. Three participants were considered “mixed feeders” because they did not have a single predominant feeding style. The IFSQ was originally validated in a sample of African American mothers of infants in North Carolina (Thompson et al., 2009) and has since been validated in Hispanic maternal populations (Gross et al., 2018; Wood et al., 2016). Benjamin-Neelon and Neelon (2020) recently utilized this measure in a racially diverse sample of mothers and fathers.

Procedures

A Facebook page dedicated to this study was created. It included information related to the study and the link to the REDCap® survey. We targeted general parenting groups and specific groups, such as those exclusively for fathers or parents of infants. Facebook groups were evaluated for selection using the following criteria: a parent-related group, a newborn or infant-related group, a bottle-feeding or formula-feeding related group, an infant father-focused

(such as first-time fathers or expectant fathers) group, or an under-represented parent or father-focused group (such as Black Fathers or Black Moms). Additionally, groups had to be currently active, having at least one post from a member per day, to meet selection criteria. We contacted administrators for each targeted Facebook group through Facebook Messenger to request permission to post information related to the study on their group pages consistent with Facebook research recommendations (Kamp et al., 2019). We requested that either the administrators post the study information to their pages, or the PI posted the study information, according to individual Facebook group page rules and the administrators' preferences. In addition to using Facebook as a means of recruitment, flyers, shown in Figure 2, were placed in local pediatricians' offices in Pitt County, North Carolina advertising the online survey study. The flyer contained instructions for navigating to the study Facebook page where respondents were able to click on the link to the REDCap® survey. Alternatively, the flyer contained a QR code that participants could scan to be immediately linked to the REDCap® survey.

From the point of recruitment, participants were prompted to click on a link to a survey in REDCap®, a secure web-based data management program (Harris et al., 2009). After questions to screen for eligibility, participants were presented with a webpage detailing informed consent; if informed consent was provided, participants were prompted to begin the survey questions. The demographic questionnaire asked participants to provide their infant's weight and length at their most recent well-child pediatrician visit. Data were collected in REDCap®. Participants were informed of their ability to withdraw from the study at any time with no penalty.

Participants had the option to enroll in a drawing for a $50 gift card. On the final screen of the survey, participants who were interested in entering the lottery incentive drawing were prompted to click on a link to a separate RedCap® survey window to provide their contact information including email address and phone number. The participants' survey responses and contact information were not linked, so their responses remained anonymous. Support for these incentives was obtained through the ECU College of Nursing Doctoral Student Research Grant

Program.

Data Management

Data were stored in REDCap®, and backup data were stored on a secured PirateDrive. Only data from surveys that were completed in full were analyzed, except for self-reported infant weight and length data. Only the PI (student researcher) and the faculty advisors identified in the UMCIRB application had access to the data in REDCap®.

Statistical Analysis

IBM SPSS, version 28, was utilized for conducting statistical analyses. Descriptive statistics including means and frequencies were used to describe demographic characteristics, parental mental health, and prevalence of feeding styles among participants. Due to the significant underrepresentation of fathers in this sample, simple frequencies were used to examine feeding style use in males compared to females. To determine prevalence of feeding styles across the sample, feeding style scores were created by calculating the mean score for the items loading on the sub-constructs related to each of the four feeding styles (Thompson et al., 2009). Higher means indicated the predominant feeding style. Each participant was assigned a predominant feeding style except for three participants who were called “multi-style feeders” because they did not have a single predominant feeding style. Sequential logistic regression was used to examine how well mental health variables (stress, depression, anxiety) predicted whether a parent was a non-responsive feeder when controlling for other variables (shame, education, children in home, amount of time parent feeds infant). Feeding styles were coded into a binary score where 1 = non-responsive feeder (laissez-faire, pressuring, restrictive, or multi-style type) and 0 = responsive feeder for the sequential logistic regression analysis. Chi-square Test for Independence was used to determine if WIC enrollment was associated with non-responsive feeding. The cutoff for statistical significance was set at $p < .05$. Table 2 identifies each research question and the corresponding statistical analysis. The analyses for

research questions 1c and 1d were not able to be conducted due to limitations with parental self-report of infant weight. This will be explained further in Chapter 5.

Table 2

Research Questions and Corresponding Statistical Analyses

Research Question	Statistical Analysis
1a. What is the relationship between stress, depression, anxiety, and feeding styles in parents of formula-fed infants?	Sequential Logistic Regression
1b. Is there a difference in stress, depression, anxiety, and parental feeding styles in mothers compared to fathers?	Frequencies
1c. What is the relationship between parental stress, depression, anxiety, and infant weight?*	Pearson Correlation
1d. What is the relationship between parental feeding styles and infant weight?*	One-way ANOVA

***** *Note.* Infant weight was not included in the analyses due to limited reporting of this data by respondents.

Strengths

A descriptive correlational design, including the Facebook recruitment strategy, is efficient because it permits researchers to obtain a large amount of data in a short amount of time from individuals of varying demographics, and it is cost-effective (Curtis et al., 2016; Polit & Beck, 2017; Ryan, 2013; Thornton et al., 2016). Additionally, anonymity in online survey research is a strength because the lack of the researcher's presence reduces social desirability bias (Ball et al., 2019). This study identified relationships between parental mental health

constructs and feeding styles, which will inform future interventions and experimental research studies to address parental mental health and childhood obesity.

Limitations

The purpose of descriptive correlational studies is to describe relationships among variables at a single point in time; therefore, causation cannot be determined with this design (Curtis et al., 2016; Polit & Beck, 2017). Additionally, only individuals who have access to the internet and understand the English language were eligible to participate in the study, which can inflict bias on the results (Ball et al., 2019). Although evidence supports the use of Facebook for recruiting a representative sample, selection bias remains a threat in non-experimental research (Polit & Beck, 2017; Thornton et al., 2016). Further, all data were obtained through parental self-report, and participants were asked to answer approximately 100 total survey items, which could have been a burden on respondents. However, participants had the option to enter a lottery incentive drawing as a token of appreciation for their time and efforts to complete the lengthy questionnaire.

Conclusion

The described methods were utilized to understand the influence of parental mental health following birth on parental feeding styles. This study used a cross-sectional descriptive correlational design. Using social media to recruit participants resulted in an ample number of participants, and it was an innovative, parent-focused strategy for obtaining responses related to infant feeding interactions; however, there are limitations to this research design and the sample was homogenous. Ultimately, this research will inform the development of future interventions to address parental mental health concerns and prevent childhood obesity.

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CHAPTER 4: INTEGRATIVE REVIEW OF MENTAL HEALTH AND FEEDING STYLES IN PARENTS OF BOTTLE-FED INFANTS

This chapter contains manuscript one, which has been submitted for publication regarding an integrative review examining the state of the science related to anxiety, depression, and feeding styles in parents of bottle-fed infants**.** This manuscript is currently under review in the Journal of Obstetric, Gynecologic, and Neonatal Nursing; therefore, only the abstract is provided.

Abstract

Objective: To examine the state of the science related to anxiety, depression, and feeding styles in parents of bottle-fed infants.

Data Sources: Literature searches were conducted in the following electronic databases: PubMed, CINAHL, Scopus, and PsycINFO.

Study Selection: Covidence systematic review management software was used throughout the study selection process to allow for full blinding of decisions by team members. Articles were eligible for inclusion if they were primary research articles in English that examined parental depression or anxiety on feeding styles in term, bottle-fed infants less than 12 months of age. No restriction was placed on date of publication due to the sparse amount of published literature on this topic. A total of 1,656 articles were identified. After removing duplicates, 876 articles were screened, and six studies were included in our review.

Data Extraction: Whittemore and Knafl's integrative review methodology was used to guide data extraction and reporting. Relevant data were extracted from all primary data sources and compiled into a matrix.

Data Synthesis: All studies were independently reviewed by at least two authors. Following the independent review, the authors collaboratively participated in a two-day intensive analysis

retreat at an off-site location. The data were reduced by categorizing the data according to the established parental feeding styles in infancy applicable to bottle-feeding.

Conclusion: Research is limited; however, our review suggests postpartum depression may be associated with non-responsive feeding styles in parents of bottle-fed infants. Notably, our findings shed light on broader issues related to infant feeding such as ethical obligations of health care providers in infant feeding care and equity in infant feeding research. Future research is warranted to inform interventions aimed at promoting responsive feeding in infancy to mitigate childhood obesity.

CHAPTER 5: MENTAL HEALTH AND FEEDING STYLES IN PARENTS OF FORMULA-FED INFANTS

This chapter contains manuscript two regarding research on stress, depression, anxiety and feeding styles in mothers and fathers of healthy, term formula-fed infants residing in the US. The introduction includes background and significance, followed by methods, results, discussion, and conclusions.

Abstract

Responsive feeding is recommended in infancy, and non-responsive feeding styles may contribute to impaired infant appetite self-regulation and the development of childhood obesity and other chronic health conditions. There is a need to investigate factors that potentially contribute to non-responsive feeding styles, including parental mental health disorders such as stress, depression, and anxiety. The purpose of this study was to investigate the influence of parental mental health following birth on feeding styles in healthy, term, formula-fed infants. A cross-sectional descriptive correlational design was employed using online surveys. Purposive and snowball sampling techniques were utilized to recruit participants online through Facebook groups. Recruitment also occurred through local pediatricians' offices. Data were collected in REDCap®. Measurement tools included a demographic questionnaire, Perceived Stress Scale (PSS-10), Patient Health Questionnaire Depression Module (PHQ-9), 7-item Generalized Anxiety Disorder Assessment (GAD-7), and Infant Feeding Style Questionnaire (IFSQ). Participants were 306 parents of healthy, term, formula-fed infants in the United States. Prevalence of dominant feeding styles exhibited by participants were responsive (43.5%), restrictive (22.5%), laissez-faire (19%), pressuring (14.1%), and multi-style (1%). Male participants comprised only 11.1% of the total sample; however, most male parents exhibited either the pressuring or restrictive feeding style, while most female parents exhibited the responsive feeding style. WIC-enrolled parents were more likely to exhibit non-responsive feeding styles compared to those not enrolled in WIC. Reduced time spent on infant feeding and

high levels of depressive symptoms along with low levels of anxiety and stress were the strongest predictors of non-responsive feeding. Our findings indicate a need for increased infant feeding support for parents, especially those experiencing depressive symptoms. Additionally, infant feeding support by healthcare professionals and in WIC programs is warranted for all parents, including those who formula-feed. Finally, there is a need to include fathers in infant feeding education and future research studies.

Introduction

How parents feed their children during infancy has been implicated in childhood obesity. Formula feeding in infancy has been associated with increased risk for rapid weight gain (RWG; Appleton et al., 2018) and higher BMI in childhood (Flores-Barrantes et al., 2020). Rapid weight gain in infancy is a strong predictor of obesity later in life (Druet et al., 2012; Singhal, 2016; Woo Baidal et al., 2016; Zheng et al., 2018) and predisposes individuals to health consequences such as hypertension, type 2 diabetes, cardiac disease, cerebrovascular accidents, osteoarthritis, sleep apnea, cancers, and psychological issues (Centers for Disease Control and Prevention [CDC], 2021a; CDC, 2021b). Infants are dependent upon their caregivers and fully rely on them to provide adequate nutrition, and feeding styles in infancy can have long-term implications on health outcomes (Thompson, 2012). Thus, there is a need to investigate factors that potentially contribute to non-responsive feeding styles among parents of infants.

Childhood obesity has been linked to parental feeding styles (Demir & Bektas et al., 2017; Vollmer & Mobley, 2013), which encompass the emotional climate that exists among the parent-child dyad during feeding sessions (El-Behadli et al., 2015). There are two main feeding styles: responsive and non-responsive. Advisory agencies such as the American Academy of Pediatrics (AAP; 2017), Institute of Medicine (IOM; Birch et al., 2011), United Nations Children's Fund (UNICEF), World Health Organization (WHO), and the United States Department of Agriculture (USDA) recommend responsive feeding (Engle & Pelto, 2011), which refers to caregivers providing a pleasant feeding environment and being in tune with and attentive to

infant hunger and satiety cues (El-Behadli et al., 2015; National Academies of Sciences, Engineering, and Medicine, 2020; Pérez-Escamilla et al., 2017; Thompson et al., 2009). According to agency guidelines, caregivers should be encouraged to provide a nurturing environment and remain attentive and responsive to their infants' hunger and satiety cues during feeding sessions (Pérez-Escamilla et al., 2021) to facilitate infant appetite self-regulation, and subsequently healthy weight trajectories (Hodges et al., 2020). Alternatively, non-responsive feeding styles encompass all types of feeding styles that deviate from the recommended responsive feeding style. With each of the non-responsive feeding styles, parents exhibit characteristics that are the opposite of responsive feeding, including not being in tune with and attentive to infant hunger and satiety cues (Pérez-Escamilla et al., 2017). Feeding styles that are most applicable to formula-feeding by bottle include laissez-faire, pressuring, restrictive, and responsive, which are defined in Table 1.

Table 1

Feeding Styles in Infancy Applicable to Bottle-Feeding

Responsive	Non-Responsive
Responsive	**Pressuring**
Definition: "The parent is attentive to child hunger and satiety cues" (Thompson et al., 2009, p. 211). Associated Practices: • No distraction during feeds • Attentive to hunger and satiety cues • Feeding "on demand"	Definition: "The parent is concerned with increasing the amount of food the infant consumes and uses food to soothe the infant" (Thompson et al., 2009, p. 211). Associated Practices: • Adding cereal to bottle • Feeding infant to make them stop crying • Feeding infant in the absence of hunger cues/ feeding on strict schedule • Continuing to feed when satiety cues are exhibited by infant
	Restrictive
	Definition:

"The parent limits the infant to healthful foods and limits the quantity of food consumed" (Thompson et al., 2009, p. 211). Associated Practices: • Limiting amount of intake • Not feeding infant when hunger cues are exhibited/ feeding on strict schedule
Laissez-faire
Definition: "The parent does not limit infant diet quality or quantity and shows little interaction with the infant during feeding" (Thompson et al., 2009, p. 211). Associated Practices: • Distractions (i.e., Watching television while feeding infant) • Propping the bottle

Note. Associated practices described in the table are from Thompson et al. (2009)

Parental depression and anxiety have been positively correlated with obesity in children ages birth through adolescence (Marco et al., 2020), and parental feeding styles have been associated with infant weight (Spill et al., 2019). Caregiver mental health, specifically parental stress, depression, and anxiety have been demonstrated to impact infant feeding responsiveness (Chen et al., 2020; Gaffney et al., 2018; Hurley et al., 2008; Hurley et al., 2015; Savage & Birch, 2017; Thompson et al., 2021). However, these studies have not examined a broad, nationwide US sample and have not specifically focused on formula-feeding families. Because parental feeding styles in infancy have been associated with infant weight (Spill et al., 2019) and formula-fed infants are at greater risk for rapid weight gain (Appleton et al., 2018), it is crucial to understand factors that may contribute to non-responsive feeding styles, such as parental mental health symptoms, to determine points of intervention to improve parent-child feeding interactions and health outcomes in formula-fed infants.

Purpose

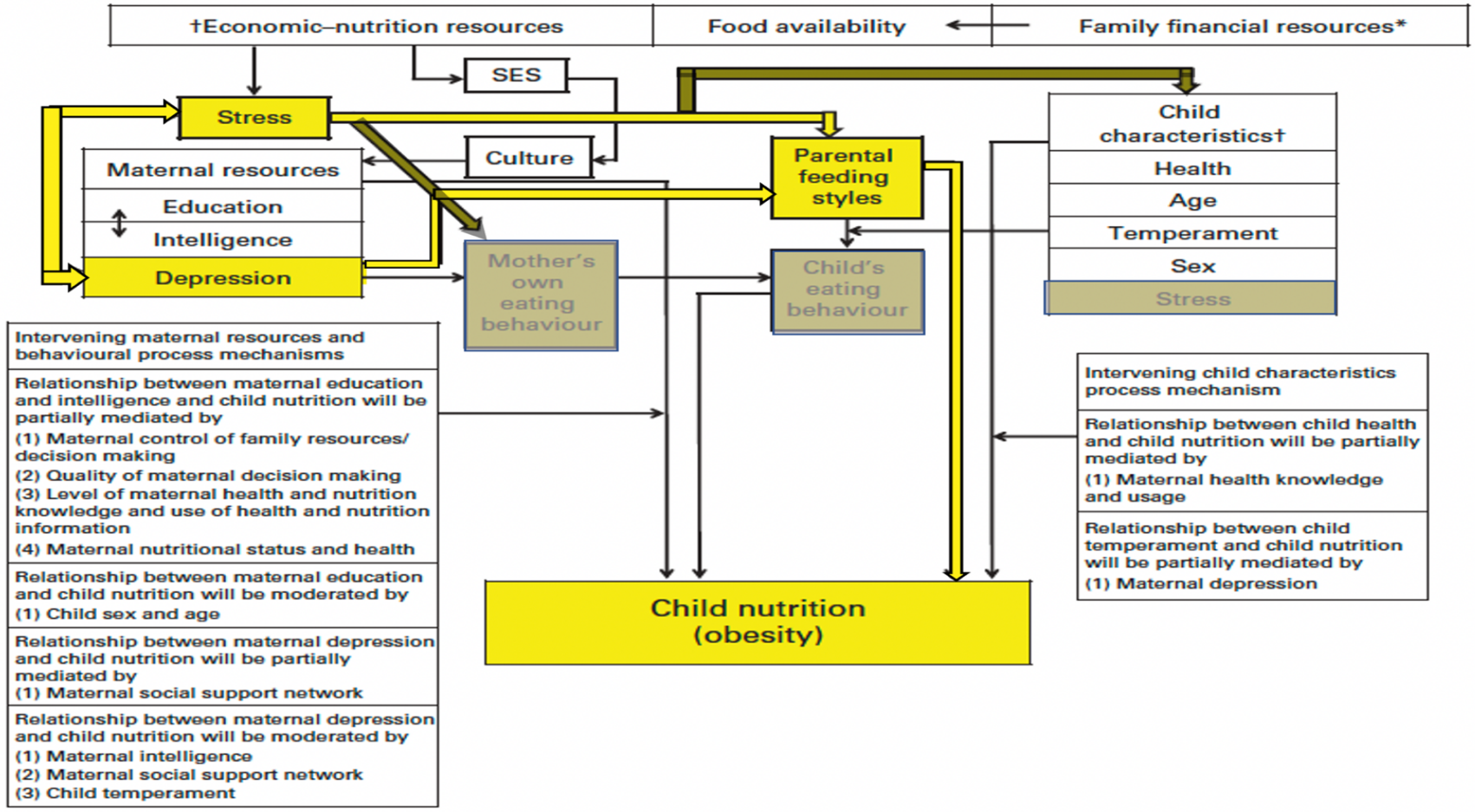
The purpose of this study was to investigate the influence of parental mental health following birth on feeding styles in parents of healthy, term, formula-fed infants during the first year of life.

Conceptual Model

UNICEF (1991) developed a conceptual model depicting a strategy for improving nutrition for women and children in developing countries. Since its conception, this model has been expanded upon and modified to provide a framework for supporting optimal maternal-child nutrition globally. Our study was guided by El-Behadli and colleagues' Extended Care Model, an extension of the UNICEF Care Model (1991), which focuses on factors influencing childhood obesity "with an emphasis on the emotional climate of the parent-child relationship within the family" (El-Behadli et al., 2015, p. S57). This model, shown in Figure 1, uses a systems approach to highlight that the emotional climate of the parent-child relationship, including mental health elements such as parental stress and depression, impacts feeding interactions. This model indicates a bidirectional influence between parental stress and depression and a unidirectional influence of parental stress and depression on feeding styles (El-Behadli et al., 2015). While anxiety is not a concept included in this model, it was explored as a mental health concept in this study because anxiety commonly occurs with depression specifically during the perinatal period and in general (Chinchilla-Ochoa et al., 2019; Nakić Radoš et al., 2018; Salcedo, 2018). The model also depicts a unidirectional relationship between parental feeding styles and child nutrition. The authors' expanded concepts and relationships are shaded and highlighted; the highlighted concepts and relationships were explored in our study.

Figure 1

El-Behadli and Colleague's Extended UNICEF Care Model



*Note. * Family financial resources will mediate the influence of maternal education and moderate the influence of social support. † Child age may moderate the influence of family economic–nutrition resources. Double-headed arrows indicate bidirectional influences and arrows intersecting other arrows indicate mediation of moderation processes*

Methods

A cross-sectional descriptive correlational design through online survey was used to examine relationships between mental health and feeding styles in parents of formula-fed infants residing in the United States (US). An online survey is a favorable method for studying a national US population because of its reach, cost-effectiveness, flexibility, and speed, and participants across the country receive the survey questions identically (Ball et al., 2019). Data were collected in REDCap®, a secure web-based data management program (Harris et al., 2009). Approval for this study was obtained from the University and Medical Center Institutional Review Board (IRB) at East Carolina University.

Participants

Inclusion criteria were parents of healthy infants less than one year of age who were currently living in the US and were exclusively formula-feeding at the time of survey completion. Exclusion criteria were individuals who: (1) did not speak English or comprehend written communication in English, (2) did not currently have a child less than 12 months of age, (3) were breastfeeding, (4) lived outside of the US, (5) currently had an infant with a pre-existing health condition that might impact feeding such as Down Syndrome, Prader-Willi Syndrome, epilepsy, cleft lip or palate, cerebral palsy, failure to thrive, or severe food allergies, or (6) currently had an infant that was born preterm (<37 weeks' gestation).

Participants were recruited online through Facebook groups. This method was selected because it provided the potential to yield a diverse sample. Facebook is the most used social media platform with about 69% of US adults using it and 70% of those adults accessing their profiles daily (Pew Research Center, 2021). Additionally, 70% of adults ages 18 to 49 use Facebook, which includes those of childbearing age, as is consistent with our target population (Pew Research Center, 2021). Further, Facebook is equally utilized by varying races and ethnicities (White 67%, Black 74%, Hispanic 72%), and is a particularly useful strategy for reaching populations that may otherwise be difficult to access (Pew Research Center, 2021;

Thornton et al., 2016). Facebook is an optimal recruitment strategy for capturing a diverse, inclusive sample representative of the US infant parent population because it is feasible, efficient, and cost-effective (Ryan, 2013; Thornton et al., 2016).

Purposive sampling techniques were utilized to recruit fathers as they were expected to be underrepresented (Thornton et al., 2016). Facebook groups specifically related to fathers of infants were pursued in addition to general parent groups because it is known that father-focused advertisements are far more successful at recruiting fathers through Facebook than gender-neutral parent advertisements (Leach et al., 2019). Snowball sampling was utilized as a recruitment strategy by encouraging individuals to share the recruitment post. In addition to inviting individuals to participate within specific groups, the Principal Investigator (PI) also posted the recruitment image to her personal Facebook page and encouraged sharing of the image by those who viewed it to attempt to reach individuals meeting inclusion criteria (Polit & Beck, 2017; Thornton et al., 2016).

Ryan (2013) suggests using a mixed recruitment approach including online and traditional methods. Therefore, in addition to using Facebook as a means of recruitment, we also recruited parents through local pediatricians' offices in Pitt County, North Carolina by placing flyers in the offices. The PI has an established relationship with the local pediatricians as she is a maternal-newborn nurse at the local academic medical center and works closely with them. Written permission to distribute the flyer was obtained from the pediatricians' offices. To minimize the threat of coercion or undue inducement, the researchers did not participate directly in the recruitment of participants from the pediatricians' offices, but instead, relied on the distribution of flyers by office personnel. Survey participants were offered an opportunity to enter a drawing for one of 20 $50 Walmart e-gift cards as an incentive to participate in the study.

Surveys

Screening Questions

Inclusion criteria screening questions included self-report of parents living in the United

States and having a healthy, term infant less than one year of age who was exclusively formula feeding at the time of the survey.

Sociodemographic Characteristics

Demographic and background data were collected through self-report. Participants were asked to provide state of residence, zip code, age, race, ethnicity, marital status, level of education, employment status, average household income, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) enrollment status, number of children living in the household and their ages, type of infant formula they use (i.e., soy, cow, goat, homemade, other), what percentage of time they feed their infant, and who else feeds their infant. Respondents were also asked to indicate their main source for infant feeding information (i.e., healthcare professionals, friends/family, internet), if they have felt shamed for their feeding method choice, if they are a biological or adoptive parent, and how they found out about the study.

Feeding Styles

The Infant Feeding Style Questionnaire (IFSQ) measures parents' beliefs about early child feeding and the behaviors they exhibit when feeding their infants (Thompson et al., 2009). Feeding styles are separated into five constructs: laissez-faire, pressuring, restrictive, responsive, and indulgent. However, the indulgent construct was not measured in this study as it is not applicable to bottle-feeding. Excluding the indulgent feeding style construct and behavior items pertaining to solid foods feeding, 43 items of the IFSQ were measured in this study. The full scale contains 13 feeding style sub-constructs, with good internal reliability (α = 0.75-.95) for each sub-construct (Heller & Mobley, 2019; Thompson et al., 2009). The IFSQ was originally validated in a sample of African American mothers of infants in North Carolina (Thompson et al., 2009) and has since been validated in Hispanic maternal populations (Gross et al., 2018; Wood et al., 2016). Benjamin-Neelon and Neelon (2020) recently utilized this measure in a racially diverse sample of mothers and fathers. Items are coded on a five-point

scale (never, seldom, half of the time, most of the time, always); of the items assessed in this study, two laissez-faire diet quality items were inversely coded. Higher scores reflect the dominant feeding style. The laissez-faire feeding style is characterized by parents who have little interaction with the infant during feeding. The laissez-faire feeding style is assessed through two sub-constructs: (1) laissez-faire in attentiveness to the child and (2) laissez-faire with respect to diet quality. Related to behavior, laissez-faire diet quality items assessed whether parents kept track of what and how much the infant consumed. For measuring belief, laissez-faire diet quality items examined whether a parent thought a toddler should be able to eat whatever they want for snack or when eating out. The pressuring feeding style involves parents concerned with increasing the amount of food the infant consumes and who use food to soothe the infant. Pressuring is assessed through three sub-constructs: (1) pressuring to finish, (2) pressuring with cereal, and (3) pressuring as soothing. The restrictive feeding style involves parents who limit the infant to healthful foods and limit the amount of food consumed. Restriction is assessed through two sub-contracts: (1) restriction to the amount of formula consumed and (2) restriction with respect to diet quality. There were no behavior items measured for the restriction construct related to diet quality because behavior items related to solid foods feeding were omitted. Examples of belief items to measure restriction with respect to diet quality were, “A toddler should never eat fast food” and “A toddler should only eat health food.” The responsive feeding style involves parents who are attentive to child hunger and satiety cues. Responsive feeding is assessed with two sub-constructs: (1) responsiveness to satiety and hunger and (2) responsive attention and interaction with the infant.

Stress

The PSS-10 was used to measure stress, and it is designed to measure how stressful one’s life has been over the past month as perceived by that individual. In the PSS-10, each item is scored zero to four with total scores ranging from zero to 40, with higher sums of scores indicating greater perceived stress (Cohen et al., 1983). A cutoff score of ≥14 on the PSS-10

was used to detect moderate to high perceived stress as suggested by other researchers studying the perinatal population (Suárez-Rico et al., 2021; Tanpradit & Kaewkiattikin, 2020). This tool has been used to measure stress in the postpartum period among mothers and fathers, with Cronbach's alpha ranging from .75 to .89 (Gao et al., 2009; Kamalifard et al., 2014; Suárez-Rico et al., 2021).

Depression

The Patient Health Questionnaire Depression Module is a four-point Likert-type scale that assesses the frequency of experiences with depressed mood and lack of pleasure in the past two weeks (Kroenke & Spitzer, 2002). A ≥10 cutoff on the PHQ-9 was used to detect moderate depression severity (Kroenke & Spitzer, 2002; Levis et al., 2019). In a meta-analysis on the use of the PHQ-9 in the perinatal population, Wang et al. (2021) detected a pool sensitivity of 0.84 and specificity of 0.81. While the PHQ-9 has not been specifically validated in the paternal population, it has been validated in primary care populations including men of varying ages (Arroll et al., 2010; Costantini et al., 2021; El-Den et al., 2018).

Anxiety

The 7-item Generalized Anxiety Disorder Assessment is a four-point Likert-type scale that assesses the frequency of experiences with worrying, nervousness, or anxiousness in the past two weeks (Spitzer et al., 2006). An optimal cut-off score of ≥13 has been established for detecting moderate to severe anxiety in the perinatal population with a sensitivity of 61.3% and a specificity of 72.7% (Simpson et al., 2014). The GAD-7 differentiates the comorbid anxiety and depressive symptoms as separate manifestations (Lutkiewicz et al., 2020) and displays greater accuracy in detecting generalized anxiety in perinatal women with comorbid depression compared to the Edinburgh Postnatal Depression Scale (EPDS) and EPDS Anxiety Subscale (Simpson et al., 2014). The GAD-7 has demonstrated acceptable reliabilities for measuring anxiety in maternal (α =0.86; Lutkiewicz et al., 2020) and paternal (α =0.85; Beesley et al.,

2019) populations during the perinatal period. Table 2 shows the psychometric properties for the IFSQ, PSS-10, GAD-7, and PHQ-9 in our study.

Table 2

Psychometric Properties for Infant Feeding Style Questionnaire and Mental Health Scales

Scale	M	SD	Range		Cronbach's α
			Min	Max	
IFSQ					
Laissez-faire	2.63	0.60	1	3.67	
Attention	2.59	0.73	1	4.40	.69
Diet quality	2.68	0.70	1	4.50	.46
Pressuring	2.64	0.73	1	4.53	
Finish	2.62	0.80	1	4.83	.81
Cereal	2.52	0.93	1	4.80	.83
Soothing	2.82	0.78	1	4.75	.73
Restrictive	3.02	0.73	1	4.78	
Amount	2.88	0.80	1	4.75	.63
Diet quality	3.14	0.89	1	5.00	.79
Responsive	3.38	0.79	1.40	5.00	
Satiety	3.45	0.90	1.29	5.00	.89
Attention	3.22	0.88	1	5.00	.70
Mental Health					
PSS-10	18.78	4.66	1	32	.77
GAD-7	7.73	4.28	0	21	.84
PHQ-9	9.11	5.02	0	23	.83

Note. N= 306. IFSQ= infant feeding style questionnaire, PSS-10= perceived stress scale, GAD-7= generalized anxiety disorder scale, PHQ-9= patient health questionnaire depression scale.

Statistical Analysis

Descriptive statistics including means and frequencies were used for demographic data and prevalence of feeding styles exhibited among participants. To determine prevalence of feeding styles across the sample, feeding style scores were created by calculating the mean score for the items loading on the sub-constructs related to each of the four feeding styles (Thompson et al., 2009). Higher means indicated the predominant feeding style. Each participant was assigned a predominant feeding style except for three participants who were

called “multi-style feeders” because they did not have a single predominant feeding style. Sequential logistic regression was used to examine how well mental health variables (stress, depression, anxiety) predicted whether a parent was a non-responsive feeder when controlling for other variables (shame, education, children in home, amount of time parent feeds infant). Feeding styles were coded into a binary score where 1 = non-responsive feeder (laissez-faire, pressuring, restrictive, or multi-style type) and 0 = responsive feeder for the sequential logistic regression analysis. Chi-square Test for Independence was used to determine if WIC enrollment was associated with non-responsive feeding. The cutoff for statistical significance was set at $p < .05$.

Results

Sampling

Administrators of 44 Facebook groups related to infant feeding or fathering were contacted between November 2021 and January 2022. Six groups shared the Facebook study page or survey link with their members. A total of 573 survey responses were obtained, with 306 completed surveys whose respondents met the study inclusion criteria.

Demographic Characteristics

Demographic data are presented in Table 3. Participants were from 39 states, with most from California (n=60), North Carolina (n=37), and Texas (n=29). The mean age of participants was 29.3 years (SD= 4.88). Most participants were White (81.7%), female (86.3%), married or in a partnership (93.8%), and educated with some college or higher (89.1%). Regarding mental health, 10.1% of participants reported experiencing moderate to severe anxiety as indicated by a GAD-7 score of ≥13. Over half (50.7%) of participants reported experiencing moderate to severe depressive symptoms as indicated by a PHQ-9 score of ≥10. Most participants reported experiencing moderate to high stress (87.6%) as indicated by a PSS-10 score of ≥14.

Table 3

Sample Characteristics

Characteristic	Total	%
Sex of Caregiver		
Male	34	11.1
Female	264	86.3
Non-Binary	8	2.6
Race/Ethnicity		
White	250	81.7
Hispanic/Latino	22	7.2
Black	19	6.2
Native American	20	6.5
Asian	2	0.7
Multiracial	3	1
Education		
High School or less	33	10.8
Some College or degree obtained	234	76.4
Graduate Degree	29	12.7
Marital Status		
Single/Never married	11	3.6
Married/Partnered	287	93.8
Divorced/Separated	8	2.6
Household Annual Income (U.S. dollars)		
<50,000	99	32.4
50,000-99,999	128	41.9
100,000-149,999	49	16
150,000+	30	9.8
Infant Sex		
Male	162	52.9
Female	144	47.1
Infant Age		
< 6 months	74	24.2
6 months-<12 months	232	75.9
Number of Children in Home besides Infant		
0	201	65.7
1	76	24.8
2-5	29	9.4
PHQ-9 Score: Depression		
<10	151	49.3
≥10	155	50.7
GAD-7 Score: Anxiety		
<13	275	89.9
≥13	31	10.1
PSS-10 Score: Stress		
<14	38	12.4
≥14	268	87.6
Age (years) (*M* and *SD*)	29.3	4.88

Characteristics Related to Infant Feeding

Characteristics related to infant feeding are presented in Table 4. Most participants were enrolled in WIC (67.6%). All respondents were exclusively formula-feeding at the time of study participation; however, 65.7% initially breastfed their infant, then switched to formula. Approximately 46% of participants reported feeling shamed for their choice to formula feed, and sources of shame included the internet and social media (29.4%), friends (28.4%), family (27.5%), health care professionals (23.2%), and other sources (3.9%). Participants were also asked about where they receive information regarding infant feeding. Participants reported receiving infant feeding information from health care professionals (56.5%), internet (15.7%), family (14.7%), friends (11.8%) and other sources (1.3%). Most participants (45.8%) reported feeding their infant 25-50% of the time, and most reported that other individuals fed their infant (85.3%) including family members (56.5%), the other parent (49.3%), or childcare providers (19.3%). Prevalence of dominant feeding styles exhibited by participants were responsive (43.5%), restrictive (22.5%), laissez-faire (19%), pressuring (14.1%), and multi-style (1%); these findings illustrate that the majority (56.6%) of participants predominantly exhibited a non-responsive feeding style. Table 5 shows that most male parents exhibited either the pressuring (29.4%) or restrictive (32.4%) feeding styles, while most female parents exhibited the responsive feeding style (47%).

Table 6 presents the binary (0/1) coding for the logistic regression predictor variables and the relationships of the predictor variables with the binary feeding style outcome variable. Although WIC-enrollment status was included in the table, it was not included in the final regression model because inclusion resulted in a poor Hosmer & Lemeshow goodness of fit test result. The poor fit may be related to the large proportion of WIC participants (67.6%) and the nature of WIC being a rather broad variable acting as a proxy for other variables such as education, family income or nutritional risk. All the predictor variables, including WIC, were significantly related to the outcome variable. Parents exhibiting a non-responsive feeding style

were less likely to have experienced shame regarding their choice of formula feeding, to have a bachelor's degree or higher, to have other children at home in addition to their infant, and to feed their infant for more than half of the infant's feeds.

Table 4

Characteristics Related to Infant Feeding

Characteristic	Total	%
WIC-enrolled		
Yes	207	67.6
No	99	32.4
Feeding Plan		
Initial plan formula only	105	34.3
Started breast switched to formula	201	65.7
How Often Participant Feeds Infant		
<25% of feeds	40	13.1
25-50% of feeds	140	45.8
50-75% of feeds	90	29.4
>75% of feeds	36	11.8
Who Else Feeds Infant		
No one	45	14.7
Other parent	151	49.3
Family members	173	56.5
Childcare provider	59	19.3
Felt Shamed for Formula Feeding		
Yes	142	46.4
No	164	53.6
Source of Shame		
Internet/Social media	90	29.4
Friends	87	28.4
Family	84	27.5
Health care professionals	71	23.2
Other	12	3.9
Source of Infant Feeding Information		
Health care professional	173	56.5
Internet	48	15.7
Family	45	14.7
Friends	36	11.8
Other	4	1.3
Type of Formula		
Cow-milk based	150	49
Soy-based	16	5.2
Protein hydrolysate	38	12.4
Goat-milk based	75	24.5
Homemade	2	0.7
Other	3	1
Unsure	22	7.2
Feeding Styles		
Responsive	133	43.5
Pressuring	43	14.1
Restrictive	69	22.5
Laissez-Faire	58	19
Multi-Style	3	1

Note. N=306. Who Else Feeds Infant and Source of Shame do not total 100% because participants were permitted to select all that applied. Multi-style describes participants who did not have a single predominant feeding style.

Table 5

Sex of Parent and Feeding Style Frequencies

Sex of Caregiver	Total	%
Male		
Responsive	6	17.6
Pressuring	10	29.4
Restrictive	11	32.4
Laissez-Faire	7	20.6
Female		
Responsive	124	47
Pressuring	30	11.4
Restrictive	56	21.2
Laissez-Faire	51	19.3
Non-Binary		
Responsive	3	37.5
Pressuring	3	37.5
Restrictive	2	25
Laissez-Faire	0	0

Note. N=303. Three participants were coded as multi-style feeders, and they are not included in this table.

Parental Mental Health and Feeding Styles

The proportion of non-responsive and responsive feeding parents with moderate to severe depressive symptoms, anxiety, and stress are shown in Table 6. Non-responsive feeding parents compared to responsive feeding parents are more likely to have moderate to severe depressive symptoms (61.6% vs. 36.1%) and less likely to have moderate to severe anxiety (6.4% vs. 15%) and stress (82.1% vs. 93.2%) than responsive feeding parents.

Table 7 presents the results of a sequential logistic regression for predicting non-responsive feeding from three mental health variables and four potentially confounding variables. The four confounding variables were entered at step 1 and the model chi-square statistic at the bottom of the table shows that adding these four control variables to an equation that contained only the constant term resulted in a significant improvement in the model's ability to predict the criterion variable, model χ^2 (4, N = 306) = 47.90, $p < .001$. For the model

containing just the constant and the four control variables, the Cox & Snell model R^2 was .145, and the Nagelkerke R^2 was = .194. At step 2, the three theoretical mental health variables were added to Model 1, resulting in Model 2. Summary statistics at the bottom of Table 7 shows that adding these three variables resulted in a significant improvement in the model's ability to predict non-responsive feeding, $\Delta\chi^2$ (3, N = 306) = 33.56, $p < .001$. Cox & Snell model R^2 was .234, and the Nagelkerke R^2 was = .313. The adjusted odds ratios for the seven predictor variables in Model 2 appear in the upper section of Table 7. The adjusted odds ratio for a given predictor variable is statistically significant ($p < .05$) if the 95% confidence interval for that adjusted odds ratio does not contain the value of 1.0. Inspection of the confidence intervals under the heading "Model 2" shows that all the predictors except for children in the home are statistically significant. The three most important predictors included PSS-10 (OR = 0.27), GAD-7 (OR = 0.23), and PHQ-9 (OR = 4.21).

Table 6

Logistic Regression Predictor Variable Categories for Predicting Non-Responsive Feeding

	Non-responsive (1)	Responsive (0)		
Variable	%	%	χ^2 (1)	p
Experienced shame			10.91	.001
0 = Yes	38.2	57.1		
1 = No	61.8	42.9		
Education			14.28	<.001
0 = ≥ Bachelor's degree	27.2	48.1		
1 = < Bachelor's	92.8	51.9		
Children home			5.17	.023
0 = Infant and other children	28.9	41.4		
1 = Infant only	71.1	58.6		
Time parent feeds infant			24.76	<.001
0 = > 50 %	28.9	57.1		
1 = ≤ 50 %	71.1	42.9		
PHQ-9			19.96	<.001
0 = < 10	38.2	63.9		
1 = ≥ 10	61.8	36.1		
GAD-7			6.23	.013
0 = < 13	93.6	85.0		
1 = ≥ 13	6.4	15.0		
PSS-10			8.23	.004
0 = <14	17.9	6.8		
1 = ≥14	82.1	93.2		
WIC			37.89	<.001
No	17.9	51.1		
Yes	82.1	48.9		

Note. N = 306. Non-responsive feeding n = 173 (56%) and responsive feeding n = 133 (44%).

Table 7

Summary of Sequential Logistic Regression Predicting Non-Responsive Infant Feeding Style from Four Control Variables and Three Mental Health Variables

Predictors	Model 1	Model 2
	OR 95% CI	OR 95% CI
Step1		
Constant	.21	.12
Shame	1.76 [1.08, 2.89]	1.76 [1.03, 3.02]
Education	2.41 [1.44, 4.01]	1.92 [1.09, 3.36]
Children at home	1.55 [0.92, 2.60]	1.48 [0.85, 2.57]
Feeding time percent	3.22 [1.96, 5.29]	2.63 [1.55, 4.47]
Step2		
PSS-10		0.27 [0.11, 0.65]
GAD-7		0.23 [0.09, 0.56]
PHQ-9		4.21 [2.35, 7.54]
Model summary statistics:		
Model χ^2 (df)	47.90 (4) ***	81.47 (7) ***
$\Delta\chi^2$ (df)	47.90 (4) ***	33.56 (3) ***
Cox & Snell Model R^2	.145	.234
Nagelkerke Model R^2	.194	.313

Note. N = 306. CI = confidence interval.

*** $p < .001$.

Discussion

Our study revealed a strong, positive relationship between parental depression and non-responsive feeding styles. This finding is consistent with other studies that found depressed mothers exhibit less responsiveness during infant feeding compared to mothers without depressive symptoms (Chen et al., 2020; Gaffney et al., 2018; Hurley et al., 2008; Savage & Birch, 2017; Thompson et al., 2021). Additionally, some studies have detected a relationship between maternal depressive symptoms and the restrictive feeding style, including practices such as making the infant wait until feeding time even if hunger cues are exhibited sooner or worrying about others feeding the infant too much (Gaffney et al., 2018; Hurley et al., 2008). When examining parental mental health, the effect of the COVID-19 pandemic must be considered. In a recent online survey of US mothers who delivered an infant during the COVID-19 pandemic, one in three participants had a positive postpartum depression screen and those who formula-fed their infants had 92% greater odds of screening positive for postpartum depression compared to those who breastfed or bottle-fed with their own expressed breastmilk (Shuman et al., 2022). These findings are relevant because our survey was conducted during the pandemic. Because our study of exclusively formula-fed parents showed a strong association between parental depressive symptoms and non-responsive feeding styles and most parents in our study (56.6%) predominantly exhibited a non-responsive feeding style, we recommend increased postpartum depression screening and responsive feeding support for all postpartum mothers and fathers in practice regardless of infant feeding method.

There was a strong, negative relationship between parental stress and anxiety with non-responsive feeding styles. In other words, participants who reported experiencing increased levels of stress and anxiety exhibited responsive feeding. This finding is different from a previous study, which found that maternal stress and anxiety were positively associated with non-responsive feeding styles in a sample of WIC-enrolled Maryland residents (Hurley et al., 2008). The reasons for this finding are not known, however we speculate this finding could be

attributed to parents potentially being stressed and anxious about responding to infant hunger and satiety cues appropriately and are therefore hyperaware of feeding responsively. Fewer studies have examined parental stress and anxiety related to infant feeding styles compared to parental depression; therefore, further research is needed to explore these relationships.

There was a significant relationship between feeding the infant for less than half of the infant's feeds and the non-responsive feeding style. Infants exhibit various feeding cues (McNally et al., 2016), and our findings suggest that the less time the parent spends interacting with the infant during feeds, the less they will understand the infant's unique feeding cues and be responsive to them. It is also important to note that 58.9% of our sample reported feeding their infant for less than half of the infant's feeds. This means that the infants of the parents in our sample are being fed by another caregiver most of the time, including the other parent (49.3%), family members (56.5%), and daycare workers (19.3%). Thus, there are important practice and policy implications to consider. First, we recommend responsive feeding education by health care providers for both parents, family members, and daycare workers. Additionally, state guidelines related to infant feeding policies in childcare facilities should align with standards published by the National Resource Center for Health and Safety in Child Care and Early Education (2021), which recommend responsive feeding including feeding one infant at a time, holding the infant for feeds, engaging with the infant through eye contact and vocalizations during feeds, initiating feeds based on the infant's hunger cues, and ending the feed based on the infant's satiety cues.

There was also a significant relationship between participants who were enrolled in WIC and non-responsive feeding styles, χ^2 (1, N = 306) = 37.89, p <.001. WIC is a federally funded supplemental food and nutrition education program for low-income pregnant and postpartum women, infants, and children up to five years of age; this program serves about half of US infants (U.S. Department of Agriculture, 2019). In a previous study, Ventura and Teitelbaum (2017) found that mothers enrolled in WIC reported using less feeding responsiveness

compared to mothers not enrolled in WIC, and Hudak and Benjamin-Neelon (2021) found that 34% of women who enrolled in WIC prenatally fed responsively, compared to 25% of women who enrolled after giving birth. Additionally, formula-feeding mothers report feeling judged for their feeding method choice and feeling less supported by WIC staff compared to breastfeeding mothers (Almeida et al., 2020). A recent matched-pair cluster randomized trial was employed to address this issue and promote responsive bottle-feeding in WIC participants. This policy, system, and environmental change approach was successful at reducing infants' risk for rapid weight gain and increasing support for formula-feeding families (Ventura et al., 2022). Our study results combined with findings from other recently published studies indicate a need to encourage WIC enrollment prenatally, promote responsive feeding in WIC education, and support all families in infant feeding regardless of feeding method choice.

In our study, most male parents exhibited either the pressuring or restrictive feeding style, while most female parents exhibited the responsive feeding style. Fathers are significantly underrepresented in infant feeding and obesity prevention research (Davison et al., 2016; Davison et al., 2018; Khandpur et al., 2014). However, the few studies that have examined paternal feeding styles in infancy have demonstrated similar findings: fathers exhibit more non-responsive feeding styles compared to mothers (Barrett et al., 2018; Benjamin-Neelon & Neelon, 2020; Daniels et al., 2020). The amount of time fathers report caring for their children has nearly tripled over the last half-century (Pew Research Center, 2013), and many families choose to formula-feed so a non-maternal caregiver can help with infant feeds (Bascom & Napolitano, 2016; DeVane-Johnson et al., 2018; Gallo et al., 2019), yet father-infant feeding interactions are much less studied. We recommend employing qualitative methods to inductively understand fathers' unique needs related to infant feeding as a first step for future research. This initial inquiry could inform future responsive feeding interventions tailored to fathers' needs to facilitate healthy weight trajectories in infancy and beyond.

Limitations

The purpose of descriptive correlational studies is to describe relationships among variables at a single point in time; therefore, causation cannot be determined with this design (Curtis et al., 2016; Polit & Beck, 2017). Additionally, only individuals who have access to the internet and understand the English language were eligible to participate in our study, which can inflict bias on the results (Ball et al., 2019). Although evidence supports the use of Facebook for recruiting a representative sample, selection bias remains a threat in non-experimental research (Polit & Beck, 2017; Thornton et al., 2016), and snowball sampling through Facebook sharing may have introduced sampling bias towards characteristics of individuals who have an active social media presence (Leighton et al., 2021), yielding a homogenous sample of potentially like-minded participants. Further, all data were obtained through parental self-report, and participants were asked to answer approximately 100 total survey items, which could have placed a burden on respondents. However, participants had the option to enter a lottery incentive drawing as a token of appreciation for their time and efforts to complete the lengthy questionnaire. Despite our attempts to strategically recruit fathers and a racially diverse sample, our sample was 81.7% White and 86.3% female. Finally, we initially aimed to obtain infant weight and length to calculate weight-for-length z-scores; however, parental self-report of infant weight and length was limited. About 40% of the data were missing and there were additional discrepancies in how some of the data were reported. For example, it was not clear if weight was being reported in pounds or kilograms in some cases, so we could not determine how valid responses were. Therefore, a decision was made to omit the limited self-reported anthropometric data in the final analyses of our study. Future studies designed to collect data in-person should collect anthropometric data to examine relationships between parental mental health, feeding styles, and infant weight, and while not accomplished in this study, researchers should consider a longitudinal design to track this phenomenon over time in future studies.

Conclusion

Our primary findings were that reduced time spent on infant feeding and high levels of

depressive symptoms along with low levels of anxiety and stress were the strongest predictors of non-responsive feeding. These findings along with previous research suggesting that non-responsive feeding is also associated with childhood obesity suggest that future studies should focus on developing interventions to increase responsive feeding in mothers and fathers of formula-fed infants.

Disclosure

The first author completed the study procedures and the wrote the narrative. The second author oversaw the research and provided extensive input on the manuscript, and suggested revisions as needed. The third author provided statistical expertise and assisted with presenting the results. This research was supported by internal grant funding from the East Carolina University College of Nursing Doctoral Research Grant Program, totaling $1,000 for participant incentives.

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APPENDIX A: IRB APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
rede.ecu.edu/umcirb/

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Taylor Nelson
CC: Pamela Reis
Date: 11/1/2021
Re: UMCIRB 21-000757
Well-Being and Feeding Styles in Parents of Formula-Fed Infants

I am pleased to inform you that your research submission has been certified as exempt on 10/30/2021. This study is eligible for Exempt Certification under category # 2c.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

Document	Description
CHS.png(0.01)	Additional Items
DemographicQuestionnaire.pdf(0.01)	Surveys and Questionnaires
DemographicQuestionnaire.pdf(0.01)	Data Collection Sheet
Eastern Peds.png(0.01)	Additional Items
ECU Peds.png(0.01)	Additional Items
ExpeditedSurveyConsent.doc(0.01)	Consent Forms
GeneralizedAnxietyDisorderGAD7.pdf(0.01)	Surveys and Questionnaires
Greenville Peds.png(0.01)	Additional Items
IFSQ_Behavior.pdf(0.01)	Surveys and Questionnaires
IFSQ_Beliefs.pdf(0.01)	Surveys and Questionnaires
Nelson_Proposal_REVISED3.docx(0.01)	Study Protocol or Grant Application
PatientHealthQuestionnairePHQ9.pdf(0.01)	Surveys and Questionnaires
PerceivedStressScalePSS10.pdf(0.01)	Surveys and Questionnaires
Recruitment FB Post.pdf(0.01)	Recruitment Documents/Scripts
Recruitment Flyer.pdf(0.01)	Recruitment Documents/Scripts
Screening Questions.pdf(0.01)	Surveys and Questionnaires

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: PERMISSION TO USE TOOLS

Permission to Use Tools

1. The PHQ-9, GAD-7, and PSS-10 are public domain tools. The appropriate authors were cited to give credit.
2. The following is the permission to use the Infant Feeding Style Questionnaire:

Hi Taylor,

Thank you for resending –I missed your e-mail.

The IFSQ and scoring guide are attached. We are asking groups interested in the IFSQ not to take individual items out of the constructs as these constructs have been validated and, more importantly, to remember that this questionnaire was developed with a particular population. It may require some pretesting in your sample.

Please let me know if you had any questions about the instrument.

Regards,
Amanda
--
Amanda Thompson, Ph.D. MPH
Professor and Associate Chair, Department of Anthropology
Professor, Department of Nutrition, Gillings School of Global Public Health
University of North Carolina at Chapel Hill

3. The following is permission to remove questions pertaining to solid feeding.

Hi Taylor,

The IFSQ has 63 questions that are appropriate for infants of all ages and another 20 questions that could be asked of mothers with infants older than 6 months (they're behavior questions about solid feeding). The scale is validated without the additional questions and we haven't used them in our recent work, so going with the 63 is fine. The scoring schema indicates which questions are for infants over 6 months only (column says >6 months) and these could be removed from the questionnaire document.

Hope this helps!
Amanda
--
Amanda Thompson, Ph.D. MPH
Professor and Associate Chair, Department of Anthropology
Professor, Department of Nutrition, Gillings School of Global Public Health
University of North Carolina at Chapel Hill

4. The following is permission to remove questions in the indulgent feeding style construct.

Hi Taylor,

The indulgent feeding styles worked in our sample with younger infants but we had lots of early complementary feeding! It would be fine to remove the construct if it is not relevant/appropriate for your sample.

Best,
Amanda
--
Amanda Thompson, Ph.D. MPH
Professor and Associate Chair, Department of Anthropology
Professor, Department of Nutrition, Gillings School of Global Public Health
University of North Carolina at Chapel Hill

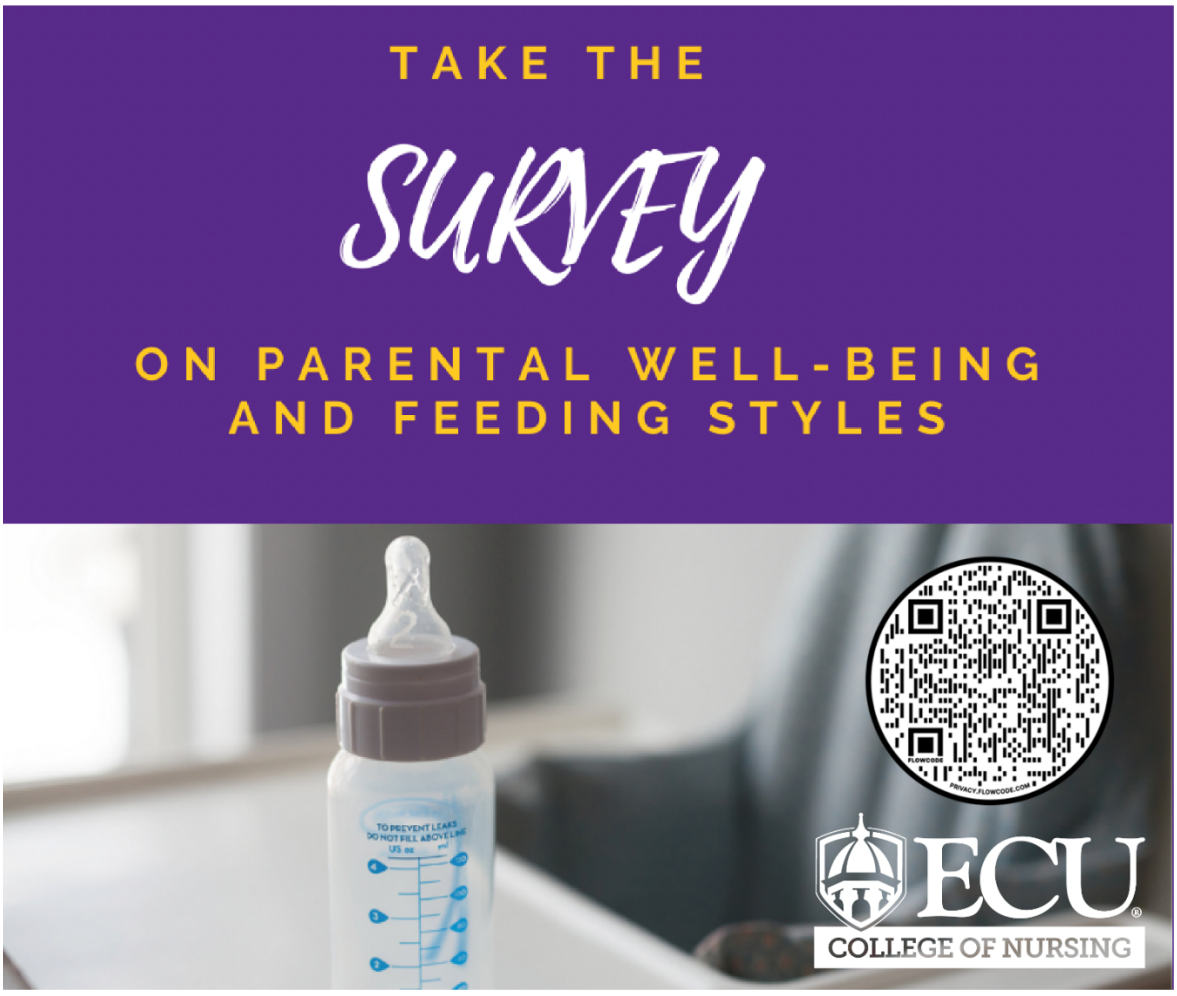
APPENDIX C: SOCIAL MEDIA SCRIPT AND IMAGE

SEEKING MOMS AND DADS OF FORMULA-FED INFANTS

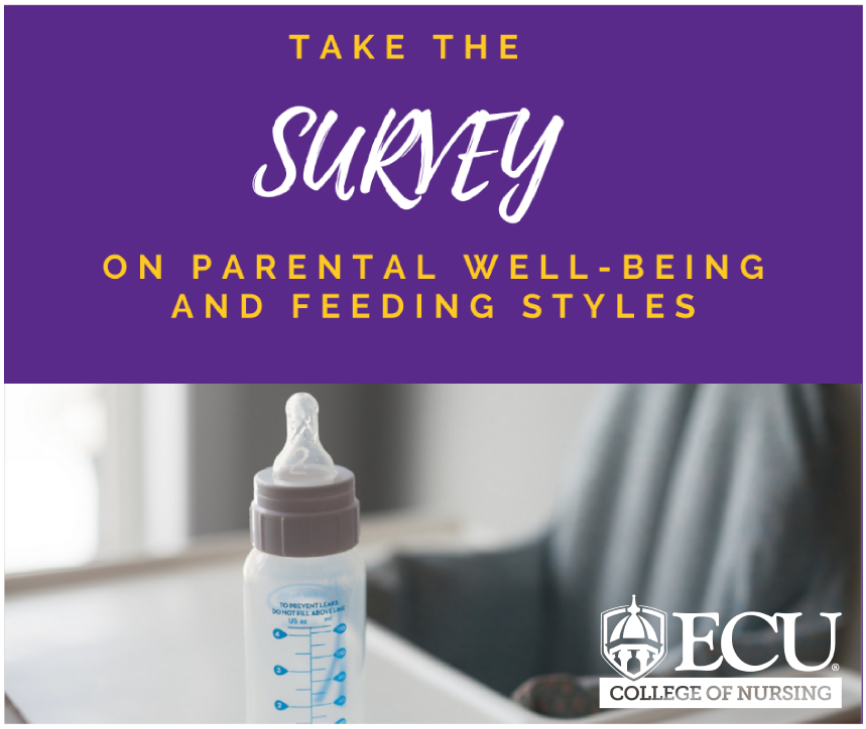
Congratulations on your bundle of joy! We are researchers at East Carolina University® trying to understand how parents' well-being might influence how they formula-feed their infants. We believe that all parents deserve support in feeding their babies. If you are willing to participate in this research study, you might be able to help us and other parents who formula-feed their infants. This confidential online survey will ask you about your well-being and how you feed your infant. It will take approximately 30 minutes to complete, and you will be entered for a chance to win a $50 Walmart e-gift card!

You can find the survey on REDCap® survey tool through the QR code on the image or at this link:
https://redcap.ecu.edu/surveys/?s=EF8W4ERJHEW4DPDC

For questions, please contact Taylor Nelson, BSN, RN, PhD(c) at nelsont14@students.ecu.edu. We appreciate your time and willingness to help others during this time.



APPENDIX D: PEDIATRICIANS' OFFICE RECRUITMENT FLYER



SEEKING MOMS AND DADS OF FORMULA-FED INFANTS

Congratulations on your bundle of joy! We are researchers at East Carolina University® trying to understand how parents' well-being might influence how they formula-feed their infants. We believe that all parents deserve support in feeding their babies. If you are willing to participate in this research study, you might be able to help us and other parents who formula-feed their infants. This confidential online survey will ask you about your well-being and how you feed your infant. It will take approximately 30 minutes to complete, and you will be entered for a chance to win a $50 Walmart e-gift card!

Visit the study Facebook page titled, "ECU Infant Feeding Study" for the survey link or scan the QR Code to be taken directly to the survey.

For questions, please contact Taylor Nelson, BSN, RN, PhD(c) at nelsont14@students.ecu.edu. We appreciate your time and willingness to help others during this time.

APPENDIX E: CONSENT LETTER FOR SURVEY RESEARCH

Consent Letter for Survey Research

Dear Participant,

I am a PhD student at East Carolina University in the College of Nursing, Department of Nursing Science. I am asking you to take part in my research study entitled, "Examining Relationships between Parental Well-Being, Feeding Styles, and Weight in Formula-Fed Infants".

The purpose of this research is to study the influence of parental well-being following birth on feeding styles and infant weight in healthy, term, formula-fed infants during the first year of life. By doing this research, I hope to learn how parents' well-being is related to the ways they feed their infants formula. Your participation is completely voluntary.

You are being invited to take part in this research because you found the study link or Facebook study page and identify as a parent of a formula-fed infant less than one year of age who lives in the U.S. The amount of time it will take you to complete this survey is approximately 30 minutes.

If you agree to take part in this survey, you will be asked questions that relate to your well-being and questions that relate to how you feed your infant. The last page of the study will invite you to click a link to enter your contact information to be entered to win a $50 Walmart e-gift card as a thank you for participating in the survey. Your contact information is not linked to the survey, so your responses will remain anonymous. This page also gives you an option to be recontacted to participate in a future study. You may choose to participate in the future study by providing an email address and phone number, or you may choose to not participate by selecting "no." Should you choose to agree to be contacted in the future, the survey will not be linked to your information, so your responses will remain anonymous.

Some of the questions will ask about your mental health. If you experience a significant amount of stress, depression, or anxiety please contact your primary healthcare provider or visit Postpartum Support International at https://www.postpartum.net/learn-more/pregnancy-postpartum-mental-health/ for free resources and a confidential helpline. If you are suicidal or have thoughts of harming yourself please seek help immediately by calling the National Suicide Prevention Lifeline at 800-273-8255.

This research is overseen by the University and Medical Center Institutional Review Board (UMCIRB) at ECU. Therefore, some of the UMCIRB members or the UMCIRB staff may need to review your research data. However, the information you provide will not be linked to you. Therefore, your responses cannot be traced back to you by anyone, including me.

If you have questions about your rights when taking part in this research, call the Office of Research Integrity & Compliance (ORIC) at 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, call the Director of ORIC, at 252-744-1971.

If you have questions about the survey, please contact Taylor Nelson, Principal Investigator, at nelsont14@students.ecu.edu.

APPENDIX F: SCREENING QUESTIONS

Do you currently live in the United States?	◯ Yes ◯ No
Do you currently have an infant less than 1 year of age?	◯ Yes ◯ No
Are you currently giving your infant only formula?	◯ Yes ◯ No
Was your infant born at less than 37 weeks gestation?	◯ Yes ◯ No
Does your infant have a health condition that might impact feeding such as Down Syndrome, Prader-Willi Syndrome, epilepsy, cleft lip or palate, cerebral palsy, failure to thrive, or severe food allergies?	◯ Yes ◯ No

APPENDIX G: BACKGROUND AND DEMOGRAPHIC QUESTIONNAIRE

Do you identify as the infant's primary male or female caregiver?	◯ Male ◯ Female ◯ Non-binary ◯ Other
Please provide more information.	_____
Is the infant your adopted or biological child?	◯ adopted ◯ biological
In what state do you live?	◯ Alabama ◯ Alaska ◯ Arizona ◯ Arkansas ◯ California ◯ Colorado ◯ Connecticut ◯ Delaware ◯ Florida ◯ Georgia ◯ Hawaii ◯ Idaho ◯ Illinois ◯ Indiana ◯ Iowa ◯ Kansas ◯ Kentucky ◯ Louisiana ◯ Maine ◯ Maryland ◯ Massachusetts ◯ Michigan ◯ Minnesota ◯ Mississippi ◯ Missouri ◯ Montana ◯ Nebraska ◯ Nevada ◯ New Hampshire ◯ New Jersey ◯ New Mexico ◯ New York ◯ North Carolina ◯ North Dakota ◯ Ohio ◯ Oklahoma ◯ Oregon ◯ Pennsylvania ◯ Rhode Island ◯ South Carolina ◯ South Dakota ◯ Tennessee ◯ Texas ◯ Utah ◯ Vermont ◯ Virginia ◯ Washington ◯ West Virginia ◯ Wisconsin ◯ Wyoming
What is your zip code?	_____
What is your age?	_____

What is your race/ethnicity? Select all that apply.	☐ White ☐ Hispanic or Latino ☐ Black or African American ☐ Native American or American Indian ☐ Asian/ Pacific Islander ☐ Multiracial ☐ Other
Please provide more information.	_____
What is your marital status?	◯ Single, never married ◯ Married or in a relationship with a partner ◯ Widowed ◯ Divorced ◯ Separated
Please click on the highest level of education you have completed.	◯ Some high school ◯ High school graduate ◯ Some college ◯ Technical/ vocational school training ◯ Associate degree ◯ Bachelor's degree ◯ Master's degree ◯ Doctorate degree
Are you employed outside of the home?	◯ Yes ◯ No
If you are employed outside of the home, please click on the option that best fits your employment status.	◯ Full-time ◯ Part-time ◯ Other ◯ N/A
What is your household income? This is the total amount of income for everyone that lives in your home.	◯ Less than $20,000 ◯ $20,000 - $34,999 ◯ $35,000 - 49,999 ◯ $50,000 - $74,999 ◯ $75,000 - $99,999 ◯ $100,000 - 149,999 ◯ $150,000 - $199,999 ◯ $200,000 or more
Are you enrolled in WIC?	◯ Yes ◯ No
How old is your infant currently?	◯ Less than 1 month ◯ 1 month ◯ 2 months ◯ 3 months ◯ 4 months ◯ 5 months ◯ 6 months ◯ 7 months ◯ 8 months ◯ 9 months ◯ 10 months ◯ 11 months

How old was your infant at their most recent well-child pediatrician visit?	◯ Less than 1 month ◯ 1 month ◯ 2 months ◯ 3 months ◯ 4 months ◯ 5 months ◯ 6 months ◯ 7 months ◯ 8 months ◯ 9 months ◯ 10 months ◯ 11 months
What was your infant's weight at their most recent well-child pediatrician visit to the nearest pound?	_____
What was your infant's length at their most recent well-child pediatrician visit to the nearest inch?	_____
How many other children live in your house besides your infant?	_____
What are the ages of those children?	_____
Aside from you, who else feeds your baby? Select all that apply.	☐ No one ☐ Other parent ☐ Family members ☐ Childcare provider ☐ Other
Please provide more information.	_____
How often do you personally feed your infant?	◯ Less than 25% of feeds ◯ 25-50% of feeds ◯ 50-75% of feeds ◯ More than 75% of feeds
Which of the following best describes your family's infant feeding plan?	◯ Initially planned to feed only formula ◯ Started breastfeeding and switched to feeding only formula
What type of formula does your infant drink?	◯ Cow-milk based ◯ Soy-based ◯ Protein hydrolysate ◯ Goat-milk based ◯ Homemade ◯ Other ◯ Unsure
Please provide more information.	_____

What is your main source for infant feeding information?	◯ Health care providers ◯ Friends ◯ Family ◯ Internet ◯ Other
Please provide more information.	_____
Have you ever felt shamed for choosing to formula feed your infant?	◯ Yes ◯ No
If you have felt shamed for choosing to formula-feed, what was the source of the shame? Select all that apply.	☐ Health care professionals ☐ Friends ☐ Family ☐ Internet/ social media ☐ Other
Please provide more information.	_____
How did you find out about this study?	◯ Pediatrician's office ◯ Facebook ◯ Word of mouth from someone you know or are associated with ◯ Other
Please provide more information.	_____

Note. Fields that state “Please provide more information” only populate if the respondent chooses “Other,” so they can specify what is meant by their choice of “Other.”

APPENDIX H: PATIENT HEALTH QUESTIONNAIRE – DEPRESSION MODULE (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? (select one number on each line)

If you answer 1, 2, or 3 to question #9, please call the National Suicide Prevention Lifeline (800-273-8255) and seek help immediately.

How often during the past 2 weeks were you bothered by....	Not at all0	Several days+1	More than half the days+2	Nearly every day+3
1. Little interest or pleasure in doing things	○	○	○	○
2. Feeling down, depressed, or hopeless	○	○	○	○
3, Trouble falling or staying asleep, or sleeping too much	○	○	○	○
4. Feeling tired or having little energy	○	○	○	○
5. Poor appetite or overeating	○	○	○	○
6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	○	○	○	○
7, Trouble concentrating on things, such as reading the newspaper or watching television	○	○	○	○
8. Moving or speaking so slowly that other people could have noticed. Or the opposite--being so fidgety or restless that you have been moving around a lot more than usual	○	○	○	○
9. Thoughts that you would be better off dead or of hurting yourself in some way	○	○	○	○

APPENDIX I: GENERALIZED ANXIETY DISORDER ASSESSMENT (GAD-7)

Over the last 2 weeks, how often have you been bothered by the following problems?				
	Not at all+1	Several days+2	Over half the days+3	Nearly every day+4
1. Feeling nervous, anxious, or on edge	○	○	○	○
2. Not being able to stop or control worrying	○	○	○	○
3. Worrying too much about different things	○	○	○	○
4. Trouble relaxing	○	○	○	○
5. Being so restless that it's hard to sit still	○	○	○	○
6. Becoming easily annoyed or irritable	○	○	○	○
7. Feeling afraid as if something awful might happen	○	○	○	○

APPENDIX J: PERCEIVED STRESS SCALE (PSS-10)

The next three questionnaires will ask about your mental health. If you have a significant amount of stress, depression, or anxiety please contact your primary healthcare provider or visit Postpartum Support International at https://www.postpartum.net/learn-more/pregnancy-postpartum-mental-health/ for free resources and a confidential helpline. Additionally, if you are suicidal or have thoughts of harming yourself please seek help immediately by calling the National Suicide Prevention Lifeline at 800-273-8255.

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by clicking how often you felt or thought a certain way.

	Never0	Almost Never1	Sometimes2	Fairly Often3	Very Often4
In the last month, how often have you been upset because of something that happened unexpectedly?	○	○	○	○	○
In the last month, how often have you felt that you were unable to control the important things in your life?	○	○	○	○	○
In the last month, how often have you felt nervous and "stressed"?	○	○	○	○	○
In the last month, how often have you felt confident about your ability to handle your personal problems?	○	○	○	○	○
In the last month, how often have you felt that things were going your way?	○	○	○	○	○
In the last month, how often have you found that you could not cope with all the things that you had to do?	○	○	○	○	○
In the last month, how often have you been able to control irritations in your life?	○	○	○	○	○

APPENDIX K: INFANT FEEDING STYLE QUESTIONNAIRE – BELIEF ITEMS

You will now read a set of statements. These statements are neither right nor wrong. We just want to know your opinion. Some of these statements may seem similar but are actually different so please read carefully.
Please indicate how strongly you agree or disagree with each statement. Infants are referring to children from birth to 12 months, and toddlers are referring to children from 12 months to 2 years of age.

	Disagree	Slightly disagree	Neutral	Slightly agree	Agree
When an infant cries it usually means he or she needs to be fed	○	○	○	○	○
An infant less than 6 months old needs more than formula or breastmilk to be full	○	○	○	○	○
I think it is okay to prop an infant's bottle	○	○	○	○	○
Putting cereal in the bottle is good because it helps an infant feel full	○	○	○	○	○
The best way to make an infant stop crying is to feed him or her	○	○	○	○	○
It's important for the parent to decide how much an infant should eat	○	○	○	○	○
It's important that an infant finish all of the milk in his or her bottle	○	○	○	○	○
An infant less than 6 months needs more than formula or breastmilk to sleep through the night	○	○	○	○	○
Cereal in the bottle will help an infant sleep through the night	○	○	○	○	○
An infant should never eat fast food	○	○	○	○	○
The best way to make a toddler stop crying is to feed him or her	○	○	○	○	○
A toddler should never eat sugary food like candy, ice cream, cake and cookies	○	○	○	○	○
A toddler should never eat fast food	○	○	○	○	○
It's very important that a toddler finish all the food that is on his or her plate	○	○	○	○	○
A toddler should be able to eat whatever he or she wants for snacks	○	○	○	○	○
It's okay for a toddler to walk around while eating as long as he or she eats	○	○	○	○	○
A toddler should never eat junk food like potato chips, Doritos, and cheese puffs	○	○	○	○	○
It's important for a parent to have rules about how much a toddler eats	○	○	○	○	○
A toddler should be able to eat whatever he or she wants when eating out at a restaurant	○	○	○	○	○
A toddler should only eat healthy food	○	○	○	○	○
It's important to help or encourage a toddler to eat	○	○	○	○	○
Your child knows when he or she is full	○	○	○	○	○
Your child knows when he or she is hungry and needs to eat	○	○	○	○	○

APPENDIX L: INFANT FEEDING STYLE QUESTIONNAIRE – BEHAVIOR ITEMS

You will now read a set of statements that refer to feeding your infant. Once again, these statements are neither right nor wrong. We just want to know your opinion. Some of these statements may seem similar but are actually different so please read carefully. Indicate which response best describes how you feel about the statement.

	Never1	Seldom2	Half of the time3	Most of the time4	Always5
I let my infant decide how much to eat	○	○	○	○	○
When my infant has a bottle, I prop/propped it up	○	○	○	○	○
My infant watches TV while eating	○	○	○	○	○
I keep track of how much my infant eats	○	○	○	○	○
I give my infant cereal in the bottle	○	○	○	○	○
I carefully control how much my infant eats	○	○	○	○	○
I watch TV while feeding my infant	○	○	○	○	○
I try to get my infant to eat even if he/she seems not hungry	○	○	○	○	○
I am very careful not to feed my infant too much	○	○	○	○	○
I try to get my infant to finish his/her food	○	○	○	○	○
When my infant cries, I immediately feed him/her	○	○	○	○	○
If my infant seems full, I encourage him/her to finish their food anyway	○	○	○	○	○
My infant knows when he/she is full	○	○	○	○	○
I try to get my infant to finish his/her formula	○	○	○	○	○
I pay attention when my infant seems to be telling me that he/she is full or hungry	○	○	○	○	○
I talk to my infant to encourage him/her to eat	○	○	○	○	○
I allow my infant to eat when he/she is hungry	○	○	○	○	○
My infant knows when he/she is hungry	○	○	○	○	○
I talk to my infant to encourage him/her to drink his/her formula	○	○	○	○	○
I keep track of what food my infant eats	○	○	○	○	○

APPENDIX M: SEPARATE REDCap® WINDOW FOR INCENTIVE CONTACT INFORMATION

Final Screen of Main Study Survey

If you would like to be entered into a drawing for a chance to win a $50 Walmart e-gift card, please click on the link below. The link will take you to a separate window to provide your contact information including your email address and phone number. If you win a gift card, study personnel will contact you via telephone to notify you, and we will send you the e-gift card via your provided email address. The contact information is not linked to the survey, so your responses will remain anonymous. We appreciate you completing the survey. Thank you so much for your time.
[Insert link to separate survey once published here]

Would you like to be entered into a drawing for a chance to win a $50 Walmart e-gift card?

- ○ no
- ○ yes

reset

Screen of Linked Separate Survey Window

Please provide your phone number and email address below to be entered for a chance to win a $50 Walmart e-gift card. Thank you for your participation in this survey.

Please provide your phone number including the area code.

Please provide your email address.

Are you willing to be recontacted in the future for a follow-up study?

- ○ No
- ○ Yes

* must provide value

reset