MATERNAL ATTITUDES, FEEDING PRACTICES AND CHILD WEIGHT-FOR-LENGTH PERCENTILES: MATERNAL PARTICIPATION VS. NON-PARTICIPATION IN A PRENATAL INFANT NUTRITION EDUCATION SESSION

By

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MATERNAL ATTITUDES, FEEDING PRACTICES AND CHILD WEIGHT-FOR-LENGTH PERCENTILES: MATERNAL PARTICIPATION VS. NON-PARTICIPATION IN A PRENATAL INFANT NUTRITION EDUCATION SESSION

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September 2016

Obesity has reached epidemic proportions nationally and internationally. All ages are affected resulting in physiological and psychological health consequences. Obesity-related habits that begin in childhood may continue into adulthood suggesting the need for developmentally targeted approaches. Efforts to reduce obesity should begin early in life with interventions targeting infants and young children.

Is there a difference in infant feeding attitudes, the initiation of breastfeeding practice, the introduction of solid foods practice, and child weight-for-length percentiles at 12, 18, and 24 months between mothers who participated in a prenatal infant nutrition education session and mothers who did not participate? The purpose of this research is to determine if relationships exist between prenatal infant nutrition education and maternal attitudes and practices related to infant feeding and child weight-for-length percentiles at 12, 18, and 24 months of age.

An Ex post facto design was used in the study in order to determine if relationships exist among the variables of interest. Two groups of mother/child dyads were compared to determine if significant differences existed. Statistical analyses for this study included Analysis of Covariance, Binary Logistic Regression, and General Linear Mixed Model. Data analysis failed to support any statistically significant correlation between participation in an infant nutrition education program and infant feeding attitudes, infant feeding practices and child weight-for-length percentiles while controlling for maternal age, race, parity, level of education and marital status.
DEDICATION

This is dedicated to my husband, Larry Lewis, for his unfailing love, patience, support, and encouragement during this journey. Also, to our children, Jeff, Sandi, Tim, Steve, Kevin and Daina, and their families who were supportive and understanding throughout this endeavor.
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<td>AAP</td>
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<td>Analysis of Covariance</td>
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<td>ANOVA</td>
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<td>BMI</td>
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<td>CDC</td>
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<td>General Linear Model</td>
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<td>Health Promotion Model</td>
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<td>RWHF</td>
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<td>TFAH</td>
<td>Trust for America's Health</td>
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<td>U.S.</td>
<td>United States</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WIC</td>
<td>Special Supplemental Nutrition Program for</td>
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<td>Women, Infants, and Children</td>
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INTRODUCTION
Introduction

Obesity has become a global epidemic (Cornette, 2008; de Onis, Blossner, & Borghi, 2010). Based on the World Health Organization (WHO) definition of overweight and obesity, worldwide, more than 1.4 billion adults, aged 20 and over were overweight or obese in 2008 (WHO, 2013). In addition, in 2011, more than 40 million children age five and under were overweight (WHO, 2013). This worldwide prevalence of obesity affects all age groups, ethnic backgrounds, and socioeconomic statuses (Cornette, 2008).

In the United States (U.S.), obesity has tripled since 1980 (Armstrong, Wacker, Best, & McPherson, 2011). All age groups and developmental stages are affected. Focusing on overweight status from 2003-2004 National Health and Nutrition Examination Surveys (NHANES) data, an estimated 9.5% of infants and children birth-23 months of age were overweight and of those 6-23 months, 10% were overweight (Centers for Disease Control and Prevention [CDC], 2010). Based on NHANES data, collected from 2009 through 2010, more than one-third of U.S. adults (20 years & over) were obese (Ogden, Carroll, Kit, & Flegal, 2012). Alarminglly, there was “no change in the prevalence of obesity among adults or children from 2007-2008 to 2009-2010” (Odgen et al., 2012, p. 1). Findings for the period 2011-2012 showed no significant change in the last ten years with 8.1% of infants and toddlers overweight, 16.9% of children and adolescents (aged 2-19 years) obese, and 34.9% of adults, 20 years and older obese (Ogden, Carroll, Kit, & Flegal, 2014). Trends in youth (age 2-19 years) remained relatively unchanged reflective of years 2011-2014 with 8.9% (2-5 years), 17.5% (6-11 years), and 20.5% (12-19 years) (Ogden, Carroll, Fryar, & Flegal, 2015).

In most states in the U.S., the burden of overweight and obesity is substantial. Obesity rates reported in 2011 were more concentrated in Southern and Midwestern states during that period, 12 states reported adult obesity rates above 30% including Mississippi with the highest rate at 34.9% followed closely by Louisiana at 33.4% (Trust for America’s Health and Robert Wood Johnson Foundation [TFAH/RWJF], 2012). As health care costs continue to escalate and are projected to increase for preventable obesity-related diseases, there is a simultaneous reduction in economic productivity, leaving states with significant health-care costs (TFAH/RWJF, 2012).
The reasons for the increase in obesity in the U.S. and worldwide are complex. Obesity is a disorder that results from energy imbalance (Hill, Wyatt, & Peters, 2012). Multiple environmental and genetic components are likely contributors to the complex etiology of obesity, a condition that can lead to chronic diseases. Lifestyle plays an important role in the prevalence of obesity. This includes personal and family choices regarding diet and exercise; cultural beliefs, practices, and expectations; and adaptation to the obesogenic environment. Obesogenic is a term that has emerged as a result of the obesity epidemic and is defined as "promoting excessive weight gain" or an environment "producing obesity" ("Obesogenic," n.d.).

Childhood obesity has garnered increasing attention in the first decade of the 21st century with a variety of interventions aimed at addressing the problem and reducing the incidence of this local, national, and global issue; however, obesity has continued to be a major health concern. In addressing childhood obesity, many contributing factors have been identified, researched, and addressed such as diet, exercise, sleep, culture, environmental factors (home, school, and neighborhood), and family income. However, few interventions addressing these factors have been successful at reducing the prevalence (Perrin, Finkle, & Benjamin, 2007).

As childhood obesity affects children of all age groups and developmental stages, developmentally targeted approaches are needed. Efforts to reduce childhood obesity should begin as early as possible with interventions targeted to infants and young children, focusing on optimal nutrition (Yanovski & Yanovski, 2011). Strategies for obesity prevention in early childhood, beginning in infancy, may contribute to the reduction of obesity throughout the life span and improvement in the associated morbidity and mortality rates. A literature review is presented in Chapter Two providing additional information related to this topic.

**Background and Significance**

Obesity-related habits beginning in childhood and resulting in overweight and obesity in youth are correlated with obesity in adulthood and the associated adverse health outcomes (Barlow, 2007; Deshmukh-Taskar et al., 2006; Ebbeling et al., 2002; Field, Cook, & Gillman, 2005; Juonala et. al., 2011; Ludwig, 2007; Stettler, Kumanyika,
A variety of physiologically related adverse health outcomes including cardiovascular disease, stroke, hypertension, type 2 diabetes, some types of cancer, osteoarthritis, gallbladder disease, dyslipidemia, and obstructive sleep apnea are associated with adult obesity (Daniels et al., 2005; Flegal, Carroll, Ogden, & Curtin, 2010; Haughton & Stang, 2012). Many obese children are now experiencing similar comorbid conditions such as hypertension, type 2 diabetes, sleep apnea, and depression (Daniels et al., 2005; Ebbeling et al., 2002; Flegal et al., 2010; Ludwig, 2007). Early intervention in childhood may impact obesity throughout the lifespan. Obesity occurring in childhood increases the risk of obesity in adulthood (Barlow, 2007; Deshmukh-Taskar et al., 2006; Field et al., 2005; Whitaker et al., 1997). Conversely, results of an analysis of four cohort studies found that overweight and obese children who became non-obese by adulthood have health outcomes similar to those adults who were never obese (Juonala et al., 2011).

Numerous primary prevention strategies focused on nutrition and weight gain during infancy (Barton, 2001, Cricco-Lizza, 2004; Horodynski et al., 2011, Karp & Lutenbacher, 2011; Paul et al., 2011; Stettler et al., 2003). Factors that have been identified as contributing to overweight in infancy are the decline of breastfeeding, the use of commercial formula, premature introduction of solid foods, socioeconomic status, and cultural influences affecting maternal beliefs and practices (Baughcum et al., 2001; Crocetti, Dudas, & Krugman, 2004; Flower, Willoughby, Cadigan, Perrin, & Randolph, 2008; Thompson & Bentley, 2012). Results of a study conducted by Fein, Labiner-Wolfe, Scanlon, and Grummer-Strawn (2008) showed that a significant percentage of mothers in the United States engaged in infant feeding practices that are considered unhealthful, including the early introduction of solid foods (21%), juice (20%), and cow's milk (20%), possibly leading to the formation of unhealthy dietary patterns in childhood and beyond.

Weight gain during infancy and early childhood that is associated with infant feeding practices is a modifiable outcome. Rapid weight gain during the first six months of infancy has been associated with an increased risk of obesity at age three years.
(Taveras et al., 2009). Results of current research suggest that rapid, high rates of weight gain during infancy may provide the initial impetus for later risk of obesity in childhood and beyond (Griffiths, Smeeth, Hawkins, Cole, & Dezateux, 2009; Paul et al., 2011, Stettler et al., 2003; Taveras et al., 2009). Implementation of proper nutritional management in infancy plays an important role in establishing the foundation of a lifetime of health and wellness.

While most adults have the ability to make and implement conscious decisions regarding diet and exercise, young children are dependent on parents or caregivers for their nutritional needs. Mothers largely influence a child’s food intake determining when, how, and why the child is fed (Baughcum et al., 2001). Maternal beliefs and attitudes guiding these decisions may be influenced by family, friends, and cultural preferences resulting in “crucial determinants of infant feeding behaviors” (Redsell et al., 2010, p. 2). Information received from other sources, including professionals, may conflict with cultural beliefs and advice from friends (Carruth & Skinner, 2001). Physicians and other caregivers may not be knowledgeable of current infant feeding recommendations and may offer conflicting advice. In a qualitative study assessing breastfeeding among participants enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), 26 of 100 mothers chose to breastfeeding with only 5 reporting that their physician influenced their decision (Stolzer, 2010). The lack of professional or conflicting advice, along with maternal beliefs and attitudes, influence practices that may lead to unhealthy feeding practices including the early introduction of solid foods and misinterpreting crying and fussiness as hunger and giving a bottle or food to soothe. This can result in a high degree of control by the parent, disabling the young child’s ability to regulate his/her own appetite (Baughcum et al., 2001). Feeding involves intense interactions between, most often, the mother and her child, and is a central aspect of parenting. “These interactions may shape the child’s eating behavior during a sensitive period of brain development and, therefore, may have a lifelong impact on appetite regulation and fatness” (Baughcum et al., 2001, p. 391).

Some parents choose to adopt what are defined as unhealthy infant feeding practices due to the preference for a large infant which is seen as a marker of health and a
In a study of complementary feeding practices, Fein et al. (2008) reported solid foods were introduced before four months of age by 24% of mothers and juice was introduced before six months of age by approximately 20% of mothers. Mothers identified as engaging in unhealthy feeding practices were frequently mothers with lower levels of education, indicating the need to target less educated mothers with infant nutrition education (Fein et al., 2008). Yanovski (2011) suggested the need to target mother-infant dyads of low socioeconomic status where obesity is more prevalent and children are at greatest risk. Gaps identified in meeting this challenge include a gap in parental knowledge regarding healthy infant feeding practices and understanding of infant behavior and a gap in consistency of information from health professionals (Redsell et al., 2010).

One way to address these gaps is to provide prenatal infant nutrition education to better inform mothers, thereby assisting them in making an educated decision about healthy feeding practices for their baby (Worobey, Lopez, and Hoffman, 2009). Additional educational interventions supplementing clinic-based teaching may be helpful. The potential for prenatal and early infancy nutrition educational interventions, particularly breastfeeding, is receiving increasing attention and merits further investigation.

**Maternal Beliefs, Attitudes, and Practices**

Maternal beliefs, attitudes and practices related to feeding are often reflective of cultural influences. Culture within groups is learned and determines beliefs, attitudes, and practices based on experiences (Caprio et al., 2008). According to Zimbardo and Ebbesen (1970) “…attitudes are seen as enduring predispositions, but ones which are learned rather than innate” (p. 6), and thus susceptible to change. Therefore, a change in attitude can affect a change in practices or behaviors. Different cultures, based on race and ethnicity, have different ideas and definitions regarding health including attractiveness, selection and preparation of food, and the causes and strategies for addressing illness (Lee, McAlexander, & Banda, 2011). Cultural ideas and definitions may be a contributory factor to the high prevalence of childhood obesity in African
Americans, Native Americans, and Mexican Americans (Caprio et al., 2008). Recent data indicate that, in 2011-2012, 20.2% of African American children and 22.4% of Hispanic children, ages 2-19 years, were obese (Ogden, Carroll, Kit, & Flegal, 2014).

An example of a cultural belief is that a fat baby is a healthy baby (Baughcum et al., 2001; Johnson et al., 2008; Redsell et al., 2010). A fat baby is likely to be an overweight baby who may experience developmental delays such as turning over, crawling, and walking. The Asian and Latino culture believe that heavier children are more likely to survive hardship, while other cultures believe heavy children are an indication of wealth (Lee et al., 2011). In research studies regarding infant feeding nutrition education and infant feeding practices, infant feeding beliefs, attitudes, and practices were found to be based on familiarity and experience among participants’ mothers, relatives, or friends (Cricco-Lizza, 2004; Johnson et al., 2008).

While ethnicity and the associated cultural beliefs have been found to be a contributing factor to childhood obesity, another group identified with high rates of obesity is low-income families. Low-income mothers are less likely to breastfeed than mothers of higher socioeconomic status which could be a factor in more rapid weight gain in the low-income infants (Wijlaars, Johnson, Van Jaarsveld, & Wardle, 2011). Findings from a study of low-income mothers included a low incidence of breastfeeding practice beyond the early postpartum period; feeding infants formula, juice, and water in higher quantities than recommended; incorrect preparation of formula; and adding cereal to bottles (Karp & Lutenbacher, 2011). Johnson et al. (2008) identified the “lack of cultural competence and experience of healthcare providers” (p. 181) as a limitation in most existing interventions focused on infant obesity. Incorporating beliefs, values, and related behaviors is necessary in providing culturally competent education addressing health disparities (Johnson et al., 2008). The awareness and incorporation of cultural and familial influences in infant nutrition education have the potential to have an impact on the future health of Americans. Providing culturally sensitive education that is respectful of beliefs and
values may increase knowledge and adherence to guidelines resulting in healthier outcomes.

**Infant Nutrition Education**

Due to the high overweight and obesity rates throughout the lifespan and the research-supported evidence that feeding practices in infancy may initiate this trajectory, there is a need to address this looming issue during infancy. The foundational basis of childhood and adult obesity are multifactorial and may include risk and protective factors that can be modified beginning with infant feeding practices (Gaffney, Kitsantas, & Cheema, 2012).

The American Academy of Pediatrics (AAP) recommends breastfeeding as the preferred method of feeding for all infants (AAP, 2012; Kleinman, 2009). In their policy statement regarding breastfeeding and the use of human milk, breastfeeding was recommended for approximately six months with continuation for one year or longer as desired by the mother and infant (AAP, 2012). Breastfeeding provides protection for the infant against obesity and impaired cognitive development in addition to childhood illnesses including acute otitis media, atopic dermatitis, gastrointestinal infections, lower respiratory infection, asthma, obesity, cardiovascular diseases, blood pressure, type 2 diabetes, and sudden infant death syndrome (AAP, 2012; Ip et al., 2007). There are also breastfeeding advantages for the mother. Maternal benefits include a reduction in postpartum bleeding and rapid involution of the uterus, earlier return to prepregnant weight, delayed resumption of ovulation resulting in increased child spacing, and a decreased risk of osteoporosis, breast cancer, and ovarian cancer (AAP, 2012). Benefits of breastfeeding for infant and mother are often cited as reasons for choosing to breastfeed (Radzyminski & Callister, 2016). In infant feeding studies, breastfeeding is presented as ideal while formula feeding is presented as standard practice (McNeil, Labbok, & Abrahams, 2010). This perception of what is considered standard practice may hinder attempts to change behaviors of mothers about the benefits of breastfeeding and likely can be changed through education.
Although breastfeeding is recommended for infant nutrition and provides benefits for infant and mother, many mothers choose to formula-feed their infants. Formula-feeding mothers may not always receive instructions on the preparation and storage of formula from a health professional. In a study by Labiner-Wolfe, Fein, and Shealy (2008), the goal was to assess mothers' knowledge of the handling, preparation, and storage of formula. Results of the study showed that a large percentage of mothers did not receive prenatal education on these topics. Practices such as failure to wash hands prior to the preparation of formula and the reuse of bottles and nipples without proper cleaning were identified, suggesting gaps in education on safe infant formula handling and preparation practices (Labiner-Wolfe et al., 2008).

Additional educational needs identified by Paul et al. (2009) include recognition of, and response to, infant cues reflecting hunger and satiety. According to the authors, parents should be encouraged to feed an infant when hungry, recognize when an infant is full and not prompt an infant to finish bottle, and avoid feeding an infant to soothe when hunger is not the issue. Infants are often fussy for reasons other than hunger. Teaching a mother ways to soothe her infant will enable her to implement other measures such as repositioning, massaging or providing a warm bath instead of offering a bottle or food to manage infant behavior (Doub, Moding, & Stifter, 2015). With a large number of mothers choosing to formula-feed their infants, it is important to provide education on important issues such as those addressed.

Timing of infant nutrition education is equally important. Educating parents prior to the birth of their child can assist them in preparing for this life-changing event. The stress of deciding the type of feeding, the frequency of feeding and dealing with complications of infant feeding can be very challenging for first-time parents as well as parents with experience. Providing early education about infant nutritional needs may better prepare mothers to handle feeding issues beginning in the first weeks of life. Information and guidance provided in the antenatal period to undecided mothers or couples with neutral attitudes may favorably influence decisions and behaviors (Shaker, Scott, & Reid, 2004). Early education regarding infant feeding practices may have a positive impact on the future health of Americans.
Purpose

The purpose of this study is to determine the influence of a prenatal infant nutrition education offering on: (a) maternal attitudes as measured by the Iowa Infant Feeding Attitude Scale, (b) initiation of breastfeeding, (c) introduction of solid foods, and (d) child weight-for-length percentiles at 12, 18, and 24 months of age as measured by the WHO weight-for-length, sex-specific growth standards and accessed from the WIC database.

Nursing Theoretical Perspective

Leininger’s Theory of Culture Care Diversity and Universality provides a useful broad nursing theoretical perspective for planning and implementing an educational session that emphasizes values, beliefs, and practices of the targeted population. Leininger’s theory focuses on the interrelationships of culture and care on health, well-being, illness, and death (Leininger, 2002). The goal of this theory is “to include and to provide culturally congruent care to people that is beneficial, will fit with, and be useful to the client, family, or culture group healthy lifeways” (Leininger, 2001, p. 39).

Culturally congruent (nursing) care refers to those cognitively based assistive, supportive, facilitative, or enabling acts or decisions that are tailor made to fit with individual, group, or institutional cultural values, beliefs, and lifeways in order to provide or support meaningful, beneficial, and satisfying health care, or well-being services (Leininger, 2001, p. 49).

Important for this study is the identification of factors that influence culture care such as cultural values, attitudes, practices, economics, education, and language. The anticipated outcome for this study is information crucial to the implementation of infant feeding practices that promote positive health outcomes associated with infant feeding decisions. The participants adapt to a beneficial or satisfying health outcome (Leininger, 2001). For this study, the health outcome of interest is the modification of cultural practices resulting from education, such that adherence to recommended infant nutrition guidelines becomes a culturally congruent practice.

Leininger developed three action-decision modes for providing culturally congruent nursing care actions and client decisions: 1) cultural care preservation and/or
maintenance, 2) culture care accommodation and/or negotiation, and 3) cultural care repatterning or restructuring (Leininger, 2001, p. 41-42). The action-decision mode fitting for this study is culture care repatterning/restructuring and is defined as: “those assistive, supportive, facilitative, or enabling professional acts or decisions that help people reorder, change, modify, or restructure their lifeways and institutions for better (or beneficial) healthcare patterns, practices, or outcomes” (Leininger & McFarland, 2006, p. 8).

A nursing theory that promotes culturally sensitive care and education is applicable for developing a culturally sensitive approach addressing misconceptions and barriers related to infant feeding practices. The care knowledge provided by health professions can be culturally sensitive while explaining potential health consequences related to actions. In this multicultural world, new knowledge and practices are necessary for nurses to provide culturally sensitive care (Leininger, 2002). Discovering and addressing culturally based factors that influence health is the central purpose of the theory. For example, Leininger’s Theory of Culture Care Diversity and Universality guided a study by Lewallen and Street (2010) in which the purpose was to explore issues encountered by African American women in initiating and sustaining breastfeeding. In this qualitative study, 15 African American women from three different regions of a southeastern state participated in focus groups with the aim of hearing directly from the women about barriers and facilitators of breastfeeding. According to Leininger’s Theory of Culture Care Diversity and Universality, it is important to gather information about health issues from the target population in order to develop interventions that are culturally sensitive (Leininger & McFarland, 2006). The study participants frequently included cultural issues in their response to questions. According to the authors, women are influenced by their cultural background, and those of family and friends, to some degree. In a culture group with health disparities, including obesity and low rates of breastfeeding initiation and duration, nursing interventions should be based on knowledge of cultural practices (Lewallen & Street, 2010).
The Sunrise Enabler (Figure 1) is a model depicting the multiple influences on care and culture (Leininger & McFarland, 2006). It can be used as a guide to explore cultural influences on personal health care beliefs, attitudes, and practices.

![Diagram of the Sunrise Enabler model](image)

**Figure 1. Leininger’s Sunrise Enabler**
Nursing Theoretical Framework

Pender’s Health Promotion Model (HPM) offers a congruent linkage between the broad issue of cultural competence and culturally competent care. The specific focus of this research is to promote culturally competent, sensitive education promoting healthy infant feedings practices. Pender’s HPM is an example of a map and can be used in the clarification of associations among concepts (Pender, Murdaugh, & Parsons, 2002). The foundation for the development of the HPM was built on Pender’s background in nursing and included a holistic nursing perspective, Social Cognitive Theory and the Expectancy-Value Theory (Pender et al., 2002). According to the Expectancy-Value Theory, behavior is rational and a person will engage in a behavior if the outcome of the action is the desired outcome with personal value while the Social Cognitive Theory addresses the interaction and interrelationships of multiple variables in the model and the inner forces and external stimuli that determine behavior (Pender et al., 2002). If the belief in following recommended infant nutrition education guidelines is perceived as the path to a desired outcome, the attitude toward following guidelines will lead to the intention or commitment to implement guidelines. The model was first published in 1982 and revised in 1996 based on the following assumptions which reflect behavioral science and nursing perspectives:

1. Persons seek to create conditions of living through which they can express their unique human health potential.
2. Persons have the capacity for reflective self-awareness, including assessment of their unique human health potential.
3. Persons value growth in directions viewed as positive and attempt to achieve a personally acceptable balance between change and stability.
4. Individuals seek to actively regulate their own behavior.
5. Individuals in all their biopsychosocial complexity interact with the environment, progressively transforming the environment and being transformed over time.
6. Health professionals constitute a part of the interpersonal environment, which exerts influence on persons throughout their life span.
7. Self-initiated reconfiguration of person-environment interactive patterns is essential to behavior change (Pender et al., 2002, p. 63).

The major concepts of the Health Promotion Model include prior related behavior, personal factors (biological, psychological, sociocultural), perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related effects, interpersonal influences, situational influences, commitment to an action plan, immediate competing demands and preferences, and the behavioral outcome – health-promoting behavior (Pender et al., 2002). The HPM (revised) is shown in Figure 2 and includes concepts of interest and their interrelationships.

Figure 2. Pender’s Health Promotion Model (revised)
Pender’s model concepts in relation to study. This study addressed factors associated with infant feeding attitudes and practices. A number of variables in the model can be instrumental in the choices a mother makes regarding how she is going to feed her infant. Education that addresses recommended guidelines may be beneficial in addressing infant nutritional needs. The health outcome of interest is incorporating recommended infant feeding guidelines, with healthy weight status as an indicator of that outcome. Infants from birth to one year of age are not capable of adopting and maintaining their own health behaviors and they are dependent upon their caregiver to establish healthy behaviors for them, including behaviors related to dietary intake. This section will discuss variables in the model that are applicable to this study.

Variables. Concepts of the HPM that were utilized as variables in the study included personal factors, prior related behaviors, activity-related affect, interpersonal influences, and health promoting behavior. These include factors that contribute to the decision-making process and influence behavior. For this study, the decision to engage or not engage in health promotion behaviors results in measurable outcomes. While the outcomes variable is not included in Pender’s HPM, it can provide a measurement which could be attributed to the degree of engagement in the health promoting behavior of interest.

Personal factors. Personal factors such as age, race, marital status, level of education, and socioeconomic status influence infant feeding attitudes and the decisions that are made regarding infant feeding practices. These factors are not easily changed and are theoretically relevant to the incorporation of recommended infant feeding practices which is the targeted health promoting behavior in this study (Pender et al., 2002). Leininger’s Sunrise Enabler model also depicts economic and educational factors as influencers of health practices and includes the influence of attitudes and practices reflective of cultural values (Leininger & McFarland, 2006).

Prior related behavior. A determinant of infant feeding practices is prior related behavior. Behaviors and actions associated with previous experience can directly influence choices and are likely to be repeated, especially if behaviors were successful and easily accommodated (Pender et al., 2002). Habits formed from prior experiences
with other children may be repeated in infant feeding practices, such as breastfeeding, formula-feeding, and the introduction on solid foods (Pender et al., 2002).

**Activity-related affect.** The affective responses associated with a behavior may be mild, moderate, or strong. These responses are stored in memory and are associated with the behavior (Pender et al., 2002). Feelings associated with a behavior will likely affect whether the behavior is repeated or maintained long term. The more positive the subjective feeling, the greater the perceived self-efficacy and commitment to perform and maintain health related behavior (Pender et al., 2002).

**Interpersonal influences.** Interpersonal influences include the beliefs, attitudes, and expectations of others, in addition to the norms and expectations of groups, which can affect health-promoting behaviors through encouragement or social pressures (Pender et al., 2002). The modeling of health behaviors, reflective of the norms of groups or cultures, can influence behaviors. This can be compared to the cultural values, beliefs, and lifeways depicted in the Leininger’s Sunrise Enabler (Leininger & McFarland, 2006). Significant others, spouses or partners, can negatively or positively affect health promoting behaviors. Marital status is an interpersonal influence selected for inclusion in this study as encouragement from significant others can influence a mother’s decision to engage in a particular behavior such as breastfeeding, formula-feeding, and the introduction of solid foods (Pender et al., 2002). Another important interpersonal influence in this study is the provision of prenatal infant nutrition education to a group of mothers developed and provided by nurses. Health professionals can influence the decision to engage in health-promoting behaviors by providing timely and accurate information (Pender et al., 2002). Other influences identified by Leininger and McFarland (2006) include cultural values, beliefs, kinship and social factors.

**Health promoting behavior.** The desired behavioral outcome in Pender’s HPM is health promoting behavior. This results from the realization that engaging in the health promoting behavior of interest will lead to better health and a better quality of life at all stages of development (Pender et al., 2002). The health promoting behavior of interest in this study is the adherence to nutritional recommendations and guidelines during infancy. The nutritional choices made by the mother for her dependent child can have a positive...
effect on the health outcomes of the child. The desired behavior of prenatal infant nutrition education is following healthy feeding practices guidelines and recommendations that results in healthy weight percentiles.

Components of Pender’s HPM that are not measured in this study are perceived benefits of action, perceived barriers to action, perceived self-efficacy, situational influences, commitment to a plan of action, and immediate competing demands. Perceived benefits can influence behavior. Perceived self-efficacy, an important factor in the HPM, addresses the important role of cognitive processes in changing behavior (Pender et al., 2002). A changed behavior is influenced by perceived benefits and will result in another factor of interest, commitment to adopting and maintaining healthy infant feeding practices. The possible relationships between the components of the HPM are important to consider when addressing health promoting behavior. While these components are not measured in this study, they are included as assumptions.

Figure 3 depicts the model for this study in relation to the focus and the variables of interest. This model illustrates the relationship of the concepts that support the HPM to factors that influence infant nutrition decisions addressed and measured in this study.
Figure 3. Theoretical Model for Study. This figure illustrates concepts of the HPM that apply to this study.

The following are assumptions of the study and include additional concepts in Pender’s Health Promotion Model:

1. Perceived benefits associated with recommended infant feeding practices will motivate engagement in the behaviors.
2. Perceived barriers associated with recommended infant feeding practices often block engaging in the behaviors.
3. Perceived self-efficacy is increased with the knowledge of benefits which leads to fewer perceived barriers associated with recommended infant feeding practices.
4. Perceived self-efficacy will motivate engagement in the behaviors.
5. Situational influences can facilitate or impede behavior.
6. Commitment to a plan of action includes defining strategies that will support the commitment and increase the likelihood of engaging in the behaviors.

7. Immediate competing demands and preferences can avert from adhering to health promoting behaviors.

8. Parents act in the best interest of their children.

Leininger’s Theory of Culture Care Diversity and Universality and Pender’s Health Promotion Model address factors, reflective of culture, that contribute to attitudes, beliefs, and practices related to infant nutrition. An awareness of cultural practices is necessary in the planning and implementation of health-related education, including an educational offering addressing infant nutrition. The Sunrise Enabler and the Health Promotion Model provide foundations for the construction of an assistive and supportive educational offering. Mothers are empowered by knowledge. Knowledge, along with perceptions of benefits and barriers, enables mothers to make decisions and modifications affecting infant feeding practices and healthy outcomes for their children.

**Definitions**

This section will provide a brief definition of terms relevant to this study in order to assist in understanding key words and phrases. This will include a conceptual and an operational definition. The terms include prenatal infant nutrition education, maternal feeding attitudes, infant feeding practices, and child weight status.

**Prenatal Infant Nutrition Education**

Conceptually, prenatal infant nutrition education is defined as teaching occurring before birth regarding the process of providing food for babies (Prenatal infant nutrition education, 2003).

Operationally, prenatal infant nutrition education is defined as education that includes recommendations from the AAP (Kleinman, 2009) and specifically addresses the benefits of breastfeeding for infant and mother, recommendations for formula feeding, timely introduction of solid food, and techniques for soothing a fussy infant
without feeding when hunger is not the issue (See Appendix A for the guidelines and materials used in the education sessions).

**Maternal Feeding Attitudes**

Conceptually, maternal feeding attitudes are defined as “the role of attitudes in determining which method of infant feeding will be chosen” by the mother (de la Mora, Russell, Dungy, Losch, & Dusdieker, 1999, p. 2363).

Operationally, maternal feeding attitudes are defined as the mother’s preference for breastfeeding or formula feeding and measured by the Iowa Infant Feeding Attitude Scale (See Appendix C).

**Infant Feeding Practices**

Conceptually, infant feeding practices are defined as the manifestations of maternal behaviors based on maternal beliefs and attitudes such as how, when, and why children are fed which may reflect cultural practices.

Operationally, infant feeding practices are defined as the initiation of breastfeeding and the time of introduction of solid foods and measured by specific questions assessing these practices included in the Demographic and Infant Feeding Instrument (See Appendix B).

**Child Weight Status**

Conceptually, child weight is defined as the sex-specific, weight-for-length percentile standard established by the World Health Organization (WHO). Low weight from birth to 24 months is defined as < 2nd percentile and high weight from birth to 24 months is defined as weight > 98th percentile of weight-for-length (CDC, 2015).

Operationally, child weight status is defined as weight and length measurements obtained at periodic evaluations of children participating in WIC and assessed by WIC qualified staff at 12, 18, and 24 months of age with sex-specific, weight-for-length percentiles based on WHO growth standards. For the purpose of this study, healthy weight-for-length percentile was defined as percentiles ranging from the 2nd percentile through the 98th percentile (See Appendix D for the WHO age- and sex-specific growth charts from CDC).
Research Question

Is there a difference in infant feeding attitudes, the initiation of breastfeeding practice, the introduction of solid foods practice, and child weight-for-length percentiles at 12, 18, and 24 months between mothers who participated in a prenatal infant nutrition education session and mothers who did not participate?

Research Hypotheses

Based on the research question, the hypotheses for this study include:

**H1:** Mothers who participated in a prenatal infant nutrition education session will have significantly higher mean scores on the Iowa Infant Feeding Attitudes Scale (IIFAS) compared to mothers who did not participate in the prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**H2:** Mothers who participated in a prenatal infant nutrition education session will initiate breastfeeding significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**H3:** Mothers who participated in a prenatal infant nutrition education session will delay the introduction of solid foods until four months of age significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**H4:** Children of mothers who participated in a prenatal infant nutrition education session will have significant lower mean weight-for-length percentiles at 12, 18 and 24 months of age when compared to children of mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

Delimitation

Participation in this study is limited to pregnant women attending a Medicaid clinic offering prenatal services located in northeast Louisiana during the Spring of 2009 through the Spring of 2011.
Summary

Chapter One introduced obesity as a global, national, and state epidemic. Obesity, along with associated health-related issues, affects all age groups. Providing prenatal infant nutrition education regarding recommended infant feeding practices is one way to address this issue early in life. Leininger’s Theory of Culture Care Diversity and Universality and Pender’s Health Promotion Model provide appropriate theoretical perspectives and frameworks for this study. Both address factors associated with decisions made regarding infant feeding decisions, specifically cultural influences on infant feeding attitudes, beliefs, and practices. Definitions of key terms are included along with the research question and research hypotheses.
LITERATURE REVIEW
Literature Review

This chapter will address the literature search and selection of articles used in this study. Key concepts addressing infant feeding attitudes, beliefs, and practices were examined. The identification of associated concepts resulted in emerging themes that included interpersonal influences on knowledge and behavior, and the effects of feeding practices throughout the lifespan.

A literature search was conducted in the EBSCO host database. The search key terms were infant feeding attitudes, infant feeding beliefs, and infant feeding practices. The search was limited to peer-reviewed journals, research articles, English language, and a time period from 2000 to 2015. With the preference of studies conducted in the United States, foreign-conducted studies were not included. Further deletion included duplication of articles within the search, articles already in possession, and articles that only briefly addressed the subject. After exclusion, 26 articles were identified.

These 26 articles were added to a collection of similar data previously collected when preparing the prenatal infant nutrition education offering used in this study. Another source of relevant literature was the reference lists of the retrieved articles. A total of 37 articles are included in this review.

Infant Feeding Attitudes and Beliefs

Attitudes represent the predisposition to behave based on beliefs representing what is known about a phenomenon (Fishbein & Ajzen, 1975). Cultural beliefs are strong determinants of behavior (Leininger, 2001; Pender et al., 2002). This section will review attitudes and cultural influences on infant feeding decisions.

Shaker, Scott, and Reid (2004) conducted a study to compare infant feeding attitudes of parents of breastfed infants and formula fed infants. Prior to delivery, mothers and their partners completed the Iowa Infant Feeding Attitude Scale (IIFAS) (de la Mora et al., 1999). Feeding method at discharge was retrieved from medical records and matched to the completed questionnaires. As predicted, mothers who breastfed had more positive attitudes toward breastfeeding and were more knowledgeable about the benefits of breastfeeding compared to parents of formula fed infants. Fathers of both groups were more likely than the mothers to disapprove of breastfeeding in public.
Parents from both groups considered their method of feeding to be the more convenient method (Shaker et al., 2004). In a similar study, women responded to a questionnaire regarding barriers to breastfeeding (McCann, Baydar, & Williams, 2007). Of the 1095 mothers, 84% of Hispanic mothers, 53% of non-Hispanic white mothers, and 34% of non-Hispanic black mothers initiated breastfeeding. Two dimensions of breastfeeding attitudes and beliefs were identified: perceived benefits and perceived barriers. Hispanic mothers scored highest on the perceived benefits of breastfeeding and black mothers scored highest on the perceived barriers of breastfeeding. Results suggest that attitudinal barriers such as breastfeeding in public and inconvenience are more prominent than structural barriers such as return to work or school (McCann et al., 2007).

Decisions made by mothers of different races may be reflective of a cultural or ethnic influence. Culture is reflected in attitudes and behaviors related to infant feeding practices (Brotanek, Schroer, Valentyn, Tomany-Korman, & Flores, 2009; Gill, Reifsnider, Mann, Villarreal, & Tinkle, 2004; Grassley & Eschiti, 2008). In a qualitative study of 30 women aged 18 to 41 years, participants want and seek extended family input from maternal and paternal grandmothers, indicating that the choice to breastfeed or formula-feed is often a cultural practice (Grassley & Eschiti, 2008). Family advice may reflect cultural beliefs and feeding practices, as grandmothers’ support is reflective of their own infant feeding practices and beliefs that may or may not encourage breastfeeding (Grassley & Eschiti, 2008). Cultural beliefs related to breastfeeding among Mexican Americans were the focus of qualitative studies by Gill et al. (2004) and Brotanek et al. (2009). Cultural beliefs included particular foods to eat and avoid during breastfeeding; avoidance of alcohol, smoking, medications, and stress; and, the use of a special drink called liquado, a blended drink of milk, sugar, egg, and fresh fruit believed to enrich breast milk (Gill et al., 2004). Mothers related the practice of prolonged bottle feeding as common in Mexican families with one mother stating “Hispanics always want their children to be chubby” (Brotanek et al., 2009, p. 20).

Beliefs and attitudes regarding the introduction of solid foods was the focus of a study by Horodynski, Olson, Arndt, Brophy-Herb, Shirer, and Shemanski (2007). Knowledge regarding infant feeding practices, the ability to apply guidelines, and the
source and type of information provided were identified as influencing factors in making the decision of when to introduce solid foods (Horodyski et al., 2007).

Results of several studies indicate that race/ethnicity and culture may influence body size preference and the attitude toward feeding for reasons other than hunger (Johnson et al., 2008; Worobey & Lopez, 2005). For example, many Mexican Americans introduce solid foods early with foods and beverages high in calories, and prolong bottle feeding due to the preference for bigger babies (Johnson et al., 2008). Worobey and Lopez (2005) surveyed multiracial, low-income, exclusively formula feeding mothers and asked them to estimate their infant's current body size, choose the body size they desired for their infant, and agree with statements that reflected their attitude toward infant feeding. Mexican mothers tended to perceive their infants as the leanest followed by other-Latina, then black, and then white when measured by the Baby Rating Scale, developed by Rand and Wright (2000). In addition, Mexican mothers preferred heavier infants with white mothers preferring leaner infants (Worobey & Lopez, 2005). When compared with scores from the Maternal Feeding Attitudes Questionnaire (Kramer, Barr, Leduc, Boisjoly, & Pless, 1983), mothers who perceived their child as leaner had higher scores on pushing feeding (Worobey & Lopez, 2005).

A study by Evans et al. (2011) addressed acculturation in Hispanic participants. Compared to acculturated Hispanics, Spanish-speaking Hispanic parents were more concerned about their child being underweight and used food to calm their children, \((p < 0.001)\). The findings suggest an association between parental feeding practices and acculturation possibly attributing to cultural differences between more and less acculturated parents. The authors emphasized the importance of replacing unhealthy feeding practices and patterns with culturally acceptable feeding practices that will lead to more healthy patterns.

Findings from a qualitative study showed that mothers who chose to breastfeed their infant approached the decision based on attitudes and beliefs supporting an infant centered focus (Radzyminski & Callister, 2016). This decision was influenced by awareness and knowledge of what was best for the infant, maternal benefits and support from significant other. Mothers choosing to formula feed provided input reflective of
their belief that formula feeding was the best method for them based on the perception that formula feeding is the way infants should be fed. This supported a maternal centered focus and included reasons for choosing to formula feed such as the father feeling left out and their mother discouraging breastfeeding (Radzyminski & Callister, 2016).

This section discussed the cultural effect on attitudes associated with infant feeding. Feeding methods such as breastfeeding and formula feeding were compared. Preference for large infants was reported as culturally related in Mexicans. Practices vary between more and less acculturated parents. Table 1 is a summary of studies addressing infant feeding attitudes.

**Table 1**

*Infant Feeding Attitudes and Beliefs*

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Date</th>
<th>Purpose of Study</th>
<th>Population/Sample</th>
<th>Method</th>
<th>Results</th>
</tr>
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<tbody>
<tr>
<td>Brotanek, J., Schroer, D., Valentyn, L., Tomey-Korman, S. &amp; Flores, G.</td>
<td>2009</td>
<td>Assess infant feeding beliefs, knowledge and practices among Mexican-Americans</td>
<td>n = 39 parents, recruited from community sites, mean age = 28 yrs, mean age of child = 2 yrs</td>
<td>Qualitative, ethnographic interviews; 31 question guide; audiotaped, transcribed, analyzed using grounded theory</td>
<td>Prolonged bottle feeding convenient; belief that toddlers should have milk as desired, good to be chubby, helps to fall asleep; knowledge deficit re: infant feeding practices and iron deficiency; transition to bottle feeding in U.S.</td>
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<tr>
<td>Author(s)</td>
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<td>Purpose of Study</td>
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<tr>
<td>Evans, A., Seth, J., Smith, S., Harris, K., Loyo, J., Spaulding, C., Van Eck, M., &amp; Gottlieb, N. “Parental feeding practices and concerns related to child underweight, picky eater, and using food to calm differ according to ethnicity/race, acculturation, and income”</td>
<td>2011</td>
<td>Differences in parental feeding practices</td>
<td>n = 721 WIC participants; 50% Hispanics</td>
<td>Cross-sectional study; Preschooler Feeding Questionnaire; Chi-square; ANOVA; univariate analyses; Mplus factor analysis</td>
<td>Feeding practices: pushing children to eat, dealing with picky eaters, parents less likely to restrict eating; differences in acculturation in Hispanics; few significant differences in feeding practices and concerns related to demographics</td>
</tr>
<tr>
<td>Gill, S., Reifsnider, E., Mann, A., Villarreal, P. &amp; Tinkle, M. “Assessing infant breastfeeding beliefs among low-income Mexican Americans”</td>
<td>2004</td>
<td>Breastfeeding cultural beliefs among low-income Mexican Americans</td>
<td>n = 10 pregnant women; 15 new mothers, 9 men; 5 grandmothers recruited from WIC clinic in Texas</td>
<td>Qualitative – Focus Group; audiotaped, transcribed, reviewed and coded</td>
<td>Themes: benefits of breastfeeding, making the decision, barriers, lack of support, cultural beliefs</td>
</tr>
<tr>
<td>Grassey, J. &amp; Eschiti, V “Grandmother breastfeeding support: What do mothers need and want?”</td>
<td>2008</td>
<td>Mothers’ perceptions of grandmothers’ knowledge and support of breastfeeding</td>
<td>n = 30 mothers recruited from a hospital and a WIC center</td>
<td>Qualitative study, focus groups; interviews audiotaped, transcribed and analyzed for themes</td>
<td>Themes: valuing breastfeeding, loving encouragement, acknowledging barriers, confronting myths, current breastfeeding knowledge</td>
</tr>
<tr>
<td>Author(s)</td>
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<td>Purpose of Study</td>
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<tr>
<td>Horodynski, M., Olson, B., Arndt, M., Brophy-Herb, H., Shirer, K. &amp; Shemanski, R.</td>
<td>2007</td>
<td>Beliefs and attitudes of mothers enrolled in Medicaid regarding when and why to introduce solid foods to their infants: Influencing factors</td>
<td>n = 23 low-income Black and Caucasian mothers with infants under 1 yr, recruited at county extension offices</td>
<td>Qualitative, audiotaped, transcribed, analyzed and coded for themes and patterns</td>
<td>Major themes: maternal knowledge and perceptions of applicability of infant feeding guidelines, and type of information useful for infant feeding decisions</td>
</tr>
<tr>
<td>Johnson S., Clark, L., Goree, K., O'Connor, M. &amp; Zimmer, L.</td>
<td>2008</td>
<td>Healthcare providers' perceptions of Mexican American infant feeding practices and obesity</td>
<td>n = 38 healthcare professionals: 13 WIC educators, 9 RNs, 8 medical assistants, 3 WIC dieticians, 3 pediatricians, 2 physician assistants</td>
<td>Qualitative, focus groups, ethnographic interviewing; audio recorded, transcribed, coded and themes extracted</td>
<td>Themes: chubby baby is healthy baby, complementary foods are introduced earlier than recommended, extended family influences feeding practices, mothers offer high-calorie food and delay weaning from the bottle</td>
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<tr>
<td>McCann, M., Baydar, N. &amp; Williams, R.</td>
<td>2007</td>
<td>Information from WIC participants about breastfeeding attitudes regarding infant feeding and infant feeding practices</td>
<td>n = 1095 The WIC Infant Feeding Practices Study</td>
<td>Longitudinal study, chi-square analysis; multivariate logistic regression; life table methodology with Kaplan Mier estimates, factor analysis</td>
<td>Hispanic mothers more likely to agree with statements about benefits of breastfeeding; Black mothers more likely to agree with statements about barriers. Insufficient milk concern for all ethnic groups</td>
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<tr>
<td>Author(s)</td>
<td>Date</td>
<td>Purpose of Study</td>
<td>Population/Sample</td>
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<tr>
<td>Radzyminski, S. &amp; Callister, L.</td>
<td>2016</td>
<td>Variables affecting the decision to formula-feed or breastfeed</td>
<td>n = 152 post-partum mothers</td>
<td>Qualitative, personal interview prior to discharge</td>
<td>Breastfeeding mothers: infant centered responses -- health of infant, knowledge, support. Formula mothers: maternal centered responses - maternal benefits, lack of knowledge related to BF.</td>
</tr>
<tr>
<td>Shaker, I., Scott, J. &amp; Reid, M.</td>
<td>2004</td>
<td>Compare infant feeding attitudes of parents of breastfed infants with those of parents of formula fed infants</td>
<td>n = 108 couples convenient sample of pregnant women and their partners in Scotland</td>
<td>Chi-square, independent t tests, Mann-Whitney U-test</td>
<td>Parents of breastfed infants had more positive attitudes toward breastfeeding than parents who formula fed their infants</td>
</tr>
<tr>
<td>Worobey, J. &amp; Lopez, M.</td>
<td>2005</td>
<td>Parental indication of infant size, their desired size of infant and attitudes toward feeding</td>
<td>n = 240 mothers; 38% Mexican; 30% other-Latino; 23% black; 9% white</td>
<td>Baby Rating Scale; Maternal Feeding Attitudes Questionnaire; One-way analysis of variance; Tukey post hoc comparisons</td>
<td>Race/ethnicity and culture may influence a mother’s idea about infant body size and attitude toward feeding infant for reasons other than hunger.</td>
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</table>

**Infant Feeding Practices**

Infant feeding practices are observable acts of behavior and “infer beliefs, attitudes, or intentions” (Fishbein & Ajzen, 1975, p. 13). Therefore, infant feeding practices are behaviors that reflect beliefs, attitudes, and practices. The choice of the method of feeding and how often to feed infants are important considerations that mothers entertain when making the decision of how and when infants will be fed during
the important first year of life. Numerous research studies have focused on infant feeding practices and the many factors that contribute to the choices that are made.

Baughcum et al. (2001) conducted a study to identify maternal feeding practices and beliefs during a child’s first year of life that may relate to overweight in the second year. In order to include mothers from diverse socioeconomic backgrounds, participants were recruited from a clinic that provided WIC services and from three pediatric practices. The Infant Feeding Questionnaire (IFQ), developed for this study by Baughcum et al. (2001), includes measures that address feeding during the first year of life: self-report items for mother and child such as age, race, maternal education, income level, breastfeeding history, maternal body mass index (BMI), and the weight of the child collected in the second year. Mothers were asked to report feeding practices in the child’s first year. Mothers who breastfed for one month or longer were less likely to have an overweight child, more likely to report higher income, and more likely to be white (Baughcum et al., 2001). Another factor that was associated with the likelihood of children being overweight was maternal obesity. Overweight or obese maternal BMI was reported more often in low-income mothers. Findings of the IFQ showed differences in feeding behaviors with high income mothers concerned with child overeating and becoming overweight and low income mothers more concerned with satisfying perceived infant hunger (Baughcum et al., 2001).

Factors contributing to the development of obesogenic feeding practices among African-American infants were examined in a sample of 217 low-income, first-time mothers of infants enrolled in the U.S. Infant Care and Risk of Obesity Study (Thompson & Bentley, 2012). Infants were followed from three months of age to 18 months of age. Sociodemographic factors, household factors, feeding beliefs, and infant feeding practices associated with age-appropriate feeding of liquids and solids were included. Data were collected at 3, 6, 9, 12, and 18 months of age. Over 75% of infants received solids or juice by three months of age. The odds of inappropriate feeding practices were higher in single (OR = 1.81, 95% CI [1.04, 3.15]), or depressed (OR = 1.49; 95% CI [1.04, 2.14]) mothers, and those who believed their baby to be “greedy” (OR = 1.65; 95%
Cl [1.21, 2.26]) (Thompson & Bentley, 2012, p. 5). These practices resulted in a higher daily intake and increased odds of high infant weight-for-length percentiles.

An objective of a study by Crocetti et al. (2004) was to calculate the frequency and the reasons for early introduction of solid foods. Primary caregivers completed questionnaires for 102 children during the child's four month check-up. Results of the study showed 67% of participants chose to formula feed their infant. Seventy-one percent of caregivers in this group placed cereal in a bottle for feeding. Caregivers reporting this feeding practice included 54% of African-American, 45% of White, and 22% Hispanic (Crocetti et al., 2004). Reasons given for early introduction of solids included infant not satisfied with breast milk or formula only, infant slept better at night, and advice given by friend or family members. Mothers who breastfed (exclusively or combined with formula) were less likely to introduce cereal early (Crocetti et al., 2004).

Fein et al. (2008) analyzed data from the 2005-2007 Infant Feeding Practices Study II. The purpose of the study was to describe factors associated with the transitions of infants’ diet including the timing of transition, how they were fed and quality of diet. A large group of mothers (1600 – 2400, sample size varied for relevant questions) drawn from a nationally distributed consumer panel responded to questionnaires addressing food frequency and feeding practices. Findings of the study included: 20.9% introduced solids foods before four months of age; 29% introduced over three new foods per week to infants 5-10 months of age; and, 22.9% introduced juice before six months (Fein et al., 2008). These practices were more likely to occur with mothers with high school education or less. In a similar study, Kuo et al. (2011) reported lower maternal education, never breast-feeding or for short duration, only one adult in household, and participation in WIC associated with the early introduction of solid foods. Similar findings were reported by Grzywacz, Tucker, Clinch, & Arcury (2010). In this study, 199 working mothers with infants at eight months of age participated for the purpose of determining factors that shape infant feeding. Personal characteristics associated with infant feeding practices included educational attainment and marital status (Grzywacz et al., 2010). Hendricks, Briefel, Novak, and Ziegler (2006) studied the effects of maternal characteristics on infant feeding practices. In this national random sample of 2515
participants, the mothers' race consisted of Hispanic, non-Hispanic African Americans, and non-Hispanic white. Mothers who were college educated were more likely to follow the APA guidelines for breastfeeding and introduction of solids and juice when compared to those less educated.

Lee et al. (2005) studied factors associated with intention to breastfeed with the presumption that intentions are predictive of future behavior. Results of this study of low-income, inner-city pregnant women showed a higher percentage of immigrant blacks, other Hispanics, Puerto Ricans, and African Americans planned to breastfeed compared to non-Hispanic whites (Lee et al., 2005). An unexpected finding was a higher likelihood of anticipated breastfeeding among African American women compared with non-Hispanic white women. While the authors stated the focus of the study was to examine factors associated with breastfeeding intention rather than breastfeeding behavior after birth of child, this unexpected finding resulted in the recommendation of more focus on breastfeeding promotion in the prenatal period. Additional analysis of this study of racially and ethnically diverse women showed that mothers more likely to report intention to breastfeed were those married or living as married, more educated, not living in public housing, and not smoking (Lee et al. 2005). Barriers to the initiation and continuation of breastfeeding were identified in a study focusing on predominantly low-income mothers in rural communities (Flower et al. 2008). The barriers included the associated pain and embarrassment, maternal employment, lack of assistance, and receiving WIC.

In 2009, food packages available to WIC participants changed in order to “better incentivize and support breastfeeding” (Whaley et al., 2012, p. 2269). As a result of this change, WIC food packets for fully breastfeeding mothers increased in value. A comparison of data prior to and after the change revealed a significant decrease in the issuance rates of food packets including formula while the issuance rate of breastfeeding packages increased 87% (Whaley et al., 2012).

In a secondary analysis of cross-sectional data, DiSantis, Hodges, and Fisher (2013) studied an ethnically diverse population including Hispanic, black, and white mothers of infants and toddlers in order to evaluate breastfeeding duration with maternal
feeding styles. Non-Hispanic white mothers of toddlers reported a longer duration of breastfeeding (greater than six months) when compared to the other mothers who breastfed. The authors found that mothers of infants and toddlers who breastfed longer reported a lower pressuring feeding style related to cereal consumption compared to mothers who breastfed for shorter durations. An important finding of the study was that mothers who breastfed at least three months reported higher levels of responsiveness to infant satiety and hunger cues when compared to mothers who breastfed for less than three months (DiSantis et al. 2013).

Recognizing hunger cues and satiety are important to prevent overfeeding and decrease maternal anxiety about the baby’s weight. Worobey et al., (2009) studied the effects of maternal behavior on infant weight gain in the first year. The participants consisted of low-income, minority mother-infant dyads recruited at a WIC center. Infant weight gain from 6 to 12 months was significantly associated with decreased maternal sensitivity to satiety cues with 40% of the infants’ weight equal to or greater than the 85th weight-for-length percentile. These findings suggest that mothers who do not slow or terminate feedings when the infant shows signs of satiety may prevent the infant from developing the ability to self-regulate intake. In a study of predominantly white, middle-class mothers, maternal feeding style and infant temperament marginally contributed to the introduction of solid food prior to four months of age, prompting the suggestion that mothers may benefit from education on how to respond to infant crying without resorting to the early introduction of solid foods (Doub, Moding & Stifter, 2015).

In a systematic review, DiSantis, Hodges, Johnson, and Fisher (2011) assessed evidence for the hypothesized relationship between discordant responsiveness in feeding and overweight in infancy and toddlerhood. Responsiveness was defined by the authors as “involving prompt, contingent and developmentally appropriate responses to the infant’s hunger and satiety cues” (DiSantis et al., 2011, p. 480). Articles were identified from three databases and assessed for quality of evidence, resulting in nine original articles which met inclusion criteria. Preliminary support for the proposed role of discordant responsiveness in overweight infants and children was concluded; however,
the authors identified a lack of consistency in the operational definition of feeding responsiveness and stated the need for further exploration (DiSantis et al., 2011).

Schlickau and Wilson (2005) reviewed studies addressing breastfeeding behaviors in Hispanic women and the concepts of the Health Promotion Model (HPM) (Pender et al., 2002). In the 25 studies reviewed, each of the 10 determinants of HPM was associated with breastfeeding outcomes (Schlickau & Wilson, 2005). The HPM provides a framework for understanding cultural factors and other determinants of breastfeeding initiation and duration and can assist nurse educators in meeting challenges while addressing the needs of diverse populations.

Table 2 is a summary of studies addressing infant feeding practices and weight status.

### Table 2

**Infant Feeding Practices**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Date</th>
<th>Purpose of Study</th>
<th>Population/Sample</th>
<th>Method</th>
<th>Results</th>
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<tbody>
<tr>
<td>Baughcum, A., Powers, S., Johnson, S., Chamberlin, L., Deeks, Jain, A. &amp; Whitaker, R.</td>
<td>2001</td>
<td>Identify maternal feeding practices and beliefs during child's first year resulting in overweight in second year</td>
<td>n = 453 mothers, diverse socio-economic backgrounds, recruited from WIC clinic and three pediatric clinics</td>
<td>Infant Feeding Questionnaire, chi-square, t-tests, linear regression, factor analysis</td>
<td>Mothers with low-income and maternal obesity were less likely to breastfeed; mothers who breastfed 1 month or longer were less likely to have overweight child</td>
</tr>
<tr>
<td>Crocetti, M., Dudas, R. &amp; Krugman, S.</td>
<td>2004</td>
<td>Caregiver awareness of infant feeding guidelines; frequency and reason for early introduction to solids</td>
<td>n = 114 primary caregivers of 4 month old infants; recruited from 2 hospital-based clinics in Maryland</td>
<td>Cross-sectional survey; 13 item questionnaire, t-test, chi-square, simple and multiple logistic regression, stepwise regression</td>
<td>71% had cereal placed in bottle for feeding: AA (54%), white (45%), Hispanic (22%); reasons: infant not satisfied, sleeps better, advice from friend or family member; 77% aware of AAP recommendations</td>
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<tr>
<td>Author(s)</td>
<td>Date</td>
<td>Purpose of Study</td>
<td>Population/Sample</td>
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<tr>
<td>DiSantis, K., Hodges, E. &amp; Fisher, J.</td>
<td>2013</td>
<td>Evaluate the association of breastfeeding duration with maternal feeding styles in infancy and toddlerhood</td>
<td>n = 154 Hispanic, Black, and White mothers</td>
<td>Infant Feeding Styles Questionnaire; secondary analysis of cross-sectional data; ANOVA and Spearman correlation, Bonferroni post hoc test, chi-square</td>
<td>White mothers breastfed longer reporting a lower pressuring feeding style and greater sensitivity to satiety cues; infants breast-fed less than 3 months were more likely to receive solid food earlier</td>
</tr>
<tr>
<td>DiSantis, K., Hodges, E., Johnson, S. &amp; Fisher, J.</td>
<td>2011</td>
<td>Hypothesized relationship between discordant or mismatched responsiveness in feeding and overweight in infancy and childhood</td>
<td>n = 9 articles meeting inclusion criteria</td>
<td>Articles assessed using Oxford University Centre for Evidence Based Medicine’s level of evidence and a narrative review</td>
<td>Proposed role of discordant responsiveness to infant feeding cues and infant/child overweight is supported</td>
</tr>
<tr>
<td>Doub, A., Moding, K. &amp; Stifter, C.</td>
<td>2015</td>
<td>Maternal feeding style and infant temperament predicting age at which infant was introduced to solid foods</td>
<td>n = 115 mother–infant dyads recruited through birth announcements and local community hospital; predominantly white, middle-class mothers</td>
<td>Longitudinal study; self-report survey at 4 and 6 months of age</td>
<td>Maternal feeding style and infant temperament contribute to the timing of solid food introduction; 1 in 4 mothers introduced solid food prior to 4 months of age</td>
</tr>
<tr>
<td>Fein, S., Labiner-Wolfe, J., Scanlon, K. &amp; Grummer-Strawn, L.</td>
<td>2008</td>
<td>Factors associated with infants’ diet transition including timing, how they are fed and quality of diet</td>
<td>n = 1600-2400 mothers depending on relevancy of questions; participants in 2005-2007 Infant Feeding Practices Study II; sample drawn from nationally distributed consumer panel</td>
<td>Longitudinal surveys; questionnaires addressed food frequencies and feeding practices frequencies, cross-tabulation with chi-square tests</td>
<td>Mothers with high school education or less were more likely to introduce solids, give juice and cow’s milk before recommended time</td>
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<td>Author(s)</td>
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<td>Purpose of Study</td>
<td>Population/ Sample</td>
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<tr>
<td>Flower, K., Willoughby, M., Cadigan, R., Perrin, E. &amp; Randolph, G.</td>
<td>2008</td>
<td>Factors associated with breastfeeding in rural communities</td>
<td>Parallel study: ( n = 30 ) Qualitative families ( n = 1292 ) Quantitative families</td>
<td>Logistic and Cox regression models</td>
<td>Maternal employment, receiving WIC, breastfeeding discomfort, embarrassment, and lack of assistance were associated with decreased initiation and discontinuation of breastfeeding</td>
</tr>
<tr>
<td>Grzywacz, J., Tucker, J., Clinch, C. &amp; Arcury, T.</td>
<td>2010</td>
<td>Working mothers’ infant feeding practices and factors that may shape infant feeding</td>
<td>( n = 199 ) working mothers with 8-month old infants</td>
<td>Cross-sectional, Survey questionnaire, simple logistic regression and multivariate logistic regression models</td>
<td>86.4% of mothers reported feeding their infants formula, 13.6% reported exclusive breastfeeding, nearly all mothers fed infants commercially prepared foods with 1 in 5 feeding infant foods associated with allergies; unhealthy feeding practices were elevated among unmarried, less educated mothers</td>
</tr>
<tr>
<td>Hendricks, K., Briefel, R., Novak, T. &amp; Ziegler, P.</td>
<td>2006</td>
<td>Maternal/child characteristics associated with feeding practices of U.S. infants and toddlers aged 4-24 months</td>
<td>( n = 2515 ) mothers with infants and toddlers 4-24 months of age – Feeding Infants and Toddlers Study cohort</td>
<td>( t )-tests and logistic regression</td>
<td>College degree associated with likelihood of initiate of and longer duration of breastfeeding, compliance with juice and complementary feeding recommendations; child in daycare associated with decreased duration of breastfeeding</td>
</tr>
<tr>
<td>Author(s)</td>
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<td>Kuo, A., Inkelas, M., Slusser, W., Maidenberg, M. &amp; Halfon, N.</td>
<td>2011</td>
<td>Factors associated with early or late introduction of solids with emphasis on racial/ethnic differences associated with maternal education</td>
<td>n = 2068 parents of children 4-35 months; National Survey of Early Childhood Health</td>
<td>Bivariate tests, logistic regression models</td>
<td>62% introduced solids between 4-6 months; white mother with more than high school education and mothers who breast-fed for 4 months or longer were less likely to introduce solids early; 92% of parents recalled discussing introduction of solids with provider though not timely</td>
</tr>
<tr>
<td>Lee, H., Rubio, M., Elo, I., McCollum, K., Chung, E. &amp; Culhane, J.</td>
<td>2005</td>
<td>Relationship between sociodemographic factors, maternal characteristics, and intention to breastfeed among low-income, inner-city pregnant women</td>
<td>n = 2690, English and Spanish speaking, low-income, inner-city pregnant women</td>
<td>Multivariate logistic regression</td>
<td>53% responded with intention to breast-feed; immigrant blacks, other Hispanics, island-born Puerto Ricans and non-Hispanic African American women were more likely to report intent to breastfeed than non-Hispanic whites</td>
</tr>
<tr>
<td>Schlickau, J. &amp; Wilson, M.</td>
<td>2005</td>
<td>Evidence that breastfeeding is a health-promoting behavior and use of the HPM to increase breastfeeding in Hispanic women</td>
<td>n = 25 studies addressing breastfeeding intention, initiation or duration were reviewed</td>
<td>Databases searched with terms Hispanic or Latino, breastfeeding, and concepts of the HPM.</td>
<td>10 determinants of health promoting behavior promote breastfeeding in Hispanic women</td>
</tr>
<tr>
<td>Thompson, A. &amp; Bentley, M.</td>
<td>2012</td>
<td>Factors contributing to the development of early obesogenic feeding practices</td>
<td>n = 217, U.S. Infant Care and Risk of Obesity Study, low-income, first-time, African-American mothers</td>
<td>Linear and logistic regression models</td>
<td>75% of infants received solids or juice before 3 months, higher odds among single, depressed mothers, increased odds of higher infant weight-for-length</td>
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<tr>
<td>Author(s)</td>
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<tr>
<td>Whaley, S., Koleilat, M., Whaley, M., Gomez, J., Meehan, K., &amp; Saluja, K.</td>
<td>2012</td>
<td>Infant feeding data before and after WIC package change that supported and incentivized breastfeeding</td>
<td>n = 180,000 infants in southern California</td>
<td>Analysis of variance, Tukey tests, analysis of covariance, chi-square</td>
<td>Rates of issuance of fully breastfeeding packages increased 87% at enrollment and packages including formula decreased significantly</td>
</tr>
<tr>
<td>Worobey, J., Lopez, M., &amp; Hoffman, D.</td>
<td>2009</td>
<td>Relative contributions of maternal characteristics and behaviors in predicting infant weight gain over the first year of postpartum life</td>
<td>n = 96 low-income, minority mother-infant dyads</td>
<td>Longitudinal study, multiple linear and backward regressions</td>
<td>Neither perinatal measures nor measures from birth to 3 months predicted weight gain from birth to 6 months; number of feeding and lessened maternal sensitivity to infant cues predicted weight gain from 6 to 12 months</td>
</tr>
</tbody>
</table>

**Knowledge and Knowledge Sources**

Knowledge regarding infant nutritional needs is important as it may be reflected in infant feeding practices. This knowledge may be derived from numerous sources including family, friends, and health professionals. It is important for healthcare professionals to assess this knowledge and provide consistent information to assist mothers in making decisions regarding the nutritional needs of their infant.

A large percentage (77%) of 114 caregivers stated that they were aware of AAP recommended infant feeding guidelines including the appropriate age to introduce solids;
however, approximately 44% of study participants fed cereal to their infants before four months of age (Crocetti et al. 2004). Hispanic caregivers, (OR = 0.2; 95% CI [0.07, 0.9]), and mothers breastfeeding exclusively or partially (OR = 0.4; 95% CI [0.2, 0.9]) were less likely to introduce solids before four months of ages (Crocetti et al., 2004).

Interviews were conducted to examine influences on mothers’ infant feeding decisions and feeding behavior change (McInnes et al., 2013). While mothers with previous experience identified themselves as the main influence, significant others, the baby and situations also influenced mothers’ feeding decisions. Before and after making an infant feeding behavior change, mothers sought approval, endorsement and justification from significant others who were more likely to confirm her decision resulting in enhanced self-esteem and confidence. These significant others included spouses, partners, health professionals, female friends and family (McInnes et al., 2013).

First-time young mothers, between 15 and 22 years of age, reported their mothers or grandmothers as sources for advice (Karp & Lutenbacher, 2011). A small percentage of the study participants reported healthcare professionals as a source of advice. Clinical implication resulting from the study suggested nurses develop interventions for early promotion of healthy infant feeding practices for this population (Karp & Lutenbacher, 2011).

In a focus group study with 36 health professionals, Olson, Horodyski, Brophy-Herb, and Iwanski (2010) addressed low-income mothers’ sources of infant feeding information. According to the participants, information is received from many sources including health professionals, relatives, and friends; however, the health professionals felt the most influential source was female relatives (Olson et al., 2010). Low-income mothers are often dependent upon their mothers’ financial and emotional support; therefore, they feel the need to respect and follow advice from this support system. Other sources of information include home visitors, extension education classes, the hospital, nutrition flyers, books, internet, and clerk at grocery store. Pediatricians and nurses often had to educate and help mothers to modify their feeding practices based on misguided advice without alienating family and friends (Olson et al., 2010).
Results of a qualitative study that focused on breastfeeding and WIC participation showed that less than 25% of mothers that plan to breastfeed were influenced by their physician (Stolzer, 2010). Mothers who planned to bottle-feed stated influencers regarding infant feeding method included mothers, husbands, boyfriends, friends, and family. Additional responses included work, school, and other children (Stolzer, 2010).

While some mothers are unaware of recommended guidelines, others are aware but fail to follow recommendations. Mothers receive knowledge and/or support from different sources including family, friends, spouses/significant others, and health professionals. Early intervention, with the inclusion of family members, is recommended in order to educate mothers regarding healthy infant feeding practices (Karp & Lutenbacher, 2011). Table 3 is a summary of studies addressing knowledge and knowledge sources.

### Table 3

**Knowledge and Knowledge Sources**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Date</th>
<th>Purpose of Study</th>
<th>Population/Sample</th>
<th>Method</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Crocetti, M., Dudas, R. &amp; Krugman, S.</td>
<td>2004</td>
<td>Caregiver awareness of infant feeding guidelines; frequency and reason for early introduction to solids</td>
<td>$n = 114$ primary caregivers of 4 month old infants; recruited from 2 hospital-based clinics in Maryland</td>
<td>Cross-sectional survey; 13 item questionnaire, $t$-test, chi-square, simple and multiple logistic regression, step-wise regression</td>
<td>77% aware of AAP recommendations, majority did not follow guidelines; need for early guidance addressing reasons for non-adherence</td>
</tr>
<tr>
<td>Karp, S. &amp; Lutenbacher, M.</td>
<td>2011</td>
<td>Infant feeding practices and knowledge in young mothers</td>
<td>$d = 67$ predominantly low-income, African American young mothers</td>
<td>Descriptive/exploratory design; survey; frequency distribution, means and standard deviations</td>
<td>53% attempted to breastfeed; 82% inappropriate feeding practices; 64% solids before 6 months; need for intervention to be developed targeting young mothers</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Date</td>
<td>Purpose of Study</td>
<td>Population/Sample</td>
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<tr>
<td>McInnes, R., Hoddinott, P., Britten, J., Darwent, K. &amp; Craig, L. “Significant others, situations and infant feeding behavior change processes: A serial qualitative interview study”</td>
<td>2013</td>
<td>To investigate how parents and significant others influence feeding behavior change</td>
<td>n = 36 pregnant women and n = 37 significant others</td>
<td>Serial qualitative interviews – 4 weekly from late pregnancy to 6 months after birth – n = 220. Interviews recorded, transcripts read and themes interpreted</td>
<td>Ecological models enhancing family efficacy and well-being, improving communication between family, increasing opportunities for health professionals to influence changes; shift from individual to family centered approach</td>
</tr>
<tr>
<td>Olson, B., Horodynski, M., Brophy-Herb, H. &amp; Iwanski, K. “Health professionals’ perspective on the infant feeding practices of low income mothers”</td>
<td>2010</td>
<td>Experiences of health professionals on assisting low-income mothers with infant feeding decisions</td>
<td>n = 36 health professionals</td>
<td>Focus groups, individual interviews and surveys; transcribed verbatim; recurring themes and content areas identified</td>
<td>6 categories emerged: Sources of feeding information; Helping mothers deal with sources of advice; Use of recommendations from health professionals; Reasons cereal introduced early; Poor mealtime environment; Providing education to mothers</td>
</tr>
</tbody>
</table>
**Infant Feeding and Obesity Later in Life**

Maternal choices of the method, introduction of solids, and the amount and frequency during the period of infancy provide a foundation for nutritional health. Dietary habits formed during this period may contribute to unhealthy eating habits later in childhood and beyond. This section discusses the occurrence of obesity beginning in childhood and the likelihood of it continuing into adulthood.

In a study by Huh, Rifas-Shiman, Taveras, Oken, and Gillman (2011), infant feeding practices were studied to determine the association with child weight at three years. Feeding behaviors of interest for this study were breastfeeding, formula feeding, and the introduction of solids. In this prospective pre-birth cohort study, 847 children were included. Five hundred and sixty-eight infants were breastfed for four months and 279 infants were formula-fed (never breastfed or stopped prior to four months of age). Among breastfed infants, the timing of introduction of solid foods was not associated with odds of obesity (OR = 1.0; 95% CI [0.3, 3.3]). However, in formula-fed infants, solid foods introduced before four months of age was associated with a sixfold increase in odds of obesity at age three years (OR = 6.3; 95% CI [2.3, 16.9]) (Huh et al., 2011).
In a similar study, Griffiths et al. (2009) studied the effects of breastfeeding and breastfeeding duration, and the age at introduction of solid foods with weight gain from birth to three years. Participants were members of the United Kingdom Millennium Cohort Study and consisted of 10,533 three-year-olds. While 68% of mothers initiated breastfeeding, 60% stopped before four months and 39% introduced solids before four months of age. A significant finding was the association between weight gain and the initiation and duration of breastfeeding (Griffiths et al., 2009). Infants receiving no breast milk gained weight faster than infants receiving breast milk (0.06; 95% CI = [0.02, 0.09] \( p = 0.001 \)) as did infants breastfed for less than four months (0.05; 95% CI = [0.01, 0.09] \( p = 0.03 \)) (adjusted regression coefficient expressed as difference in z-scores). In this study, the early introduction of solid foods was not associated with faster weight gain (OR = -0.01; 95% CI = [-0.04, 0.03] \( p = 0.8 \)) (Griffiths et al., 2009).

Goodell, Wakefield, and Ferris (2009) studied the relationship between birth weight, rapid weight gain, and early childhood obesity in a low-income, inner-city, minority population. In the retrospective chart review, 8% \( (n = 16) \) of the children were underweight, 62% \( (n = 126) \) were normal weight, 12% \( (n = 24) \) were overweight and 18% \( (n = 36) \) were obese at three years of age. Analyses resulted in findings that children experiencing rapid weight gain between birth and one year of age were more likely to be obese at 24 to 38 months than children who did not experience rapid weight gain (OR = 9.2; 95% CI [3.73, 22.91]). In this study, children born with low birth weight did not increase the odds of being obese and were more likely to be underweight at 24 to 38 months than children born with normal weights (OR = 4.15; 95% CI [1.11, 15.52]) (Goodell et al., 2009). These studies addressed infant feeding methods including breastfeeding, formula-feeding and the early introduction of solid foods. Results of the studies indicated that formula-feeding and the early introduction of solids during infancy resulted in an increased odds of obesity at three years of age.

Obesity in childhood can result in obesity in adulthood. Deshmukh-Taskar et al. (2006) conducted a study in Louisiana with the intent of tracking overweight status from childhood (9-11 years old) to young adulthood (19-35 years old). The longitudinal sample consisted of 841 young adults with a baseline weight obtained in childhood and a
follow-up weight obtained in young adulthood. Participants in the study included 68% Euro-Americans (EA) and 32% African-Americans (AA) with 63.5% female and 36.5% male. Height and weight were obtained at baseline and follow-up with BMI computed. Four categories were used to categorize the participants based on childhood weight and young adult weight: normal weight in childhood and adulthood (NW-NW); normal weight in childhood to overweight in adulthood (NW-OW); overweight in childhood to normal weight in adulthood (OW-NW); and, overweight in childhood and adulthood (OW-OW) (Deshmukh-Taskar et al., 2006). At baseline, 24.7% of the children were overweight (AA girls = 32.9%; EA girls = 21.3%; EA boys = 28.2%; and, AA boys = 14.9%). At follow-up, 57.7% of young adults were overweight (AA women = 69.9%; EA women = 44%; EA men = 71.7%; and AA men = 55.3%). More than half of the participants remained in the same category (NW-NW and OW-OW); however, over one-third (35.2%) shifted from NW-OW category. Only 2.3% of participants who were overweight as a child became normal weight as a young adult. The authors concluded that early initiation of overweight prevention programs is needed to address overweight and the associated chronic diseases (Deshmukh-Taskar et al., 2006).

Numerous studies have also addressed infant feeding patterns leading to weight gain in infancy and subsequent obesity in adulthood. An analysis of four cohort studies led to conclusions that children who are overweight or obese have an increased risk of being overweight or obese as an adult (Juonala et al., 2011). An encouraging reported outcome of this analysis was that if children became non-obese by adulthood, their health was comparable to adult who have never been obese (Juonala et al., 2011).

Stettler et al. (2003) conducted a study with the aim of determining if rapid weight gain in infancy was a risk factor for obesity in young adults. In this cohort study, 300 African Americans were followed from birth to age 20. Rapid weight gain was defined by the authors as an increase in weight-for-age one or more standard deviations from the mean between birth and four months (Stettler et al., 2003). At age 20, 8% (n = 24) of the participants were obese with one-half (n = 12) of these having a history of rapid weight gain during infancy. Results from additional investigation showed a trend in overweight status with approximately half (n = 6) of the 20 year old obese participants (n =
having a reported rapid weight gain during infancy. The authors reported results showing evidence of a pattern of rapid weight gain during infancy and obesity in adulthood (OR = 5.22; 95% CI [1.55, 17.6]; p = 0.008) and concluded that a critical period for the development of obesity is early infancy (Stettler et al., 2003). The results of these studies show an increased risk of obesity in adulthood associated with overweight in infancy, a pattern of rapid weight gain in infancy, and obesity in childhood.

In a systematic review addressing breast-feeding and childhood obesity, Arenz, Ruckerl, Koletzko, and Von Kries (2004) identified nine studies that met inclusion criteria for meta-analysis. The outcome measure was odds of obesity during childhood. Results of the meta-analysis showed that breastfeeding significantly reduced the risk of childhood obesity (OR = 0.78; 95% CI [0.71, 0.85]). The authors concluded that breastfeeding had a small but consistent protective effect against childhood obesity (Arenz et al., 2004).

Similar findings were reported in a meta-analysis conducted by Harder, Bergmann, Kalllischnigg, and Plagemann (2005). Seventeen studies met the criteria and were included in the analysis. Meta-regression resulted in the duration of breastfeeding as inversely associated with the risk of overweight (regression coefficient = 0.94, 95% CI [0.89, 0.98]). The dose-dependent association was confirmed with categorical analysis showing a 4% decrease in the risk of obesity associated with one month of breastfeeding (OR = 0.96/month of breastfeeding, 95% CI [0.94, 0.98]). This dose-dependent associated finding lasted up to nine months duration of breastfeeding and strongly supports a longer duration of breastfeeding for decreasing overweight later in life (Harder et al., 2005).

In a quantitative review of published literature, Owen, Martin, Whincup, Smith, and Cook (2005) examined the influence of initial infant feeding on obesity later in life. Analysis was based on odds ratios of obesity among infants that were initially breastfed compared with infants that were formula-fed. A total of 28 studies providing odds ratio estimates were included. Four of the studies pertained to infants, 23 pertained to children, and two focused on adults. Results of the review of these studies related breastfeeding to a lower risk of obesity compared with formula feeding (OR = 0.87; 95%
CI [0.85, 0.89]) (Owen et al., 2005). Consistent evidence of a relationship between breastfeeding and reduced risk of obesity was provided by both small and large studies with a stronger association in small studies. There was a stronger association with prolonged breastfeeding, unaltered by age outcome measure. The authors concluded that breastfeeding is protective against obesity although the magnitude remains unclear. Strategies to increase breastfeeding could play an important role in the prevention of obesity.

The findings of the meta-analyses and the review of the literature resulted in strong associations between breastfeeding and decreased risk of obesity. These findings included a breast-feeding duration association for reducing the risk of obesity later in life. Table 4 is a summary of studies addressing the effect of feeding practices on obesity later in life.

Table 4

**Infant Feeding and Obesity Later in Life**

<table>
<thead>
<tr>
<th>Author(s)</th>
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<td>Arenz, S., Ruckerl, R., Koletzko, B. &amp; Von Kries, R. &quot;Breast-feeding and childhood obesity - A systematic review&quot;</td>
<td>2004</td>
<td>The relationship between breast-feeding and obesity in childhood, a systematic review</td>
<td><em>n</em> = 9 studies with &gt; 69,000 participants, children older than 1 year</td>
<td>Odds ratio for childhood obesity as defined by BMI</td>
<td>Breastfeeding reduced the risk of childhood obesity significantly</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Date</td>
<td>Purpose of Study</td>
<td>Population/Sample</td>
<td>Method</td>
<td>Results</td>
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<tr>
<td>Deshmukh-Taskar, P., Nichols, T., Morales, M., Yang, S., Zakeri, I. &amp; Berenson, G.</td>
<td>2006</td>
<td>Determine if childhood overweight status from childhood to young adulthood: The Bogalusa heart study</td>
<td>n = 841 young adults participating in the Bogalusa Heart Study</td>
<td>Heights and weights with means, standard deviations and percentiles; ANOVA; multiple linear regression; McNemar test; Cohen's kappa agreement</td>
<td>Overweight increased from 24.7 to 57.7%; 35.2% of children shifted from normal weight to overweight; 61.9% remained in highest BMI quartile from childhood to adulthood; ethnic groups at risk should be monitored more closely in their growing years</td>
</tr>
<tr>
<td>Goodell, L., Wakefield, D. &amp; Ferris, A.</td>
<td>2009</td>
<td>The relationship between low birth weight, rapid weight gain, and early childhood obesity</td>
<td>n = 203 three year olds</td>
<td>Chi-square, t-tests; multiple regression</td>
<td>Children with rapid weight gain in 1st year were more likely to be obese; low birth weight did not increase odds</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Date</td>
<td>Purpose of Study</td>
<td>Population/ Sample</td>
<td>Method</td>
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<tr>
<td>Griffiths, L., Smeeth, L., Hawkins, S., Cole, T. &amp; Dezateux, C.</td>
<td>2009</td>
<td>The effect of breastfeeding initiation, breastfeeding duration and age of introduction of solid foods on weight gain from birth to 3 yrs.</td>
<td><em>n</em> = 10,533 3yr old children from UK Millennium Cohort Study</td>
<td>Linear regression adjusting for confounding factors</td>
<td>Infants receiving no breast milk grew faster than infants that were breastfed; infants breastfed &lt;4 months grew faster than infants breastfed longer; early introduction of solid foods was not associated with faster weight gain</td>
</tr>
<tr>
<td>Harder, T., Bergmann, R., Kallischnigg, G. &amp; Plagemann, A.</td>
<td>2005</td>
<td>Comprehensive meta-analysis of the existing studies on duration of breast-feeding and risk of overweight</td>
<td><em>n</em> = 17 studies</td>
<td>Unadjusted odds ratio; weighted mega-regression; pooled odds ratio; pool-first method</td>
<td>Dose dependent association between longer duration of breast-feeding and decrease in risk of obesity</td>
</tr>
<tr>
<td>Huh, S., Rifas-Shiman, S., Taveras, E., Oken, E. &amp; Gillman, M.</td>
<td>2011</td>
<td>The association between timing of introduction of solid foods during infancy and obesity at 3 years of age</td>
<td><em>n</em> = 847 children, Project Viva, part of a prospective pre-birth cohort study</td>
<td>Logistic regression models</td>
<td>In infants breastfed for 4 months (67%) the timing of solid food was not associated with odds of obesity at age 3; introduction of solid food prior to 4 months, in formula-fed infants was associated with a sixfold increase in odds of obesity at 3 years</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Date</td>
<td>Purpose of Study</td>
<td>Population/ Sample</td>
<td>Methods</td>
<td>Results</td>
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<tr>
<td>Juonala, M., Magnussen, C., Berenson, G., Venn, A., Burns, T., Sabin, M. &amp; Raitakari, O.</td>
<td>2011</td>
<td>Analysis of four prospective cohort studies that measured childhood and adult BMI</td>
<td>$n = 6328$ subjects with data available: Male – 2961 Female – 3367</td>
<td>Chi-square or analysis of variance used to compare characteristics, Comparisons of baseline characteristics using linear or logistic regression. BMI for child, Poisson regression; meta-analysis</td>
<td>$14.6%$ ($n = 5554$) of normal wt. children were obese as adults; $64.6%$ ($n = 774$) of overweight or obese children were obese as adults; $82.3%$ ($n = 147$) of obese children were obese as adults;</td>
</tr>
<tr>
<td>Owen, C., Martin, R., Whincup, P, Smith, G. &amp; Cook, D.</td>
<td>2005</td>
<td>Examine the influence of initial infant feeding on obesity in later life</td>
<td>$n = 28$ studies for quantitative review</td>
<td>Calculation of odds ratio from studies; fixed effect models; funnel plots; meta-regression; sensitivity analyses</td>
<td>Initial breast-feeding protects against obesity later in life</td>
</tr>
<tr>
<td>Stettler, N., Kumanyika, S., Katz, S., Zemel, B. &amp; Stallings, V</td>
<td>2003</td>
<td>Determining whether a pattern of rapid weight gain during early infancy is a risk factor for the development of obesity at age 20</td>
<td>$n = 300$ African Americans in cohort from birth to age 20</td>
<td>Weight-for-age $z$ scores, multiple logistic regression, chi-square</td>
<td>Rapid weight gain during infancy is associated with obesity in early adulthood; early infancy is a critical period for intervention</td>
</tr>
</tbody>
</table>
Chapter Two consisted of a literature review addressing key topics of the study including infant feeding attitudes and beliefs, infant feeding practices, knowledge and knowledge sources, and the effect of infant feeding decisions on weight status later in life. The purpose of this literature review was to present the concepts related to this study and key research findings and to identify gaps in the literature. Infant feeding beliefs and attitudes are influenced by culture and are reflected in the chosen feeding practices and health outcomes. Formula feeding versus breastfeeding and the early introduction of solid foods has been identified as practices that may lead to overweight beginning in infancy. While overweight and obesity are present in all races and social groups, personal factors that have been associated with a higher prevalence include culture, family income, maternal age, race, education, and marital status.

Studies in this literature review also have addressed numerous needs for education and support related to infant feeding practices. These needs include strategies to increase breastfeeding, identification of reasons and influencing factors for nonadherence to AAP infant feeding recommendations, and the early promotion of healthy infant feeding education, particularly for young, single mothers with a high school education or less. While research is needed to address identified needs, there are gaps in the literature of educational interventions with cultural considerations. Specifically, there are gaps addressing these needs in the prenatal environment to a population identified at risk for childhood obesity.
MATERIALS AND METHODS
Materials and Methods

This chapter presents the research design that was used for this study. A description of the sample, instruments, data collection procedures, and statistical tests for analysis are included. Prenatal infant nutrition education that was previously presented to a group of pregnant women is described in detail.

Research Question

Is there a difference in infant feeding attitudes, the initiation of breastfeeding, the introduction of solid foods, and child weight-for-length percentiles at 12, 18, and 24 months between mothers who did participated in a prenatal infant nutrition education session and mothers who did not participate?

Research Hypotheses

Based on the research question, the hypotheses for this study include:

**H1:** Mothers who participated in a prenatal infant nutrition education session will have significantly higher mean scores on the Iowa Infant Feeding Attitude Scale (IIFAS) compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**H2:** Mothers who participated in a prenatal infant nutrition education session will initiate breastfeeding significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**H3:** Mothers who participated in a prenatal infant nutrition education session will delay the introduction of solid foods until four months of age significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**H4:** Children of mothers who participated in a prenatal infant nutrition education session will have significant lower mean weight-for-length percentiles at 12, 18 and 24 months of age when compared to children of mothers who did not participate in a
prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

**Research Design**

An ex post facto design was used for this study. Ex post facto, when translated, means “after the fact” (Polit & Beck, 2004, p. 188). Ex post facto studies are also referred to as correlational research in which an attempt is made to “understand relationships among variables” (Polit & Beck, 2004, p. 189). It is retrospective and prospective in design as the independent variable, prenatal infant nutrition education, had already occurred and was examined prospectively to see if there were correlations/relationships among the independent variable, prenatal infant nutrition education, and the dependent variables, maternal attitudes, maternal practices (initiation of breastfeeding and timely introduction of solid foods), and child weight-for-length percentiles at 12, 18, and 24 months of age.

**Participants**

The sample for this study was a convenience sample and included two groups of mother/child dyads. Mothers who attended a Medicaid clinic that provided prenatal care, along with the child resulting from that pregnancy, were recruited and enrolled in the study. Mothers also reported participation in WIC for the child in the study. One group of mothers (Education Group) received the prenatal infant nutrition education offering and the other group (Control Group) did not receive the education. The education was offered from Spring of 2009 through Spring 2011 and was in addition to any prenatal education that may have been routinely provided to all mothers attending the clinic during this time period. The Education Group consisted of women present on the dates and times the education was offered. The Control Group consisted of women who attended the clinic during the same timeframe (Spring 2009 through Spring 2011) but were not present at the clinic on the dates the education was offered and therefore did not receive the education. The ex post facto design is applicable for the study of the relationship of prenatal infant nutrition education and maternal infant feeding attitudes, infant feeding practices, and child weight-for-length percentiles at 12, 18 and 24 months in the Education Group and the Control Group.
Instrumentation

The main outcome measures of this research study are maternal infant feeding attitudes, maternal infant feeding practices, and child weight-for-length percentiles at 12, 18 and 24 months. Instruments that were utilized for this study included the Iowa Infant Feeding Attitude Scale and the Demographic and Infant Feeding Instrument.

**Iowa infant feeding attitude scale.** To predict feeding practices for infants, it is important to assess attitudes toward appropriate infant feeding practices. The dependent variable, maternal feeding attitudes, was measured by the Iowa Infant Feeding Attitude Scale (IIFAS) for a comparison between mothers who received the prenatal infant nutrition education and mothers who did not receive the education (See Appendix C). The IIFAS is a self-administered instrument and consists of 17 items with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Respondents were instructed to indicate the extent to which they agree with each statement. Nine of the items are worded in a manner favorable to breastfeeding, and the remaining items were worded in a manner favorable to formula feeding. Items favoring formula feeding are reverse scored (i.e., 1 = 5, 2 = 4, 4 = 2, and 5 = 1) and a total attitude score was computed. Total attitude scores could range from 17 (indicating positive formula feeding attitudes) to a high of 85 (reflecting positive attitudes toward breastfeeding). A high score reflects a preference for breastfeeding.

Psychometric analyses in studies conducted by de la Mora et al. (1999) indicated the IIFAS provided a “reliable and valid assessment of attitudes toward different methods of infant feeding” (p. 2377). Reliability was reported in three studies conducted by the authors that focused on assessing maternal attitudes of postpartum mothers toward various aspects of infant feeding, examining the ability of the scale to predict choice of infant feeding method, and evaluating the ability of scores to predict actual breastfeeding behavior. Cronbach’s alpha reliability of the studies was 0.86, 0.85, and 0.68 respectively. (See Appendix C).

The Iowa Infant Feeding Attitude Scale (IIFAS) was developed and tested by de la Mora et al. (1999). The instrument has been translated into other languages for use in assessing infant feeding attitudes in other countries and cultures. A Japanese version was
utilized by Inoue, Binns, Katsuki, and Ouchi (2013) in a study describing infant feeding practices, knowledge and attitudes of Japanese mothers of 18 month-old children. Cronbach’s alpha indicating reliability was for this study was 0.46 (Inoue et al., 2013). Another translation of IIFAS was utilized by Chen et al. (2013) to assess infant feeding attitudes of two groups of Chinese mothers with children under five. Cronbach’s alpha was reported to be 0.55 and 0.69 (Chen et al., 2013).

In Scotland, Shaker et al. (2004) used the IIFAS with a convenient sample of 108 pregnant women and their partners. Method of feeding at discharge was obtained from medical records. Parents of breastfed infants were more knowledgeable about breastfeeding and had more positive attitudes toward breastfeeding. The authors reported Cronbach’s alpha of 0.79 and 0.77 for mothers and fathers, respectively.

A systematic review was conducted by Chambers, McInnes, Hoddinott, and Alder (2007) to compare and contrast reported reliability and validity of measurements evaluating “maternal breastfeeding knowledge, attitudes, confidence or self-efficacy and/or satisfaction including measures that can be used to predict the initiation and/or duration of breastfeeding” (p. 17). Only publications reporting development or further psychometric testing were thoroughly reviewed. Twenty-two papers were reviewed allowing for the evaluation of 13 self-report measures. Four measures had sufficient evidence to support their use: the Breastfeeding Self-Efficacy Scale (Dennis & Faux, 1999), the Iowa Infant Feeding Scale (de la Mora et al., 1999), the Breastfeeding Attrition Prediction Tool (Janke, 1994), and the Modified Breastfeeding Evaluation Scale (Leff, Jefferis, & Gagne, 1994). These measures included self-efficacy with breastfeeding, evaluation of breastfeeding success, attitudes to feeding infants, subjective norms and perceived control toward breastfeeding. The two measures addressing attitudes were the Breastfeeding Attrition Prediction Tool, a lengthy 41-item scale measuring subjective norms and perceived control towards breastfeeding in addition to attitudes, and the IIFAS, a 17-item scale measuring attitudes toward infant feeding. In review of the IIFAS, the authors reported moderate to good reliability and validity along with the ability to differentiate between breastfeeders and mother who bottle feed. The authors
concluded with the need for the development of additional robust, validated measures for predicting the likelihood of breastfeeding for clinical utility (Chambers et al., 2007).

**Demographic and infant feeding instrument.** For the purposes of this study, the dependent variable, infant feeding practices, is defined as the initiation of breastfeeding and the time of introduction of solid foods measured by specific questions assessing these practices included in the Demographic and Infant Feeding Instrument (See Appendix B). This instrument was developed by the student researcher to capture the data necessary for this study. Items on this instrument reflect findings from studies that are relevant to the variables in this study. The Demographic and Infant Feeding Instrument was also used to collect additional data including demographic characteristics of the mothers that have been shown to influence infant feeding practices, including age, race, education, parity, and marital status at the time of the birth of the child in the study.

**World Health Organization Growth Charts**

The dependent variable, child weight-for-length percentiles, is defined as the weight-for-length measurements of children at 12, 18, and 24 months of age converted to percentiles. These measurements were previously obtained during clinic visits by clinic personnel and entered into the system by the WIC staff. The weight and length measurements were retrieved for the study by clinic personnel through retrospective chart review of data available in the State of Louisiana WIC database and provided to the researcher. WHO growth charts are recommended by the CDC for infants and children from birth to two years of age (CDC, 2010a). For the purposes of this study, percentiles were based on the WHO growth standards and determined by WHO age and sex-specific growth charts (CDC, 2010b). Low weight-for-length in these age groups is defined as < 2nd percentile and high weight-for-length in these age groups is defined as > 98th percentile (CDC, 2015). (See Appendix D for the WHO age and sex-specific, weight-for-length growth charts from CDC).

**Methods**

This section presents a discussion of the research methods used for this study including the educational program, sample characteristics, measures for the protection of human subjects, the data collection procedure, and data analysis.
**Educational program.** A culturally sensitive educational offering was developed and presented by two registered nurses with pediatric experience in practice, management, and nursing education. This included the student researcher and another nurse serving as pediatric faculty at a local university. The educational offering was funded by a grant from a local agency and developed by the nurse educators to address the increasing rate of obesity in all age groups living in the local area. The purpose of the educational offering was to inform expectant mothers of AAP recommended guidelines for infant feeding in the first year of life and included recommendations related to breastfeeding, formula feeding, and the introduction of solid foods. Other topics included recognition of infant hunger and satiety cues and normal growth patterns in infancy. Presentation guidelines were developed and presented by the two nurse educators to ensure consistency in the education that was provided (See Appendix A).

The population of interest for the prenatal infant nutrition education was low-income pregnant mothers. Due to the nature of their family income, the mothers qualified for Medicaid services and were receiving prenatal care at a Medicaid clinic. The Medicaid program provides medical benefits to low-income individuals and families. While the federal government establishes the general rules and guidelines, individual states establish specific requirements. The Federal Poverty Level income guidelines are used to determine eligibility in the Medicaid program. Women who are pregnant and meet the federal income guidelines may be eligible for no-cost health coverage for all prenatal and delivery care, depending on state specific guidelines (Louisiana Department of Health, n. d.).

The information was presented in one-on-one sessions with each session lasting approximately 10-15 minutes. The sessions consisted of oral communication, review and provision of pamphlets, and an opportunity for questions. The main points of the education included (1) breastfeeding as the best choice for mom and baby with health benefits for both, (2) formula feeding as recommended substitute for breastfeeding, (3) the timely introduction of solid foods, (4) recognition of infant cues of hunger and satiety, and (5) ways to soothe infant without feeding when hunger is not the issue. Participants were provided pamphlets reinforcing this information for later reference and review.
The nurse educators researched available pamphlets and selected those that addressed the main points of the education. These pamphlets were ordered and given to mothers during the education session. An additional pamphlet, developed by the nurse educators, addressing key points was provided and reviewed at the end of the sessions. This pamphlet addressed normal weight gains at 4-6 months and 1 year of age, the ability to follow cultural practices for feeding the infant while controlling the amount he or she is fed, and how overfeeding can result in an overweight child and health consequences (see Appendix A). Expenses related to the pamphlets were covered with designated grant funds.

The education was presented two days a week for a two-year period with the exception of clinic closures and holidays. The teaching sessions were offered to women while they were waiting for their appointment with their practitioner. Gaps in knowledge regarding infant nutrition identified in a review of relevant literature were addressed in a culturally sensitive educational approach focused on a population at high risk for childhood obesity. An important aim of the infant nutrition educational sessions was to inform mothers of the risk of health issues related to overweight in infancy, childhood, and beyond that could be the result of feeding practices.

Another aim of the program was to provide mothers who chose to breastfeed with a portable breast pump. Mothers who chose to breastfeed were provided with a portable breast pump and mothers who chose to formula feed were provided with a set of bottles. The breast pumps and bottles were paid for with designated grant funds. Contact information was provided by the mothers who received the education. This information included name and phone numbers, and allowed for follow-up with the mothers when their child was born. This contact information was also provided for follow-up with mothers in an effort to address issues related to infant feeding and infant weight at routine check-ups. All mothers provided contact information.

**Sample.** The target population for this study was mothers expecting a child during the time an educational offering was offered at a Medicaid clinic and the infant resulting from that pregnancy. Over 600 pregnant women received this education during a two-year period. The average age was 23 years. The participants included 343
Caucasian, 261 African-American, and 10 other (Hispanic and Asian). The sampling design for this study was a convenience purposive sample of mother/child dyads in which the mother attended the Medicaid clinic where she received prenatal care. The timeframe for the infant nutrition education offering took place beginning in Spring 2009 through Spring 2011. Purposive sampling allowed for the recruiting of mothers who received the infant nutrition education in order make comparisons between two groups.

**Recruitment.** The sample population consisted of an Education Group, a group of mothers who received the infant nutrition education while attending the Medicaid clinic that provided prenatal care and a Control Group, a group of mothers who attended the same Medicaid clinic for prenatal care but did not receive the infant nutrition education. Inclusion criteria for this study were as follows: English-speaking, a pregnancy during the time the infant nutrition education was offered resulting in the live birth of an infant surviving at 24 months without a medical condition affecting appetite or growth, attendance at the same Medicaid clinic for prenatal care during the time period of Spring 2009 to Spring 2011, and WIC participation. The two groups of women are assumed to have similar demographics and socioeconomic characteristics as they are all WIC and Medicaid eligible and attended the clinic during the same timeframe. These characteristics include: female, child-bearing age, income level qualifying for Medicaid, attendance at the same prenatal clinic, and participation in WIC.

The Education Group and the Control Group were recruited by placing flyers at three local WIC centers that provide services for this population. The flyers provided initial information about the study and a telephone number for contact purposes for those mothers interested in participating in the study. During the recruitment period, the researcher attended local WIC clinics to recruit and communicated with the WIC staff regarding suggestions for additional recruiting methods. Nurses and other personnel staffing the WIC clinics were asked to assist with recruiting. Networking was also utilized by requesting that mothers approached and agreeing to participate in the study share this information with other mothers that might be interested and meet the eligibility criteria. During recruitment and gaining informed consent, mothers were reassured that their care would not be affected by their decision to participate in the study or not.
researcher was not alerted to any difficulty in the completion of the forms by the mothers recruited at the clinic site as they filled out the information with minimal to no assistance. In addition to recruiting at the WIC clinics, the researcher was also contacting mothers in the Education Group by phone using telephone contact information submitted after participation in the infant nutrition education session. Mothers who agreed to participate were sent a packet in the mail. The contents of the packet were reviewed and instructions for the return of the information were given.

Protection of Human Subjects. Financial support for the development and implementation of the infant nutrition education program was provided by the Living Well Foundation. The Foundation was notified of the intent to conduct this study. Approval to conduct this study was requested and received from the Institutional Review Board (IRB) at the Louisiana State Department of Health and Hospitals which also gave permission to access data from the WIC database. Personnel at the local and state WIC offices were contacted and informed of the study. Potential participants were made aware of the study by flyers placed in the waiting areas of the WIC clinics and periodic announcements by the researcher prior to WIC classes. Potential participants who received the infant nutrition education were contacted by telephone by the researcher regarding the study. Participants were provided information addressing the purpose of the study, the voluntary nature of participation, any potential risks or benefits associated with the study, the right to withdraw from the study at any time, and measures to protect confidentiality and anonymity. Participants were also assured that whether they choose to participate in the study or not participate, or participate in the study initially and withdraw later, their decision would not affect their regular care at the WIC clinic. HIPAA consents were obtained from participants allowing access to the mother’s record in the WIC database in order to collect weight data on the child.

Data Collection Procedure. Packets containing the study information were distributed to interested individuals encountered at WIC clinics or mailed to the addresses submitted by participants that were contacted by networking or by phone. Information in the packets included a cover letter explaining the study, informed consent documents for mother and child and HIPAA release of medical information consent for the child for
retrieving infant weight-for-length measurements from the WIC database. Also included were the study instruments which included the Demographic and Infant Feeding Instrument and the IIFAS and a postage paid, pre-addressed envelope for return of the forms.

The informed consents for mother and child and the HIPAA release of medical information contained identifiable information such as names and addresses. Upon receipt of these completed forms, security of information was maintained by the investigator with the storage of documents in a locked box in a locked office. Coded data, with no personal identifiable data, were stored on a computer protected by password protection.

The Demographic and Infant Feeding Instrument included demographic information pertaining to the mother and also addressed infant feeding practices specific to this study, including the initiation of breastfeeding and the introduction of solid foods. The IIFAS was utilized to collect data from the mothers pertaining to infant feeding attitudes specific to breastfeeding and formula feeding. Participants completed these instruments and returned them as directed with the consent to obtain child weight-for-length measurements at 12, 18, and 24 months of age from the Louisiana WIC database. These measurements were collected at the regional WIC office with assistance from the regional nutritionist. This information included the name of the child and the child's date of birth. Security of this information was maintained in a locked box in a locked office. Measurements were recorded on a spreadsheet with the use of a participant code to protect and maintain confidentiality. No names were used.

Mothers completing and returning the questionnaires and consents received a $10 gift card. This gift card was mailed to the study participants after receipt of this information and verification of the child's height and weight measurements in the WIC database. As a reminder, phone calls were made to those potential participants who had requested and received a packet and had not returned study information at the end of one, two, and three months.

The intent of recruiting was to obtain a sample size sufficient to test research hypotheses adequately (Polit & Beck, 2004). For required sample size estimation,
weight-for-length percentile was considered the primary outcome measure. For \( \alpha = .05 \), \( \beta = .20 \), a difference between the treated and untreated groups of \( \Delta = 5 \) weight-for-length percentile units and \( \sigma = 15 \) weight-for-length percentile units, the estimated sample size requirement is 72 observations per group (Norman & Streiner, 2000, p. 298).

The goal was to recruit the largest sample possible in order for the findings of this study to be representative of the population of interest. After complete exhaustion of the contact list of women who received the infant nutrition education offering during 2009-2011, the sample recruitment was closed.

**Data Analysis**

**Statistical Methods.** Demographic data, including age, race, level of education, parity, and marital status were used to describe mothers who received the prenatal infant nutrition education (Education Group) and mothers who did not receive the education (Control Group). Study hypotheses are shown in Table 5. The General Linear Model (GLM), binary logistic regression and the General Linear Mixed Model was used to test the hypotheses. Specifically, GLM was used for analysis of covariance (ANCOVA) when there is a continuous dependent variable and categorical and continuous predictor variables (H1). Binary logistic regression was used when there is a binary dependent variable and categorical and continuous predictor variables (H2 and H3). General Linear Mixed Model was used to perform analysis of variance (ANOVA) for repeated measures to test for a significant interaction between participation in the prenatal infant nutrition education session and the mean weight-for-length percentiles measured at 12, 18, and 24 months, controlling for mother’s age, race, parity, level of education, and marital status (H4). Table 6 presents the description and coding for the study variables.

SPSS, version 22, was used for data analysis. An alpha level of .05 was used to determine statistical significance unless otherwise specified. For each method, appropriate assumptions were assessed and may have included one or more of the following:

**Normality of error terms.** Normality of error terms was investigated by calculating the correlation coefficient between the regression model’s residual values and their expected
value under normality. The expected value under normality of the \(k^{th}\) smallest observation from a sample of size \(n\) is given by:

\[
\sqrt{MSE} \left[ z\left(\frac{k - 0.275}{n + 0.25}\right) \right]
\]

Where \(k\) = the rank of the ordered residuals
\(n\) = sample size
\(MSE\) = mean square error of the regression model.

High correlation coefficients are indicative of normality. Additionally, reference values are available for comparing the obtained coefficient to critical values for various sample sizes in the presence of normal error terms. If the obtained correlation coefficient is at least as large as the reference value for \(\alpha=.01\), the error terms are considered reasonably normally distributed (Kutner, et al, 2005, page 115).

**Homogeneity of variance.** Homogeneity was tested by use of Levene’s Test of Equality of Error Variance that compares error terms variance across all level combinations of the between-subjects factors, for between-subjects factors only.

**Independence of Errors.** Independence of error terms was assumed unless there were repeated measurements per observation for a given hypothesis.

**Linearity.** For each linear model, Generalized Linear Model and General Linear Model, the predicted dependent variable was plotted against studentized residual values to assess the total effect of the regression variate. The plots were visually examined to identify possible non-linear relationships in the regression variate.

**Multicollinearity.** Multicollinearity was assessed by use to the variance inflation factor (VIN). A VIN equal to or greater than 10 will indicate severe problems with multicollinearity, and appropriate remedies will be taken to address multicollinearity where needed.

**Outliers.** Although not a formal assumption of most statistical methods, outliers were identified by frequency distributions of all study variables. Those cases with a value that was not biologically plausible or with extreme values relative to other sample cases were checked for accuracy of data input. Data entry errors were corrected if needed. Cases
with outlying values that are not data entry errors and are biologically plausible were retained for subsequent analysis.

**Compound symmetry.** Repeated measures ANOVA or ANCOVA require that the pattern of covariances or correlations between the repeated measurements is constant across trials. This is referred to as compound symmetry, or in some cases sphericity. This assumption for repeated measures ANCOVA when needed was tested by use of Mauchly’s Test of Sphericity.
Table 5

**Statistical Analyses for Study**

<table>
<thead>
<tr>
<th>Analyses</th>
<th>Demographics</th>
<th>Descriptive</th>
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<tr>
<td><strong>H1</strong> Mothers who participated in a prenatal infant nutrition education session will have significantly higher mean scores on the Iowa Infant Feeding Attitudes Scale (IIFAS) compared to mothers who did not participate in the prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.</td>
<td>Age, Race, Level of Education, Parity, Marital Status</td>
<td>ANCOVA – continuous dependent variable, categorical and continuous predictor variables</td>
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<td><strong>H2</strong> Mothers who participated in a prenatal infant nutrition education session will initiate breastfeeding significantly more often when compared to mothers who did not participate in the prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.</td>
<td>Age, Race, Level of Education, Parity, Marital Status</td>
<td>Binary Logistic Regression – binary dependent variable, categorical and continuous predictor variables</td>
</tr>
<tr>
<td><strong>Ho3</strong> Mothers who participated in a prenatal infant nutrition education session will delay the introduction of solid foods until four months of age significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.</td>
<td>Age, Race, Level of Education, Parity, Marital Status</td>
<td>Binary Logistic Regression – binary dependent variable, categorical and continuous predictor variables</td>
</tr>
<tr>
<td><strong>H4</strong> Children of mothers who participated in a prenatal infant nutrition education session will have significant lower mean weight-for-length percentiles at 12, 18 and 24 months of age when compared to children of mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.</td>
<td>Age, Race, Level of Education, Parity, Marital Status</td>
<td>Repeated Measures ANCOVA – continuous dependent variable</td>
</tr>
</tbody>
</table>
## Table 6

*Description and Coding of Study Variables*

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Code Name</th>
<th>Level</th>
<th>Coding Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iowa Infant Feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Scores</td>
<td>IIFAS</td>
<td>Continuous/Ordinal</td>
<td>scores, Likert Scale</td>
</tr>
<tr>
<td>Breastfeeding Initiation</td>
<td>BF</td>
<td>Categorical/Nominal</td>
<td>1 = Yes; 2 = No</td>
</tr>
<tr>
<td>Delayed Solids</td>
<td>solid_4mo</td>
<td>Categorical/Nominal</td>
<td>1 = Yes; 2 = No</td>
</tr>
<tr>
<td>Weight-for-Length</td>
<td>Time</td>
<td>Categorical/Nominal</td>
<td>@12MO %</td>
</tr>
<tr>
<td>Percentiles</td>
<td></td>
<td></td>
<td>@18MO %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>@24MO %</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Age</td>
<td>Age3_4</td>
<td>Categorical/Nominal</td>
<td>1 = &lt; 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = 20 - 29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 = 30 - &gt; 40</td>
</tr>
<tr>
<td>Mother’s Race</td>
<td>RACE</td>
<td>Categorical/Nominal</td>
<td>1 = African American</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = Caucasian</td>
</tr>
<tr>
<td>Mother’s Education</td>
<td>EDLEVEL</td>
<td>Categorical/Nominal</td>
<td>1 = &lt; High School</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = High School</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 = Some College</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 = College Degree</td>
</tr>
<tr>
<td>Marital Status</td>
<td>MS</td>
<td>Categorical/Nominal</td>
<td>1 = Married</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = Other</td>
</tr>
<tr>
<td>Mother’s Parity</td>
<td>PARITY</td>
<td>Categorical/Nominal</td>
<td>1 = First Child Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 = First Child No</td>
</tr>
</tbody>
</table>
Summary

Data collection and data analysis methods for this study were presented. Chapter Three addresses materials and methods and includes the research question and the research hypotheses. The research design was discussed including a description of the participants. The instruments utilized for data collection were discussed addressing their applicability to measuring the variables of interest in this study. The instruments include the Iowa Infant Feeding Attitude Scale and the Demographic and Infant Feeding Instrument. Also discussed were the WHO growth charts that were utilized in determining weight-for-length percentiles. The methods section introduced and described the infant feeding education offering and the sample population, the protection of human subjects, and the data collection procedure. Data analysis was included addressing the statistical analysis of data that apply to the stated hypotheses.
RESULTS
Results

The purpose of this study was to determine the influence of a prenatal infant nutrition education offering on: (a) maternal attitudes, (b) the initiation of breastfeeding, (c) the introduction of solid foods, and (d) child weight-for-length percentiles at 12, 18, and 24 months of age. Mothers who received the prenatal infant nutrition education were compared to mothers who did not receive the education in an effort to determine if differences existed. This chapter presents a description of the sample and findings from the data analysis of the research hypotheses.

Description of Sample

Recruitment efforts resulted in the receipt of packets from 129 mothers. Five mother/infant dyads were excluded from the study due to low birth weight of the infant (less than five pounds). Four mother/infant dyads were excluded due to lack of any measurement data available for the child in the WIC database. Three mother/infant dyads were excluded from the study because the date of birth of the child was determined to be outside of the study specified range. Additional review of data identified three mothers who were neither African American nor Caucasian. Due to the small number; and, in order to control for race as a covariant, these mothers were excluded from the analysis. One of these mothers was previously excluded in a prior group mentioned above. After exclusions, the sample consisted of 115 mothers. Mothers who received Infant Nutrition Education totaled 61 (Education Group) and mothers who did not receive the Infant Nutrition Education totaled 54 (Control Group).

Hypotheses Testing

H1: Mothers who participated in a prenatal infant nutrition education session will have significantly higher mean scores on the Iowa Infant Feeding Attitudes Scale (IIFAS) compared to mothers who did not participate in the prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

To test H1, GLM was used to perform analysis of covariance with infant feeding attitudes as the continuous dependent measure and participation in a prenatal infant nutrition education session, mother’s age, race, parity, level of education, and marital
status as predictors. The obtained correlation coefficient between the regression model’s residual values and their expected value under normality was \( r = .987 \). For \( \alpha = .01 \), the critical value for \( n = 100 \) is .982, thus the distribution of error terms does not substantially depart from a normal distribution. The Levene Test for Equality of Error Variance resulted in \( p = .405 \), indicating that the homogeneity of error variance assumption is tenable. For the regression model, the maximum obtained VIF was 1.58, which failed to indicate multicollinearity among the predictor variables. The plot of the predicted dependent variable against model’s studentized residual values did not indicate a non-linear relationship. Remedial measures for H1 do not appear to be warranted.

Attitude scores for the IIFAS could range from 17 (indicating positive formula feeding attitudes) to a high of 85 (indicating positive attitudes toward breastfeeding). The range of scores for this study was 34 to 70. As shown in Table 7, the ANCOVA between-subjects effects for the prenatal infant nutrition education failed to demonstrate a significant difference in the mean response of infant feeding attitudes scores (\( p = .82 \)) between participants who did (\( \bar{x} = 52.7 \)) and did not (\( \bar{x} = 52.96 \)) participate in prenatal infant nutrition education while controlling for mother’s age, race, parity, level of education, and marital status. Thus, H1 was rejected. There was a statistically significant inverse relationship between IIFAS scores and patient age (\( p = .03 \)) with older participants tending to score lower on the IIFAS than younger participants. Other control variables failed to reach statistical significance (See Tables 7 and 8).
### Table 7

**H1: Tests of Between Subjects Effects**

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>468.32</td>
<td>6</td>
<td>78.05</td>
<td>1.93</td>
<td>.08</td>
</tr>
<tr>
<td>Intercept</td>
<td>17478.78</td>
<td>1</td>
<td>17478.78</td>
<td>431.46</td>
<td>.00</td>
</tr>
<tr>
<td>Infant Nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>2.022</td>
<td>1</td>
<td>2.00</td>
<td>.05</td>
<td>.82</td>
</tr>
<tr>
<td>Race</td>
<td>105.65</td>
<td>1</td>
<td>105.65</td>
<td>2.61</td>
<td>.11</td>
</tr>
<tr>
<td>Parity</td>
<td>55.59</td>
<td>1</td>
<td>55.59</td>
<td>1.37</td>
<td>.24</td>
</tr>
<tr>
<td>Marital Status</td>
<td>28.92</td>
<td>1</td>
<td>28.92</td>
<td>.71</td>
<td>.40</td>
</tr>
<tr>
<td>Education Level</td>
<td>.34</td>
<td>1</td>
<td>.34</td>
<td>.01</td>
<td>.93</td>
</tr>
<tr>
<td>Age 30 - &gt;40</td>
<td>207.10</td>
<td>1</td>
<td>207.10</td>
<td>5.11</td>
<td>.03</td>
</tr>
<tr>
<td>Error</td>
<td>4051.08</td>
<td>100</td>
<td>40.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>305931.00</td>
<td>107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>4519.40</td>
<td>106</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 8

**H1: Iowa Infant Feeding Attitude Scale Scores**

<table>
<thead>
<tr>
<th>Infant Nutrition Education</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>57</td>
<td>52.65</td>
<td>6.38</td>
</tr>
<tr>
<td>No</td>
<td>51</td>
<td>52.96</td>
<td>6.82</td>
</tr>
</tbody>
</table>
H2: Mothers who participated in a prenatal infant nutrition education session will initiate breastfeeding significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

To test H2, binary logistic regression was used with initiation of breastfeeding as the binary dependent variable and participation in a prenatal infant nutrition education session, mother’s age, race, parity, level of education, and marital status as predictors. Logistic regression does not make traditional assumptions of normality and homogeneity of variance for the independent variables. The predictor variables are the same as for H1, thus the maximum obtained VIF was 1.58, which failed to indicate multicollinearity among the predictor variables.

As shown in Table 9, results of the logistic regression failed to show a statistically significant association between participation in a prenatal infant nutrition education session and subsequent initiation of breastfeeding (p = .96), controlling for mother’s age, race, parity, level of education, and marital status. Thus, H2 was rejected. Race was a significant predictor (p = .02) of initiation of breastfeeding with Caucasians having a higher proportion of mothers who initiated breastfeeding (68.0%) compared to African-American mothers (42.1%). Education level was also a significant predictor (p = .04) with mothers with higher levels of education associated with a greater breastfeeding initiation rate (See Tables 9 and 10). Other control variables failed to achieve statistical significance.
Table 9  
**H2: Initiation of Breastfeeding – Tests of Model Effects**

<table>
<thead>
<tr>
<th></th>
<th>Wald Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant Nutrition Education</td>
<td>.003</td>
<td>1</td>
<td>.96</td>
</tr>
<tr>
<td>Race</td>
<td>5.594</td>
<td>1</td>
<td>.02</td>
</tr>
<tr>
<td>Parity</td>
<td>.007</td>
<td>1</td>
<td>.94</td>
</tr>
<tr>
<td>Education</td>
<td>4.275</td>
<td>1</td>
<td>.04</td>
</tr>
<tr>
<td>Age</td>
<td>1.403</td>
<td>1</td>
<td>.24</td>
</tr>
<tr>
<td>Marital Status</td>
<td>.862</td>
<td>1</td>
<td>.35</td>
</tr>
</tbody>
</table>

Table 10  
**H2: Initiation of Breastfeeding – Race and Education Level**

<table>
<thead>
<tr>
<th>Initiation of Breastfeeding</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>42.1% (n = 24)</td>
<td>57.9% (n = 33)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>68.0% (n = 34)</td>
<td>32.0% (n = 16)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; Less than High School</td>
<td>50.0% (n = 8)</td>
<td>50.0% (n = 8)</td>
</tr>
<tr>
<td>High School</td>
<td>40.0% (n = 18)</td>
<td>60.0% (n = 27)</td>
</tr>
<tr>
<td>Some College</td>
<td>71.4% (n = 25)</td>
<td>28.6% (n = 10)</td>
</tr>
<tr>
<td>College Graduate</td>
<td>63.6% (n = 7)</td>
<td>36.4% (n = 4)</td>
</tr>
</tbody>
</table>
H3: Mothers who participated in a prenatal infant nutrition education session will delay the introduction of solid foods until four months of age significantly more often when compared to mothers who did not participate in a prenatal infant nutrition education session while controlling for mother's age, race, parity, level of education, and marital status.

To test H3, binary logistic regression was used with delayed introduction of solid foods until four months of age as the binary dependent variable and participation in a prenatal infant nutrition education session, mother’s age, race, parity, level of education, and marital status as predictors. Logistic regression does not make traditional assumptions of normality and homogeneity of variance for the independent variables. The predictor variables are the same as for H1, thus the maximum obtained VIF was 1.58, which failed to indicate multicollinearity among the predictor variables.

As shown in Table 11, results of the logistic regression failed to show a statistically significant association between participation in a prenatal infant nutrition education session and delayed introduction of solid foods until four months of age (p = .76) while controlling for mother’s age, race, parity, level of education, and marital status. Sixty-five percent of mothers who received prenatal infant nutrition education delayed introduction of solid foods until age of four months compared to 65.4% of mothers who did not receive the education (See Table 12). Thus, H3 was rejected. Control variables failed to achieve statistical significance.
Table 11

H3: Delayed Introduction of Solid Foods – Variables in the Equation

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>Wald Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant Nutrition Education</td>
<td>.096</td>
<td>1</td>
<td>.76</td>
</tr>
<tr>
<td>Age</td>
<td>1.033</td>
<td>1</td>
<td>.31</td>
</tr>
<tr>
<td>Race</td>
<td>1.307</td>
<td>1</td>
<td>.25</td>
</tr>
<tr>
<td>Parity</td>
<td>.302</td>
<td>1</td>
<td>.58</td>
</tr>
<tr>
<td>Education Level</td>
<td>.441</td>
<td>1</td>
<td>.51</td>
</tr>
<tr>
<td>Marital Status</td>
<td>.024</td>
<td>1</td>
<td>.88</td>
</tr>
</tbody>
</table>

Table 12

H3: Delayed Introduction of Solid Foods

<table>
<thead>
<tr>
<th>Delayed Introduction of Solid Foods</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant Nutrition Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>65.0% (n = 39)</td>
<td>35.0% (n = 21)</td>
</tr>
<tr>
<td>No</td>
<td>65.4% (n = 34)</td>
<td>34.6% (n = 18)</td>
</tr>
</tbody>
</table>

H4: Children of mothers who participated in a prenatal infant nutrition education session will have significant lower mean weight-for-length percentiles at 12, 18 and 24 months of age when compared to children of mothers who did not participate in a
prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

To test H4, General Linear Mixed Model was used to perform a repeated measures ANCOVA procedure to test the interaction between the mean weight-for-length percentile at 12, 18, and 24 months of age and participation in a prenatal infant nutrition education session while controlling for mother’s age, race, parity, level of education, and marital status.

The obtained correlation coefficients between the regression model’s three residual values for the weight-for-length percentiles at 12, 18, and 24 months of age and their expected values under normality were $r = .940$, $r = .962$, and $r = .989$, respectively. For $\alpha = .01$, the critical value for $n = 50$ is $r = .966$, thus the distribution of error terms does not substantially depart from a normal distribution for the obtained residual values at 24 months. There was evidence that the errors terms at 12 and 24 months deviated from normality. Levene’s Test for Equality of Error Variance for the three time periods resulted in $p = .040$, $p = .692$, and $p = .280$, respectively, indicating that the homogeneity of error variance assumption is tenable for the dependent measures at 18 and 24 months but not at 12 months. However, the ANOVA procedure is considered robust for minor departures of normality and homogeneity of variance; thus, remedial measures were not employed. For the regression model, the maximum obtained VIF was 1.58, which failed to indicate multicollinearity among the predictor variables. The plot of the predicted dependent variables against the model’s studentized residual values did not indicate a non-linear relationship.

As shown in Table 13, H4 tested by use of a Mixed model procedure also failed to demonstrate a significant interaction ($p = .74$) between participation in the prenatal infant nutrition education session and the three mean weight-for-length percentiles, controlling for mother’s age, race, parity, level of education, and marital status (number of participants = 87 at 12 months, 66 at 18 months, 54 at 24 months). Thus results of the mixed model repeated procedure rejected $H04$ (See Table 14). Thus, H4 was rejected.
Table 13

**H4: Mixed Methods - Tests of Fixed Effects**

<table>
<thead>
<tr>
<th>Source</th>
<th>Numerator df</th>
<th>Denominator df</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1</td>
<td>77.82</td>
<td>32.43</td>
<td>.00</td>
</tr>
<tr>
<td>Infant Nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>1</td>
<td>78.93</td>
<td>1.59</td>
<td>.21</td>
</tr>
<tr>
<td>Time</td>
<td>2</td>
<td>124.19</td>
<td>1.21</td>
<td>.30</td>
</tr>
<tr>
<td>Race</td>
<td>1</td>
<td>79.69</td>
<td>.01</td>
<td>.92</td>
</tr>
<tr>
<td>Parity</td>
<td>1</td>
<td>79.77</td>
<td>.01</td>
<td>.93</td>
</tr>
<tr>
<td>Marital Status</td>
<td>1</td>
<td>79.63</td>
<td>.41</td>
<td>.53</td>
</tr>
<tr>
<td>Breast Feeding</td>
<td>1</td>
<td>78.72</td>
<td>.37</td>
<td>.55</td>
</tr>
<tr>
<td>Education Level</td>
<td>1</td>
<td>76.14</td>
<td>2.44</td>
<td>.12</td>
</tr>
<tr>
<td>Age</td>
<td>1</td>
<td>75.50</td>
<td>1.34</td>
<td>.25</td>
</tr>
<tr>
<td>Infant Nutrition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education*Time</td>
<td>2</td>
<td>124.14</td>
<td>.30</td>
<td>.74</td>
</tr>
</tbody>
</table>
Table 14 displays the weight-for-length percentiles for the three time periods for Mixed Methods.

**Table 14**

<table>
<thead>
<tr>
<th>Infant Nutrition Education</th>
<th>Time</th>
<th>#Participants</th>
<th>Mean Weight Percentile</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12 mos.</td>
<td>44</td>
<td>71.6</td>
<td>3.68</td>
</tr>
<tr>
<td></td>
<td>18 mos.</td>
<td>29</td>
<td>70.8</td>
<td>4.30</td>
</tr>
<tr>
<td></td>
<td>24 mos.</td>
<td>27</td>
<td>74.6</td>
<td>4.35</td>
</tr>
<tr>
<td>No</td>
<td>12 mos.</td>
<td>43</td>
<td>75.1</td>
<td>3.89</td>
</tr>
<tr>
<td></td>
<td>18 mos.</td>
<td>37</td>
<td>78.4</td>
<td>4.12</td>
</tr>
<tr>
<td></td>
<td>24 mos.</td>
<td>27</td>
<td>81.5</td>
<td>4.55</td>
</tr>
</tbody>
</table>

Data analysis failed to support any statistically significant correlation between participation in an infant nutrition education program and infant feeding attitudes, infant feeding practices and child weight-for-length percentiles while controlling for maternal age, race, parity, level of education and marital status.
DISCUSSION
Discussion

The purpose of this study was to determine the influence of a prenatal infant nutrition education offering on: (a) maternal attitudes, (b) initiation of breastfeeding, (c) introduction of solid foods, and (d) child weight-for-length percentiles at 12, 18, and 24 months of age. Overweight and obesity continue to be present in our society affecting all age groups and developmental stages. Research studies have suggested that overweight and obesity early in life is a predictor of overweight throughout the life span (Barlow, 2007; Deshmukh-Taskar et al., 2006; Ebbeling et al., 2002; Field et al., 2005; Juonala et al., 2011; Ludwig, 2007; Stettler et al., 2003; Thompson & Bentley, 2012; Whitaker et al., 1997). Feeding practices in the infancy stage which have been associated with cultural beliefs and practices, have been identified as contributing to this problem and include a decrease in breastfeeding and the early introduction of solid foods (Baughcum et al., 2001; Crocetti et al., 2004; Flower et al., 2008; Thompson & Bentley, 2012).

The Iowa Infant Feeding Attitude Scale (IIFAS) was used in this study to measure a preference toward breastfeeding or formula feeding, which may be influenced by cultural values, beliefs and practices. This tool has been utilized in various studies assessing attitudes toward different feeding methods at various stages in childhood: newborn (Shaker et al., 2004), 18 months (Inoue et al., 2013) and children under 5 years of age (Chen et al., 2013). While total attitude scores could range from 17 (indicating positive formula feeding attitudes) to a high of 85 (reflecting positive attitudes toward breastfeeding), the range for this study was 34 to 70. It was hypothesized that there would be significant higher scores in mothers who received infant nutrition education compared to mothers who did not receive the education. The hypothesis was not supported. These scores may be reflective of more similarities than differences in the two groups including current socio-economic factors and educational level. A possible explanation is that mothers in this study attended the same clinic for prenatal care and may have been exposed to additional prenatal education including infant nutritional needs and the benefits of breastfeeding provided by the clinic. In addition, as WIC participants, mothers may have been exposed to nutritional education. While participation in and the content of any additional education is unknown, these care practices have the potential to
influence infant feeding decisions (Leininger, 2002). Another reason may be the instrument itself. The IIFAS is commonly used in infant nutrition studies to measure maternal attitudes and in some studies the internal consistency was low. However, in some instances attitudes may not always produce actions, particularly if perceived barriers are high and significant others are not supportive. It is hard to change attitudes and behaviors; therefore, one education session with handouts may not have been enough to increase knowledge and influence change.

In addition, results show there is no significant difference in the initiation of breastfeeding and the time of introduction of solid foods between the two groups while controlling for covariates. These results failed to support the hypotheses stating that there would be a significant difference in infant feeding practices related to breastfeeding and the time of introduction of solid foods between the two groups. Mothers were asked to recall initiation of breastfeeding at birth and to indicate the month they introduced solid foods. Maternal recall of breastfeeding initiation appears to be more accurate compared to recall of breastfeeding duration which becomes less accurate with time (Li, Scanlon & Serdula, 2005). In this study, more Caucasians initiated breastfeeding than African Americans and mothers with higher levels of education initiated breastfeeding more often than those with lower levels of education. These results are supported in previous research findings (DiSantis et al., 2013; Hendricks et al., 2006). The number of mothers who reported the initiation of breastfeeding may have been influenced by the 2009 WIC food package change. This change supported breastfeeding with a food package of increased value for mothers who reported fully breastfeeding (Whaley et al., 2012). Mothers who received prenatal infant nutrition education delayed introduction of solid foods until age of four months (65%) compared to 65.4% of mothers who did not receive the education showing minimal differences. However, it is encouraging that two-thirds of mothers overall did not start solid foods before four months of age.

Results also suggest that there was no significant difference in child weight-for-length mean percentiles at 12, 18, and 24 months of age when comparing the two groups. The hypothesis was not supported as there was no significant difference in the mean percentiles when comparing the two groups. This is not surprising when considering that
mothers in both groups did not differ significantly on the initiation of breastfeeding or the delay of introduction of solid foods until the age of four months.

**Limitations of Study**

Limitations are present in every study and it is important to identify and address these. The first limitation is the convenience sampling. All mothers that participated in this study attended the same clinic and may not be representative of the population of interest, socioeconomically disadvantaged women participating in WIC. This limitation may affect the generalizability of the findings. In addition, no formal evaluation of the infant nutrition education program was conducted prior to implementing. This limitation could have influenced the effectiveness of the intervention and the lack of differences between the two groups.

Another limitation identified in this study is recall bias. Mothers who breastfed their child were asked to recall the initiation and the number of months of breastfeeding duration. All mothers were asked to recall the child’s age in months when solid foods were introduced. Maternal recall is common in studies measuring breastfeeding duration and the introduction of solid food; however, inaccuracies may occur due to poor recall or a desire to give a socially acceptable response (Li, Scanlon, & Serdula, 2005). The authors found that mothers were able to recall breastfeeding initiation more accurately than the duration; however, the shorter the recall period, the more accurate the duration recall (Li, Scanlon, & Serdula, 2005). In this study, the length of time mothers were asked to recall ranged from approximately four to six years.

The retrieval of information from a database also presents as a limitation. Measurements of the children in the study were obtained from the WIC database. These measurements were obtained by an employee(s) and entered into the database. As data collection is recorded and data is entered into the database, the possibility of human error is present. The accuracy of this information must be included as a limitation.

The smaller than needed sample size for this study is important to include as this limitation reduces power and the ability to discover causal relationships which can affect findings producing less accurate estimates (Polit & Beck, 2004). Numerous attempts were made to contact potential participants by phone. The majority of the mothers
unavailable or unable to contact was due to telephone numbers no longer in service or wrong telephone numbers. Many of the mothers contacted did not participate in the local WIC after their child was born because they no longer met eligibility criteria. The main reasons for ineligibility included graduating from college and obtaining a job, husband getting a better paying job, and moving out of state. Additionally, only two racial groups were included, limiting generalizability. It is important to note that in Louisiana, African Americans and Caucasians make up the majority of the population at 32.5% and 63.2%, respectively (U. S. Census Bureau, 2015).

**Strengths of Study**

Ex Post Facto studies, also referred to as correlational studies, play an important role in the social sciences. It is an approach to investigating practical problems that are prevalent in society as a whole or in particular groups of individuals. Experimentation is not always the best approach to the many problems in health and nursing.

A strength identified in this study is addressing a national health concern, childhood obesity. With the knowledge that overweight and obesity statuses begin early in life and, according to research may track throughout the life span, it is important to address this issue with continued focus, intervention, and research. This study allowed for the comparison of results from previous studies conducted in various regions in the United States to a region within a southern state. While this study allowed for the comparison of Caucasians and African Americans mothers participating in WIC, significant findings comparable to other areas of the country were the initiation of breastfeeding and the educational level of breastfeeding mothers. An additional strength of this study is that it could easily be replicated in other areas of the country, providing insight into the differences and similarities that exist between groups and regions.

**Theoretical Frameworks**

Cultural surroundings, familiarity, and support can be strong influencers and predictors of behaviors including infant feeding decisions. An awareness of cultural influences on health, wellness, illness, and death is beneficial in planning a culturally sensitive approach to educate and inform regarding health issues. Leininger’s Theory of Culture Care Diversity and Universality (Leininger, 2002) and Pender’s Health
Promotion Model (Pender et al., 2002) provided a theoretical foundation for this study. Both supported the identification of cultural factors influencing health decisions addressed in this study. Leininger’s Sunrise Enabler depicts the influence of factors on health and well-being and identified those pertinent to consider for this study including cultural values and beliefs, education, economics, social factors and kinship.

One of the requirements for participating in this study was eligibility and participation in WIC. This eligibility was the consequence of economic status factors which was identified by Leininger and illustrated in the Sunrise Enabler as an influencer of health-related decisions and actions (Leininger, 2001). These factors, along with many others, have been identified as cultural influencers that determine behaviors, actions and ideas. After meeting eligibility criteria and receiving the WIC benefits, participants become a part of the culture of WIC. This was clearly illustrated in the study by Whaley et al., (2012) which focused on the impact of the 2009 WIC policy change on infant feeding decisions. This policy incentivized mothers who reported fully breastfeeding with increased provisions in their WIC package which resulted in an 86% increase in the rate of issuance of the fully breastfeeding packet at infant enrollment over a three year period (Whaley et al., 2012). This supports the inclusion of the culture of WIC as a determinant and factor in decisions regarding infant feeding practices. This further supports the identification of political factors by Leininger’s Sunrise Enabler as an influencer of health decisions.

Pender’s Health Promotion Model provided an additional framework for this study (Pender et al., 2002). More specific factors that influence change are important to consider when implementing health promotion change. It has allowed for the identification of relevant, specific variables that have been identified in previous research that can affect change. It is helpful in providing a visual for clarification among concepts leading to the outcome of interest. Culturally acceptable feeding practices leading to more healthy patterns and outcomes are needed to replace unhealthy feeding practices. This can be accomplished by providing mothers and families with knowledge about benefits, challenges, ways to overcome problems, and proper techniques so that they can make informed choices that they believe are best for them and their baby.
Pender's Health Promotion Model identified personal factors that may influence the decision to incorporate and adhere to a health promoting behavior including age, race, marital status and level of education. These personal factors were included in this study as independent variables of interest. Race and education level were significant predictors of breastfeeding initiation with a larger percentage of Caucasians and mothers with higher levels of education initiating breastfeeding. These finding were supported in previous studies (Hendricks et al., 2006; Kuo et al., 2011; McCann et al., 2007).

**Recommendations for Future Studies**

Future studies should include interventional studies with the intervention addressing recommended infant feeding practices and recommended nutrition choices for additional age groups. This should be preceded by a pre-test and followed with a post-test. Although knowledge alone may not be enough to effect change, it is important to account for the acquisition of new information and knowledge gained. Studies that include maternal recall regarding infant feeding practices should be implemented in a timely manner in order to obtain reliable information. Cultural aspects of diet and nutrition should be considered with emphasis on health maintenance. Additional tools, including scales and surveys, need to be developed that reflect a more sensitive measure of cultural attitudes and practices.

Longitudinal studies would be beneficial in studying the outcomes on overweight and obesity by comparing children and adults at various stages that were WIC participants as children with non-participants. Qualitative studies may be helpful in identifying issues regarding diet habits in order to implement change. In order to provide culturally sensitive interventions, it is helpful to gather information from the target group. Focus groups provide discussion and sharing that may be beneficial, adding new knowledge, information and direction to address the many facets of obesity.

Pender's Health Promotion Model includes additional concepts that were not included in this study, such as perceived benefits, perceived barriers, perceived self-efficacy, situational influences, and commitment to a plan of action. Including these measures in future studies may provide additional insight and findings. This knowledge
may be beneficial in understanding internal and external forces that determine behavior and lead to effective strategies for adopting and adhering to health promoting behaviors. Future studies could also include a larger sample size with more diversity in socioeconomic status.

Summary

The purpose of this study was to determine the influence of a prenatal infant nutrition education offering on: (a) maternal attitudes, (b) initiation of breastfeeding, (c) introduction of solid foods, and (d) child weight-for-length percentiles at 12, 18, and 24 months of age. One of the main goals of this educational offering was to educate mothers on recommended infant feeding practices prior to the birth of their child. Leininger’s Sunrise Enabler depicts educational factors as an influencer of practices related to health (Leininger & McFarland, 2006). Health care professionals have been identified by mothers as influential in mothers’ decisions related to infant feeding (McInnes et al., 2013). An infant nutrition education offering was developed by two registered nurses in order to address guidelines and misconceptions related to infant feeding practices. Providing culturally sensitive education increases knowledge and clarifies misconceptions, empowering mothers to make informed decisions related to infant nutrition; however, in this study, providing education was not enough to show significant differences between the two groups. The health outcome of interest was the modification of cultural practices resulting from education, such that adherence to recommended infant nutrition guidelines becomes a culturally congruent practice. The infant nutrition education session and the pamphlets provided did not provide sufficient knowledge to show differences related to infant feeding practices between the two groups. Based on the hypotheses and the results obtained from analysis, it was concluded that the infant nutrition education may not have been adequate and did not produce the proposed effects.

The current state of obesity is the result of nearly three decades of social change that has affected nearly every aspect of lives including home, school and work environments. The consequences affect diet, activity level, health and home life. And, while there are some encouraging signs of stabilization in numbers, efforts must be continued to address overweight and obesity for all age groups, including infancy. This
requires continued awareness and knowledge of cultural influences that may have an impact on health at all stages of development and providing assistive, supportive information to enable mothers to repattern/restructure feeding practices for better health outcomes.
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review of measures assessing mothers’ knowledge, attitudes, confidence and


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APPENDIX A

NUTRITION EDUCATION PROGRAM GUIDELINES

AND

MATERIALS
Presentation Guidelines for Healthy Mom

I. Questionnaire
   A. Supplies: questionnaire, pen
   B. Includes age of woman, number of children, previous experience breastfeeding or bottle feeding, and plans for feeding baby.

II. Introduction of newborn nutritional needs.
   A. Supplies: Chart, belly balls
   B. Discuss size of newborn stomach and the nutritional needs of the rapid growth in the first six months.
   C. Educate on when to begin solid foods (4 months). Emphasis problems that can be encountered when starting solid foods too soon. Discourage adding cereal to bottle or using infant feeders.
   D. Cultural aspect to address is that some cultures perceive a fat baby as a healthy baby; therefore, they are continuously offering a bottle (often when infant is not hungry) or introducing solid foods too early. This can lead to problems with the digestive system. It can also begin a lifestyle of overeating which can lead to childhood obesity. Normal growth patterns will be discussed later.

III. Discuss breastfeeding as choice for meeting infant nutritional needs.
   A. Supplies: Chart, pamphlets
   B. Discuss benefits of breastfeeding for infant, mom, family and community. Discuss frequency of feeding. Discuss how to know if infant is getting enough. Discuss need for mom to eat nutritional diet. Discuss need for supplements if breastfeeding continues for more than 4-6 months.
   C. Address cultural beliefs of breastfeeding: perceived negative effect on mother’s health, peer-pressure, social acceptance, restricts lifestyle, inconvenient, physical discomfort, father unable to participate in feeding, disbelief that breastfeeding is better for infant’s health than formula.
IV Formula as choice for meeting infant nutritional needs.

A. Supplies: Leaflets; bottles

B. Discuss infant formula nutrition
   i. Recommended substitute for breastfeeding during first year of life. No cow’s milk, soy beverages, goat’s milk, or low-iron formulas during 1st year
   ii. Specialized formulas available for those experiencing intolerance

C. Discuss appropriate amounts to avoid overfeeding.
   i. 1st week of life: 2 ounces every 2-3 hours
   ii. 1mo – 4 mo: average 20 ounces per day
   iii. 4 mo – 6 mo: average 31 ounces per day

D. Discuss cues of satiety: turning away, fussing, falling asleep, slowing pace of sucking, spitting up, spitting out bottle, stop sucking, etc.

V Discuss ways to soothe fussy infant without giving a bottle when hunger is not the issue.

A. Discuss cuddling, rocking/swinging, pacifier, play (be sure your baby does not stay in a carrier too much), repositioning, diaper changes, bath, massage, burping, etc.

B. Discuss cues of hunger: rooting, sucking, hand movement, and crying.

C. Discuss problems of overfeeding: irritability, spitting up, rapid weight gain which can lead to a life-long problem with obesity.

VI. Classes held at local hospitals discussing caring for infants

A. Informational sheets from local hospitals

B. Discuss WIC program

VII. Normal growth patterns for infants

A. Healthy Starts, Healthy Futures Pamphlets

B. Explain: at 4-6 months of age infants double birth weight and by 1 year of age infants triple birth weight
C. Discuss exclusive breastfeeding and avoidance of overfeeding with bottle to keep growth adequate not excessive

D. Culture Aspect: If someone tries to “fatten up” your baby tell them that a baby is healthier when she is not too fat or too thin. A fat baby is not necessarily a healthy baby. Culture definitely influences infant nutrition, but you can still control the amount your infant is fed and the age solid foods are introduced.

VIII. Provide brief overview, allow for questions, comments.

A. Ask for participation and gather contact information for when baby arrives.

B. Explain that if breastfeeding is established, a portable breast pump will be supplied and if formula will be used, a set of bottles will be provided.
Points to Remember...

- 4 months of age: look for double birth weight and by 1 year of age they triple their birth weight.
- A fat baby is not necessarily a healthy baby. You can still follow your child's practices for feeding your baby while controlling the amount he or she eats.
- Overfeeding can cause your child to gain more weight than necessary with extra lead to being overweight throughout the childhood years.
- Childhood overfeeding can lead to many different health consequences starting in childhood and continuing into adulthood. Studies have shown a direct link of obesity in many life-threatening health problems, including diabetes, asthma, cancer, and respiratory disease.

How do you know when your baby is hungry?
- Turning, irritable, or has feed in the mouth
- Sucking
- Hand movements toward mouth
- Crying

How do you know when your baby is full?
- Turning head away from bottle
- Putting
- Pouting, rubbing
- Slowing pace of sucking
- Spitting up
- Spitting out bottle
- Stoppage of sucking

How do you soothe your baby without feeding him or her?
- Cuddling
- Rocking, swinging
- Pedialyte
- Play (be sure your baby does not stay in one position too much)
- Repositioning
- Diaper changes
- Bath
- Massage
- Singing

Breastfeeding: The best choice for your baby
- Bond is baby & mom in many ways
- Known to prevent childhood obesity

Formula feeding: Recommended substitute for breastfeeding
- You must be careful and follow guidelines for amounts to feed your baby
- If you feed your baby too much, it can lead to childhood obesity.

Solid foods: Should not be introduced until at least four months of age (unless directed by a physician)
- 4-6 months, Rice Cereal and by space
- 6 months, Green beans
- 7 months, Fries Foods
- 9-12 months, Finger & table foods

How do you know when your baby is ready for solid food?
- Turn head to one side
- Spitting up
- Rejection of bottle
- Limb movements toward mouth
- Crying

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Healthy Starts: Healthy Futures

The purpose of this project is to educate parents prior to delivery on infant nutrition needs. Proper nutrition in infancy plays a very important role in establishing the foundation of future health and wellness. The goals of the project are to:
- Educate parents about the health benefits of breastfeeding and the advantages of introducing solid foods at the appropriate age
- Train and educate parents about the importance of the role of the nurse in the health care setting

This project directly complies with the mission and priorities of Living Well Foundation, the funding source of this project.
Some women have concerns about breastfeeding their babies because they have heard inaccurate information about it. They may worry that their milk supply will be inadequate or that breastfeeding will be hard to learn, painful, or inconvenient. Once false ideas about breastfeeding are dispelled, women can make informed decisions based on the facts.

Discuss any concerns about breastfeeding with a lactation consultant or another healthcare professional. He or she can tell you the facts and answer any questions you may have about breastfeeding.

The information contained in this pamphlet is not intended to replace the advice of a healthcare professional.

1. Breastmilk helps your baby grow healthy and strong.

2. Breastmilk is just what your baby needs in just the right amounts.

3. Breastmilk changes to meet your growing baby’s needs.

4. Breastmilk is gentle to your baby’s stomach and easy to digest.

5. Breastfed babies are less likely to have diarrhea and vomiting.

6. Breastfed babies’ bowel movements usually have less odor.

7. Breastfed babies often have fewer ear infections and lower respiratory tract infections such as pneumonia.

8. Breastfeeding may help protect against sudden infant death syndrome (SIDS).

9. Breastfed babies may be less likely to develop allergies and less likely to become obese later in life.

10. Breastfeeding is a special experience that you can share with your baby.
Great reasons for you

1. Breastfeeding often makes weight loss easier and may help you return to your pre-pregnancy weight faster.

2. Breastfeeding can help your uterus return to its normal size more quickly.

3. Your breastmilk is always ready: no mixing, measuring, or heating; no sterilization or refrigeration; no cleanup.

4. Nighttime feedings are quicker and easier.

5. Breastfeeding saves money—there’s nothing to buy.

6. Breastfeeding may lower your risk of certain cancers and increase your bone strength.

7. Breastfeeding helps you feel close to your baby and is a warm and cozy time for both of you.

8. You are providing the best nutrition for your baby’s growing body.

9. You can read to an older child while you breastfeed your baby. It’s a great time for everyone to cuddle.

10. Breastfeeding is a special gift that only you can give your baby.
Breast milk is the best food for your baby.

It has everything your baby needs, in just the right amounts. It also helps keep your baby from getting sick.

Most experts recommend breastfeeding for at least the first year of your baby's life.

Formula from a store can't compare to breast milk. Formula is OK, but breast milk is much better.

Breastfeeding is also good for you.

Breastfeeding may help you:
- get back into shape
- get your uterus back to normal size
- reduce your risk of several kinds of cancer, including breast cancer
- share a special closeness with your baby.

Breastfeeding costs less than formula. And there are no bottles to prepare, clean, or carry. You can feed your baby any time, anywhere.

Most women can breastfeed!

If you have any questions, talk with a health-care provider or person trained to give advice about breastfeeding.

Please read:
Talk to your health-care provider! This folder is not a substitute for the advice of a qualified health-care provider. The photos in this folder are of models. The models have no relation to the issues presented. Some trademarks, including registered trademarks, in this folder are property of the respective trademark owners.
Breastfeeding is worth learning!

To begin:

- Get comfortable.
  - Hold your baby close, facing your breast.
  - This helps make sure your baby is in the right position to latch on to your breast.
  - Tickle your baby's lower lip with your nipple. Your baby's mouth will open. Make sure it opens as wide as a yawn.
  - Help your baby take the breast deeply into his or her mouth. The lower jaw should be away from the nipple with chin pressed against breast.

Once your baby is latched on:

- Let him or her feed for at least 10-20 minutes on each side.
- Change the breast you start with each time.
- Listen for gulping sounds to make sure your baby is swallowing milk, not air.

To stop feeding:

- Press down on your breast near baby's mouth.
- Slide a clean finger into baby's mouth. Gently remove baby from breast.
- Burp your baby with a gentle rub or pat to his or her back. Then offer the other breast.

Do not set a schedule. Breastfeed whenever your baby is hungry.

Breastfeeding may take some getting used to.

You may have some discomfort at first. Here’s what to do for:

- **Full breasts**
  - Breastfeed often. This can mean up to 10 or 12 times a day.

- **Cracked or sore nipples**
  - Make sure your baby takes your breasts properly when feeding.
  - Wash your breasts with warm water only. Soap may remove natural oils.
  - Coat your nipples with a little breast milk after each feeding. Let them air dry.

- **Clogged milk ducts**
  - You may find a small, tender lump in your breast. If so:
    - Breastfeed often.
    - Change your baby’s position.
    - Try warm showers.
    - Have your baby sit on your lap when feeding.
    - If the lump does not go away or if you have a fever, call your health-care provider.

Stay with it!

Any discomfort will soon pass.

Take good care of yourself!

Eat a healthy, balanced diet. Choose a variety of fruits, vegetables, and grains (at least half should be whole grains). Limit saturated fats, trans fats, cholesterol, sodium, and sugar. Make lean, low-fat, or nonfat choices when possible—for example, with meat and milk.

Drink lots of water. Try to drink a glass of water each time you nurse.

Balance rest and exercise. Sleep when your baby sleeps. Ask friends and family for help. Check with your health-care provider before starting to exercise.

Don't use illegal drugs. They can pass to your baby in your breast milk.

Avoid alcohol, caffeine, and tobacco. They are not healthy for you or your baby.

Check with your health-care provider before taking any prescription or over-the-counter medicines.

It's normal to have questions or worries about breastfeeding.

If you do, call:

- your health-care provider
- your local WIC program or local health department
- your hospital's labor and delivery department
- other mothers who have breastfed.

La Leche League® can also help. This group gives support to breastfeeding mothers. Visit www.lalecheg.org or call 1-800-525-3243.

Give your baby a healthy start with breastfeeding!
Preparation of Infant Formula

Breastmilk or iron-fortified infant formula is your baby’s most important food until the first birthday. It is all your baby needs until 6 months of age.

Mix infant formula carefully. Your baby’s health depends on it. Follow the directions on the can.

For concentrated formula, follow these steps:
- Wash and rinse the lid of the can.
- Shake the can well then open it.
- Mix equal amounts of concentrated formula and warm or cooled boiled water in a clean container. (Do not use hot water)
- Shake the formula or stir it well.
- Cover and refrigerate the formula, except what you are going to feed your baby right away.
- Use the formula within 48 hours (2 days).
- Throw away any formula that has been out of the refrigerator for over 1 hour.

For powered formula, mix each bottle when needed. Most formulas are made by adding 1 scoop of powdered formula to every 2 ounces of water. But read the label to make sure you are mixing it right.

Water for formula

For the first 3 months, boil the water in a clean pot or pan for 1 minute. Then let it cool before mixing it with concentrated or powered formula. Even bottled drinking water or spring/filtered water should be boiled because it is not sterile. Refrigerate the boiled water.

If you have old metal pipes, run the cold tap water for 2 minutes to clear the pipes before boiling it. If you have well water, please get the water tested to make sure it is safe, or buy bottled water. Contact your local parish health unit to find out more about water testing.

Tips on formula feeding

Wash bottles and nipples in hot, soapy water. Use a bottle brush. Rinse everything well with hot water. Use bottles that are easy to clean, not ones shaped like clowns or teddy bears.

Baby does not need formula to be very warm. You can take the chill out of a cold bottle by running hot tap water on it or let it sit in a pan or pot of hot water.

Do not use the microwave! The formula can get too hot and burn the baby’s mouth.

To check how warm the formula is, shake it and then sprinkle a little on your wrist. If it has gotten too warm, run the bottle under cold water and then check it again.

After you fill a regular baby bottle and screw the ring around the nipple, unscrew the ring a little. This lets some air in and makes sucking easier. This is not necessary if you use disposable liners.

Baby does not need to drink plain water unless the doctor says to give it.

Do not give anything but breastmilk or formula in the bottle. Other drinks should not be given to young babies.

How much to give baby?

Let your baby decide how much is enough. You can expect your newborn to take about 2 to 3 ounces every 2 or 3 hours. The amount each day can range from 16 to 36 ounces in 24 hours.

As baby gets bigger, he will go longer between feedings and take more at each feeding. Most babies take about 4 to 6 ounces of formula and feed 4 to 5 times a day by 4 months old.
Feed your baby can be a wonderful part of the day. Whether you have decided to bottle feed your baby or you need to supplement breastfeeding with bottle feeding, enjoy this time with your baby.

What you need:
- Nipples and bottles (5–7 of each)
- Bottle brushes
- Burp cloths

Talk to your healthcare professional about finding a formula (ready-to-feed, concentrated, or powdered) that provides the nutrition your baby needs.

Cleaning guidelines:
Supplies such as nipples and bottles can be sterilized by placing them in boiling water for 5–10 minutes.
- Use a dishwasher or warm soapy water to wash supplies after each use. Rinse well.

How to prepare formula:
- Always wash your hands.
- Check the expiration date.
- Wash the top of the can before opening it.
- Carefully follow the directions on the formula’s label.
- Ask your healthcare professional whether the water needs to be boiled before adding formula to it.
- Refrigerate mixed formula in bottles that will be used within 24 hours.
- Never use a microwave to warm formula.

Shake or swirl the bottle so that the formula and water are evenly mixed.

Helpful hints for feeding time:
Feed your baby when he seems hungry, about every 2–4 hours.
- Sit in a comfortable spot, and hold your baby so that her head is a little higher than her body.
- Tilt the bottle so that milk fills the nipple.
- Burp your baby after every 2–3 ounces (60–89 milliliters) of formula.
- If your baby does not finish the feeding within an hour, throw out that bottle’s leftovers.
- Never leave your baby unattended with a bottle, and do not prop the bottle to feed your baby.
- Talk with your baby’s healthcare professional for additional guidelines if you are using a bottle to give your baby breastmilk.
HEALTHY STARTS: HEALTHY FUTURES

Name: _______________________________________________

Age: ___________________ Due Date: _______________________

Race: White  African American  Asian  Hispanic  Other: ______

Number of Previous Pregnancies: _____Number of Living Children:_____

If this is not your first pregnancy:

Did you breastfeed your children? YES  NO

Did you bottle-feed your children? YES  NO

What type of feeding are you planning for this baby?  BREASTFEED  BOTTLE-FEED

Can we contact you after the birth of your child? YES  NO

If Yes, Please list 3 contact phone numbers:

1. _______________  2. _______________  3. ____________________
APPENDIX B

DEMOGRAPHIC AND INFANT FEEDING

INSTRUMENT
Demographic and Infant Feeding Instrument

Please answer the following questions by placing a check in the correct blank. Answer the questions based on the time period when you gave birth to your child that was born in Spring of 2009 through Fall of 2011. If you had more than one child born during this time period, please answer questions specific to one child.

1. Child’s Birthday (month, date, year) __________________________

2. How old were you when your child was born? _______

3. What is your race? African American _____ Caucasian _____
   Latino_____ Asian_____ Other _____

4. What was your level of education at the time of birth of this child?
   Less than 12 years____ High School_____ Some College_____ College Degree_____

5. What was your marital status at time of birth? Married _____ Other _____

6. When your baby was born, did you initiate/attempt breastfeeding? Yes ____ No __

7. If you breastfed for any length of time, how long did you breastfeed?
   Less than 1 month____ 4 – 6 months____ 
   2 – 4 months____ Beyond 6 months____

8. When did you begin feeding solid foods? This includes putting cereal in a bottle?
   Less than 1 month_____ 1 – 3 months____ 4 – 6 months____

9. Was this child your first child? Yes____ No____

   If not, how many children have you given birth to? ______

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APPENDIX C

IOWA INFANT FEEDING ATTITUDE SCALE
The Iowa Infant Feeding Attitude Scale

For each of the following statements, please indicate how much you agree or disagree by circling the number that most closely corresponds to your opinion (1 = strong disagreement [SD], 2 = disagreement [D], 3 = neutral [N], 4 = agreement [A], 5 = strong agreement [SA]). You may choose any number from 1 to 5.

<table>
<thead>
<tr>
<th>Statement</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The nutritional benefits of breast milk last only until the baby is weaned from breast milk.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Formula-feeding is more convenient than breast-feeding.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Breast-feeding increases mother-infant bonding.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Breast milk is lacking in iron.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Formula-fed babies are more likely to be overfed than are breast-fed babies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Formula-feeding is the better choice if a mother plans to work outside the home.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Mothers who formula-feed miss one of the great joys of motherhood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Women should not breast-feed in public places such as restaurants.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Babies fed breast milk are healthier than babies who are fed formula.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Breast-fed babies are more likely to be overfed than formula-fed babies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Fathers feel left out if a mother breast-feeds.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. Breast milk is the ideal food for babies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. Breast milk is more easily digested than formula.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. Formula is as healthy for an infant as breast milk.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. Breast-feeding is more convenient than formula feeding.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. Breast milk is less expensive than formula.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. A mother who occasionally drinks alcohol should not breast-feed her baby.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Hello,

My name is Connie Lewis. I am currently pursuing my PhD in Nursing and would like to use the Iowa Infant Feeding Attitude Scale for my dissertation work. I would like to request a copy of the IIFAS along with any information available regarding the tool. I understand that if I use the tool, a summary of my findings is requested. I will be glad to comply with this request. My mailing address is:

Connie Lewis  
Kitty Degree School of Nursing  
University of Louisiana at Monroe  
Monroe, LA

Thanks,
Connie Lewis  
Assistant Professor  
University of Louisiana at Monroe  
School of Nursing

Delamora, Arlene [SOE] < >
9/19/2013Connie Lewis  
UMMC

I have attached a copy of our paper that describes the psychometric properties of the scale and a copy of the scale can be found on the last page. You have our permission to use the scale in your research, let me know if you have any questions about the paper or the scale.

Arlene de la Mora, Ph.D.  
Research Scientist  
Research in Studies in Education (RISE)  
School of Education  
Iowa State University  
Ames, IA

Dr. Delamora,

Thank you for sending the article on the reliability and validity of the Iowa Infant Feeding Attitude Scale and for giving me permission to use the scale. I really appreciate your prompt reply to my request.

Thanks,
Connie Lewis
APPENDIX E

PERMISSION CORRESPONDENCE
On Mon, Jun 9, 2014 at 7:57 PM, Connie Lewis wrote:

Dr. Pender,

I am currently pursuing my PhD at University of Mississippi Medical Center in Jackson, MS. My focus of interest is childhood obesity. More specifically, the purpose of my research is to see if there is a difference in maternal attitudes, feeding practices, and weight-for-length percentiles in mother/child dyads in which the mothers received education and mother/child dyads in which the mothers did not receive education. I chose the Health Promotion Model as a theoretical framework for my research. I would like to personally ask for permission to include the Health Promotion Model in my dissertation. Thank you for your consideration.

Connie Lewis
Associate Professor
University of Louisiana at Monroe
School of Nursing

Nola Pender
6/10/2014
Connie Lewis PhD research

Dear Connie:

You have my permission to include the Health Promotion Model in your Dissertation. Here is an attachment with two websites that may be of use to you. Good luck with your academic work.

Wishing you good health,

Nola Pender
Re: Forum Approval Notification

McFarland, Marilyn

Sent: Tuesday, July 15, 2014 6:03 AM
To: Dr. John S Vanderlaan
Cc: Connie R. Lewis

Connie, Just send me email with request. I can give you a release. Give me title. I am interested in hearing about your project. Marilyn M

Marilyn McFarland, PhD, RN, FNP-BC, CTN-A
Professor, Department of Nursing
School of Health Professions and Studies

On Jul 14, 2014, at 8:04 PM, "Dr. John S Vanderlaan" wrote:

Begin forwarded message:

From: 
Subject: Forum Approval Notification
Date: July 14, 2014 at 12:34:37 PM EDT
To: 

The following information is waiting for approval in forum Dr. Madeleine Leininger:

Name: Connie Lewis
Email: 
Subject: Permission to use Sunrise Enabler in dissertation
Country: USA

Message:
I would like to use Leininger's Sunrise Enabler in my dissertation. I am unsure how to get permission and who to contact for this copyrighted material. Any information would be greatly appreciated.

Connie Lewis
You have my permission. I would value hearing about your study when finished. Thank you,
Marilyn McFarland

Marilyn McFarland, PhD, RN, FNP-BC, CTN-A
Professor, Department of Nursing
School of Health Professions and Studies
The University of Michigan-Flint

Connie Lewis, RN, BSN
Associate Professor
Kitty Degree School of Nursing
University of Louisiana at Monroe

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MATERNAL ATTITUDES, FEEDING PRACTICES AND CHILD WEIGHT-FOR-LENGTH PERCENTILES: MATERNAL PARTICIPATION VS. NON-PARTICIPATION IN A PRENATAL INFANT NUTRITION EDUCATION SESSION

Connie S. Lewis, Ph.D.
School of Graduate Studies in the Health Sciences
University of Mississippi Medical Center
September 2016

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Committee Chair